COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

GR5261-STATISTICAL METHODS IN FINANCE

Final Project

Group members& Individual Contribution

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1. Summary

In this project, we choose 15 stocks from 5 industries, namely Basic Materials(BHP, CRH, NUE), Energy(XOM, PTR, ENB), Financial Service(JPM, BAC, TD), Real Estate(AMT, CCI, PSA) and Tec(AAPL, MSFT, ADBE). We conduct analysis base on their monthly returns and closing prices from 2014/12/11 to 2019/1/11**.** We first calculate sample statistics and plot equity curve to understand basic properties of these assets. Based on portfolio theory, we plot efficient frontiers and construct MVP, efficient portfolio and tangency portfolio within target return and with and without short-sales. Next, we use the PCA method to conduct the principal component analysis and assess risk management by calculating VaR and ES under parametric and non-parametric methods. Finally, we use copula to identify the optimal model.

We found that:

- Portfolio construction has an effect of diversification since it has lower risk compared with individual assets
- The betas of the stocks ranges from 0.06(JPM) to 1.71(ADBE), and 8 stocks among the 15 stocks have beta larger than 1.
- The annual return estimates of the 15 assets ranges from -0.12(BAC) to 0.32(PSA).
- Short-sale makes higher estimated mean return possible and we would suffer from higher risk for higher return requirement.
- For asset allocation, with target monthly return of 0.5%, efficient portfolio has higher risk, VaR and ES than MVP as a penalty of higher return.
- VaR and ES helps as identify extreme investment loss under different portfolio with an initial investment value of $100000.
- We use PCA to decide how many stocks we want to pick in the portfolio and their weights and explain the variance of a set of variables by reducing the number of dimensions.
- T-Copula has the minimum AIC and fits best for our assets data.

2. Descriptive Statistics

The sample statistics of each assets (Means, standard deviations, Skewness Coefficients, Kurtosis Coefficients and beta of each asset) are shown in the Appendix Table 2.1 .

As is shown in the table, JPM has the largest mean closing prices of $200.45 per share, while MSFT has the smallest mean closing prices of $22.01 per share. PSA has the largest closing prices standard deviation of 79.36, and with a standard deviation of 3.03 AMT has the smallest standard deviation. For Skewness Coefficients, most of the stocks are positive skewed, except for CRH, PTR, AMT, CCI, MSFT, ADBE. Most of the absolute value of the skewness coefficients are within 1, except for BAC (Skewness Coefficients: 1.36). For Kurtosis Coefficients, most of the stocks are negative, except JPM and BAC, which means most of the assets are light-tailed distribution. Stocks' betas ranges from 0.06(JPM) to 1.71(ADBE), and 8 stocks among the 15 stocks have beta larger than 1.

Most of the monthly prices plots of the stocks exhibits a clear upward trending from January 2015 to November 2019, except the monthly prices of BAC, which shows a downward trending, and the

monthly prices of CRH and AMT fluctuates during the period. As for the monthly returns plots, no clear trends can be seen from the graphs, but the range of the returns are all between -0.2 to 0.2. There is an extreme large positive return of up to 28% of MSFT in November, 2016, mainly because Microsoft Corp. (MSFT) buys LinkedIn Corp. (LNKD) for $26.2 billion in 2016.

The equity curves for each asset show similar patterns to the monthly prices plots of each stock. Most of the equity curves are increasing during the selected period. The equity curve of BAC exhibits a decreasing trend, and the $1 became $0.47 in the end.

AMT and CRH's equity curves fluctuates during the period, went from $1 to $0.88, and $1 to $1.01, respectively. Among all the increasing equity curves, PSA has the largest increment, from $1 to $4.26. The equity curve of S&P 500 also shows an upward trend, from $1 to $1.53, and most of the selected assets exhibits better performance than S&P 500.

The histograms, boxplots and qq-plots represent the distribution of each stock return series. From these graphs, it can be concluded that most of the returns look normally distributed. And from the boxplots, we can clearly see that except BHP, CRH, NUE, JPM, BAC, TD, all the remaining stocks have outliners

For the stationarity test, we first see the plots of each return series to see the trend, then we do the acf and pacf tests respectively. If the acf and pacf lines all fall within the boundaries, the return series is stationary. From the test results, we can conclude that the return series of ENB, JPM, AMT, PSA, AAPL and TD is not stationary. The return series is stationary at lag 1. All the other return series are stationary.

In distributions fitting to the data, we choose normal distribution, Cauchy distribution, and logistic distribution to fit into each asset. Then, the results of each fits are compared using AIC or BIC, the smaller AIC or BIC indicates better fitting. From the fitting results, we can see that XOM, AMT, CCI, PSA, MSFT, ADBE, TD fits better in logistic distribution than other distributions, BHP, CRH, NUE, PTR, ENB, JPM, BAC, AAPL fits better in normal distribution than other distributions.

The Sharpe's slopes, annual return estimates and annual standard deviation estimates of each stock are shown in the table below. As is shown in Appendix Table 2.2, PSA has the highest Sharpe's slope (0.28). This means PSA is the most attractive stock in terms of the risk-adjusted return. The annual return estimates of the 15 assets ranges from -0.12(BAC) to 0.32(PSA), which indicates PSA has the highest potential return and BAC has the lowest return. Most of the annual standard deviation estimates are within 1, except NUE. And the annual standard deviation estimates ranges from 0.55(TD) to 1.06(NUE), which shows that the annual return estimates of TD is the most steady one, while the annual return estimates of NUE fluctuates the most.

Among the 105 pairwise scatterplots in between each of the 15 asset returns in Appendix Figure 2.3, we can see there are some linear relationships exists. For example, there exists a near linear

relationship between the return series of BHP and AAPL. XOM and TD also show a rough linear relationship from the scatterplots.

From the 15*15 covariance matrix of the returns on the assets, we can see that most of the stocks have near 0 covariance with other stocks, so there is no clear direction of linear association.

3. Portfolio Theory

The minimum variance portfolio of the 15 selected stocks is constructed by the weights as illustrated in Appendix Table 3.1.

The estimate of mean return of the MVP is 0.0109, the estimate of standard deviation of the MVP is 0.16. The value at risk and expected shortfall of the MVP is 0.0393 and 0.026, respectively. Since we are using a "long-only" strategy here, the weights of each stock are between 0 and 1, with JPM accounted for the biggest weights (0.2731). It is noticeable that the weights of XOM, ENB, BAC, AAPL, MSFT, ADBE are zero. This is because we are looking for the minimum variance portfolio, and by not buying these assets we can achieve the minimum variance, which is 0.0259.

The annualized mean of the MVP is 0.1303 and the annualized standard deviation is 0.56. The annualized mean of the MVP is smaller than the median of the individual (0.13897), and the smallest mean return is -0.12, the biggest mean return is 0.32, which means the return series is negative skewed. The annualized mean of the MVP is smaller than the median of the individual (0.13897), and the smallest mean return is -0.12, the biggest mean return is 0.32, which means the return series is negative skewed. The annualized standard deviation of the MVP is 0.7683, which is greater than the median of the 15 stocks (0.7317). The 5% value-at-risk of the $100,000 investment over a one- month investment horizon for the MVP is 2600.88, that means there is a 0.05 probability that the portfolio will fall in value by more than $100,000 over a one-month period. Assume that the return series of individual assets are normal distributed, we have the minimum VaR of 6248 and maximum VaR of 13587. Compare the individual VaR with the VaR of the MVP, we can conclude that MVP has VAR that is far smaller than the individual VaR.

When short-sales is allowed, we have the minimum variance portfolio constructed as followed:

	Weights
BHP	0.39
CRH	0.08
NUE	0.12
XOM	-0.07
PTR	0.09
ENB	0.03
JPM	0.29
BAC	-0.05

AMT	0.07
CCI	0.02
PSA	0.01
AAPL	-0.03
MSFT	-0.13
ADBE	-0.09
TD	0.26

The estimate of mean return of the MVP is 0.011, the estimate of standard deviation of the MVP is 0.02. The value at risk and expected shortfall of the MVP is 0.03 and 0.04, respectively. Compared with the "long-only" strategy, the expected return of the M VP with short-sales allowed is slightly bigger, and the variance is slightly smaller, which indicates better performance. Since we are using a "short-sales allowed" strategy here, the weights of each stock can be positive or negative, with BHP accounted for the biggest weights (0.39). It is noticeable that the weights of XOM, BAC, AAPL, MSFT, ADBE are negative, which means we need to short sell these stocks to achieve the minimum variance.

There are 49 points of the efficient portfolio frontier, among which 5 of the points are constructed as followed:

	1	13	25	37	49
BHP	0	0	0.135	0.1905	0
CRH	0	0	0.052	0	0
NUE	0	0	0.0445	0.0015	0
XOM	0	0	0	0.0698	0
PTR	0	0.0131	0.1143	0.0146	0
ENB	0	0	0	0	0
JPM	0.0456	0.4456	0.2995	0.1178	0
BAC	0.9544	0.3362	0.043	0	0
AMT	0	0.0761	0.0763	0.0176	0
CCI	0	0	0.0257	0	0
PSA	0	0	0	0.2889	1
AAPL	0	0	0	0.0574	0
MSFT	0	0	0	0	0
ADBE	0	0	0	0	0
TD	0	0	0.2097	0.02419	0

As is shown in the graph, PSA has the highest Sharpe's slope (0.28). This means PSA is the most attractive stock in terms of the risk-adjusted return.

	Sharpe's slope
BHP	0.11
CRH	-0.21
NUE	-0.00
XOM	0.11

PTR	0.02
ENB	0.12
JPM	0.07
BAC	-0.28
AMT	-0.12
CCI	-0.05
PSA	0.28
AAPL	0.22
MSFT	0.06
ADBE	-0.03
TD	0.07

When short-sale are not allowed, the tangency portfolio has a mean return of 0.018 and a risk of 0.0334. The VaR is 0.0329 while the expected shortfall is 0.0514. The Sharpe ratios of the tangency portfolio is 0.04, which is higher than the median and the mean of the individual stocks. This means the tangency portfolio shows better performance in terms of risk-return than the individual stocks.

4. Asset Allocation:

With a target monthly return of 0.5%, we construct efficient portfolio with only long-handed allowed as follows:

Asset	Weight
BHP	0.0737
CRH	0.1253
NUE	0
XOM	0.0065
PTR	0
ENB	0.0744
JPM	0.1870
BAC	0
AMT	0
CCI	0.2524
PSA	0.2704
AAPL	0
MSFT	0
ADBE	0.0103
TD	0

Under this condition, the risk of efficient portfolio, which identified by its standard deviation, is 0.026. it lies between the max and min standard deviation of individual assets. Thus shows a result of portfolio risk diversification.

For efficient portfolio, the VaR under 95% confidence level is $3815.241, meaning that with an initial investment of $100000, there is a probability of 5% that we would have a loss over $3815.241. The expected shortfall of this efficient portfolio is $4905, which can be view as an expected value of extreme loss.

We use a risk free return of 1.02% for risk free asset such as T-Bill. When T-Bill is added, we have a new tangency portfolio with weights as follows:

Asset	Weights
BHP	0
CRH	0
NUE	0
XOM	0
PTR	0
ENB	0
JPM	0.18305
BAC	0
AMT	0.18746
CCI	0.07036
PSA	0.09131
AAPL	0
MSFT	0.00949
ADBE	0.45833
TD	0

When T-Bill is added, new tangency portfolio has a risk the same as former since the risk only decided by composite of risky assets.

The VaR and ES of $5719 and $7290 respectively, which means we could say that with a probability of 5% that we would suffer a loss over $5719 and the expected value of extreme loss under this condition is $7290, indicating a higher extreme loss.

Therefore, we could conclude that, compared to MVP, when a target return is set, we would suffer from higher risk, VaR and ES as penalty for a higher investment return.

5. Principal Component Analysis:

For each asset we take in our portfolio, we take the correlation of each asset and use the PCA method to do the analysis here.

From Appendix Table 5.1, we can see that BAC and JPM are most highly correlated; XOM and PSA are least correlated. Based on the estimated correlation values, the diversification will definitely reduce

risk with these assets. Before the investigation, it is reasonable to think that those stocks from the same industry are most likely correlated, but in the table we can see it is not always true. Some companies, such as BHP and PTR, they separately come from Basic Material Industry and Energy Industry, but their correlation is 0.644. Also, it is interesting to see that the Real Estate Industry is not so correlated with other four industries. The correlation table is also a good tool to see the connection between two industries.

PCA:

Many financial markets are characterized by a high degree of collinearity between returns. Sometimes the High-Dimensional data will be challenging to analyze. PCA finds structure in the covariance or correlation matrix and uses this structure to locate low-dimensional subspaces containing most of the variation in the data. Here we use PCA to decide how many stocks we want to pick in the portfolio and their weights, and we can also use it to explain the variance of a set of variables by reducing the number of dimensions without much loss of information.

After the PCA analysis, we can get the Importance of components as follows:

	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5
Standard deviation	2.3532234	1.5344210	1.3145593	1.085521	0.89722301
Proportion of Variance	0.3691774	0.1569632	0.1152044	0.078557	0.05366728
Cumulative Proportion	0.3691774	0.5261405	0.6413450	0.719902	0.77356923
	Comp.6	Comp.7	Comp.8	Comp.9	Comp.10
Standard deviation	0.77769804	0.7607973	0.71880326	0.66171150	0.57773775
Proportion of Variance	0.04032095	0.0385875	0.03444521	0.02919081	0.02225206
Cumulative Proportion	0.81389018	0.8524777	0.88692289	0.91611370	0.93836576
	Comp.11	Comp.12	Comp.13	Comp.14	Comp.15
Standard deviation	0.53748470	0.4667242	0.45695857	0.37674464 8	0.258929898
Proportion of Variance	0.01925932	0.0145221	0.01392074	0.00946243 5	0.004469646
Cumulative Proportion	0.95762508	0.9721472	0.98606792	0.99553035 4	1.000000000

In this case, We will concentrate on the first six principal components since approximately 80 % of the variation in the changes in yields is in the space they span. We obtain 15 principle components, and each of them explains a percentage of the total variation in the dataset.

By seeing Appendix Figure 5.2, we can find the PCA loadings for each individual stock in the portfolio and put their weights.

6. Risk Management:

Stocks	Parametric VaR	Parametric ES	Non-parametric VaR	Non-parametric ES
BHP	15409.704	696684.9	13964.068	15990.949

CRH	9900.213	613187.6	7501.922	9360.530
NUE	15132.608	681531.8	11234.193	14462.744
XOM	7502.651	460400.7	8301.331	13104.718
PTR	12829.102	559894.0	12442.213	14745.646
ENB	10348.095	561009.9	8113.286	12839.361
JPM	11402.750	671344.7	8814.023	11732.335
BAC	10892.250	721394.5	13037.482	14846.206
AMT	10920.430	633322.0	5718.061	8863.308
CCI	8413.707	541128.2	5691.386	8016.968
PSA	8690.647	524667.2	6605.385	9245.768
AAPL	12904.703	727851.5	11778.580	15051.276
MSFT	11130.360	720650.7	7718.307	10378.117
ADBE	12520.927	734215.7	6361.934	8436.443
TD	7961.452	544327.1	7423.464	11837.354

Table 6.1

Based on the estimated means and variances of each asset we get before, we can calculate the VaR and ES by parametric method and non-parametric method. According to the Table 6.1, we get can know that at a one month horizon for parametric method, BHP has the highest VaR and CCI has the lowest VaR; ADBE has the highest ES and XOM has the lowest ES; at a one month horizon for non-parametric method, BHP has the highest VaR and CCI has the lowest VaR; BHP has the highest ES and CCI has the lowest ES. Based on these two different methods, we can see the diversity of the result of our VaR and ES.

By further analysis, we use the bootstrap to compute estimated standard errors and 95% confidence intervals for VaR and expected short fall ,which is shown in Appendix Table 6.2. After using the bootstrap, even if these risk measures are estimated with considerable uncertainty, we can know how precise our data and make it more precise.

7 . Copulas:

Copula	t	Clayton	Gumbel	Frank	Joe
Loglikelihood	278.5	71.17	64.99	59.78	47.38
AIC	-553	-140.34	-127.98	-117.56	-92.76

Table 7.1

From Table 7.1, we can see that the t-copula has the minimum AIC, so we can say that the t-copula fits better the return data. We know that the primary financial application of copula models is risk assessment and management of portfolios that contain assets which exhibit co-movements in extreme behavior. By knowing the t-copula is better for the model, we can further investigate relationship between the correlation and t-copula.

8.Conclusion:

Sample statistics show that most of the assets exhibits a clear upward trending and negative kurtosis and there is no clear direction of linear association.

Based on portfolio theory, the expected return of the MVP with short-sales allowed is slightly bigger, and the variance is slightly smaller, which indicates better performance. The betas of many stocks (CRH,NUE,XOM,PTR,JPM,AMT,TD), which means that they are not the aggressive asset.

PSA is the most attractive stock in terms of the risk-adjusted return because it has the highest Sharpe's slope. Most of the annual standard deviation estimates are within 1, except NUE. The annual return estimates of TD is the most steady one, while the annual return estimates of NUE fluctuates the most.

Our goal of building the portfolio is to minimize the risk and get the highest return. For the stock PSA, it has the highest return and its Sharpe's slope is biggest, which means that we should have the biggest weight(0.28) in our portfolio. For those stocks that have negative return, we should short them in building our portfolio.

The PCA result shows that we need concentrate on the first six principal components because they explain at least 80% of the total risk of our investment.

Furthermore, if we have $100000 to invest, we should invest more on those stocks with highest Expected Shortfall, such as ADBE and BHP. By applying the whole portfolio to different copulas We find that the t-copula fits better the return data because it has the minimum AIC.

Appendix

	Mean	Standard deviation	Skew	Kurtosis	Beta
BHP	83.2	23.82	0.06	-1.47	1.21
CRH	72.62	4.3	-0.23	-0.61	0.99
NUE	36.22	9.8	0.06	-0.97	0.94
XOM	130.02	41.74	0.83	-0.37	0.4
PTR	30.19	4.11	-0.31	-0.93	0.84
ENB	146.96	44.68	0.6	-0.55	1.21
JPM	200.45	22.02	0.26	0.12	0.06
BAC	67.18	14.33	1.36	1.4	1.21
AMT	32.26	3.03	-0.47	-0.44	0.52
CCI	46.1	8.65	-0.11	-1.59	1.04
PSA	165.16	79.36	0.37	-1.49	1.07
AAPL	77.2	32.76	0.59	-0.92	1.22
MSFT	22.01	6.54	-0.09	-1.58	1.65
ADBE	50.46	8.66	-0.33	-1.2	1.71
TD	94.13	21.37	0.59	-0.69	0.24

Table 2.1

	Sharpe’s slope	Annual return	Annual S.D.
BHP	0.11	0.20	0.73
CRH	-0.21	-0.01	0.63
NUE	-0.00	0.12	1.06
XOM	0.11	0.19	0.64
PTR	0.02	0.13	0.69
ENB	0.12	0.23	0.91
JPM	0.07	0.08	0.61
BAC	-0.28	-0.12	0.88
AMT	-0.12	0.28	0.79
CCI	-0.05	0.09	0.63
PSA	0.28	0.32	0.71
AAPL	0.22	0.29	0.75
MSFT	0.06	0.18	0.98
ADBE	-0.03	0.09	0.97
TD	0.07	0.16	0.55

Table 2.2

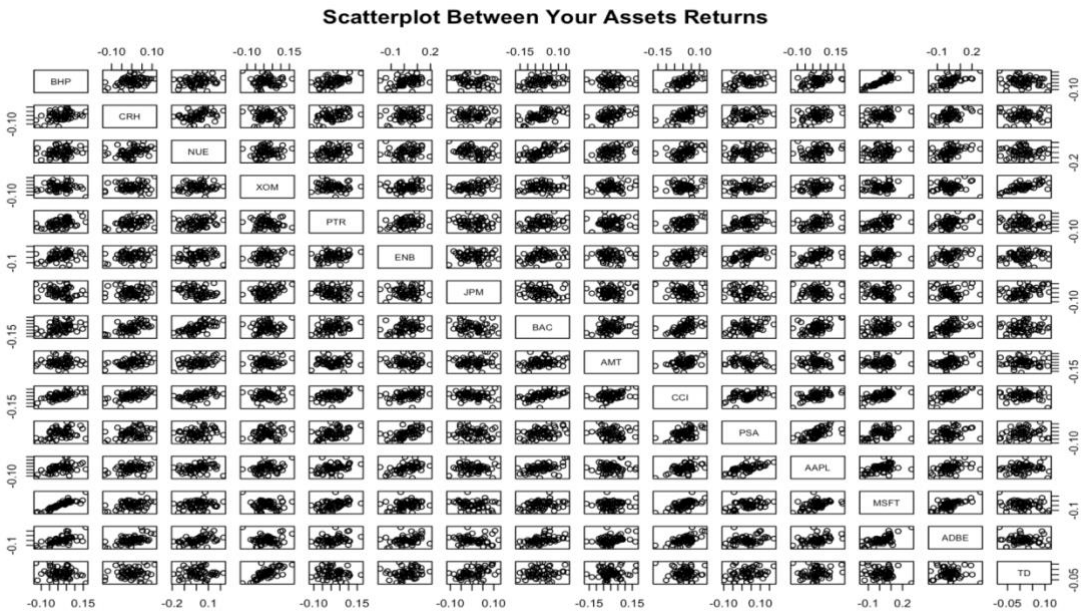

Figure 2.3

	Weights
BHP	0.1816
CRH	0.0119
NUE	0.0630
XOM	0.0000
PTR	0.1203
ENB	0.0000
JPM	0.2731
BAC	0.000
AMT	0.0784
CCI	0.0026
PSA	0.0195
AAPL	0.0000
MSFT	0.0000
ADBE	0.0000
TD	0.2496

Table 3.1

	BHP	**CRH**	**NUE**	**XOM**	**PTR**	**ENB**	**JPM**	**BAC**	**AMT**	**CCI**	**PSA**	**AAPL**	**MSFT**	**ADBE**	**TD**
BHP	1	0.238	0.461	0.305	0.644	0.407	0.209	0.217	0.102	-0.015	-0.365	0.122	0.222	0.25	0.47
CRH	0.238	1	0.335	0.39	0.305	0.085	0.46	0.45	-0.067	-0.145	-0.09	0.285	0.375	0.425	0.477
NUE	0.461	0.335	1	0.589	0.505	0.357	0.63	0.693	0.036	-0.087	-0.104	0.281	0.405	0.285	0.635
XOM	0.305	0.39	0.589	1	0.639	0.443	0.414	0.402	0.113	0.068	0.001	0.187	0.399	0.348	0.591
PTR	0.644	0.305	0.505	0.639	1	0.33	0.351	0.312	0.119	0.079	-0.26	0.259	0.444	0.373	0.576

ENB	0.407	0.085	0.357	0.443	0.33	1	0.098	0.092	0.247	0.078	0.045	-0.047	0.084	-0.052	0.422
JPM	0.209	0.46	0.63	0.414	0.351	0.098	1	0.921	-0.046	-0.212	-0.256	0.268	0.49	0.395	0.667
BAC	0.217	0.45	0.693	0.402	0.312	0.092	0.921	1	-0.064	-0.222	-0.21	0.282	0.467	0.376	0.631
AMT	0.102	-0.067	0.036	0.113	0.119	0.247	-0.046	-0.064	1	0.709	0.344	0.218	0.281	0.236	0.082
CCI	-0.015	-0.145	-0.087	0.068	0.079	0.078	-0.212	-0.222	0.709	1	0.411	0.214	0.112	0.194	-0.09
PSA	-0.365	-0.09	-0.104	0.001	-0.26	0.045	-0.256	-0.21	0.344	0.411	1	0.019	-0.01	-0.059	-0.174
AAPL	0.122	0.285	0.281	0.187	0.259	-0.047	0.268	0.282	0.218	0.214	0.019	1	0.46	0.579	0.305
MSFT	0.222	0.375	0.405	0.399	0.444	0.084	0.49	0.467	0.281	0.112	-0.01	0.46	1	0.639	0.537
ADBE	0.25	0.425	0.285	0.348	0.373	-0.052	0.395	0.376	0.236	0.194	-0.059	0.579	0.639	1	0.472
TD	0.47	0.477	0.635	0.591	0.576	0.422	0.667	0.631	0.082	-0.09	-0.174	0.305	0.537	0.472	1

Table 5.1

	Comp.1	**Comp.2**	**Comp.3**	**Comp.4**	**Comp.5**	**Comp.6**	**Comp.7**	**Comp.8**
BHP	0.237	/	0.394	0.419	0.117	0.239	0.132	0.203
CRH	0.254	/	-0.175	/	-0.597	0.552	/	0.372
NUE	0.333	/	0.118	-0.236	0.197	-0.228	0.293	0.243
XOM	0.302	/	0.214	-0.189	-0.360	-0.451	-0.195	
PTR	0.305	/	0.276	0.300	-0.108	-0.370	-0.193	0.148
ENB	0.154	-0.107	0.544	-0.238	/	0.301	0.278	-0.418
JPM	0.330	0.191	-0.202	-0.252	0.312	/	-0.141	/
BAC	0.325	0.195	-0.205	-0.292	0.325	/	/	0.155
AMT	/	-0.547	/	/	0.320	0.306	-0.179	/
CCI	/	-0.572	/	/	0.174	/	-0.141	0.390
PSA	/	-0.388	/	-0.527	-0.304	/	/	/
AAPL	0.202	-0.220	-0.344	0.244	/	-0.141	0.744	/
MSFT	0.296	-0.171	-0.238	/	/	/	-0.285	-0.538
ADBE	0.269	-0.196	-0.327	0.289	-0.132	/	/	-0.163
TD	0.365	/	/	/	0.133	/	-0.241	/
	Comp.9	**Comp.10**	**Comp.11**	**Comp.12**	**Comp.13**	**Comp.14**	**Comp.15**	
BHP	0.463	0.130	/	/	0.116	0.483	/	/
CRH	/	-0.258	/	/	/	-0.108	/	/
NUE	0.263	/	0.452	/	-0.369	-0.377	0.134	/
XOM	-0.343	/	0.258	0.191	/	0.472	/	/
PTR	/	-0.226	-0.406	/	0.280	-0.468	/	/
ENB	-0.259	/	/	-0.236	0.325	-0.164	/	/
JPM	-0.129	/	-0.198	/	0.300	/	0.681	/
BAC	/	/	/	/	0.289	/	-0.709	/
AMT	/	-0.212	0.131	0.611	-0.103	/	/	/

CCI	-0.202	0.112	-0.107	-0.626	/	/	/	/
PSA	0.540	0.135	-0.240	0.107	0.214	/	/	/
AAPL	-0.239	-0.225	-0.144	/	/	0.148	/	/
MSFT	0.329	-0.442	0.142	-0.309	/	0.152	/	/
ADBE	/	0.666	0.296	/	0.210	-0.258	/	/
TD	0.311	/	-0.542	/	-0.611	/	/	/

Figure 5.2

	Parametric VaR	Parametric ES	Non-parametric VaR	Non-parametric ES
Standard Error	72.76539	22118.48	74.31096	659.3997
Confidence Interval	(10909,11200)	(582267, 670741)	(8824.4 9121.8)	(10606.6 13244.2)

Table 6.2