Tactical Asset Allocation System

"in sample" and "out of sample" results

w/ and w/o Shorting of Assets

Sample: I O

Frequency: M W D

Version: 2 Signal: A Ts S C

Version: 5 Signal: A Ts S C

Sample: I O

In sample: 01/01/2007 – 8/31/2015

Out of Sample: 9/1/2015 – 7/28/2016

SAA & Benchmark

In Sample Vs Out of Sample

Summary Statistics

I

In Sample	SAA	Benchmark
Annual Returns	0.035538	0.044064
Standard Deviation	0.058568	0.096812
Sharpe Ratio	0.606781	0.455150
Maximum Drawdown	-0.217169	-0.350269
Hit Ratio	0.549757	0.557718
Returns Ratio	1.553340	1.836534
Skewness	-0.390237	-0.267914
Kurtosis	8.901982	12.097028

O

Out of Sample	SAA	Benchmark
Annual Returns	0.049540	0.075393
Standard Deviation	0.079949	0.082609
Sharpe Ratio	0.619643	0.912652
Maximum Drawdown	-0.100697	-0.084605
Hit Ratio	0.502110	0.542017
Returns Ratio	1.802598	1.913365
Skewness	-0.299685	-0.432676
Kurtosis	4.258839	4.585462

In both in sample and out of sample periods:

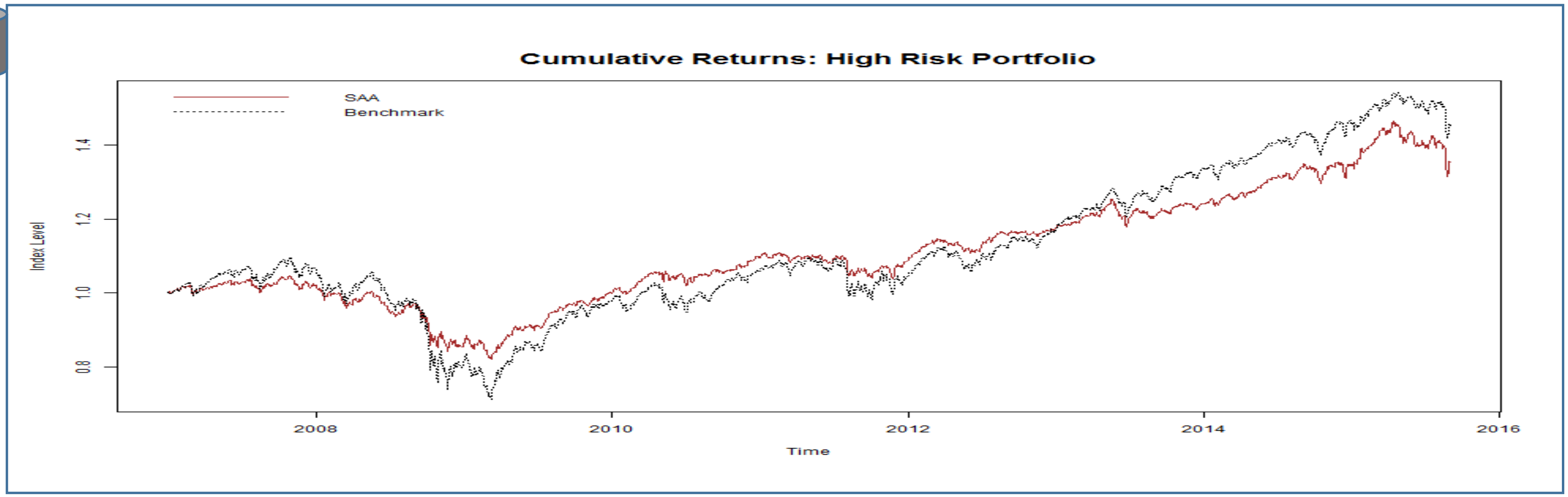
- Current portfolio (SAA) is performing far better than the benchmark in bad times
- Standard deviation, Skewness and kurtosis are lesser in portfolio than benchmark

Differences:

- Unlike in sample period, cumulative drawdowns in out of sample are more compared to benchmark

Cumulative Returns

I



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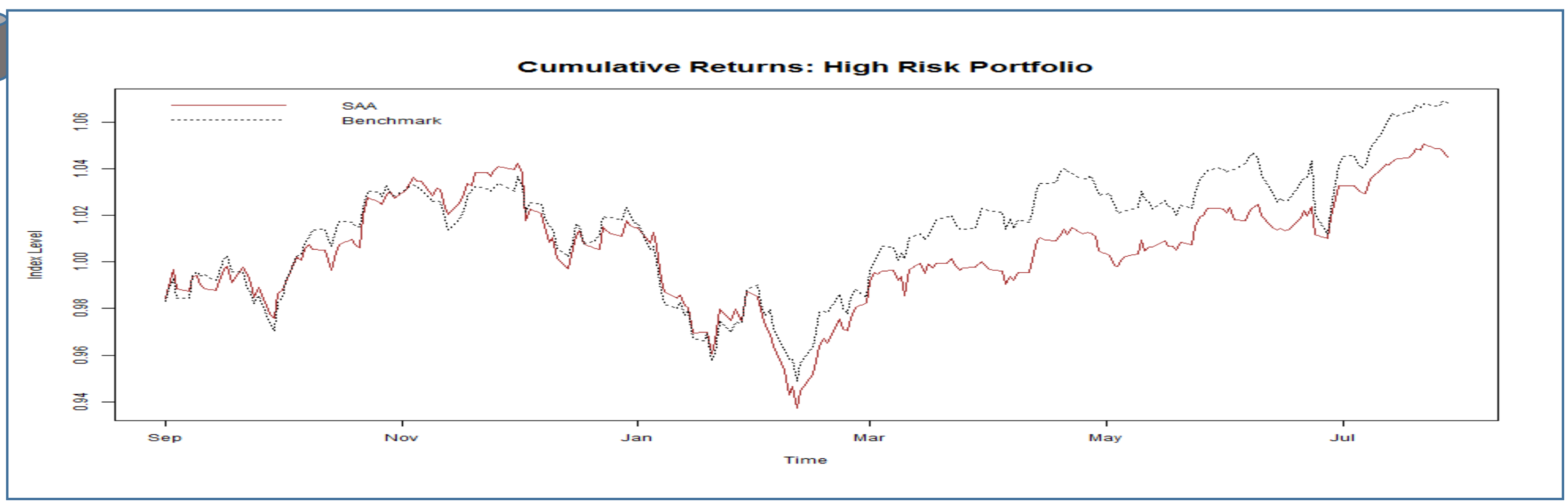
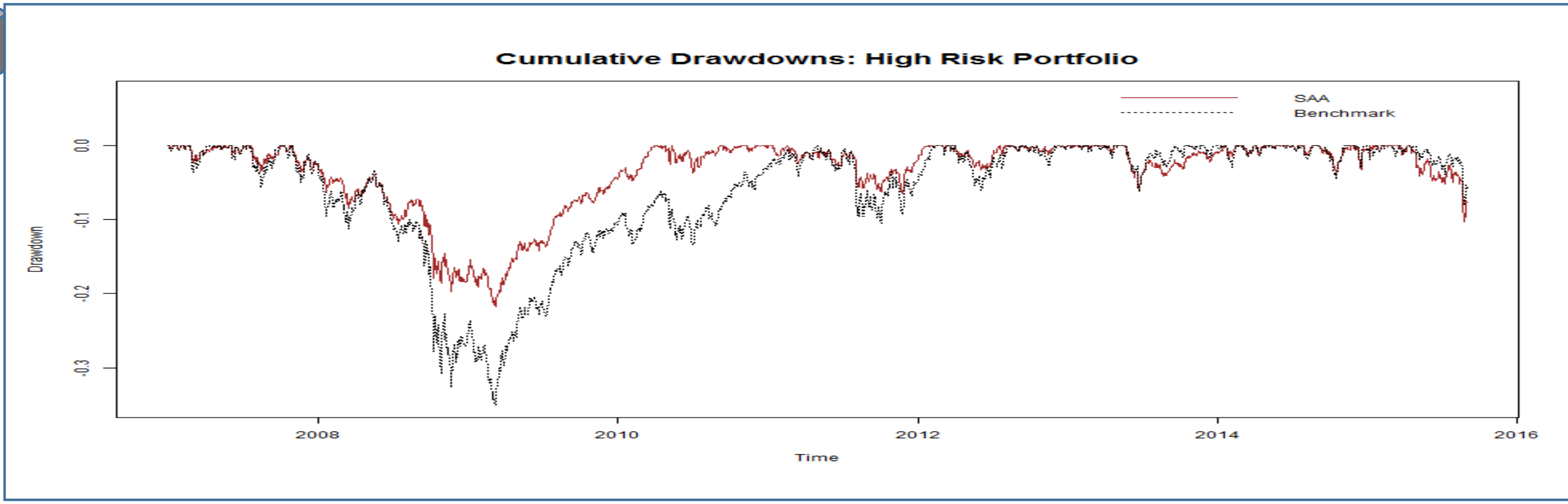


Cumulative Drawdowns

I



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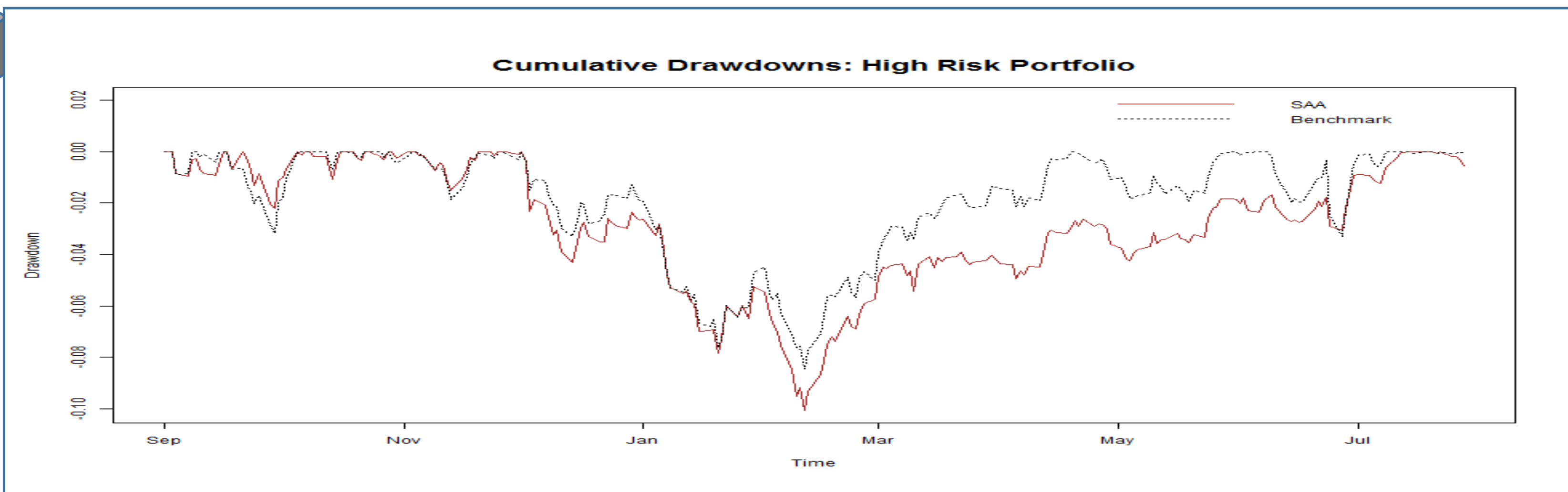
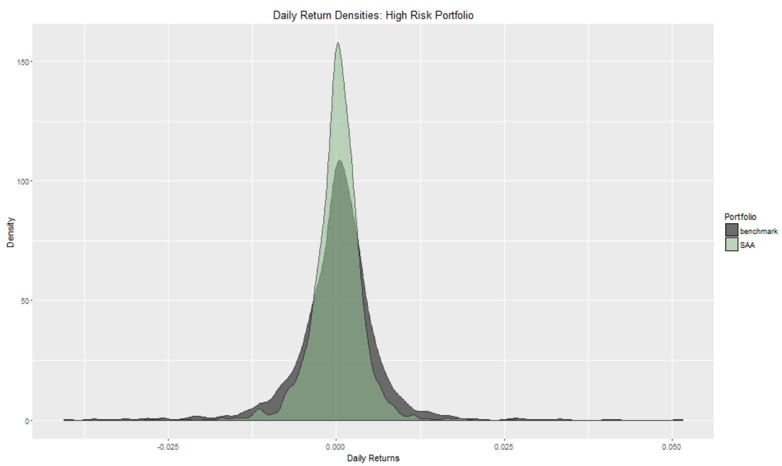
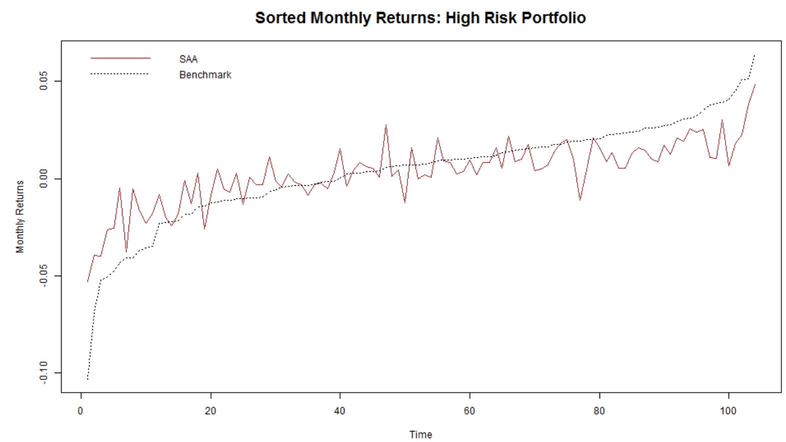


Return Densities & Sorted Monthly Returns

I





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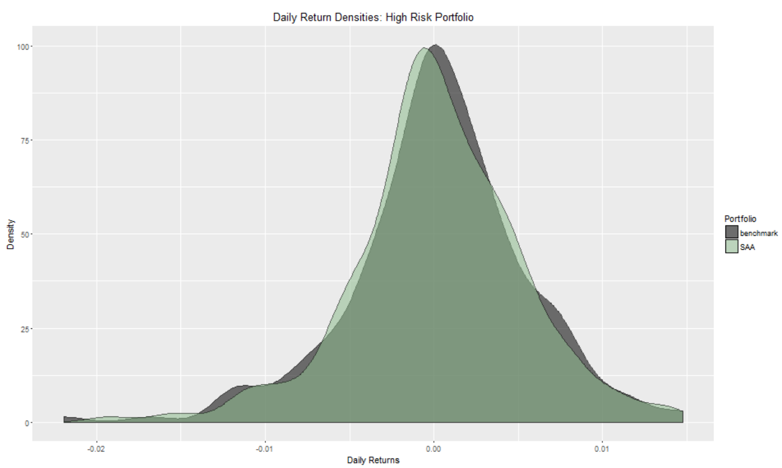
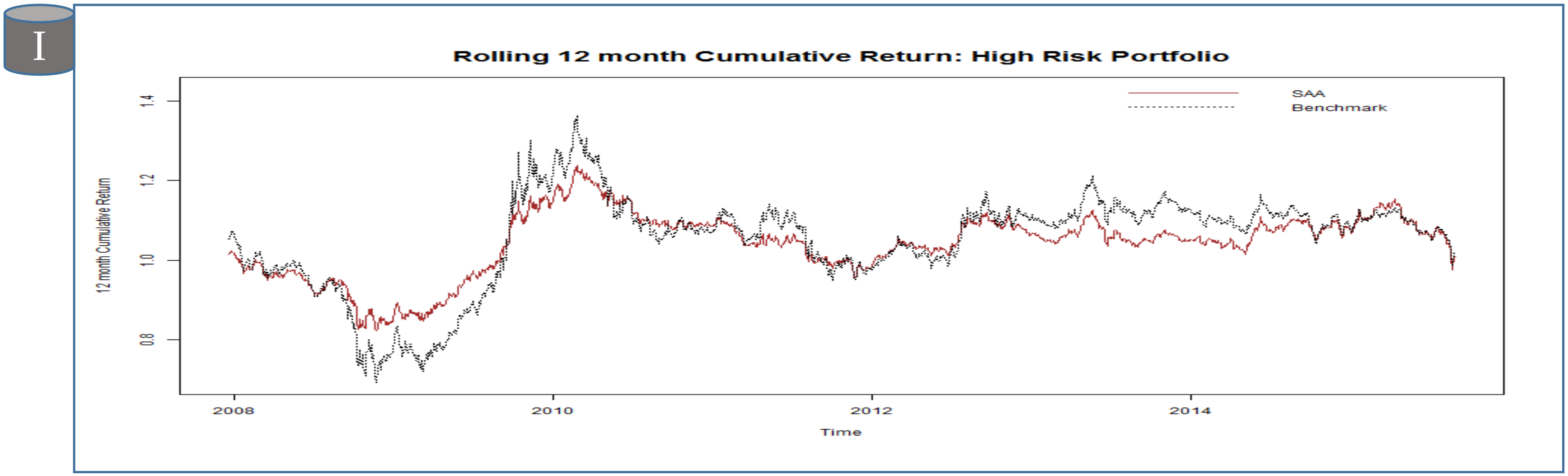
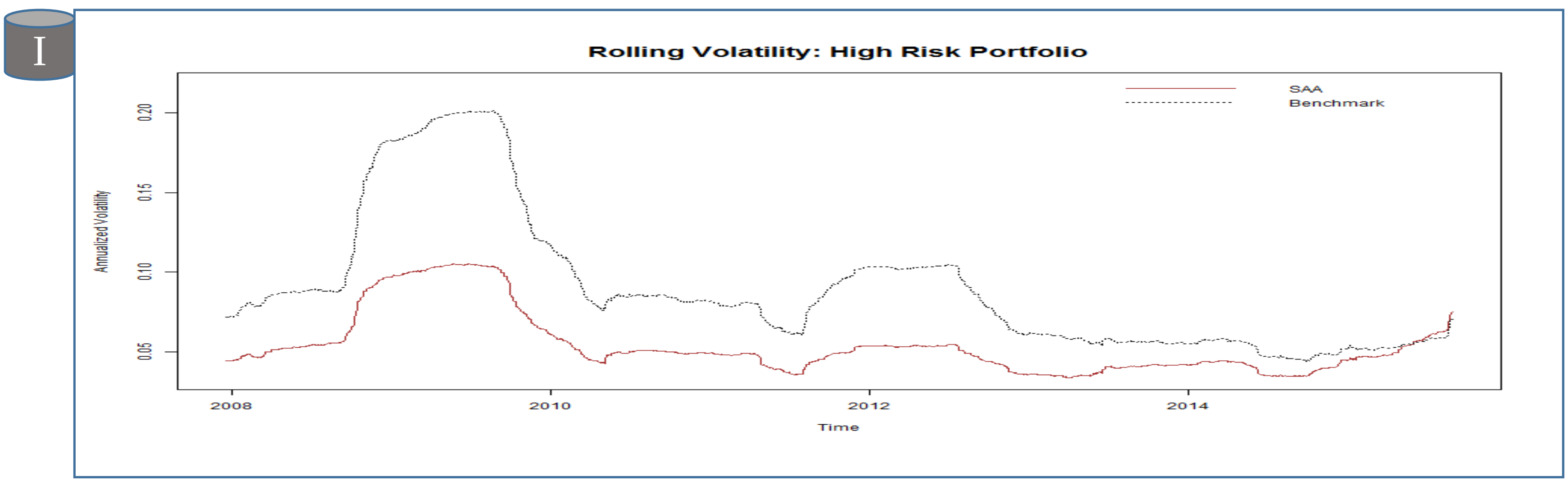


Rolling 12 Month Returns and Volatility





Sample: I

Frequency: M W D

Signal: C

TAA System

In Sample Analysis

Version 2 (no shorting) Vs Version 5 (shorting)

Summary Statistics

2

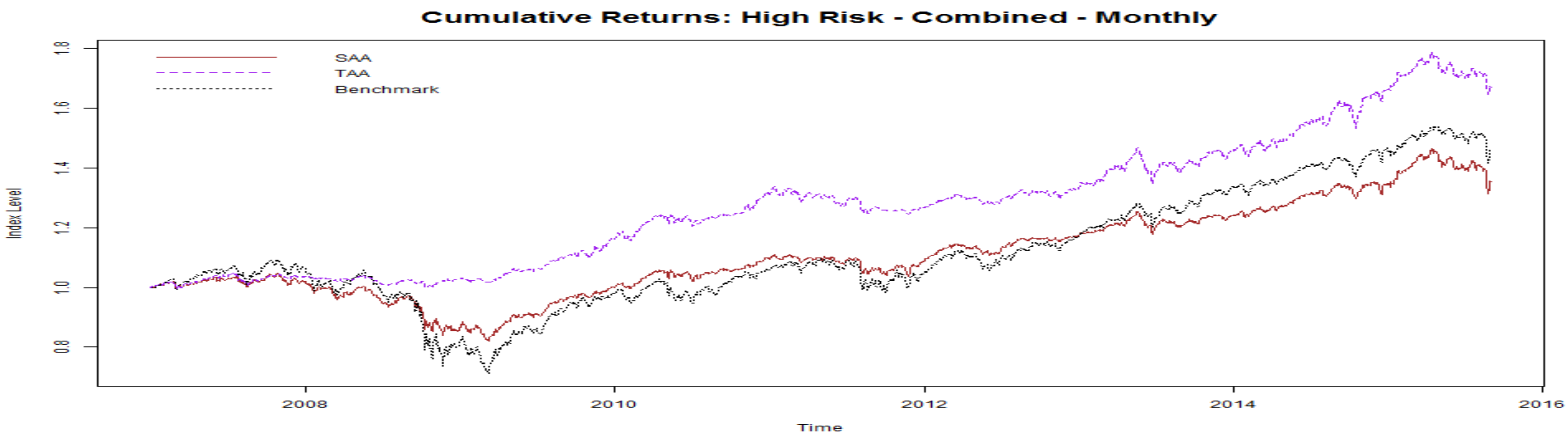
High Risk	SAA	Benchmark	TAA - Monthly	TAA - Weekly	TAA - Daily
Annual Returns	0.035538	0.044064	0.061067	0.052164	0.054398
Standard Deviation	0.058568	0.096812	0.048339	0.047561	0.047093
Sharpe Ratio	0.606781	0.455150	1.263299	1.096778	1.155119
Maximum Drawdown	-0.217169	-0.350269	-0.080319	-0.080788	-0.078120
Hit Ratio	0.549757	0.557718	0.558160	0.555506	0.557718
Returns Ratio	1.553340	1.836534	1.640839	1.589345	1.600904
Skewness	-0.390237	-0.267914	-0.399387	-0.433040	-0.378527
Kurtosis	8.901982	12.097028	6.652447	6.501795	6.214228

5

High Risk	SAA	Benchmark	TAA - Monthly	TAA - Weekly	TAA - Daily
Annual Returns	0.035450	0.044064	0.069166	0.054920	0.059305
Standard Deviation	0.057877	0.096812	0.053221	0.052619	0.052428
Sharpe Ratio	0.612500	0.455150	1.299591	1.043730	1.131160
Maximum Drawdown	-0.217505	-0.350269	-0.083799	-0.126870	-0.106821
Hit Ratio	0.549757	0.557718	0.557276	0.554180	0.551526
Returns Ratio	1.551595	1.836534	1.699424	1.626018	1.647577
Skewness	-0.410164	-0.267914	-0.153509	-0.341951	-0.194449
Kurtosis	8.174698	12.097028	5.909300	5.939380	5.848791

Cumulative Returns

2



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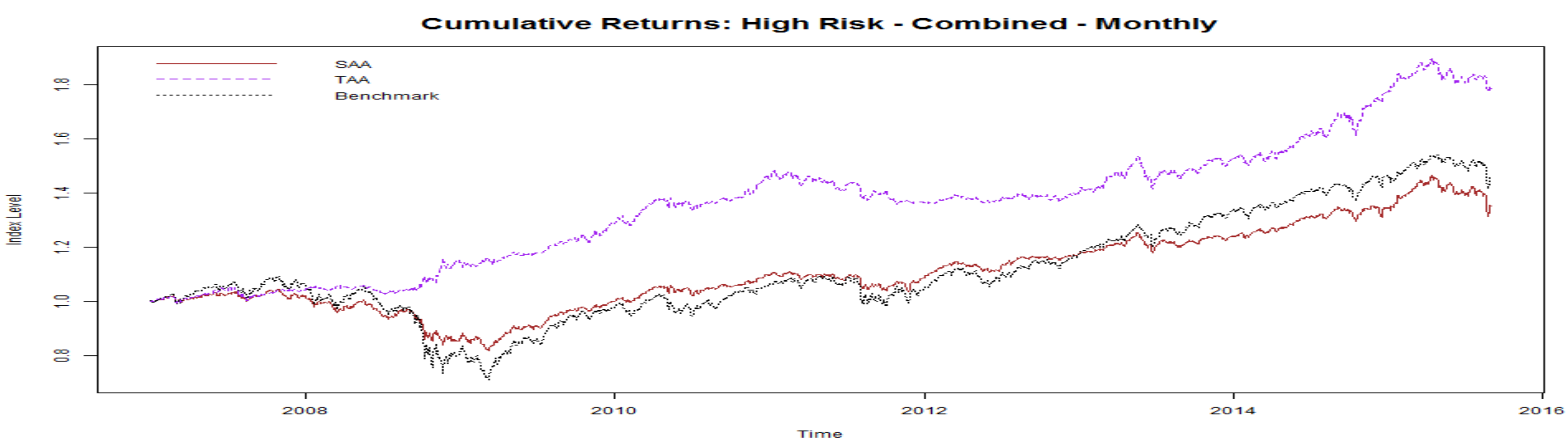

Cumulative Drawdowns

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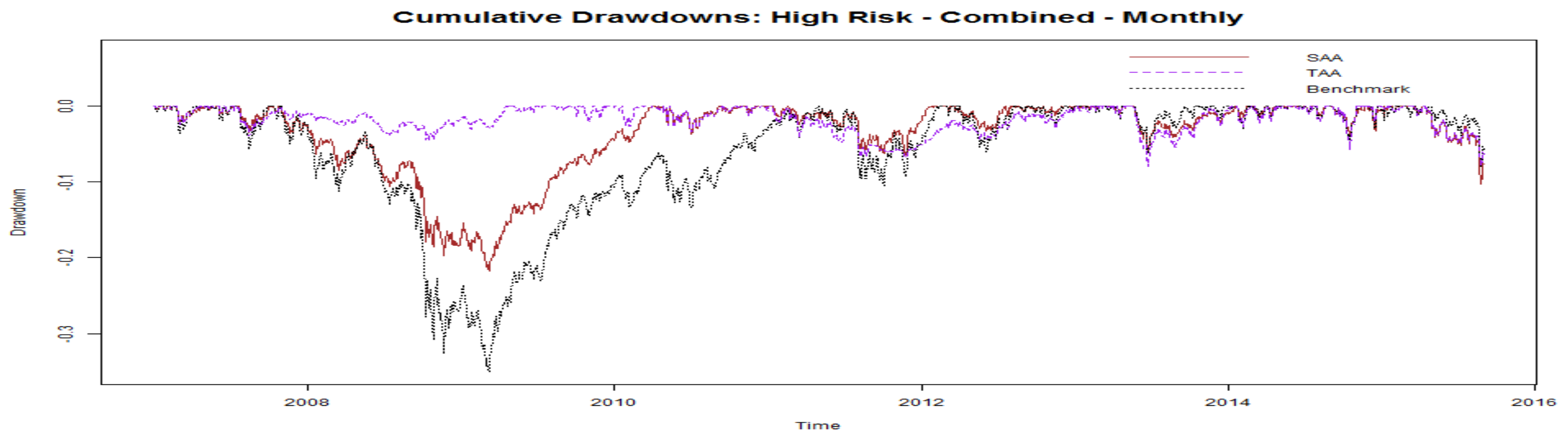

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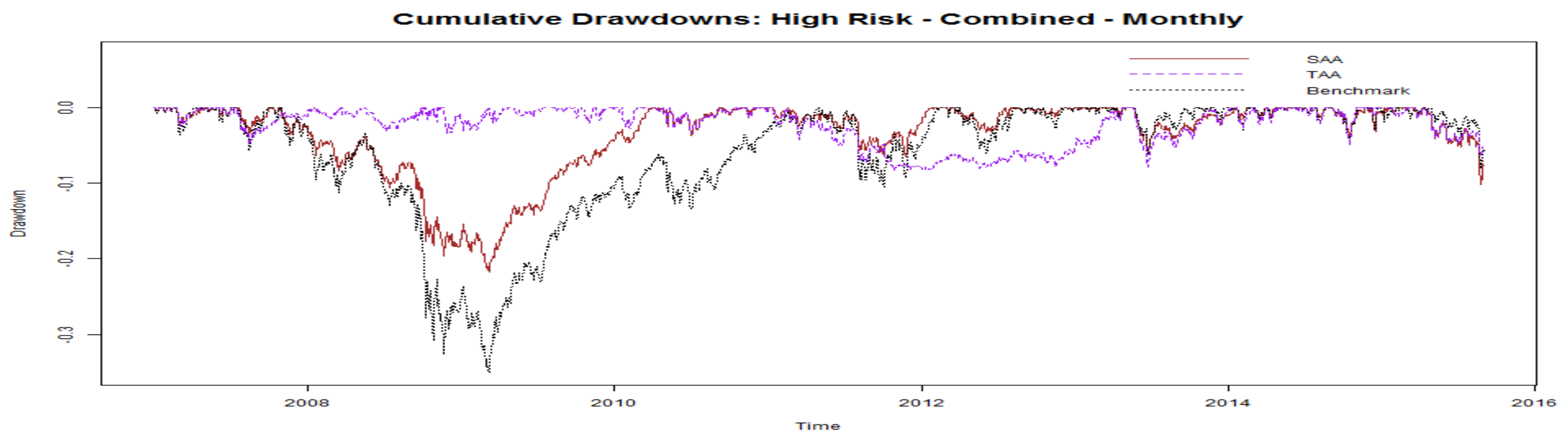
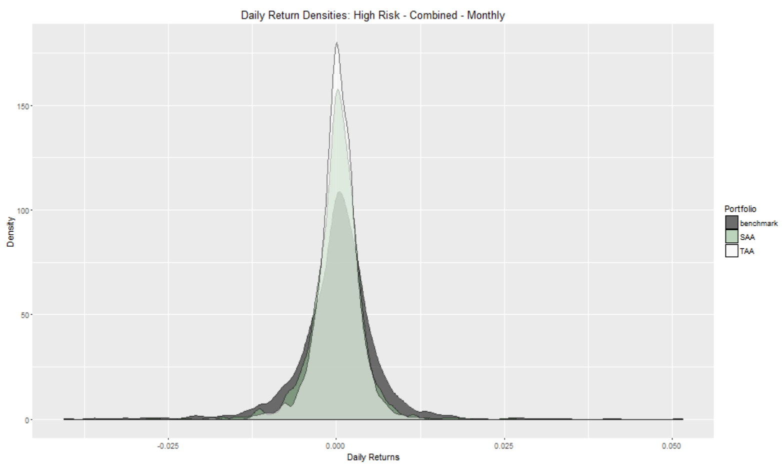
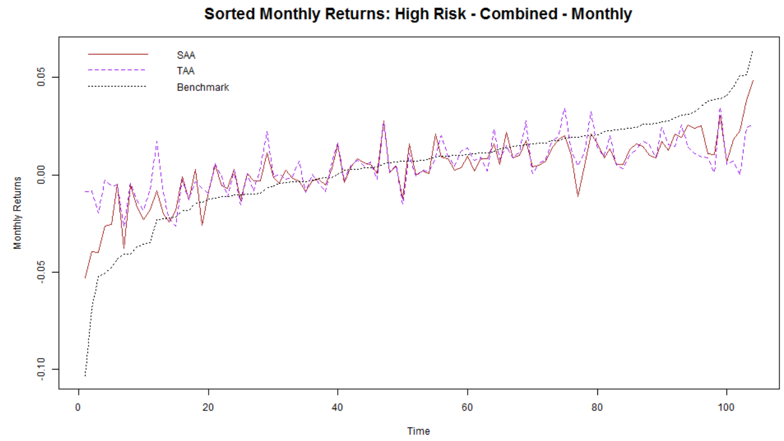


Return Densities & Sorted Monthly Returns

2





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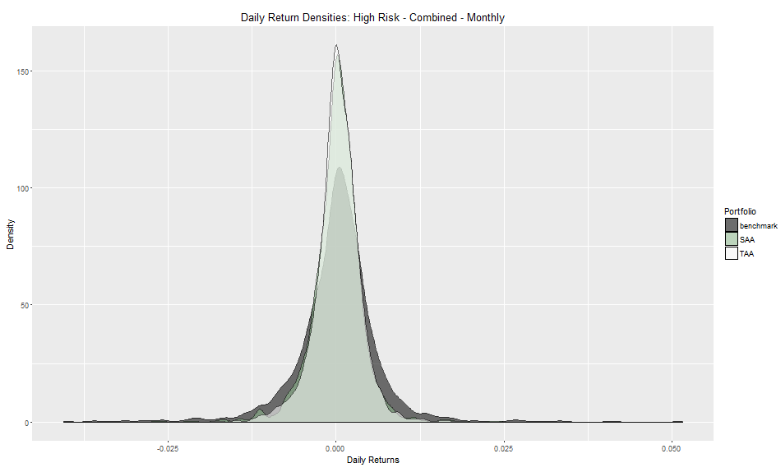
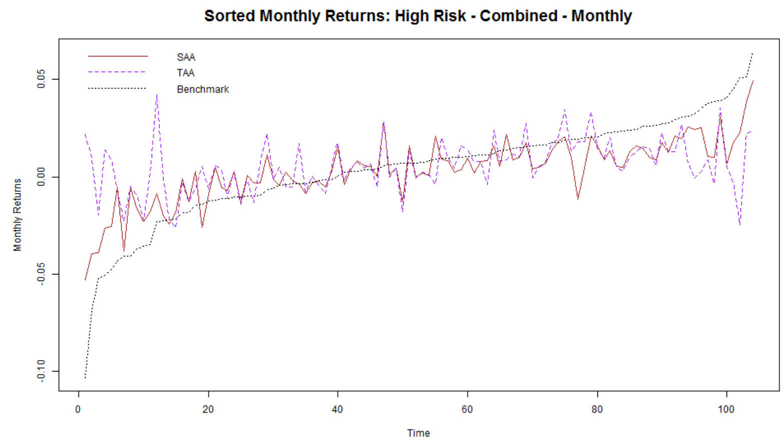
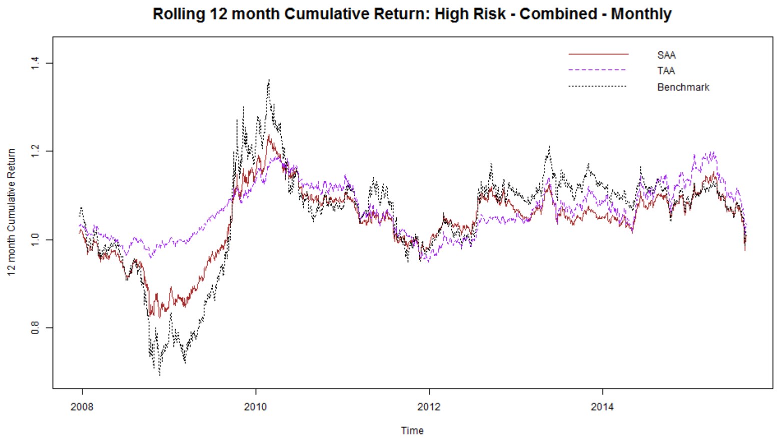
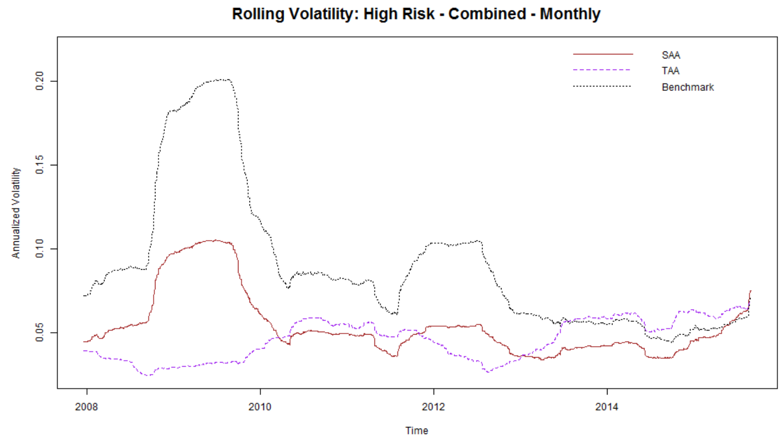




Rolling 12 Month Returns and Volatility

2





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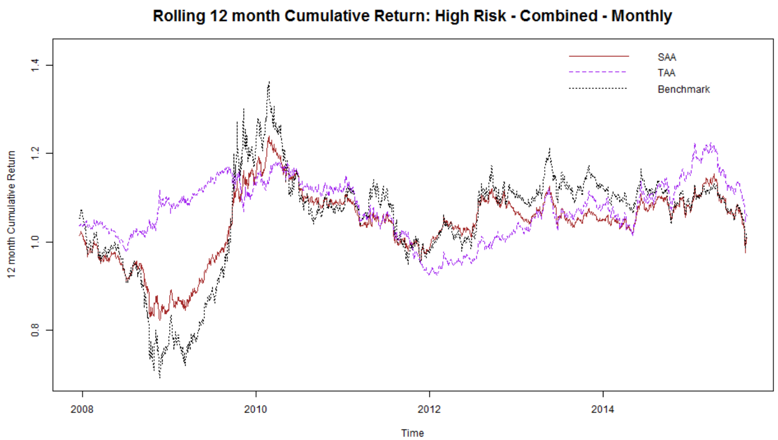
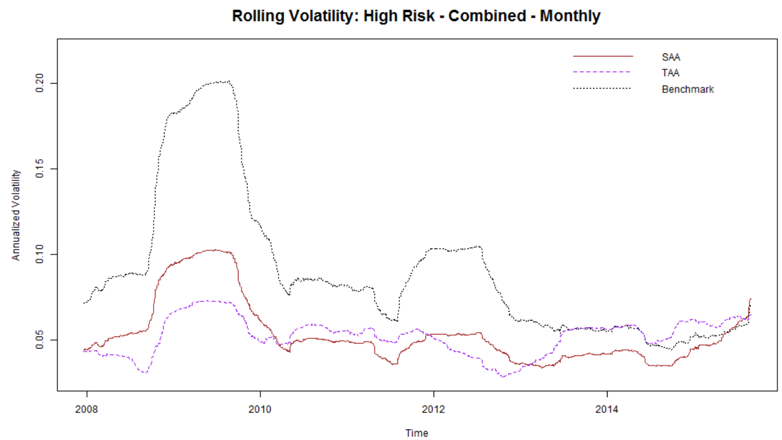




Year wise Analysis

Annual Returns	SAA	Benchmark	Monthly (Version 2)	Monthly (Version 5)	Weekly (Version 2)	Weekly (Version 5)	Daily (Version 2)	Daily (Version 5)
2007	0.020686	0.067005	0.035974	0.041655	0.014515	0.005740	0.005388	-0.014453
2008	-0.153317	-0.234408	-0.006708	0.097819	-0.012297	0.087381	-0.003595	0.107622
2009	0.156887	0.196957	0.130024	0.126567	0.133575	0.131408	0.133210	0.135521
2010	0.095909	0.084535	0.126875	0.127831	0.123908	0.125735	0.124054	0.124882
2011	-0.007725	-0.014343	-0.032060	-0.060133	-0.054251	-0.103727	-0.046722	-0.082549
2012	0.079982	0.119128	0.049290	0.024000	0.057596	0.040659	0.064795	0.050774
2013	0.058241	0.147150	0.098945	0.093831	0.081686	0.069042	0.089971	0.078000
2014	0.082339	0.087720	0.137612	0.160173	0.115654	0.135285	0.119194	0.140550
2015	0.010452	-0.004080	0.008878	0.010590	0.013870	0.012436	0.003894	-0.003926

Standard Deviation	SAA	Benchmark	Monthly (Version 2)	Monthly (Version 5)	Weekly (Version 2)	Weekly (Version 5)	Daily (Version 2)	Daily (Version 5)
2007	0.043962	0.071116	0.038671	0.042746	0.038269	0.041789	0.037704	0.042194
2008	0.092727	0.179552	0.028629	0.064946	0.028628	0.065605	0.029325	0.067800
2009	0.063147	0.117316	0.039740	0.050071	0.041677	0.048173	0.041578	0.047963
2010	0.048781	0.080925	0.054844	0.055021	0.055081	0.055306	0.054544	0.054661
2011	0.052774	0.101933	0.045204	0.051854	0.043486	0.052938	0.041646	0.049806
2012	0.035770	0.060715	0.033658	0.031679	0.034992	0.033316	0.034789	0.033241
2013	0.041510	0.055217	0.058603	0.056518	0.057927	0.055706	0.057769	0.055518
2014	0.043937	0.051307	0.062631	0.060875	0.060882	0.058886	0.060319	0.058035
2015	0.080171	0.073172	0.064744	0.059150	0.059166	0.054707	0.058432	0.055236

Year wise Analysis

Sharpe Ratio	SAA	Benchmark	Monthly (Version 2)	Monthly (Version 5)	Weekly (Version 2)	Weekly (Version 5)	Daily (Version 2)	Daily (Version 5)
2007	0.470531	0.942187	0.930255	0.974467	0.379300	0.137359	0.142891	-0.342546
2008	-1.653424	-1.305516	-0.234315	1.506149	-0.429534	1.331924	-0.122578	1.587344
2009	2.484489	1.678858	3.271840	2.527756	3.204982	2.727831	3.203850	2.825547
2010	1.966133	1.044602	2.313373	2.323305	2.249547	2.273433	2.274394	2.284659
2011	-0.146383	-0.140712	-0.709218	-1.159666	-1.247549	-1.959419	-1.121888	-1.657415
2012	2.236018	1.962098	1.464454	0.757585	1.645974	1.220397	1.862540	1.527450
2013	1.403066	2.664955	1.688401	1.660205	1.410152	1.239402	1.557440	1.404948
2014	1.874041	1.709706	2.197192	2.631190	1.899650	2.297430	1.976056	2.421812
2015	0.130368	-0.055754	0.137119	0.179032	0.234424	0.227317	0.066639	-0.071075

Maximum Drawdown	SAA	Benchmark	Monthly (Version 2)	Monthly (Version 5)	Weekly (Version 2)	Weekly (Version 5)	Daily (Version 2)	Daily (Version 5)
2007	-0.036251	-0.057222	-0.039408	-0.048827	-0.034870	-0.052519	-0.038387	-0.071434
2008	-0.175998	-0.309720	-0.037243	-0.034032	-0.038579	-0.050625	-0.039125	-0.050621
2009	-0.075039	-0.150218	-0.020593	-0.020669	-0.023290	-0.023351	-0.023008	-0.023069
2010	-0.037424	-0.077861	-0.034445	-0.034669	-0.031891	-0.031993	-0.033545	-0.033749
2011	-0.064775	-0.105329	-0.068257	-0.083799	-0.080788	-0.126870	-0.077016	-0.106821
2012	-0.033685	-0.060587	-0.025363	-0.023670	-0.022072	-0.021391	-0.023144	-0.022342
2013	-0.059115	-0.062706	-0.080319	-0.078378	-0.079727	-0.079335	-0.078120	-0.078486
2014	-0.039404	-0.045907	-0.057564	-0.050382	-0.052027	-0.043530	-0.050220	-0.039708
2015	-0.102496	-0.081299	-0.078895	-0.064516	-0.069955	-0.057227	-0.069534	-0.066571

Turnover Metrics

2

	Monthly (SAA)	Monthly (TAA)	Weekly (TAA)	Daily (TAA)
	M	M	W	D
Total Turnover	3.007135	13.760348	29.706094	54.026073
Mean Annual Turnover	0.350225	1.602593	3.426904	6.232464
Annual Txn Costs	0.000210	0.000962	0.002056	0.003739
Annual Returns	0.035538	0.061067	0.052164	0.054398
Net of Txn Costs	0.035328	0.060105	0.050108	0.050659

5

	Monthly (SAA)	Monthly (TAA)	Weekly (TAA)	Daily (TAA)
Total Turnover	3.007135	23.513422	47.128342	91.590838
Mean Annual Turnover	0.350225	2.738481	5.436740	10.565947
Annual Txn Costs	0.000210	0.001643	0.003262	0.006340
Annual Returns	0.035450	0.069166	0.054920	0.059305
Net of Txn Costs	0.035240	0.067523	0.051658	0.052965

Sample: O

Frequency: M W D

Signal: C

TAA System

Out of Sample Analysis

Version 2 (no shorting) Vs Version 5 (shorting)

Summary Statistics

2

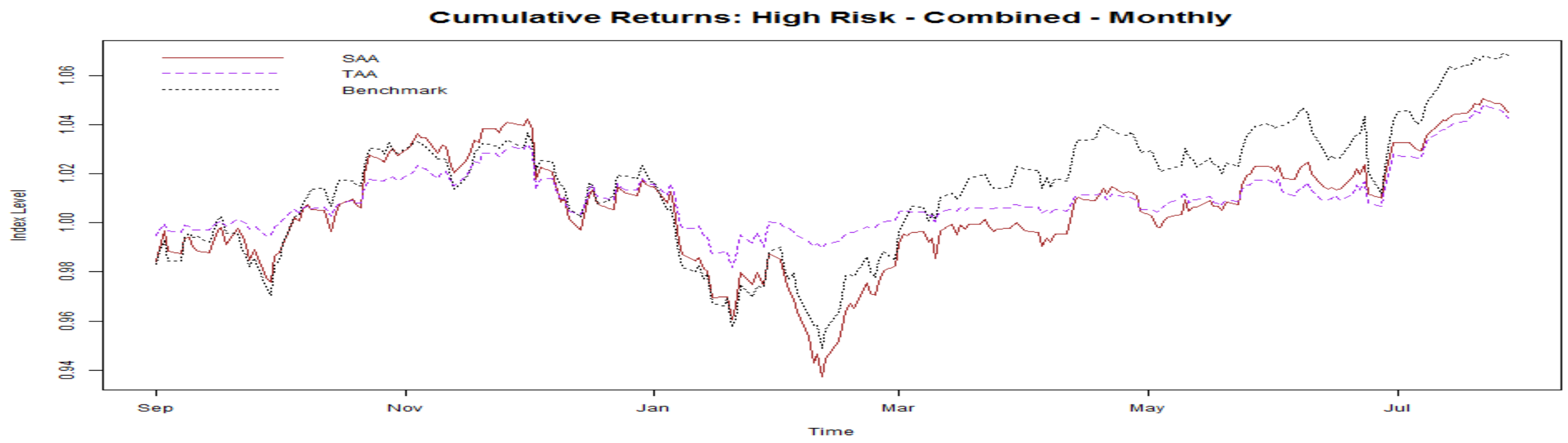
High Risk	SAA	Benchmark	TAA - Monthly	TAA - Weekly	TAA - Daily
Annual Returns	0.049540	0.075393	0.047042	0.046302	0.044329
Standard Deviation	0.079949	0.082609	0.046377	0.040368	0.041433
Sharpe Ratio	0.619643	0.912652	1.014331	1.146986	1.069900
Maximum Drawdown	-0.100697	-0.084605	-0.048682	-0.040519	-0.034946
Hit Ratio	0.502110	0.542017	0.535865	0.536481	0.540084
Returns Ratio	1.802598	1.913365	1.551220	1.533967	1.523245
Skewness	-0.299685	-0.432676	-0.593094	-1.123565	-1.049284
Kurtosis	4.258839	4.585462	7.520838	10.080503	9.307292

5

High Risk	SAA	Benchmark	TAA - Monthly	TAA - Weekly	TAA - Daily
Annual Returns	0.048593	0.075393	0.063384	0.050212	0.048521
Standard Deviation	0.079058	0.082609	0.038878	0.042874	0.044650
Sharpe Ratio	0.614649	0.912652	1.630328	1.171159	1.086696
Maximum Drawdown	-0.099951	-0.084605	-0.026678	-0.034846	-0.031359
Hit Ratio	0.502110	0.542017	0.556962	0.570815	0.548523
Returns Ratio	1.793412	1.913365	1.648737	1.564629	1.558204
Skewness	-0.312959	-0.432676	-0.717419	-0.701575	-0.587487
Kurtosis	4.262058	4.585462	7.819155	7.594973	6.669886

Cumulative Returns

2



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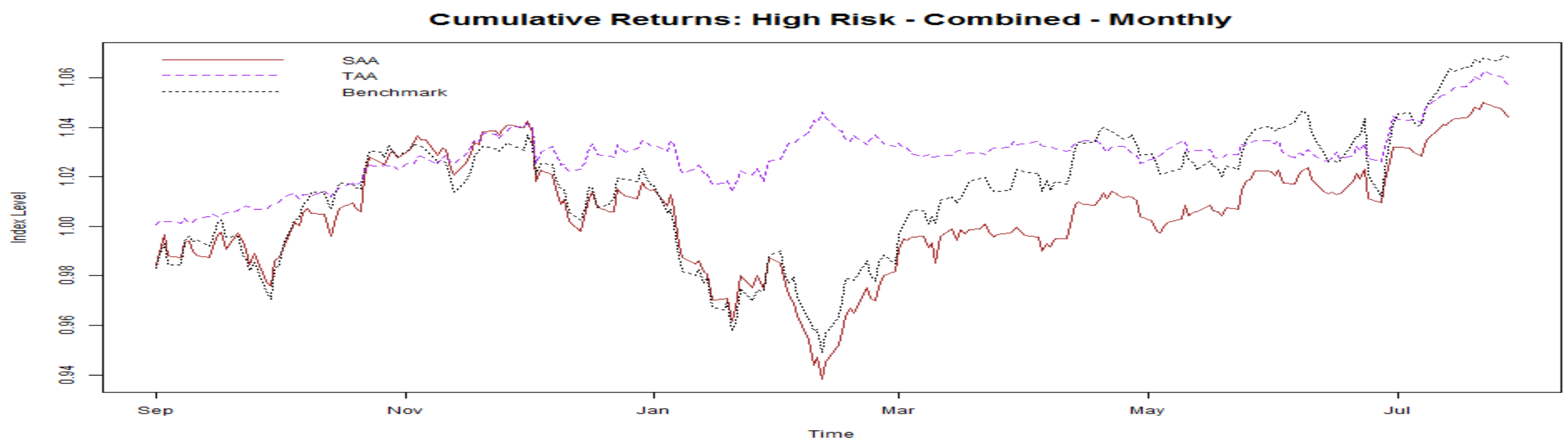
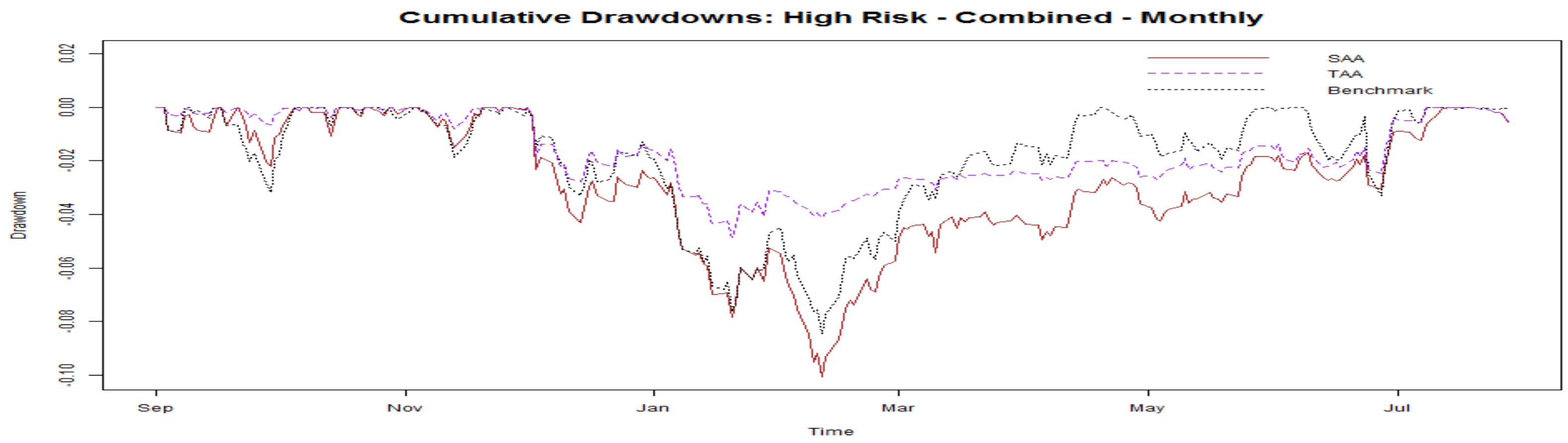


Cumulative Drawdowns

2



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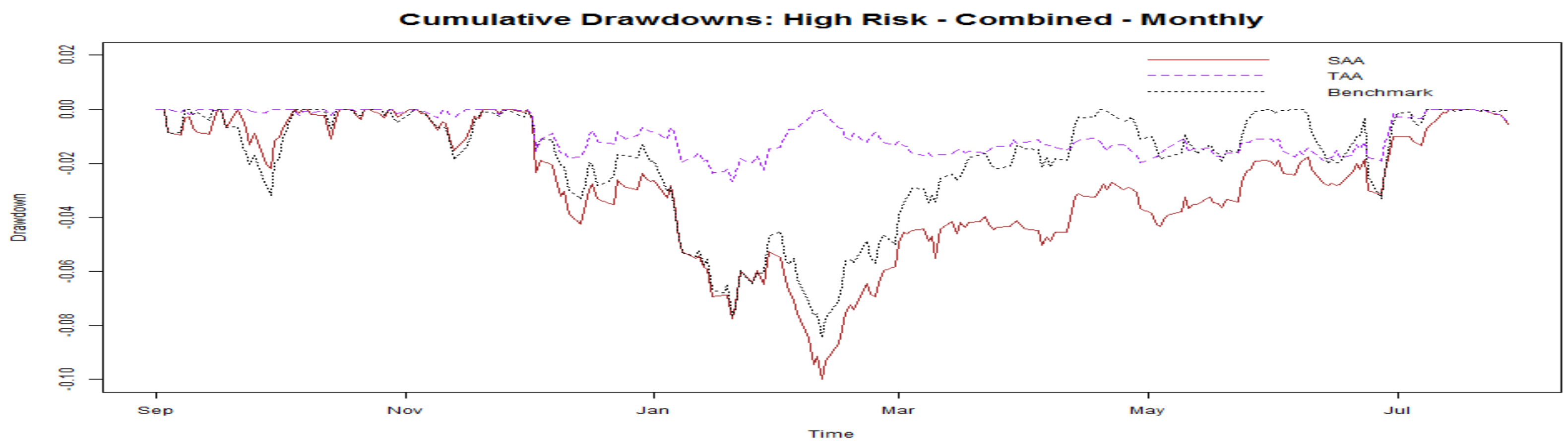

Return Densities & Sorted Monthly Returns

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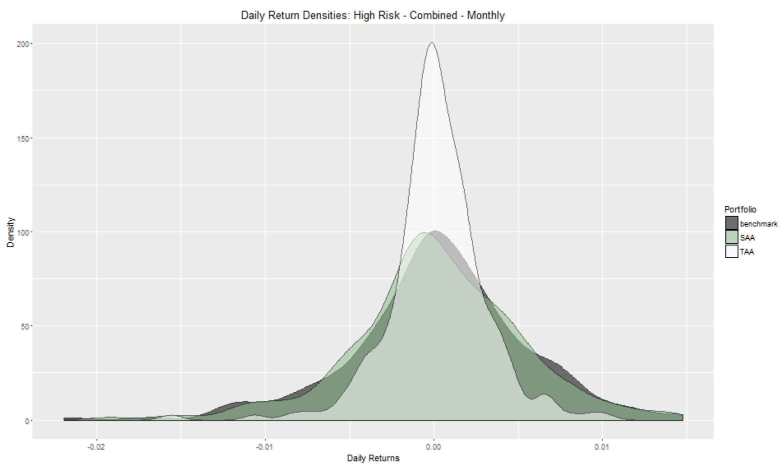

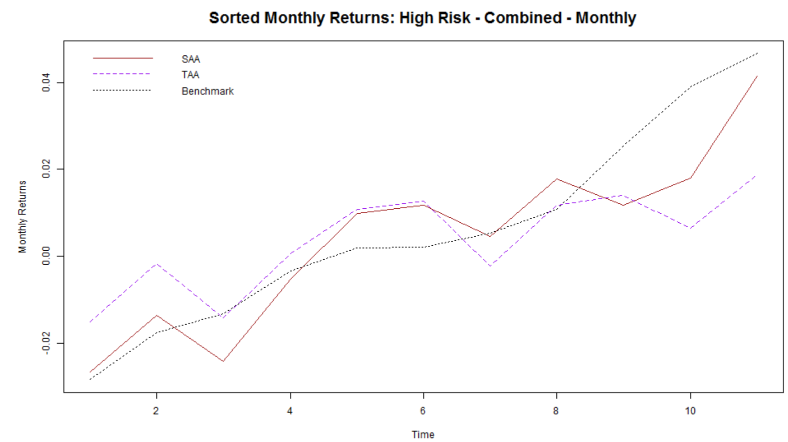

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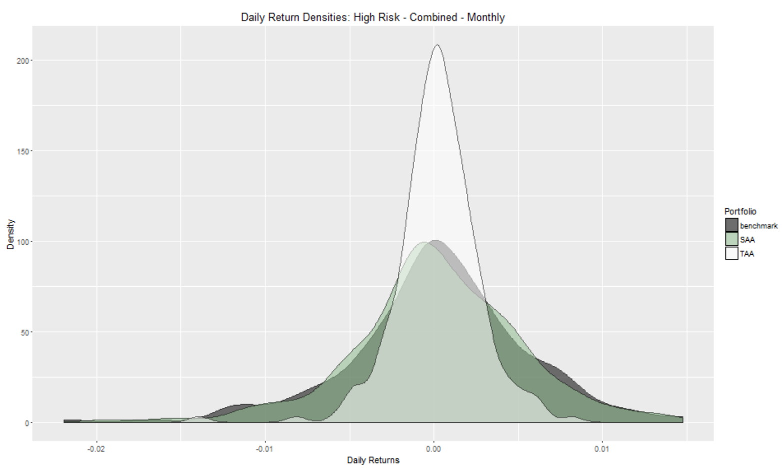

Year wise Analysis

Annual Returns	SAA	Benchmark	Monthly (Version 2)	Monthly (Version 5)	Weekly (Version 2)	Weekly (Version 5)	Daily (Version 2)	Daily (Version 5)
2015	0.044565	0.051697	0.047953	0.102050	0.057419	0.085270	0.030729	0.043427
2016	0.052674	0.089734	0.046744	0.041927	0.040460	0.031650	0.052503	0.051720

Standard Deviation	SAA	Benchmark	Monthly (Version 2)	Monthly (Version 5)	Weekly (Version 2)	Weekly (Version 5)	Daily (Version 2)	Daily (Version 5)
2015	0.087160	0.080854	0.048726	0.038647	0.047591	0.042029	0.047695	0.040388
2016	0.075674	0.083879	0.045100	0.039091	0.035833	0.043447	0.037411	0.047117

Sharpe Ratio	SAA	Benchmark	Monthly (Version 2)	Monthly (Version 5)	Weekly (Version 2)	Weekly (Version 5)	Daily (Version 2)	Daily (Version 5)
2015	0.511298	0.639381	0.984139	2.640530	1.206502	2.028861	0.644275	1.075226
2016	0.696069	1.069807	1.036457	1.072557	1.129134	0.728456	1.403419	1.097695

Maximum Drawdown	SAA	Benchmark	Monthly (Version 2)	Monthly (Version 5)	Weekly (Version 2)	Weekly (Version 5)	Daily (Version 2)	Daily (Version 5)
2015	-0.043142	-0.033124	-0.028006	-0.018398	-0.027297	-0.018351	-0.025892	-0.015968
2016	-0.076314	-0.066699	-0.033476	-0.020065	-0.024266	-0.034846	-0.019789	-0.031359

O

C

Turnover Metrics

M M W D

2

	Monthly (SAA)	Monthly (TAA)	Weekly (TAA)	Daily (TAA)
Total Turnover	0.000000	1.097785	2.888062	6.400871
Mean Annual Turnover	0.000000	1.318065	3.273735	7.058362
Annual Txn Costs	0.000000	0.000791	0.001964	0.004235
Annual Returns	0.049540	0.047042	0.046302	0.044329
Net of Txn Costs	0.049540	0.046251	0.044338	0.040094

5

	Monthly (SAA)	Monthly (TAA)	Weekly (TAA)	Daily (TAA)
Total Turnover	0.000000	1.799765	4.590719	10.921891
Mean Annual Turnover	0.000000	2.160901	5.203765	12.043777
Annual Txn Costs	0.000000	0.001297	0.003122	0.007226
Annual Returns	0.048593	0.063384	0.050212	0.048521
Net of Txn Costs	0.048593	0.062087	0.047090	0.041295

Comparison Analysis

In both in sample and out of sample periods:

- Version 5 (shorting) produced better returns in bad times than benchmark compared to Version2
- Drawdowns in Version5 are lesser during bad times and more during good times compared to Version2
- Monthly rebalancing showed best performance