# **Algorithm Trading Project**

Python was used in Jupyter Notebook to do these programming for algorithm trading. I have tried to create a replica of S&P 500, but instead of 500 stocks I chose top 150 stocks and created a portfolio using Efficient Market Frontier and Shrape Ratio optimization by the use of various financial metrics and indicators that present a niche view of a stock's financial health. Various libraries were used like pandas, numpy, statsmodels.api etc.

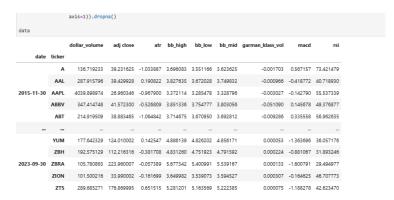
#### **Downloaded S&P Data:**



#### **Calculated Technical Indicators:**



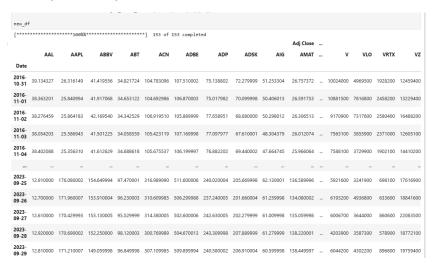
#### Aggregate to monthly level and filter top 150 most liquid stocks for each month:



### Calculate Monthly Returns for different time horizons as features:

		adj close	atr	bb_high	bb_low	bb_mid	garman_klass_vol	macd	rsi	return_1m	return_2m	return_3m	return_6m	return_9m
date	ticker													
2017- 10-31	AAL	45.534168	1.011062	3.994389	3.849110	3.921750	-0.000363	-0.018697	41.051784	-0.014108	0.022981	-0.023860	0.016495	0.007008
	AAPL	39.870972	-0.906642	3.692324	3.598569	3.645447	-0.000892	-0.039275	69.196833	0.096808	0.015250	0.044955	0.028875	0.038941
	ABBV	69.460686	0.375557	4.317799	4.225041	4.271420	-0.027715	0.473814	55.247862	0.022728	0.098590	0.091379	0.056495	0.047273
	ABT	49.240391	-1.040044	3.954699	3.907545	3.931122	-0.003906	0.276133	53.844941	0.021276	0.034308	0.034801	0.038672	0.031320
	ACN	130.915802	-0.986514	4.893594	4.814228	4.853911	-0.003066	0.352342	69.365078	0.064180	0.048454	0.037202	0.028692	0.027398
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2023- 09-30	VRTX	351.690002	0.029799	5.879295	5.838959	5.859127	0.000037	0.027907	52.406728	0.009617	-0.000923	-0.000208	0.018495	0.022140
	VZ	32.990002	-1.078816	3.584371	3.519855	3.552113	0.000056	-0.350385	42.222486	-0.056890	-0.016122	-0.033458	-0.021495	-0.014100
	WFC	40.650002	-0.558742	3.798900	3.718132	3.758516	0.000234	-0.282325	40.920273	-0.015500	-0.057917	-0.013554	0.016712	0.000702
	WMT	162.500000	-0.196379	5.116986	5.081613	5.099300	0.000024	0.399459	54.722508	-0.000676	0.010014	0.012354	0.017574	0.016553
	XOM	116.410004	0.601335	4.793504	4.713293	4.753399	0.000045	1.400623	59.440192	0.046947	0.046139	0.030496	0.012838	0.008747

## Define portfolio optimization function



### Visualized Portfolio returns and compared to SP500 returns:

