3.4 Statistical Test on Different Shrinkage Approaches

	shrink 0 pct	shrink 50 pct	shrink 100 pct	linear shrinkage	non-linear	OAS
mean	0.570269	0.457837	0.374985	0.617957	0.591669	0.598039
std	0.827262	0.837339	1.200127	0.832114	0.829660	0.833494
skewness	0.100723	0.018710	-0.578672	0.220716	0.198135	0.166657
kurtosis	-0.394558	-0.874358	0.097834	-0.314266	-0.270590	-0.346162
min	-0.997900	-1.060554	-2.484602	-0.831503	-0.934247	-0.924112
25%	0.043538	-0.156461	-0.322805	0.122116	0.113124	0.083471
50%	0.556955	0.435143	0.478084	0.530163	0.469034	0.532853
75%	1.089416	1.077236	1.053372	1.084535	1.055794	1.083906
max	2.141238	1.962221	2.220851	2.312856	2.277912	2.245206

Table 1: Statistics for shrinking towards TBN

	shrink 0 pct	shrink 50 pct	shrink 100 pct	linear shrinkage	non-linear	OAS
mean	0.570269	-0.107652	0.185268	0.617957	0.591669	0.598039
std	0.827262	1.233194	1.087677	0.832114	0.829660	0.833494
skewness	0.100723	0.016754	-0.391751	0.220716	0.198135	0.166657
kurtosis	-0.394558	-0.559147	0.468850	-0.314266	-0.270590	-0.346162
min	-0.997900	-2.440214	-2.358890	-0.831503	-0.934247	-0.924112
25%	0.043538	-0.916301	-0.415789	0.122116	0.113124	0.083471
50%	0.556955	-0.302844	0.122880	0.530163	0.469034	0.532853
75%	1.089416	0.714129	0.947005	1.084535	1.055794	1.083906
max	2.141238	2.158873	2.175455	2.312856	2.277912	2.245206

Table 2: Statistics for shrinking towards scaled TBN

	shrink 0 pct	shrink 50 pct	shrink 100 pct	linear shrinkage	non-linear	OAS
mean	0.570269	0.715518	0.826949	0.617957	0.591669	0.598039
std	0.827262	0.892961	0.958998	0.832114	0.829660	0.833494
skewness	0.100723	0.613549	0.754595	0.220716	0.198135	0.166657
kurtosis	-0.394558	0.771022	1.209482	-0.314266	-0.270590	-0.346162
min	-0.997900	-0.602185	-0.633502	-0.831503	-0.934247	-0.924112
25%	0.043538	0.096474	0.044075	0.122116	0.113124	0.083471
50%	0.556955	0.785626	0.927632	0.530163	0.469034	0.532853
75%	1.089416	1.059937	1.204106	1.084535	1.055794	1.083906
max	2.141238	2.971447	3.358311	2.312856	2.277912	2.245206

Table 3: Statistics for shrinking towards identity matrix

We compare naive approach, Ledoit and Wolf (linear and non-linear) method and OAS[4] method in this section. Here OAS stands for Oracle Approximating Shrinkage Estimator. It's an improved shrinkage estimator yielding a smaller MSE than Ledoit and Wolf's one. Also the test performance varies according to shrinkage target selection. So we follow the same pipeline (1. construct shrunk portfolio 2. backtest to get performance(Sharp ratio) 3. statistical analysis) to test on three different shrinkage targets.

The last three methods(linear shrinkage, non-linear shrinkage and OAS) doesn't change across tables. Because they shrink to the same shrink target, identity matrix, by default. While naive approaches' performance vary hugely for different shrinkage target, identity matrix as target seems yielding better performance. In Table 3, both linear and non-linear methods gains smaller variance also lower Sharpe ratio average. It's the trade off between variance and bias.