ICBS – Student Investment Fund
Quantitative Strategies

Alternative Risk Premia

2022-2023

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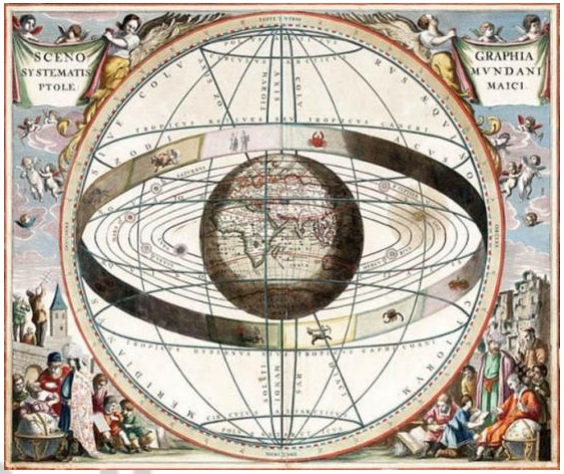
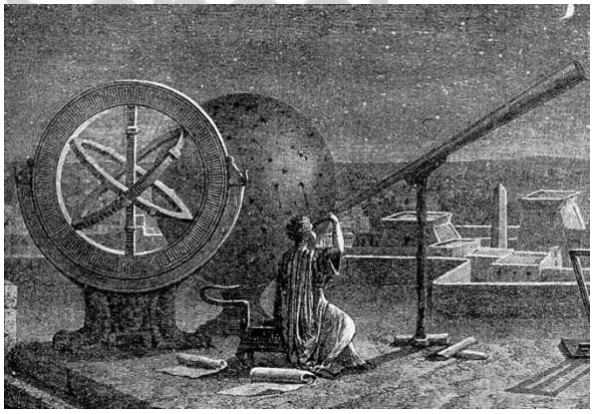
Introduction



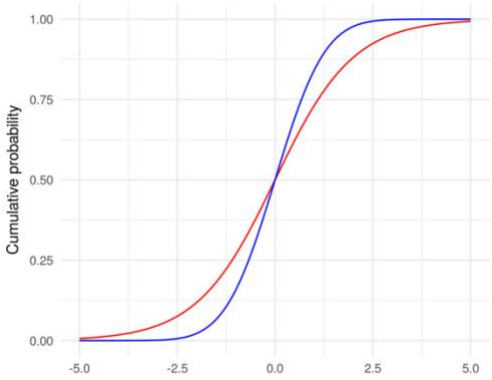
Investors, especially, value investors, have vigorously drawn parallels to Astrology. However, advance civilization, such as the Mesopotamians, Egyptians, and the Ancient Greek's a huge sense of meaning and inspiration from looking up at the stars. To commemorate, special occasions in one's life, they would look up to the sky, and mark the position of celestial bodies. Eventually, human curiosity led to corelation's being drawn between these stars and life events. As rudimentary as, the common men were back in the day, a select few turned their attention, to corelating the celestial bodies, to physical occurrences, leading man to realise, just how inconsequential his existence is on this planet, in the grander scheme of the universe.



The larger point here being that, if one looks at data close enough and in the right context, there is plentiful information on what is and what is not. Gone are the days of little information and sparse market liquidity, where value investors likening of technical analysis to astrology held some truth. Much like the ancient Greeks turned their telescopes to the sky, we intend to turn the modern computer loose on pricing information. Using the inferences drawn from these tools, one can begin to look at pricing information in a context that was previously not possible. Hopefully, eventually, the value investors begin calling Technical analysis the astronomy of finance world!

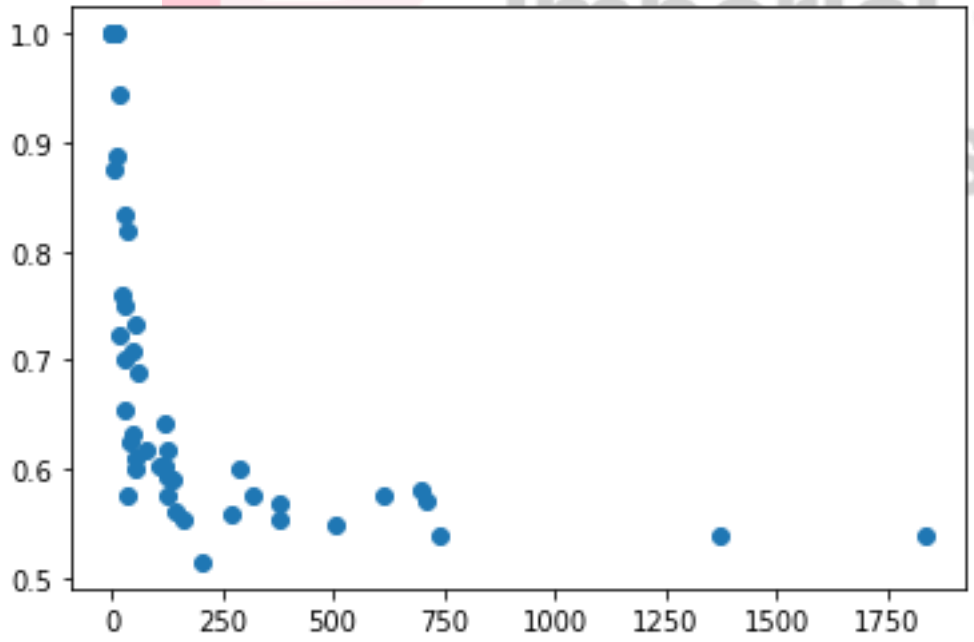
Strategy Overview - Basics

1. Identify valid indicators of pricing action.
    a. Process has been intuitive and manual,
    b. Planning to make it systemic via PCA and feature engineering
2. Classify data by moments (various combination of technical indicators).
3. Deep-dive into these occurrences. See how these cluster behave.
4. Pick regressors, and train logistic model group wise and gain signal predictions
5. Back-test



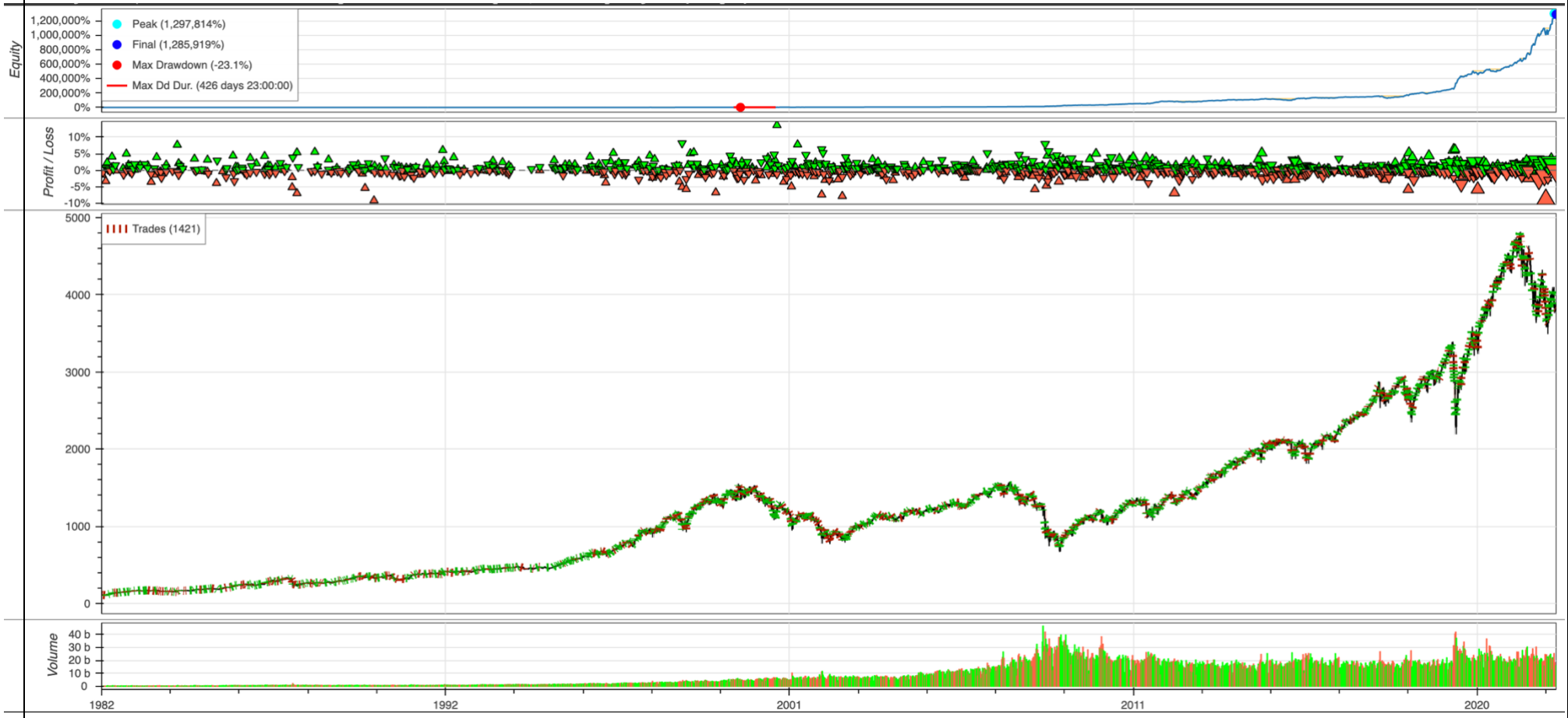
Strategy – Insights

- Grouping :
  - As number of observation increase in a group, accuracy falls
  - Future Works:
    - Price weighted accuracy check
    - Better grouping techniques



	name	acc	num
0	(-1, -1, 0, 1, 1, 0)	0.732143	56
1	(-1, -1, 0, 1, 1, 1)	0.708333	48
2	(-1, -1, 1, 1, 0, 0)	1.000000	6
3	(-1, -1, 1, 1, 0, 1)	1.000000	6
4	(-1, -1, 1, 1, 1, 0)	0.600000	55
5	(-1, -1, 1, 1, 1, 1)	0.611111	54
6	(-1, 0, 0, 1, 0, 0)	1.000000	3
7	(-1, 0, 0, 1, 0, 1)	1.000000	8
8	(-1, 0, 0, 1, 1, 0)	0.574803	127
9	(-1, 0, 0, 1, 1, 1)	0.560284	141
10	(-1, 0, 1, 1, 0, 0)	0.875000	8
11	(-1, 0, 1, 1, 0, 1)	1.000000	9
12	(-1, 0, 1, 1, 1, 0)	0.700000	30
13	(-1, 0, 1, 1, 1, 1)	0.833333	30
14	(0, -1, 0, 1, 0, 0)	1.000000	4
15	(0, -1, 0, 1, 0, 1)	1.000000	1
16	(0, -1, 0, 1, 1, 0)	0.589928	139
17	(0, -1, 0, 1, 1, 1)	0.818182	33
18	(0, -1, 1, 1, 0, 0)	0.575758	33
19	(0, -1, 1, 1, 0, 1)	1.000000	7
20	(0, -1, 1, 1, 1, 0)	0.559259	270
21	(0, -1, 1, 1, 1, 1)	0.601852	108
22	(0, 0, 0, 0, 0, 0)	0.539137	1373
23	(0, 0, 0, 0, 0, 1)	0.575856	613
24	(0, 0, 0, 0, 1, 0)	0.593496	123
25	(0, 0, 0, 0, 1, 1)	0.617886	123
26	(0, 0, 0, 1, 0, 0)	0.549495	505
27	(0, 0, 0, 1, 0, 1)	0.601375	291
28	(0, 0, 0, 1, 1, 0)	0.538420	1835
29	(0, 0, 0, 1, 1, 1)	0.538566	739
30	(0, 0, 1, 0, 0, 0)	0.581766	697
31	(0, 0, 1, 0, 0, 1)	0.575949	316
32	(0, 0, 1, 0, 1, 0)	0.601695	118
33	(0, 0, 1, 0, 1, 1)	0.618421	76
34	(0, 0, 1, 1, 0, 0)	0.554054	377
35	(0, 0, 1, 1, 0, 1)	0.514706	204
36	(0, 0, 1, 1, 1, 0)	0.570827	713
37	(0, 0, 1, 1, 1, 1)	0.569149	376
38	(0, 1, 0, 0, 0, 0)	0.944444	20
39	(0, 1, 0, 0, 0, 1)	1.000000	4
40	(0, 1, 1, 0, 0, 0)	0.760000	25
41	(0, 1, 1, 0, 0, 1)	0.888889	9
42	(1, 0, 0, 0, 0, 0)	0.641667	122
43	(1, 0, 0, 0, 0, 1)	0.553459	159

Strategy Results : S & P 500 with 0.2% Trading Commission



- Able to trade prolonged market downturns
- Able to catch higher % return trades with more accuracy than lower % returns, hence a 55% win rate is able to yield gains
- Unable to recognise sudden market swings that go against the pricing sentiment with high accuracy
- Unable to weigh trades efficiently, as of now. Low percentage trades needs to be weighed with less capital allocation

Strategy Results : S & P 500 with 0.02% Trading Commission

Start	1982-06-23 00:00...
End	2023-01-06 00:00...
Duration	14807 days 01:00:00
Exposure Time [%]	99.980434
Equity Final [$]	1280736867.157485
Equity Peak [$]	1305685433.931912
Return [%]	1280636.867157
Buy & Hold Return [%]	3436.480933
Return (Ann.) [%]	26.258323
Volatility (Ann.) [%]	22.449921
Sharpe Ratio	1.16964
Sortino Ratio	2.254047
Calmar Ratio	1.135025
Max. Drawdown [%]	-23.13457
Avg. Drawdown [%]	-2.164473
Max. Drawdown Duration	400 days 00:00:00
Avg. Drawdown Duration	21 days 00:00:00
# Trades	2924
Win Rate [%]	60.225718
Best Trade [%]	18.465118
Worst Trade [%]	-9.358938
Avg. Trade [%]	0.324018
Max. Trade Duration	120 days 00:00:00
Avg. Trade Duration	6 days 00:00:00
Profit Factor	1.715729
Expectancy [%]	0.342385
SQN	4.987486
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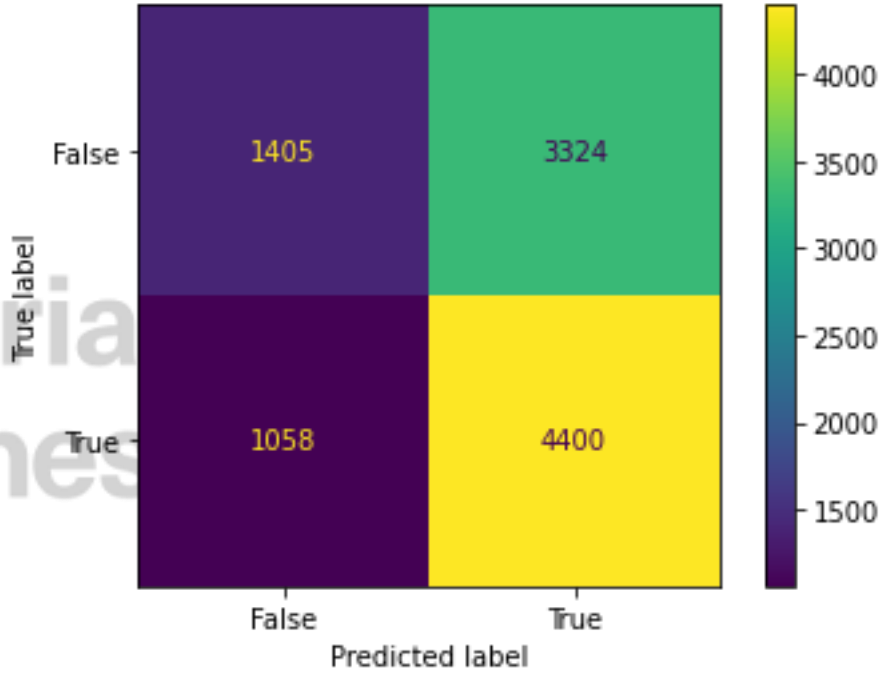

Strategy Results : Invesco DB Commodity Index Tracking Fund with 0.02 % commission

Strategy Results: Invesco DB Commodity Index Tracking Fund with 0.02 % commission

Start	2006-04-11 00:00...
End	2023-01-06 00:00...
Duration	6114 days 01:00:00
Exposure Time [%]	99.95255
Equity Final [$]	19480225.026357
Equity Peak [$]	19480225.026357
Return [%]	19380.225026
Buy & Hold Return [%]	4.665807
Return (Ann.) [%]	37.052435
Volatility (Ann.) [%]	27.703429
Sharpe Ratio	1.337467
Sortino Ratio	2.785252
Calmar Ratio	1.63495
Max. Drawdown [%]	-22.662729
Avg. Drawdown [%]	-2.98097
Max. Drawdown Duration	397 days 00:00:00
Avg. Drawdown Duration	22 days 00:00:00
# Trades	1481
Win Rate [%]	55.840648
Best Trade [%]	14.127734
Worst Trade [%]	-10.083773
Avg. Trade [%]	0.356618
Max. Trade Duration	49 days 00:00:00
Avg. Trade Duration	5 days 00:00:00
Profit Factor	1.673221
Expectancy [%]	0.380461
SQN	4.180109
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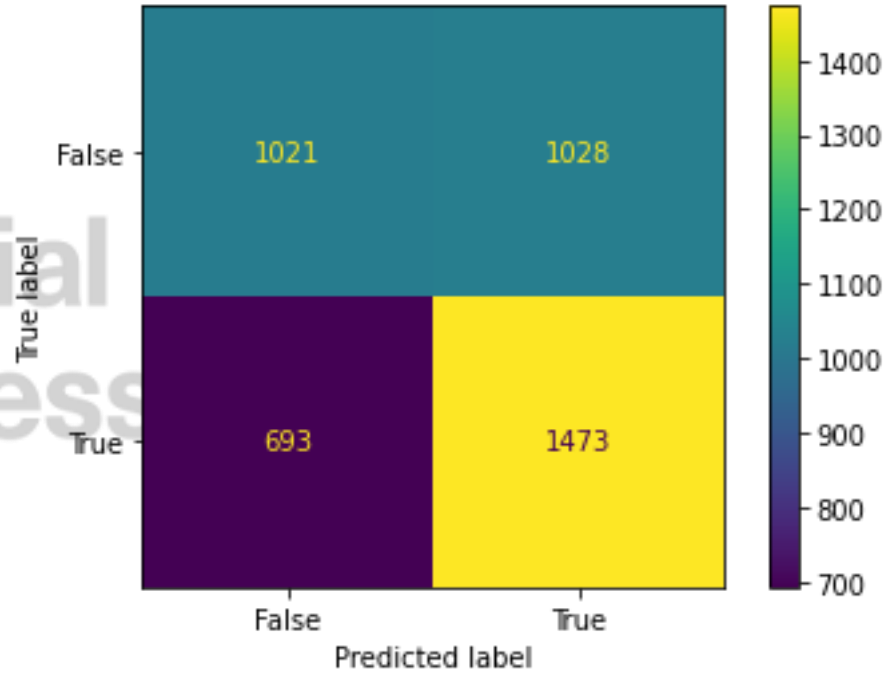

Model Validation

- Time series cross validation :
  - Beta's need to converge
  - Variance of beta must converge too
- Rolling Window Test:
  - Conducting testing on rolling windows to see if there is some time series component to the data that needs to be factored in

Further Developments

- Trade Weighing,
  - Kelly Criterion using the Logistic model probabilities
  - Leveraged ETF's on high probability trades
- Sharpe Raito improvement
  - Variable Logistic Regression threshold for prediction
- Stop-loss integration to mitigate downside
- Trade cost reduction:
  - Strategy Optimisation
    - Exit Criterion & Time Horizon extension
    - Rollover of strategy
  - Exploring to Mid-frequency applications (weekly)
- ***Model Validation needs special attention & robust time series testing !***

$$f^* = \frac{bp - q}{b}$$

- f = the fraction of the bankroll to bet
- b = the decimal odds − 1
- p = the probability of winning
- q = the probability of losing, which is 1 − p