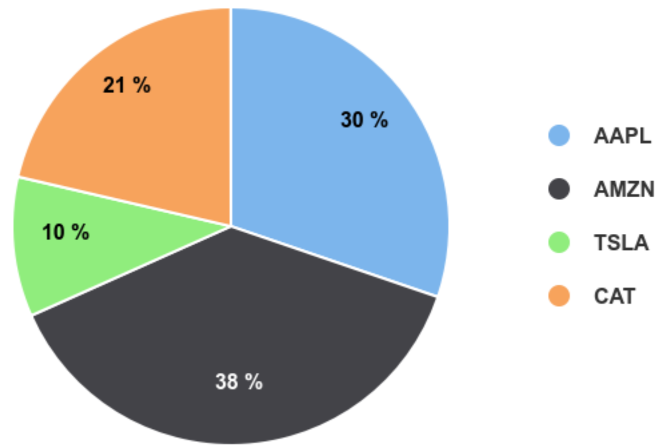
Report Parameters

Model	Historical Returns
Start Date	01/01/2014
End Date	12/31/2017
Initial Balance	$10,000
Optimization Goal	Maximize Sharpe Ratio
Rebalancing	Rebalance monthly

Maximum Sharpe Ratio

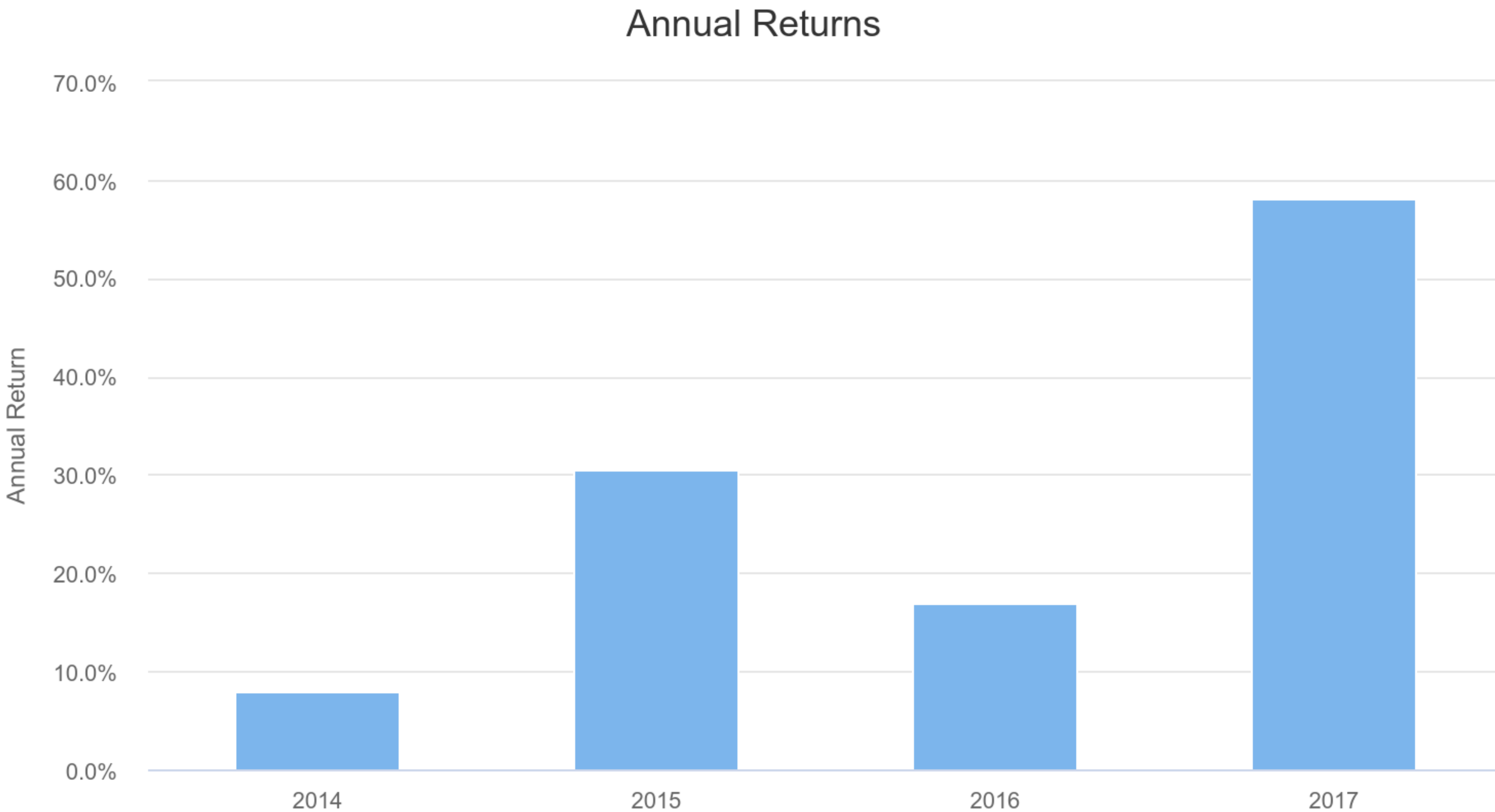
Ticker	Name	Allocation	Min. Weight	Max. Weight
AAPL	Apple Inc.	30.23%	0.00%	100.00%
AMZN	Amazon.com, Inc.	38.09%	0.00%	100.00%
TSLA	Tesla Inc	10.31%	0.00%	100.00%
CAT	Caterpillar, Inc.	21.37%	0.00%	100.00%



Portfolio Performance

Metric	Maximum Sharpe Ratio
Start Balance	$10,000
End Balance	$26,005
CAGR	26.99%
Expected Return	28.95%
Stdev	17.99%
Best Year	58.15%
Worst Year	7.85%
Max. Drawdown	-14.48%
Sharpe Ratio (ex-ante)	1.60
Sharpe Ratio (ex-post)	1.42
Sortino Ratio	2.79
US Stock Market Correlation	0.74


Portfolio Growth
$30,000
$25,000
$20,000
$15,000
$10,000
$5,000
$0
Portfolio Balance ($)
Jan 2014
Jul 2014
Jan 2015
Jul 2015
Jan 2016
Jul 2016
Jan 2017
Jul 2017
Jan 2018
Maximum Sharpe Ratio


Annual Returns
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Annual Return
2014
2015
2016
2017

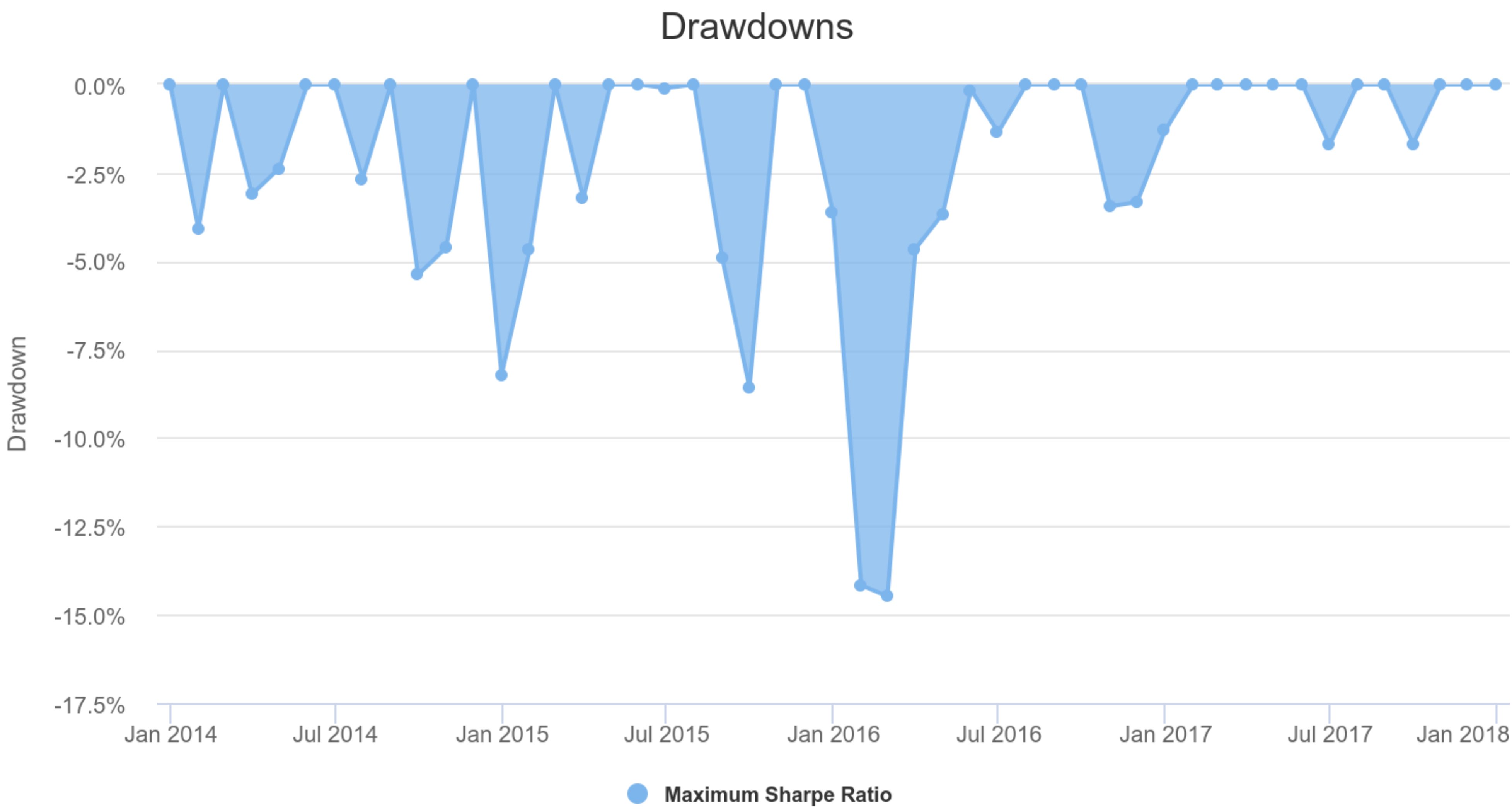
Risk and Return Metrics

Metric	Maximum Sharpe Ratio
Arithmetic Mean (monthly)	2.14%
Arithmetic Mean (annualized)	28.95%
Geometric Mean (monthly)	2.01%
Geometric Mean (annualized)	26.99%
Volatility (monthly)	5.19%
Volatility (annualized)	17.99%
Downside Deviation (monthly)	2.63%
Max. Drawdown	-14.48%
US Market Correlation	0.74
Beta (*)	1.36
Alpha (annualized)	10.42%
R Squared	54.60%
Sharpe Ratio	1.42
Sortino Ratio	2.79
Treynor Ratio (%)	18.73
Calmar Ratio	2.35
Active Return	15.66%
Tracking Error	12.62%
Information Ratio	1.24
Skewness	-0.21
Excess Kurtosis	-0.31
Historical Value-at-Risk (5%)	-6.94%
Analytical Value-at-Risk (5%)	-6.31%
Conditional Value-at-Risk (5%)	-9.57%
Upside Capture Ratio (%)	210.02
Downside Capture Ratio (%)	147.93
Safe Withdrawal Rate	37.14%
Perpetual Withdrawal Rate	20.14%
Positive Periods	32 out of 48 (66.67%)
Gain/Loss Ratio	1.38

(*) US stock market is used as the benchmark for calculations. Value-at-risk metrics are based on monthly values.

Maximum Sharpe Ratio Returns

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Inflation	Balance
2014	-4.09%	6.40%	-3.11%	0.76%	2.79%	5.28%	-2.66%	9.42%	-5.38%	0.81%	7.29%	-8.21%	7.85%	0.76%	$10,785
2015	3.86%	6.57%	-3.23%	9.32%	2.79%	-0.10%	6.50%	-4.91%	-3.86%	12.04%	3.26%	-3.64%	30.49%	0.73%	$14,073
2016	-10.93%	-0.36%	11.50%	1.04%	3.64%	-1.20%	8.30%	0.02%	6.75%	-3.45%	0.12%	2.11%	16.84%	2.07%	$16,443
2017	7.88%	5.18%	3.65%	5.35%	6.46%	-1.71%	2.14%	4.66%	-1.68%	10.38%	3.21%	1.87%	58.15%	2.11%	$26,005



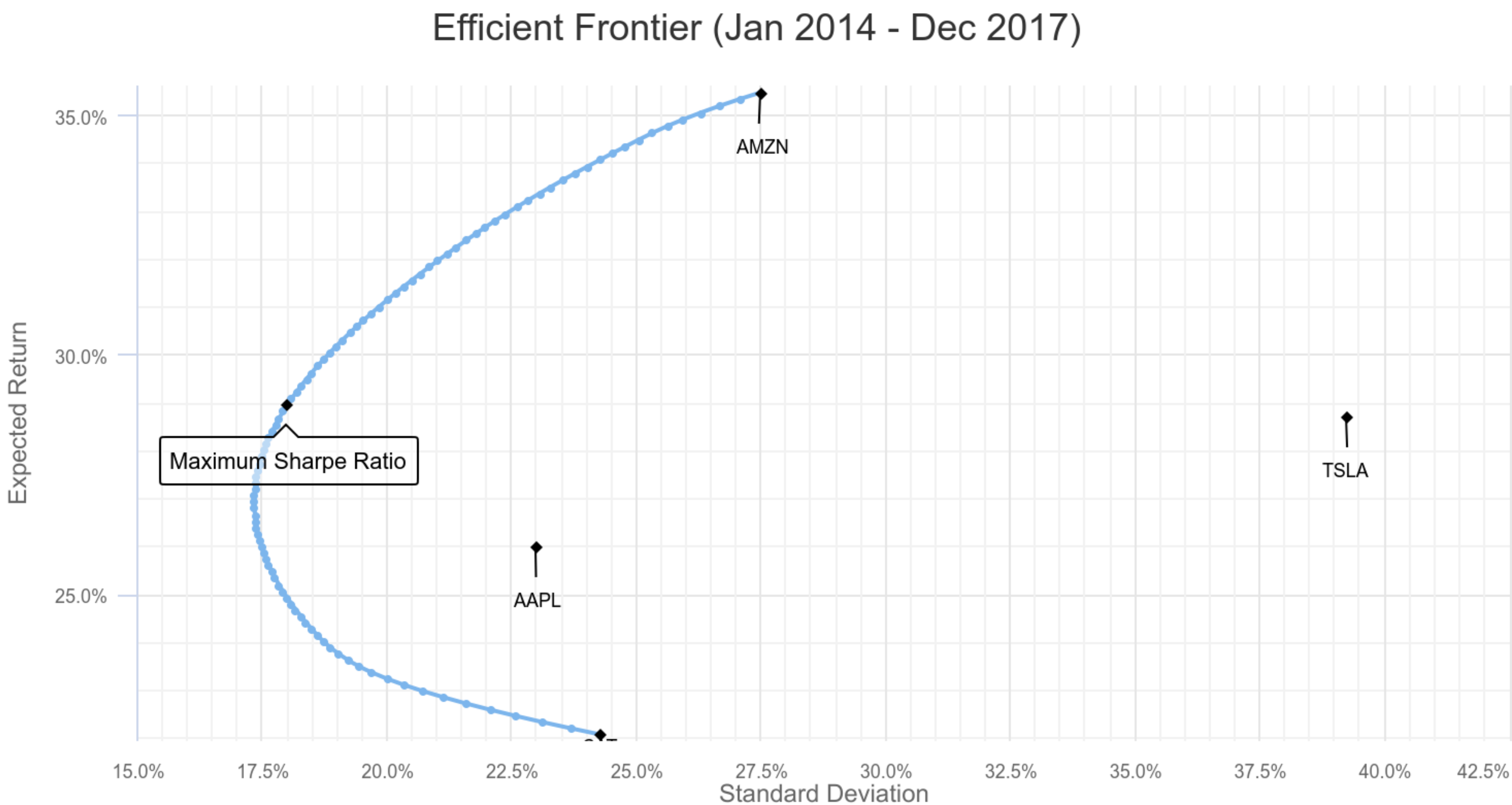
Drawdowns for Maximum Sharpe Ratio (worst 10)

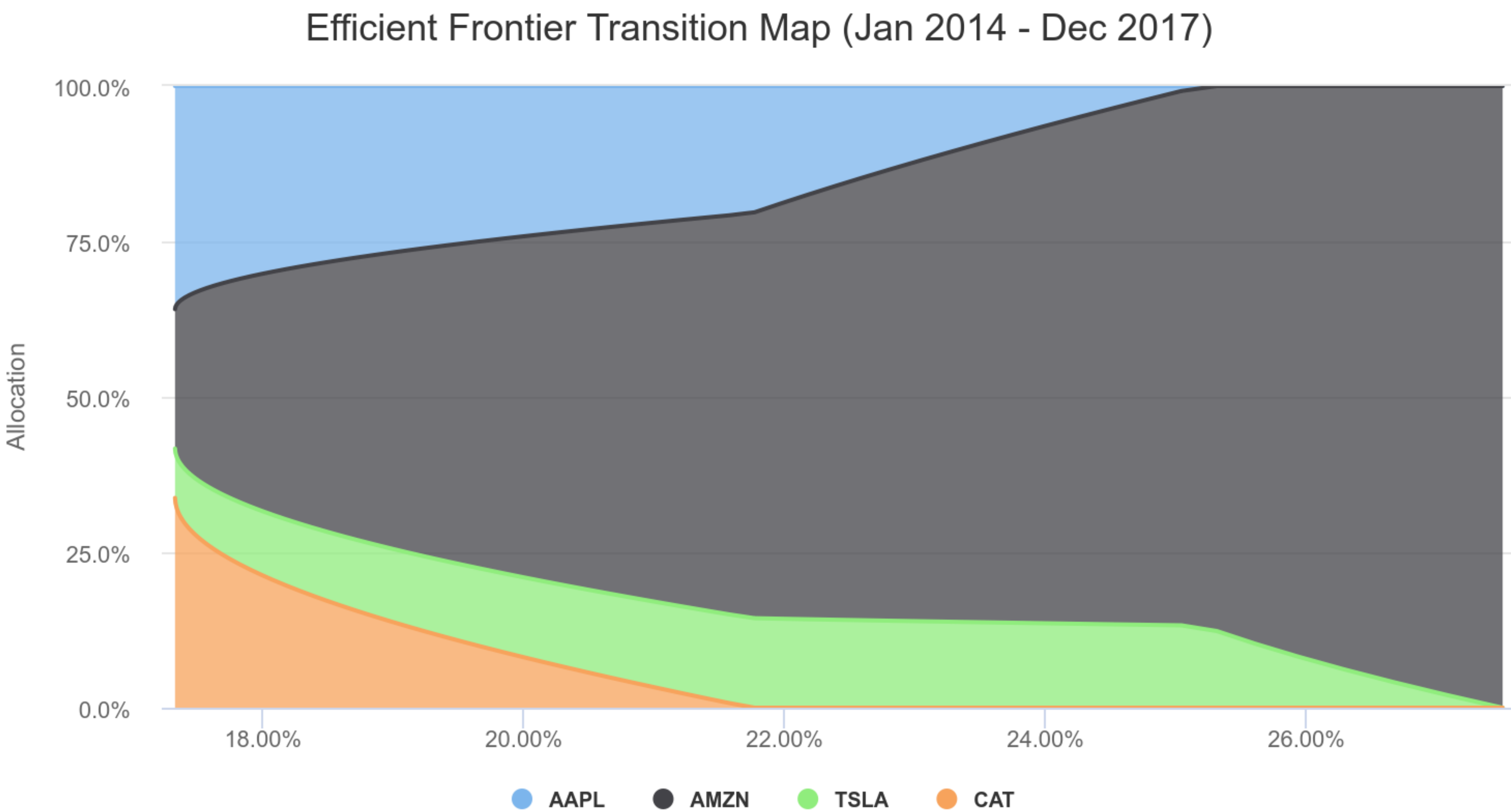
Rank	Start	End	Length	Recovery By	Recovery Time	Underwater Period	Drawdown
1	Dec 2015	Feb 2016	3 months	Jul 2016	5 months	8 months	-14.48%
2	Aug 2015	Sep 2015	2 months	Oct 2015	1 month	3 months	-8.58%
3	Dec 2014	Dec 2014	1 month	Feb 2015	2 months	3 months	-8.21%
4	Sep 2014	Sep 2014	1 month	Nov 2014	2 months	3 months	-5.38%
5	Jan 2014	Jan 2014	1 month	Feb 2014	1 month	2 months	-4.09%
6	Oct 2016	Oct 2016	1 month	Jan 2017	3 months	4 months	-3.45%
7	Mar 2015	Mar 2015	1 month	Apr 2015	1 month	2 months	-3.23%
8	Mar 2014	Mar 2014	1 month	May 2014	2 months	3 months	-3.11%
9	Jul 2014	Jul 2014	1 month	Aug 2014	1 month	2 months	-2.66%
10	Jun 2017	Jun 2017	1 month	Jul 2017	1 month	2 months	-1.71%

Efficient Frontier Assets

#	Asset	CAGR	Expected Return (*)	Standard Deviation	Sharpe Ratio (*)	Min. Weight	Max. Weight
1	Apple Inc. (AAPL)	22.85%	26.01%	22.98%	1.121	0.00%	100.00%
2	Amazon.com, Inc. (AMZN)	30.86%	35.48%	27.50%	1.281	0.00%	100.00%
3	Tesla Inc (TSLA)	19.94%	28.73%	39.22%	0.726	0.00%	100.00%
4	Caterpillar, Inc. (CAT)	18.66%	22.07%	24.27%	0.899	0.00%	100.00%

(*) Expected return is annualized from historical monthly mean return. Ex ante Sharpe Ratio calculated using historical 1-month treasury bill returns as the risk-free rate (0.25% annualized).


Efficient Frontier (Jan 2014 - Dec 2017)
Expected Return
35.0%
30.0%
25.0%
Standard Deviation
15.0%
17.5%
20.0%
22.5%
25.0%
27.5%
30.0%
32.5%
35.0%
37.5%
40.0%
42.5%
AMZN
Maximum Sharpe Ratio
TSLA
AAPL


Efficient Frontier Transition Map (Jan 2014 - Dec 2017)
100.0%
75.0%
50.0%
25.0%
0.0%
Allocation
18.00%
20.00%
22.00%
24.00%
26.00%
AAPL
AMZN
TSLA
CAT

Efficient Frontier Points

#	AAPL	AMZN	TSLA	CAT	Expected Return (*)	Standard Deviation (*)	Sharpe Ratio (*)
1	0.00%	0.00%	0.00%	100.00%	22.07%	24.27%	0.899
2	3.32%	0.00%	0.00%	96.68%	22.20%	23.68%	0.927
3	6.64%	0.00%	0.00%	93.36%	22.33%	23.12%	0.955
4	9.97%	0.00%	0.00%	90.03%	22.46%	22.58%	0.983
5	13.29%	0.00%	0.00%	86.71%	22.59%	22.06%	1.012
6	16.61%	0.00%	0.00%	83.39%	22.71%	21.58%	1.041
7	19.93%	0.00%	0.00%	80.07%	22.84%	21.13%	1.069
8	23.26%	0.00%	0.00%	76.74%	22.97%	20.71%	1.097
9	26.58%	0.00%	0.00%	73.42%	23.10%	20.33%	1.124
10	29.90%	0.00%	0.00%	70.10%	23.23%	19.98%	1.150
11	33.22%	0.00%	0.00%	66.78%	23.36%	19.68%	1.174
12	36.54%	0.00%	0.00%	63.46%	23.50%	19.42%	1.197
13	39.60%	0.00%	0.16%	60.24%	23.63%	19.20%	1.217
14	40.85%	0.00%	1.40%	57.75%	23.76%	19.01%	1.236
15	42.10%	0.00%	2.64%	55.26%	23.89%	18.85%	1.254
16	43.34%	0.00%	3.88%	52.78%	24.02%	18.70%	1.271
17	43.83%	0.49%	4.61%	51.07%	24.15%	18.58%	1.286
18	43.45%	1.54%	4.77%	50.25%	24.28%	18.47%	1.301
19	43.07%	2.58%	4.93%	49.42%	24.41%	18.36%	1.316
20	42.69%	3.62%	5.09%	48.60%	24.54%	18.26%	1.331
21	42.32%	4.67%	5.25%	47.77%	24.67%	18.16%	1.345
22	41.94%	5.71%	5.40%	46.95%	24.81%	18.06%	1.359
23	41.56%	6.76%	5.56%	46.12%	24.94%	17.98%	1.373
24	41.18%	7.80%	5.72%	45.29%	25.07%	17.89%	1.387
25	40.81%	8.85%	5.88%	44.47%	25.20%	17.82%	1.400
26	40.43%	9.89%	6.04%	43.64%	25.33%	17.74%	1.414
27	40.05%	10.93%	6.20%	42.82%	25.47%	17.68%	1.426
28	39.67%	11.98%	6.35%	41.99%	25.60%	17.62%	1.439
29	39.30%	13.02%	6.51%	41.17%	25.73%	17.56%	1.451
30	38.92%	14.07%	6.67%	40.34%	25.86%	17.51%	1.463
31	38.54%	15.11%	6.83%	39.52%	26.00%	17.47%	1.474
32	38.16%	16.16%	6.99%	38.69%	26.13%	17.43%	1.485
33	37.78%	17.20%	7.14%	37.87%	26.26%	17.40%	1.495

#	AAPL	AMZN	TSLA	CAT	Expected Return (*)	Standard Deviation (*)	Sharpe Ratio (*)
34	37.41%	18.25%	7.30%	37.04%	26.40%	17.37%	1.505
35	37.03%	19.29%	7.46%	36.22%	26.53%	17.35%	1.514
36	36.65%	20.33%	7.62%	35.39%	26.66%	17.34%	1.523
37	36.27%	21.38%	7.78%	34.57%	26.80%	17.33%	1.532
38	35.90%	22.42%	7.94%	33.74%	26.93%	17.33%	1.540
39	35.52%	23.47%	8.09%	32.92%	27.06%	17.33%	1.547
40	35.14%	24.51%	8.25%	32.09%	27.20%	17.34%	1.554
41	34.76%	25.56%	8.41%	31.27%	27.33%	17.35%	1.560
42	34.39%	26.60%	8.57%	30.44%	27.47%	17.37%	1.566
43	34.01%	27.65%	8.73%	29.62%	27.60%	17.40%	1.572
44	33.63%	28.69%	8.89%	28.79%	27.73%	17.43%	1.576
45	33.25%	29.73%	9.04%	27.97%	27.87%	17.47%	1.580
46	32.88%	30.78%	9.20%	27.14%	28.00%	17.52%	1.584
47	32.50%	31.82%	9.36%	26.32%	28.14%	17.57%	1.587
48	32.12%	32.87%	9.52%	25.49%	28.27%	17.62%	1.590
49	31.74%	33.91%	9.68%	24.67%	28.41%	17.69%	1.592
50	31.37%	34.96%	9.84%	23.84%	28.54%	17.75%	1.594
51	30.99%	36.00%	9.99%	23.02%	28.68%	17.83%	1.595
52	30.61%	37.05%	10.15%	22.19%	28.82%	17.90%	1.595
53	30.23%	38.09%	10.31%	21.37%	28.95%	17.99%	1.595
54	29.86%	39.13%	10.47%	20.54%	29.09%	18.08%	1.595
55	29.48%	40.18%	10.63%	19.72%	29.22%	18.17%	1.594
56	29.10%	41.22%	10.78%	18.89%	29.36%	18.27%	1.593
57	28.72%	42.27%	10.94%	18.07%	29.49%	18.37%	1.591
58	28.34%	43.31%	11.10%	17.24%	29.63%	18.48%	1.589
59	27.97%	44.36%	11.26%	16.42%	29.77%	18.60%	1.587
60	27.59%	45.40%	11.42%	15.59%	29.90%	18.72%	1.584
61	27.21%	46.45%	11.58%	14.77%	30.04%	18.84%	1.581
62	26.83%	47.49%	11.73%	13.94%	30.18%	18.97%	1.578
63	26.46%	48.53%	11.89%	13.12%	30.31%	19.10%	1.574
64	26.08%	49.58%	12.05%	12.29%	30.45%	19.24%	1.570
65	25.70%	50.62%	12.21%	11.47%	30.59%	19.38%	1.565
66	25.32%	51.67%	12.37%	10.64%	30.73%	19.53%	1.561
67	24.95%	52.71%	12.53%	9.82%	30.86%	19.68%	1.556
68	24.57%	53.76%	12.68%	8.99%	31.00%	19.83%	1.550

#	AAPL	AMZN	TSLA	CAT	Expected Return (*)	Standard Deviation (*)	Sharpe Ratio (*)
69	24.19%	54.80%	12.84%	8.17%	31.14%	19.99%	1.545
70	23.81%	55.85%	13.00%	7.34%	31.28%	20.15%	1.540
71	23.44%	56.89%	13.16%	6.52%	31.42%	20.32%	1.534
72	23.06%	57.93%	13.32%	5.69%	31.55%	20.49%	1.528
73	22.68%	58.98%	13.48%	4.87%	31.69%	20.66%	1.522
74	22.30%	60.02%	13.63%	4.04%	31.83%	20.84%	1.515
75	21.93%	61.07%	13.79%	3.22%	31.97%	21.02%	1.509
76	21.55%	62.11%	13.95%	2.39%	32.11%	21.20%	1.503
77	21.17%	63.16%	14.11%	1.57%	32.25%	21.39%	1.496
78	20.79%	64.20%	14.27%	0.74%	32.39%	21.58%	1.489
79	20.31%	65.29%	14.40%	0.00%	32.52%	21.77%	1.482
80	18.92%	66.76%	14.32%	0.00%	32.66%	21.97%	1.475
81	17.52%	68.24%	14.24%	0.00%	32.80%	22.17%	1.468
82	16.13%	69.72%	14.15%	0.00%	32.94%	22.38%	1.461
83	14.74%	71.19%	14.07%	0.00%	33.08%	22.60%	1.453
84	13.34%	72.67%	13.99%	0.00%	33.22%	22.82%	1.445
85	11.95%	74.14%	13.91%	0.00%	33.36%	23.05%	1.437
86	10.56%	75.62%	13.83%	0.00%	33.50%	23.28%	1.428
87	9.16%	77.09%	13.74%	0.00%	33.64%	23.52%	1.420
88	7.77%	78.57%	13.66%	0.00%	33.78%	23.76%	1.411
89	6.37%	80.04%	13.58%	0.00%	33.92%	24.01%	1.403
90	4.98%	81.52%	13.50%	0.00%	34.06%	24.26%	1.394
91	3.59%	83.00%	13.42%	0.00%	34.20%	24.51%	1.385
92	2.19%	84.47%	13.34%	0.00%	34.34%	24.78%	1.376
93	0.80%	85.95%	13.25%	0.00%	34.49%	25.04%	1.367
94	0.00%	87.67%	12.33%	0.00%	34.63%	25.31%	1.358
95	0.00%	89.72%	10.28%	0.00%	34.77%	25.61%	1.348
96	0.00%	91.78%	8.22%	0.00%	34.91%	25.94%	1.336
97	0.00%	93.83%	6.17%	0.00%	35.05%	26.29%	1.324
98	0.00%	95.89%	4.11%	0.00%	35.19%	26.67%	1.310
99	0.00%	97.94%	2.06%	0.00%	35.33%	27.07%	1.296
100	0.00%	100.00%	0.00%	0.00%	35.48%	27.50%	1.281

(*) Ex-ante values shown for portfolio return and volatility. Ex ante Sharpe Ratio calculated using historical 1-month treasury bill returns as the risk-free rate (0.25% annualized).

Portfolio Components

Ticker	Name	CAGR	Stdev	Best Year	Worst Year	Max DD	Sharpe Ratio	Sortino Ratio	US Mkt Correlation
AAPL	Apple Inc.	22.85%	22.98%	48.48%	-3.02%	-27.02%	1.01	1.72	0.58
AMZN	Amazon.com, Inc.	30.86%	27.50%	117.78%	-22.18%	-23.74%	1.11	2.34	0.48
TSLA	Tesla Inc	19.94%	39.22%	47.85%	-10.97%	-30.01%	0.64	1.22	0.27
CAT	Caterpillar, Inc.	18.66%	24.27%	75.00%	-22.99%	-39.60%	0.82	1.38	0.61

Monthly Correlations

Ticker	Name	AAPL	AMZN	TSLA	CAT	Maximum Sharpe Ratio
AAPL	Apple Inc.	-	0.35	0.15	0.27	0.70
AMZN	Amazon.com, Inc.	0.35	-	0.15	0.17	0.80
TSLA	Tesla Inc	0.15	0.15	-	0.29	0.45
CAT	Caterpillar, Inc.	0.27	0.17	0.29	-	0.56

Return Decomposition

Ticker	Name	Maximum Sharpe Ratio
AAPL	Apple Inc.	$4,033
AMZN	Amazon.com, Inc.	$7,321
TSLA	Tesla Inc	$1,323
CAT	Caterpillar, Inc.	$3,328

Risk Decomposition

Ticker	Name	Maximum Sharpe Ratio
AAPL	Apple Inc.	27.06%
AMZN	Amazon.com, Inc.	46.68%
TSLA	Tesla Inc	10.23%
CAT	Caterpillar, Inc.	16.04%

Notes:
- Past performance is not a guarantee of future returns and data and other errors may exist. See Disclaimer and Terms of Use
- The year range is automatically adjusted based on the selected year range and available return data for the specified assets
- See methodology section of the FAQ for more information on portfolio optimization and its limitations.
- CAGR = Compound Annual Growth Rate
- Stdev = Annualized standard deviation of monthly returns
- Sharpe ratio is calculated and annualized from monthly excess returns over the risk free rate (1-month treasury bill)
- Drawdowns are calculated based on monthly returns.
- The backtested results include monthly rebalancing of portfolio assets to match the specified allocation.
- The results use total return and assume that all dividends and distributions are reinvested. Taxes and transaction fees are not included.