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Net App Daily Stock Price Regression Modeling

Abstract -

The goal of this paper is to determine the daily stock price of Net App (NTAP) based on the stock prices of various other Information Technology components in the S&P 500. Net App is an information technology company that stores data for companies as well as manages different companies' data. Despite not selling actual hardware the services can be offered to companies with data storage needs and could be potentially used by any company that can't store all the data that they have. Sixty-three components were chosen at the start of the analysis as potential independent variables. Out of those sixty-three components forty-two were chosen based on how well they correlated with Net App. After determining which components were most correlated to Net App those forty-two components were put into a regression model and using a few different variable selection methods, stepwise selection was used to get a first-order model. This stepwise model had twenty components used as independent variables but had issues with multicollinearity. Multicollinearity is when multiple components are predicting the same thing in a model and this was dealt with by removing components that had a high Variance Inflation Factor. After removing components that caused issues with multicollinearity we were left with a first-order model with seven components. These seven components were Akanai (AKAM), Advanced Micro Devices (AMD), Enphase (ENPH), Juniper Networks (JNPR), Micron Technology (MU), Palo Alto Networks (PANW), TE Connectivity (TEL). These components from the first-order model were then tested to determine if any of them needed a quadratic term added and only

JNPR was determined to need a quadratic term. These seven components were also tested for any interaction between each other and while there were interactions between many of the components only one was determined to be significant in the model and this was the interaction between AMD and JNPR. Three different models were then created in addition to the first-order model, one with the quadratic term added to the first-order model, one with the interaction term added to the first-order model, and one with both added to the first-order model. In the end, the best model for predicting the daily stock price of Net App (NTAP) was the model with Akanai (AKAM), Advanced Micro Devices (AMD), Enphase (ENPH), Juniper Networks (JNPR), Micron Technology (MU), Palo Alto Networks (PANW), TE Connectivity (TEL), AMD*JNPR(interaction term), and JNPR*JNPR(quadratic term).

Data -

Is there any way to predict the daily stock price of Net App if the daily stock price using the daily stock prices of other information Technology components in the S&P 500? The goal is to answer this question using multiple regression and more. Before I did any exploratory data analysis I determined that this data set had 251 observations and 65 variables. When determining what variables I was going to consider to predict the daily stock price of Net App I thought that since all of the companies in this data set are a part of the same main category in the S&P 500 all of them had the potential to be correlated and even though Net App has a different sub-category than many of the other comments in the data set I hypothesized that since net App stores data for companies if other companies are doing well then they are going to have more data to store which made me think that any company in this data set could have a correlation to

Net App. I also hypothesized that companies that follow the same trends as Net App would have a higher correlation. For example, if Net App's daily stock price increased from January to March and Apple's daily stock price also increased during that time then they would be more correlated since they followed the same patterns.

Exploratory Data Analysis -

I began my exploratory analysis by comparing the trends of all sixty-three potential independent variables with the dependent variable over the time period that this data was collected. When looking at the plot of the first five potential independent variables and dependent variable all of these lines follow the same sort of pattern even though some components have more of a price difference than NTAP (figure 1). When looking at the next five potential independent variables again most of the potential variables follow a similar trend but, ADI and ANSS have periods of decay at the end while NTAP has growth which could make these two components not good predictors (figure 2). The next five potential independent variables graph is harder to read but, going off of the last graph of NTAP the only graph that looks considerably different trend-wise would probably be CDW because that component seems to steadily increase over the whole time period (figure 3). When looking at the graph for the next five variables all of these variables seem to follow the same trends at NTAP except ENPH because that component seems to decrease steadily over a large period of time when NTAP is increasing (figure 4). The next graph with the next five potential variables shows only two components that seem to follow the same trends as NTAP and those two are FICO and IT (figure 5). In the next graph of the next five potential variables the only component that didn't really follow the same trend as NTAP was HPQ (figure 6).

When looking at the next graph of the next five potential independent variables only MCHP and KEYS seem to not follow the same trends as NTAP (figure 7). The graph of the next five potential independent variables had two components NVDA and MPWR that didn't really follow the same trend as NTAP (figure 8). For the next five potential variables, all of them seem to follow the same trend as NTAP (figure 9). The only component in the next graph that doesn't seem to follow the same trend as NTAP is ROP which makes it potentially not a good predictor (figure 10). Out of the next five potential independent variables, only SEDG doesn't seem to follow the same trend as NTAP (figure 11). The only potential independent variables that seem to share the same trend as NTAP in this graph would be TDY and TRMB everything else seems to not follow the same trend (figure 12). For the last three components only ZBRA doesn't seem to follow the same trend as NTAP and probably wouldn't be a good predictor (figure 13). After analyzing all of these graphs most of the sixty-three potential independent variables followed the same trend as NTAP and there only seemed to be fifteen potential variables that didn't seem like they would be good predictors and those were ADI, ANSS, CDW, ENPH, FSLR, GEN, FTNT, HPQ, MCHP, KEYS, NVDA, MPWR, ROP, SEDG, ZBRA. I also didn't think there were any potential outliers, none of the graphs had any peaks or dips that resembled anything that was unreasonable.

After analyzing all of the graphs I ran a proc corr to see which potential independent variables correlated the most to NTAP. I took out any potential variables with less than a 0.5 correlation coefficient and most of these variables that were taken out didn't follow the same trend as NTAP in the graphs from before (figure 14). This whittled down the amount of potential independent variables from sixty-three to forty-two and there were only six potential variables that had a moderate to high correlation coefficient that I didn't think followed the same trend as NTAP and those were ENPH, KEYS, NVDA, MPWR, ROP, AND SEDG. Overall my hypothesis from before was mostly correct since most of the correlation coefficients that were over 0.5 seemed to have similar graphs to NTAP.

Methodology -

To find out the daily stock price of Net App a few different SAS procedures were used. The first procedure that I used was proc print to print out the data set to see if the data set was actually imported correctly. The procedures that I used for the exploratory data analysis were proc sgplot and proc corr. Proc sgplot was used to make the line graphs of all of the variables prices over the time period of the data set to compare the trends to our dependent variables. Proc corr was used to correlate all of the potential independent variables to the dependent variable and it gives you a correlation coefficient and a corresponding p-value as well as scatterplots. Proc reg was used in a variety of ways. It was used with a few different variable selection methods and to make a few different models as well as to test multicollinearity. Proc glm select was also used for variable selection. Proc glm and plm were both used to see if there were any interactions between potential independent variables. All of these procedures helped build the best model for predicting the daily stock prices of Net App.

Results -

<u>Correlation Analysis</u> -

After thoroughly exploring the data set and seeing all of the different variables stock prices over time forty-two out of the initial sixty-three independent variables were determined to be potential predictors of Net App's daily stock price. In order to go from sixty-three independent variables to forty-two independent variables I ran a proc corr in SAS when doing my exploratory data analysis and only chose potential independent variables from the table that had a moderate to high correlation coefficient and a corresponding significant p-value because this is a strong indication of a good predictor (figure 14). I then graphed the scatterplots for all the forty-two potential variables and eighteen of the potential independent variables had a moderate to high positive correlation with Net App but, also had lots of potential outliers which may cause issues later on (figures 15 - 32). These variables are ADBE, AMAT, ADSK, AVGO, CDNS, CSCO, CTSH, FICO, INTU, KLAC, LRCX, NVDA, NXPI, ON, ORCL, PTC, NOW, and SNPS and I was surprised to see so many potential outliers considering none of the graphs from earlier looked too terrible. Next, there were eleven variables that had a moderate to strong positive relationship with Net App but, had a few potential outliers which is more of what I was expecting to see (figures 33 - 43). These variables included ACN, AMD, APH, ANET, IT, MU, MSFT, PANW, ROP, TYL, and WDC. After this, I saw eight potential independent variables with a moderate to strong positive relationship with Net App and presented no potential outliers and these variables were AKAM, AAPL, FFIV, HPE, INTC, MPWR, CRM, and TEL (figures 44 - 51). There were also two potential independent variables EPAM and KEYS presented a moderate to strong negative relationship with Net App and also had no potential outliers (figures 52 - 53). There were also three independent variables with a moderate to strong negative relationship with Net App and also had quite a few potential outliers (figures 54 - 56). Those variables were ENPH, JNPR, and SEDG. When looking at all of the correlation coefficients and scatter plots there are a lot of potential and significant predictors for the daily stock price of Net App and it'd be hard to choose which ones are potentially the best with only proc corr thus other methods of variable selection are going to have to be used in this situation.

Proc Reg and GLM Select -

After determining which independent variables are strongly correlated with Net App it was time to start selecting variables for a potential model. For variable selection for a potential model, I used proc reg and a few different selection methods which were stepwise, backward, forwards, r^2, adjusted r^2, c(p), and press. When looking at the stepwise model it took twenty-six steps to get a model and this model had an adjusted r^2 value of 0.958, a coefficient of variation of 1.78838, an f-value of 301.21 with a corresponding p-value of 0.0001, a mean squared error of 1.55632, a root MSE of 1.24752, and also had no insignificant t-tests (figure 57). The residual plots also looked pretty good overall, the predicted value plot was scattered and didn't seem to have any patterns, the qq plot was pretty straight and the residuals hugged the line pretty well, and the residuals were also fairly normally distributed. The fit mean plot was decent but, kind of looked a little off and the only thing that was not decent overall was the cooks D (figure 58). Next, I looked at the forwards selection model and this model had an adjusted r^2 value of 0.9594, a coefficient of variation of 1.75809, an f-value of 258 with a corresponding p-value of 0.0001, a mean squared error of 1.50404, a root MSE of 1.22639, and also had 1 insignificant t-tests (figure 57). The residual graphs looked very similar to the stepwise regression model other than the qq plot which looked a little wonky, this isn't that surprising since the method of selection is fairly similar (figure 59).

Next, I looked at the backwards selection model and this model had an adjusted r^2 value of 0.9612, a coefficient of variation of 1.72024, an f-value of 238.89 with a corresponding p-value of 0.0001, a mean squared error of 1.43997, a root MSE of 1.19999, and also had 2 insignificant t-tests (figure 57). The residual graphs looked very similar to the stepwise regression model other than the qq plot which looked a little better, but again this isn’t that surprising since the method of selection is fairly similar (figure 60). For the next selection method, I chose r^2 and this might’ve been the worst model selection-wise. This model had an adjusted r^2 value of 0.9612, a coefficient of variation of 1.7367, a f-value of 145.37 with a corresponding p-value of 0.0001, a mean squared error of 1.46766, a root MSE of 1.21147, and also had 24 insignificant t-tests (figure 57). The residual plots again looked fairly similar to the others but, with that many insignificant t-tests this model shouldn’t be considered (figure 61). Next, I used adjusted r^2 selection and this model had an adjusted r^2 value of 0.9613, a coefficient of variation of 1.71773, a f-value of 214.93 with a corresponding p-value of 0.0001, a mean squared error of 1.43577, a root MSE of 1.71773, and also had 7 insignificant t-tests (figure 57). Again the residual plots looked similar to the others but, there were too many insignificant t-tests to consider this model as well (figure 62). This led to c(p) selection and this model had an adjusted r^2 value of0.9608, a coefficient of variation of 1.7277, a f-value of 228.01 with a corresponding p-value of 0.0001, a mean squared error of 1.4525, a root MSE of 1.7277, and also had 6 insignificant t-tests (figure 57). The residual plots look very similar to the others but, this model also had a lot of insignificant t-tests and should be considered (figure 63). Lastly, I used press selection as well, and this model had an adjusted r^2 value of 0.9588, a coefficient of variation of

1.7715, a f-value of 291.89 with a corresponding p-value of 0.0001, a mean squared error of 1.5271, a root MSE of 1.357, and also had 0 insignificant t-tests (figure 57). The residual plots almost look identical to the stepwise model (figure 64). This makes a lot of sense because the press selection model had every variable in the stepwise model except for CTSH. When comparing stepwise selection to forwards selection despite forwards selection having similar key statistics the f value was lower and since once a variable is added it can't be removed there was an insignificant independent variable. The same story is true with backward selection except there were two insignificant independent variables because once a variable is removed it can't be put back in. When comparing stepwise to either r-squared selection, adjusted r-squared selection, and c(p) selection stepwise is way better because the downfall of these selection methods is that they only consider the one prioritized key statistic and nothing else and in this case, all three of these models have a lot of insignificant independent variables and a low f value when compared to the stepwise model. Lastly, When comparing the stepwise model to the press selection model both are extremely similar but, the stepwise model is better overall since the f-value is larger and the residual plots are a slight bit better but, there really isn't a big difference between the models since the only variable that isn't in both is CTSH which is left out of the press model. The stepwise model had nineteen independent variables which is lower than the forty-two that we started this process with. Overall stepwise was the best selection method and this is why I used the stepwise model as a base model to build off of.

After selecting the stepwise model as the base for building my own model the first thing that I did was test for multicollinearity since there is an extremely high likelihood that out of the nineteen different independent variables at least two are correlated with each other. To test for multicollinearity I used the stepwise model from before and ran a proc reg with the vif on. I then took out the independent variables with the highest vif value over ten one by one and re-ran proc reg until I ended up with a model where there were no vif values over ten(figures 65-73). After removing all of the variables that were causing issues with multicollinearity in our model I was left with a model that had ten variables. Out of these ten variables four of them ended up being insignificant and needed to be taken out(figure 74). After taking these independent variables out I was left with a model that had seven independent variables that were NTAP = -12.44381 + 0.27253*AKAM - 0.08168*AMD + 0.02370*ENPH -0.53755*JNPR + 0.25578*MU + 0.06425*PANW + 0.37875*TEL (figure 75). This is what I believe to be the best first-order model after going through variable selection as well as dealing with multicollinearity.

I then tested for potential interactions between all of the independent variables by using proc glm and plm. When graphing all of the interaction plots I determined that there may be a potential interaction between AKAM and ENPH, AKAM and JNPR, AKAM and PAWN, AMD and ENPH, AMD and JNPR, AMD and MU, AMD and PANW, ENPH and MU, ENPH and PANW, ENPH and TEL, MU and PANW, and lastly MU and TEL based on the interactions plots because not all of the lines have the same slope (figures 76-87). I then added all of these interaction terms to the original first-order model and ran a proc reg. When looking at the individual t-tests for each individual independent variable in the interaction model with H0: Bi = 0 and Ha: Bi doesn't equal 0. A few of the t-tests aren't significant at an alpha of 0.05 meaning that there isn't sufficient evidence to reject the null hypothesis in any of those cases. Also in a few cases, the interaction term is really close to 0 meaning that some of the interaction terms don't add to our original model(figures 88-91). After removing the insignificant terms I was left with a model that had only one significant interaction term and that was AMD*JNPR. This is what I determined to be the best interaction model which was NTAP = 90.30109 + 0.32690*AKAM -1.16443*AMD + 0.02331*ENPH -3.96330*JNPR + 0.20181*MU + 0.05609*PANW + 0.39808*TEL + 0.03550*AMD*JNPR.

After determining the best interaction model I then tested for potential quadratic terms. I used proc sgplot to graph scatter plots of all seven variables against the dependent variable. When looking at the graphs only ENPH, JNPR, and MU seem to be possible quadratic terms (figures 92-94). I then added these terms to the first order model and when looking at the individual t-tests for each individual independent variable in the quadratic model with H0: Bi = 0 and Ha: Bi doesn't equal 0.One of the t-tests isn't significant at an alpha of 0.05 meaning that there isn't sufficient evidence to reject the null hypothesis in any of those cases. Also in one case, the quadratic term is really close to 0 meaning that that quadratic term doesn't add to our original model(figures 95-97). After removing the insignificant quadratic terms I was left with the best quadratic model with one siginifignat quadratic term that was JNPRSQ and the model was NTAP = -97.44524 + 0.28436*AKAM - 0.09603*AMD + 0.02122*ENPH + 5.23004*JNPR + 0.25264*MU + 0.07506*PANW + 0.34676*TEL - 0.09423*JNPR*JNPR.

After determining that a quadratic term and interaction term were significant I then added both terms to the original model and compared all four of the potential models. When looking at the key statistics for the first order model this model had an adjusted r^2 value of 0.9056, a coefficient of variation of 2.68203, a f-value of 343.47, with a corresponding p-value of 0.0001, a mean squared error of 3.5003, a root MSE of 1.87091, and also had 0 insignificant t-tests (figure 57). The residual plots also looked pretty good overall, the predicted value plot was scattered but had some clumps, the qq plot was pretty straight but the tails looked slightly curved, the fit mean plot was pretty straight, and the residuals were also fairly normally distributed. The cook's d plot had quite a few potential outliers (figure 98). When looking at the key statistics for the quadratic model this model had an adjusted r^2 value of 0.9131, a coefficient of variation of 2.61425, a f-value of 318.04, with a corresponding p-value of 0.0001, a mean squared error of 3.32561, a root MSE of 1.82362, and also had 0 insignificant t-tests (figure 57). The residual plots also looked pretty good overall, the predicted value plot was scattered but had some clumps, the qq plot was pretty straight, the fit mean plot was pretty straight and better than the first order model, and the residuals were also fairly normally distributed and also better than the first order model. The cook's d plot had quite a few potential outliers (figure 99). When looking at the key statistics for the interaction model this model had an adjusted r^2 value of 0.9164, a coefficient of variation of 2.523776, a f-value of 343.47, with a corresponding p-value of 0.0001, a mean squared error of 3.09935, a root MSE of 1.7605, and also had 0 insignificant t-tests (figure 57). The residual plots also looked pretty good overall, the predicted value plot was scattered and better than the first order model and the quadratic model, the qq plot was pretty straight but the tails curved, the fit mean plot was pretty straight and better than the first order model, and the residuals were also very normally distributed and also better than the first order model and the quadratic model. The cook's d plot had quite a few potential outliers and was worse than the quadratic model (figure 100). When looking at the key statistics for the model with both the quadratic term and interaction term this model had an adjusted r^2 value of 0.9174, a coefficient of variation of 2.50798, a f-value of 309.61, with a corresponding p-value of 0.0001, a mean squared error of 3.06073, a root MSE of 1.7495, and also had 0 insignificant t-tests (figure 57). The residual plots also looked pretty good overall, the predicted value plot was scattered and looks to be the best overall, the qq plot was pretty straight but the top tail was slightly curved but, is probably the second best overall, the fit mean plot was pretty straight and probably the straightest overall, and the residuals were also very normally distributed and the best overall. The cook's d plot had quite a few potential outliers and was worse than the quadratic model (figure 101). The only thing that was concerning with all four of these models was the cook's d graphs so I investigated this issue a little further. When using the all function in the proc reg only the first order model and the quadratic had outliers that had some cause for concern but the interaction model and the model with the quadratic and the interaction term had no outliers that were a cause for concern (figures 102 and 103).

After doing all of this analysis the best overall model in this situation is the model with the quadratic term and interaction term because it has the highest adjusted r^2 value, the lowest correlation coefficient, the lowest MSE and root MSE, as well as the second best to best plots and also had no outliers that seemed to be cause for concern (figure 57). This model is NTAP = 29.88361 + 0.32644*AKAM - 1.03255*AMD + 0.02198*ENPH - 0.32176*JNPR + 0.20704*MU + 0.06314*PANW + 0.37784*TEL + 0.3091*AMD*JNPR - 0.05226*JNPR*JNPR(figure 104). When interpreting this model when every independent variable is held constant the daily stock price of NTAP is 29.88361. When all other independent variables are held constant for every one increase in AKAM's daily stock price the daily stock price for NTAP will increase by 0.32644. When all other independent variables are held constant for every one increase in AMD's daily stock price the daily stock price for NTAP will decrease by 1.03255. When all other independent variables are held constant for every one increase in ENPH's daily stock price the daily stock price for NTAP will increase by 0.02198. When all other independent variables are held constant for every one increase in JNPR's daily stock price the daily stock price for NTAP will decrease by 0.32176. When all other independent variables are held constant for every one increase in MU's daily stock price the daily stock price for NTAP will increase by 0.20704. When all other independent variables are held constant for every one increase in PANW's daily stock price the daily stock price for NTAP will increase by 0.06314. When all other independent variables are held constant for every one increase in TEL's daily stock price the daily stock price for NTAP will increase by 0.37784. When all other independent variables are held constant for every one increase in AMD's daily stock price as well as for every one increase in JNPR's daily stock price the daily stock price for NTAP will increase by 0.3091. When all other independent variables are held constant for every one increase in JNPR's daily stock the stock price for NTAP will decrease by 0.05226 times JNPR^2.

Final Conclusions and Next Steps -

Overall I think that the four potential models were all pretty good overall but, the model with the interaction term and quadratic term turned out to be the best. I think that using this model should result in a decent idea of what Net App's daily stock price will be. I think that there are a ton of different ways to approach how to use regression to help figure out what the daily price of Net App will be. I think that if I were to do this analysis over again I would probably start with stepwise selection because using proc corr resulted in a final model that didn't include any components that were apart of Net App's sub category as predictors which I thought was very interesting and I think that if I originally approached this analysis in this way it may have resulted in one of the predictors being apart of Net App's sub category. I also think that if I had more time to complete this analysis I probably would've used many different approaches to come up with a few different "best" models and compared those against each other to get the best possible model. Overall I don't think that the model I determined to be the best in this analysis is bad and should give a decent idea of Net App's daily stock price given the stock prices of the independent variables but, there is always room for improvement.

Appendix

Figure 1

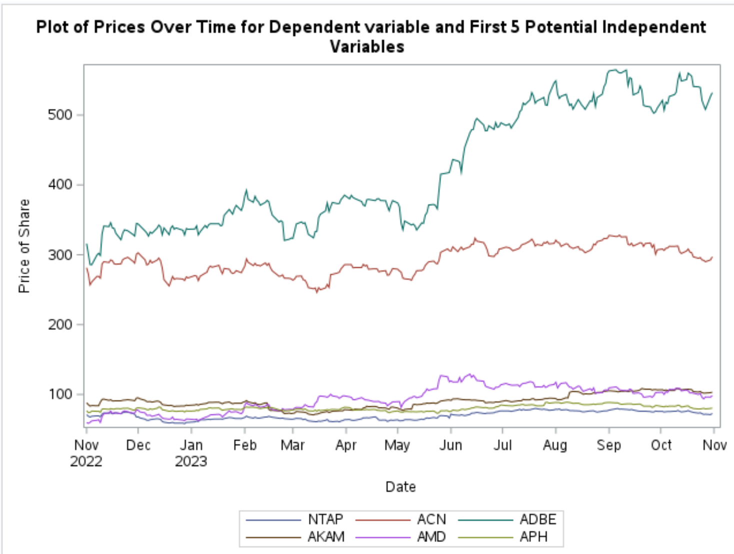
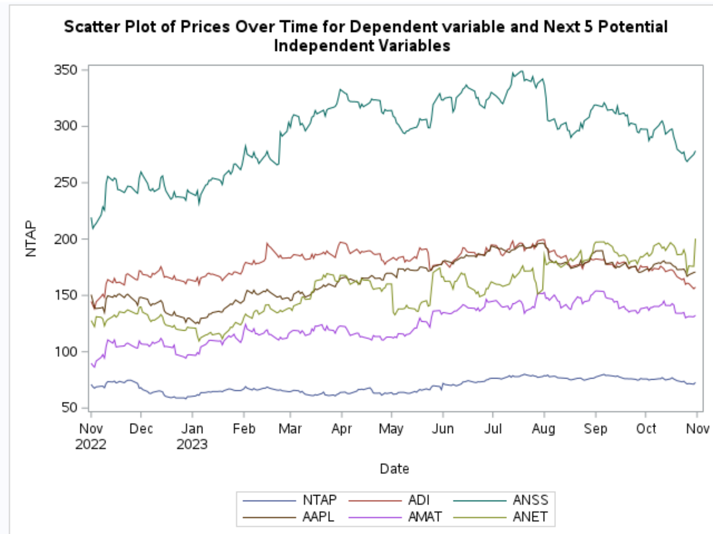


Figure 2



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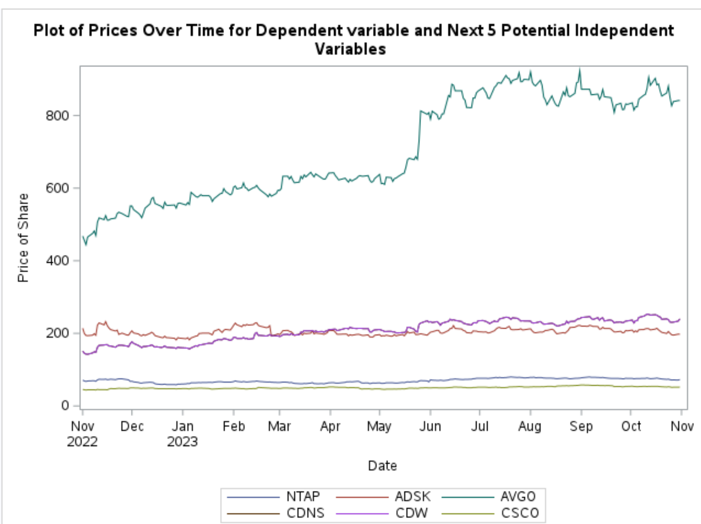

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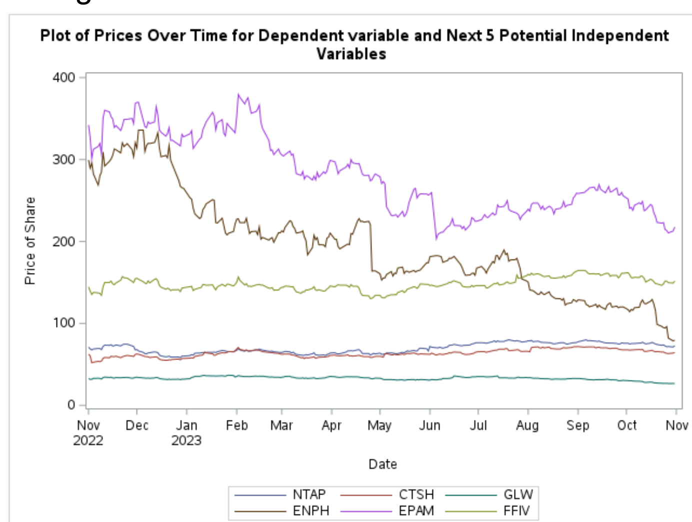

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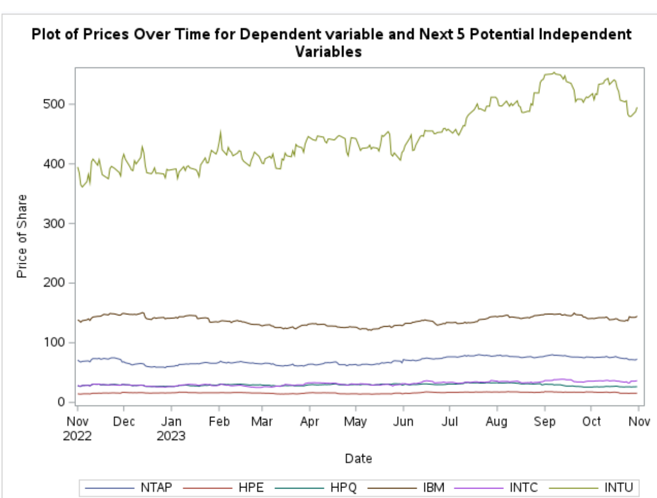


Figure 6

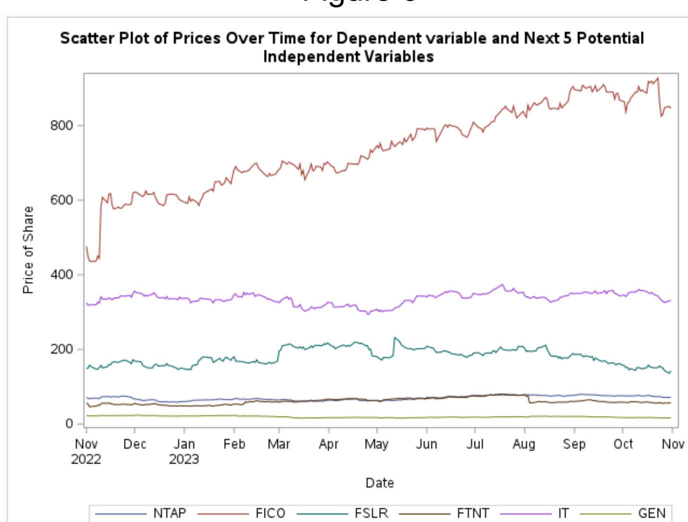
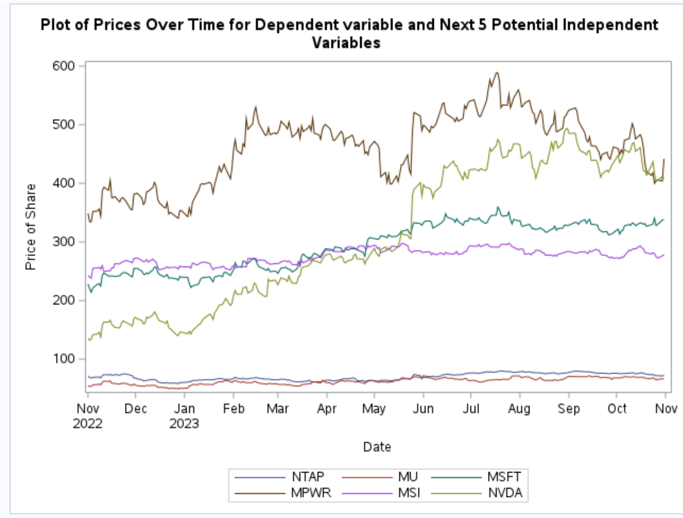


Figure 7



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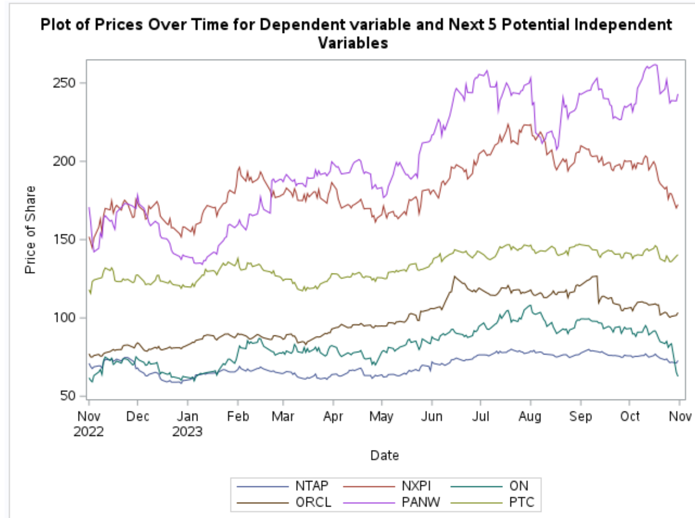


Figure 9

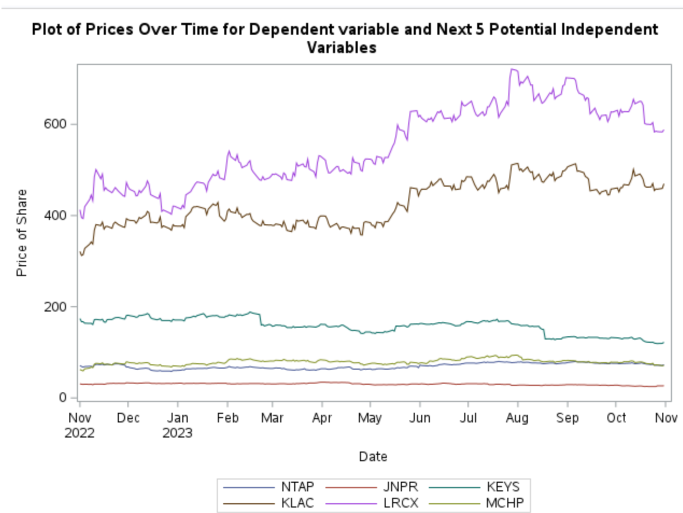
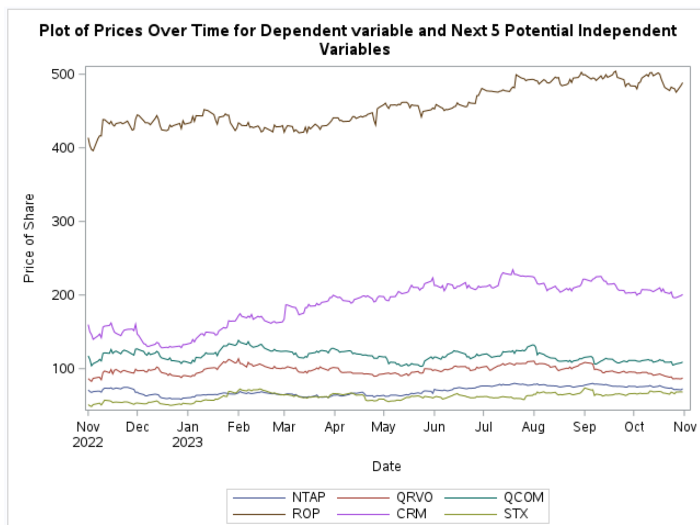


Figure 10



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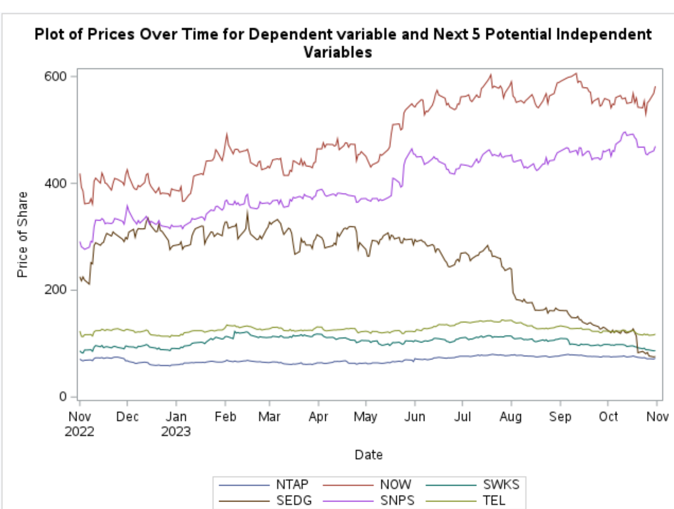

Figure 12

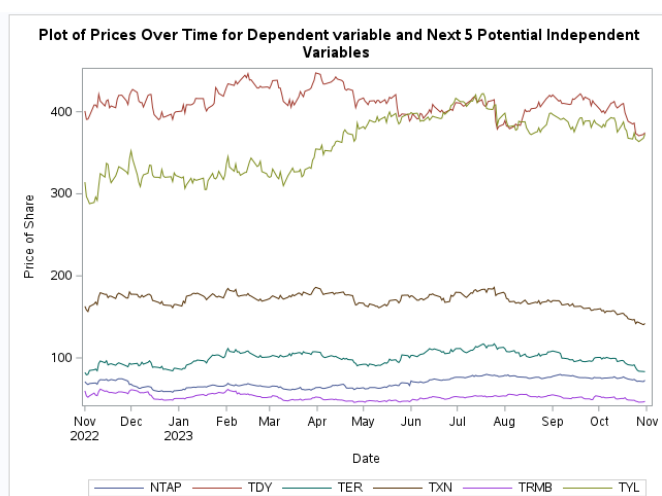

Figure 13

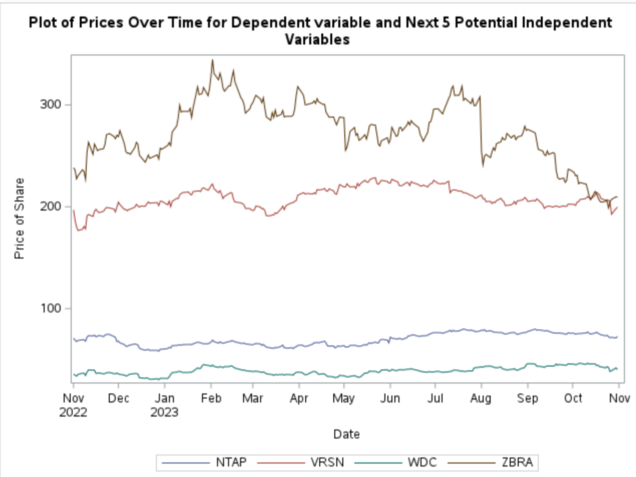

Figure 14

Pearson Correlation Coefficients, N = 251 Prob > |r| under H0: Rho=0	NTAP
ACN ACN	0.88205 <.0001
ADBE ADBE	0.84715 <.0001
AKAM AKAM	0.77867 <.0001
AMD AMD	0.63357 <.0001
APH APH	0.81628 <.0001
ADI ADI	0.17567 0.0053
ANSS ANSS	0.38982 <.0001
AAPL AAPL	0.73304 <.0001
AMAT AMAT	0.78478 <.0001
ANET ANET	0.68149 <.0001
ADSK ADSK	0.57336 <.0001
AVGO AVGO	0.79121 <.0001
CDNS CDNS	0.66504 <.0001
CDW CDW	0.42628 <.0001
CSCO CSCO	0.69307 <.0001
CTSH CTSH	0.74897 <.0001
GLW GLW	-0.23080 0.0002
ENPH ENPH	-0.53296 <.0001
EPAM EPAM	-0.51908 <.0001
FFIV FFIV	0.75299 <.0001
FICO FICO	0.69207 <.0001
FSLR FSLR	-0.04817 0.4474
FTNT FTNT	0.40008 <.0001
IT IT	0.67097 <.0001
GEN GEN	-0.00876 0.8901
HPE HPE	0.68109 <.0001
HPQ HPQ	0.36377 <.0001
IBM IBM	0.47911 <.0001
INTC INTC	0.80139 <.0001
INTU INTU	0.76683 <.0001
JNPR JNPR	-0.58143 <.0001
KEYS KEYS	-0.36328 <.0001
KLAC KLAC	0.80147 <.0001
LRCX LRCX	0.81284 <.0001
MCHP MCHP	0.46576 <.0001
MU MU	0.74705 <.0001
MSFT MSFT	0.68944 <.0001
MPWR MPWR	0.50289 <.0001
MSI MSI	0.43141 <.0001
NVDA NVDA	0.78352 <.0001
NXPI NXPI	0.81588 <.0001
ON ON	0.79116 <.0001
ORCL ORCL	0.77126 <.0001
PANW PANW	0.77506 <.0001
PTC PTC	0.86295 <.0001
QRVO QRVO	0.31103 <.0001
QCOM QCOM	-0.08283 0.1909
ROP ROP	0.79076 <.0001
CRM CRM	0.64390 <.0001
STX STX	0.40663 <.0001
NOW NOW	0.81418 <.0001
SWKS SWKS	0.02070 0.7442
SEDG SEDG	-0.65915 <.0001
SNPS SNPS	0.74261 <.0001
TEL TEL	0.57884 <.0001
TDY TDY	-0.31987 <.0001
TER TER	0.41276 <.0001
TXN TXN	-0.15369 0.0148
TRMB TRMB	0.25364 <.0001
TYL TYL	0.64362 <.0001
VRSN VRSN	0.04677 0.4607
WDC WDC	0.70004 <.0001
ZBRA ZBRA	-0.24659 <.0001

Figure 15

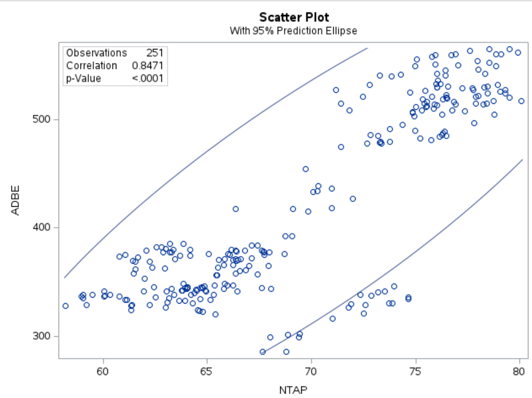

Figure 16

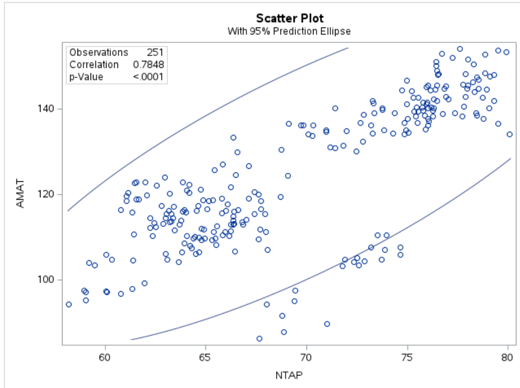

Figure 17

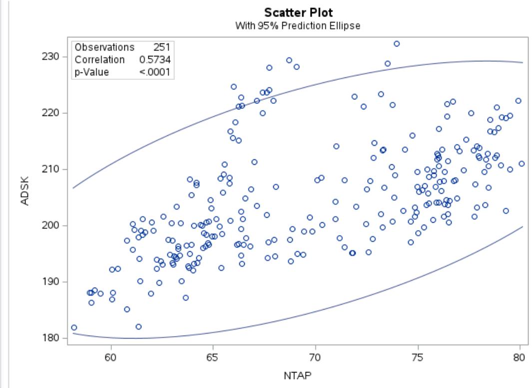

Figure 18

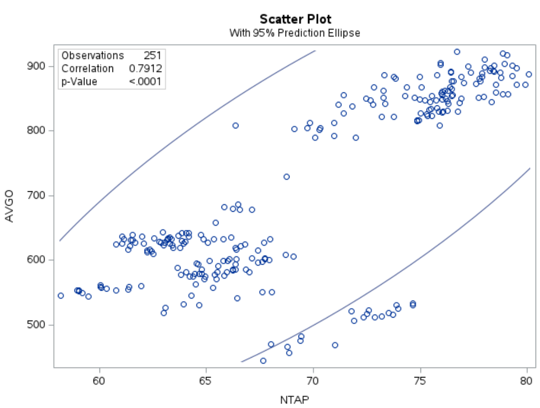

Figure 19

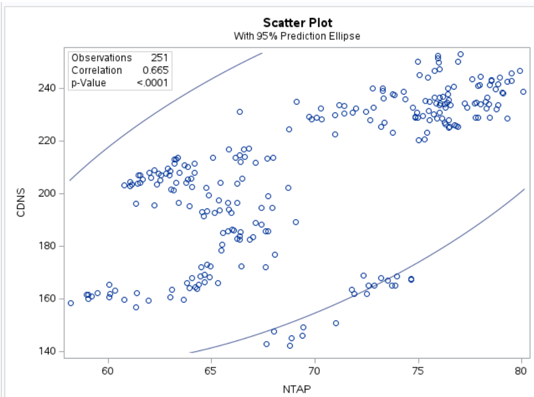

Figure 20

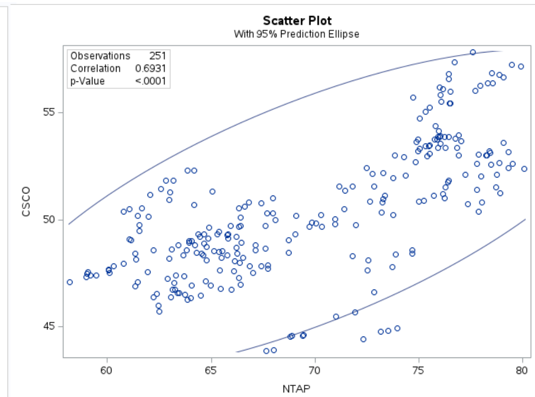

Figure 21

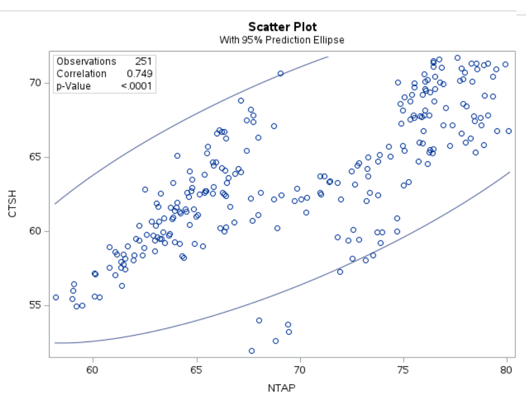

Figure 22

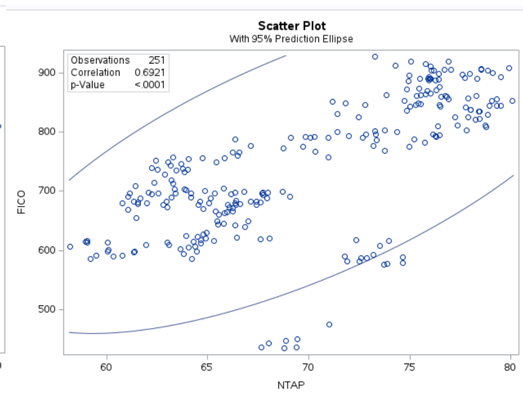

Figure 23

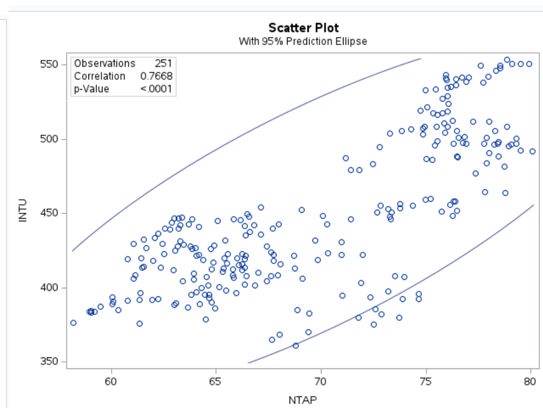

Figure 24

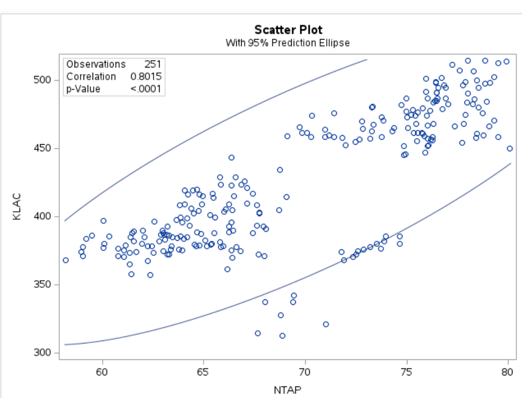

Figure 25

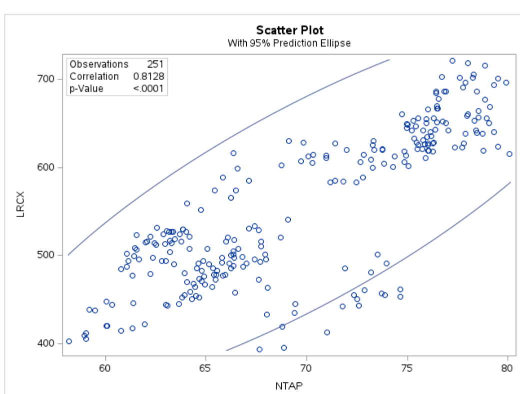

Figure 26

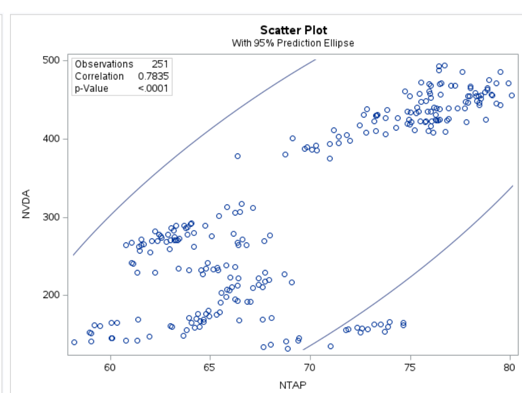

Figure 27

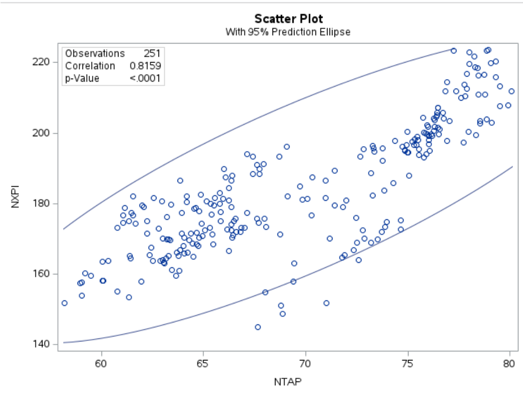

Figure 28

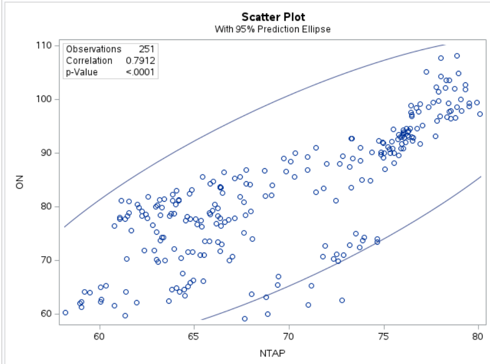

Figure 29

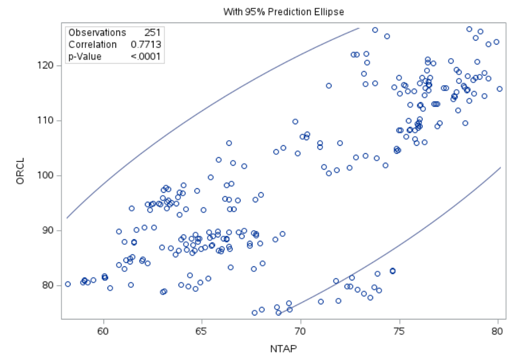

Figure 30

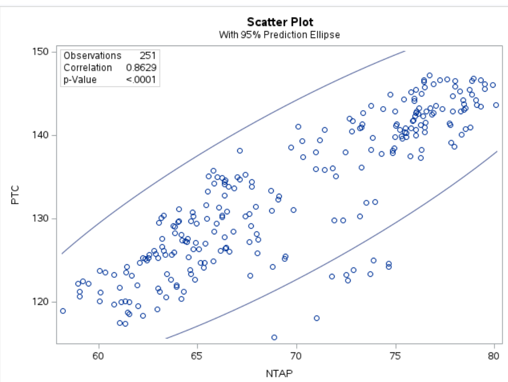

Figure 31

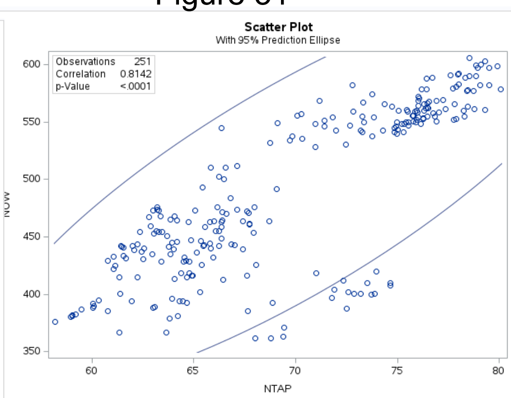

Figure 32

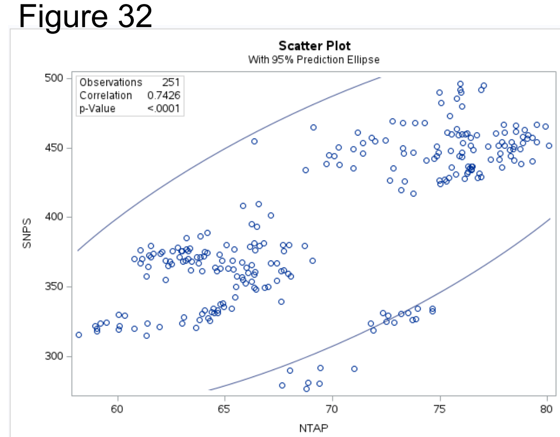

Figure 33

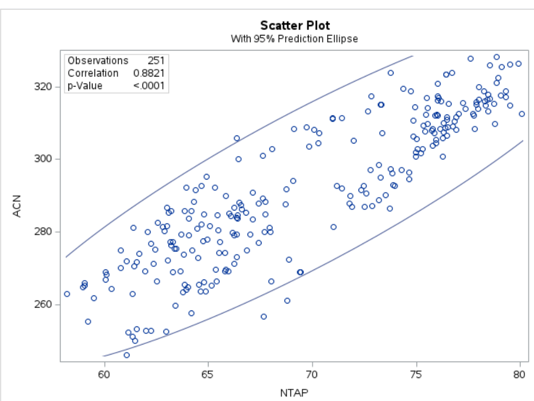

Figure 34

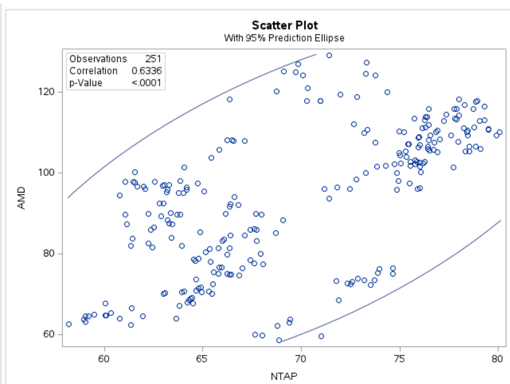

Figure 35

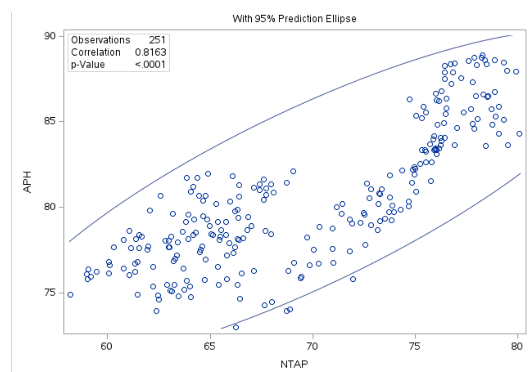

Figure 36

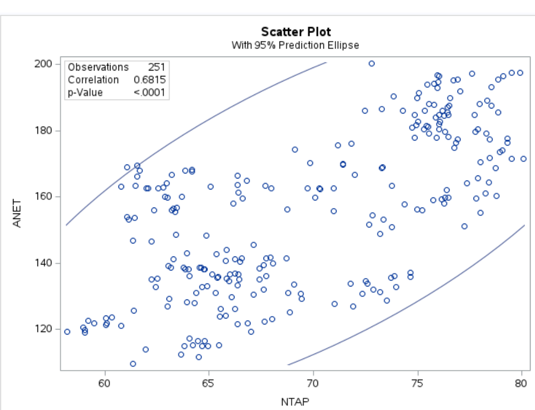

Figure 37

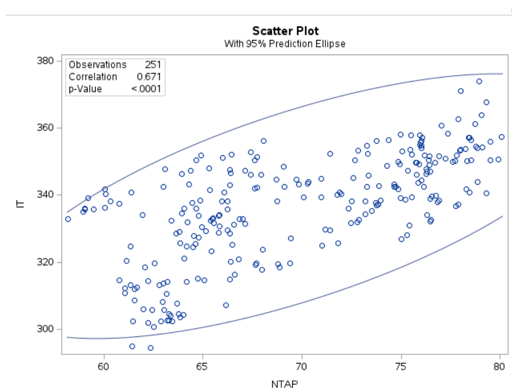

Figure 38

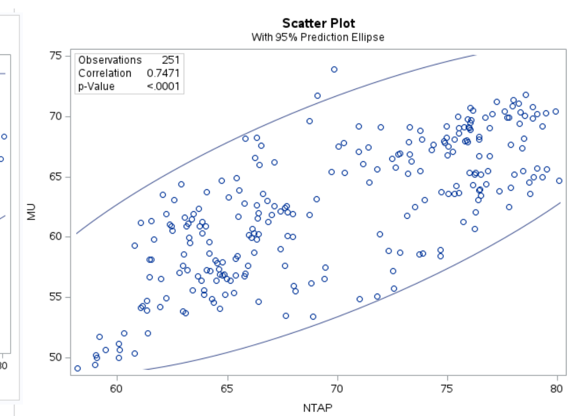

Figure 39

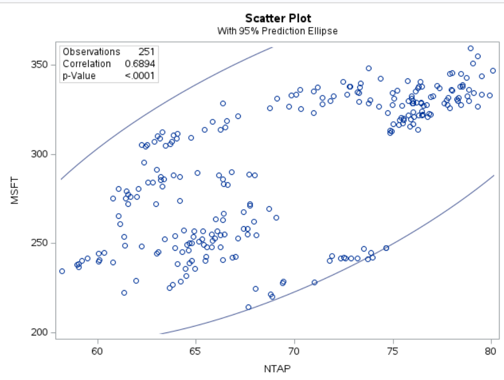

Figure 40

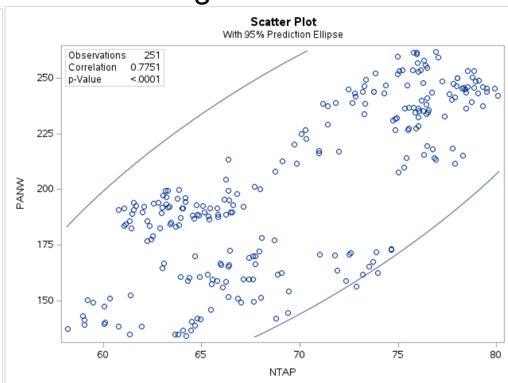

Figure 41

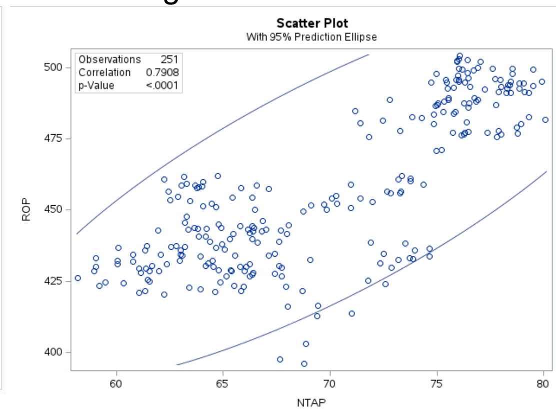

Figure 42

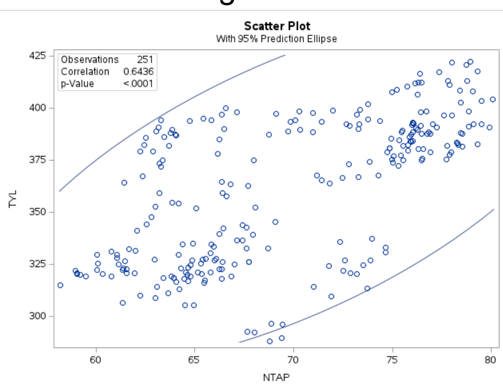

Figure 43

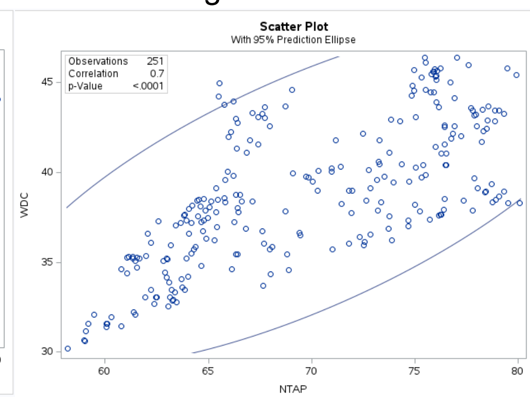

Figure 44

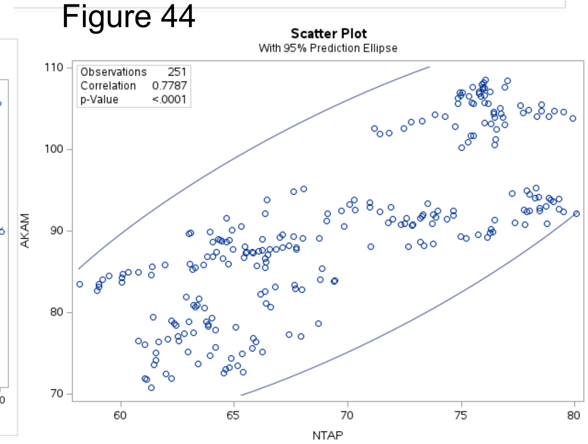

Figure 45

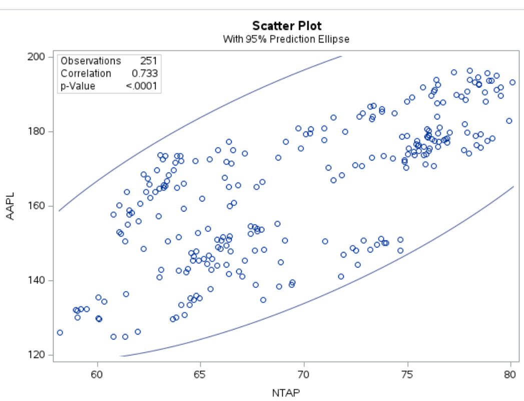

Figure 46

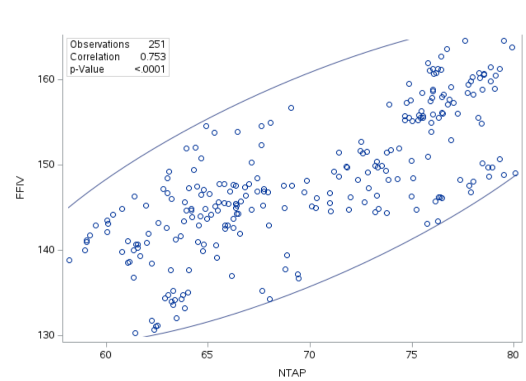

Figure 47

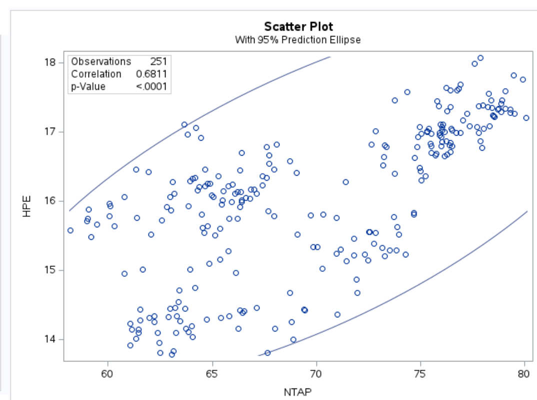

Figure 48

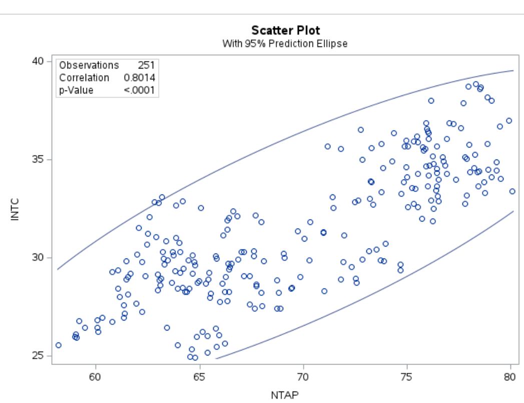

Figure 49

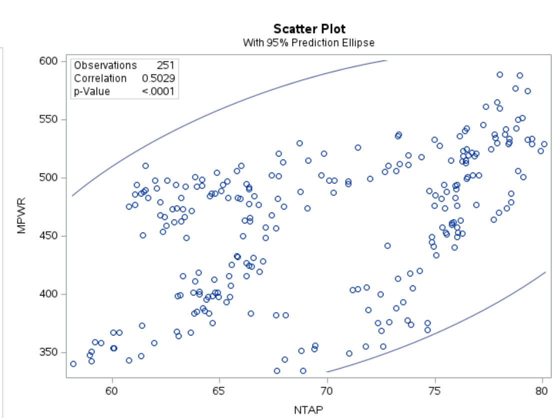

Figure 50

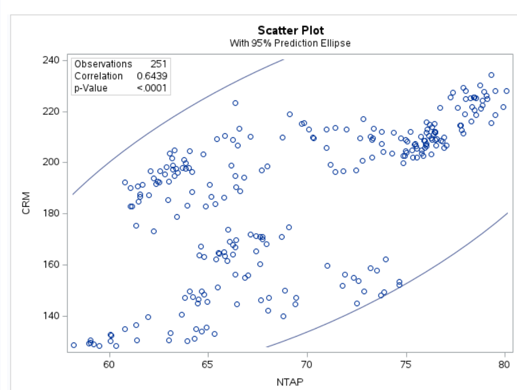

Figure 51

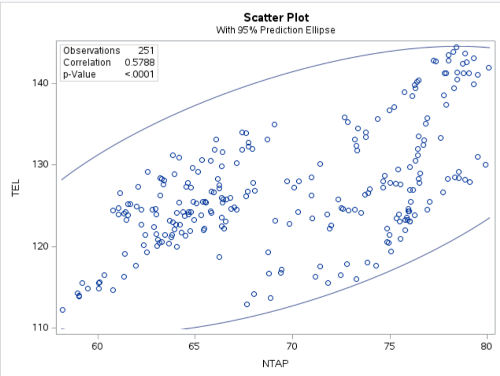

Figure 52

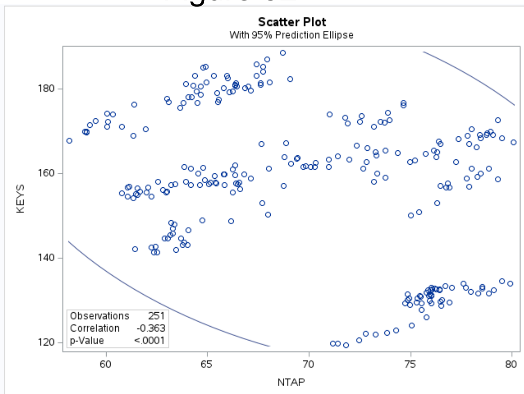

Figure 53

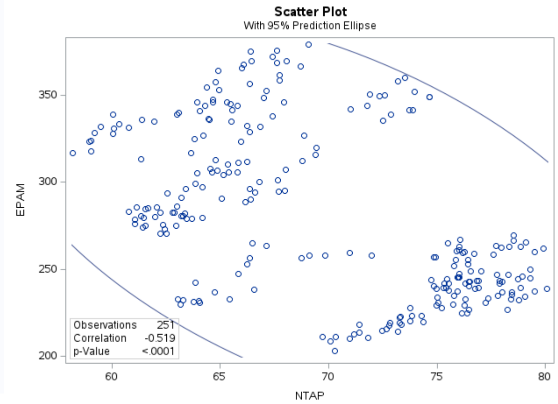

Figure 54

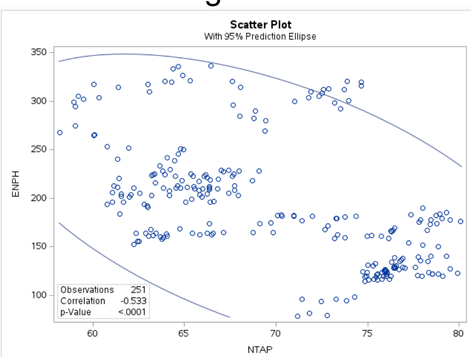

Figure 55

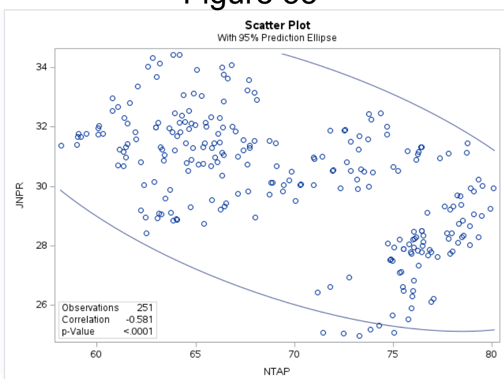

Figure 56

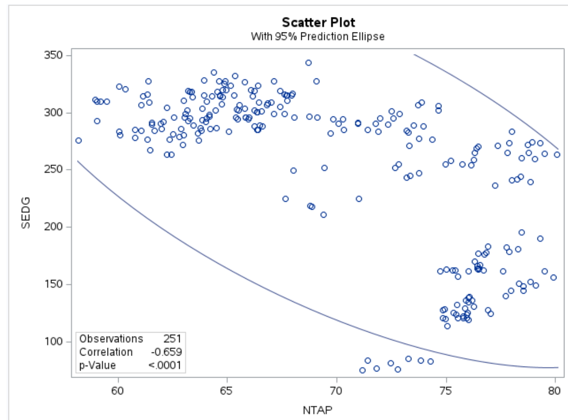

Figure 57

key statistic	stepwise	forwar	backwa	rsquare	adjrsq	c(p)	press	first or	quadra	interact	mixed
adj R^2	0.958	0.9594	0.9612	0.9671	0.9613	0.9608	0.9588	0.9056	0.9131	0.9164	0.9174
coeff var	1.78838	1.75809	1.72024	1.7367	1.71773	1.7277	1.7715	2.68203	2.61425	2.52376	2.50798
f-value	301.21	258	238.89	145.37	214.93	228.01	291.89	343.47	318.04	343.47	309.61
Pr>f	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
MSE	1.55632	1.50404	1.43997	1.46766	1.43577	1.4525	1.5271	3.5003	3.32561	3.09935	3.06073
root MSE	1.24752	1.22639	1.19999	1.21147	1.71773	1.7277	1.357	1.87091	1.82362	1.7605	1.7495
Insignifigant t tests	0	1	2	24	7	6	0	0	0	0	1
plots								worst	3rd best	2nd best	best plots

Figure 58

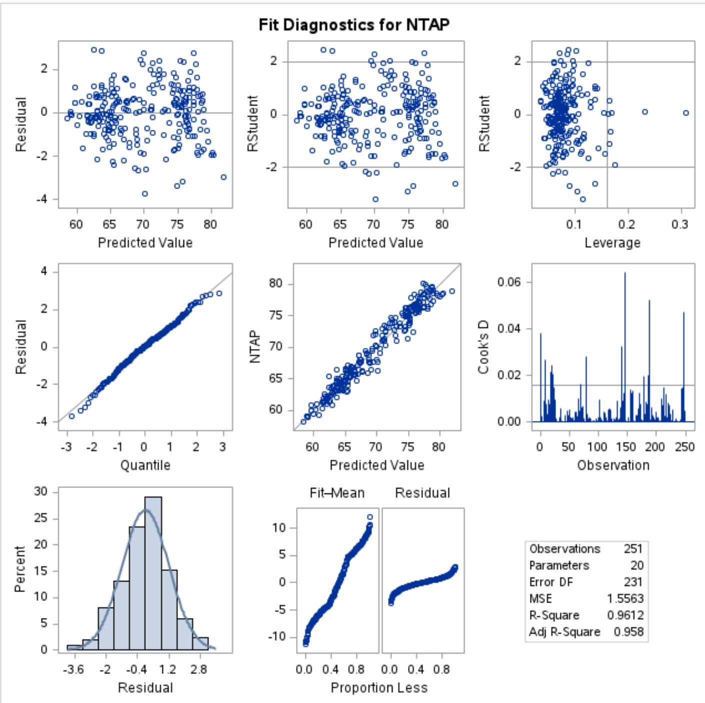

Figure 59

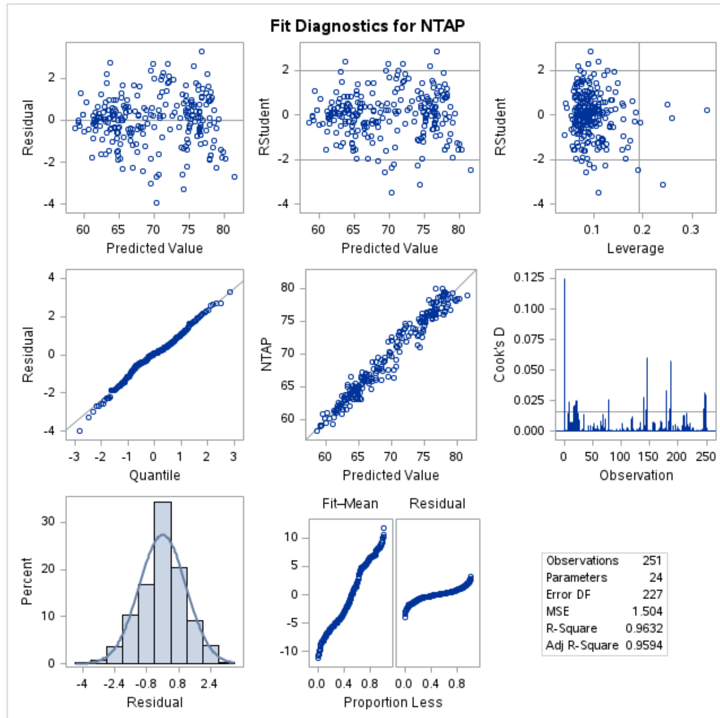

Figure 60

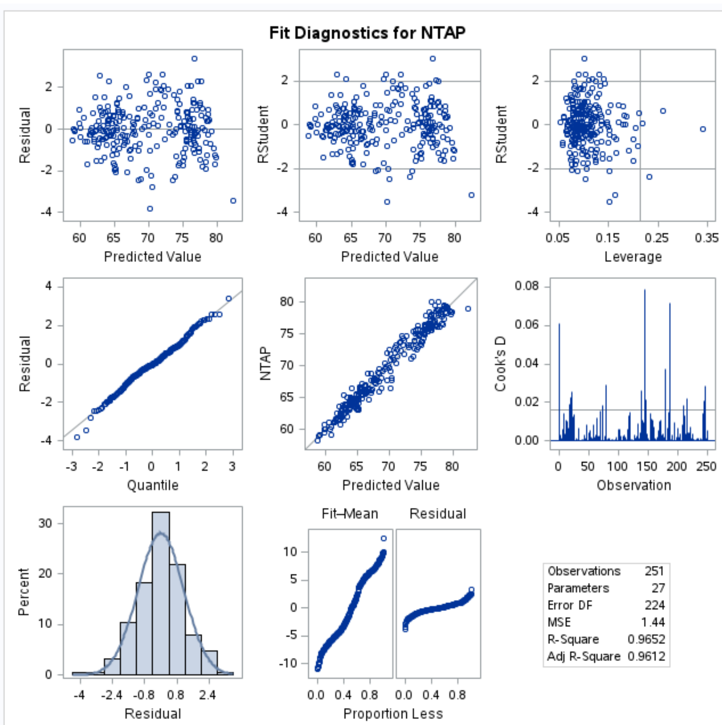

Figure 61

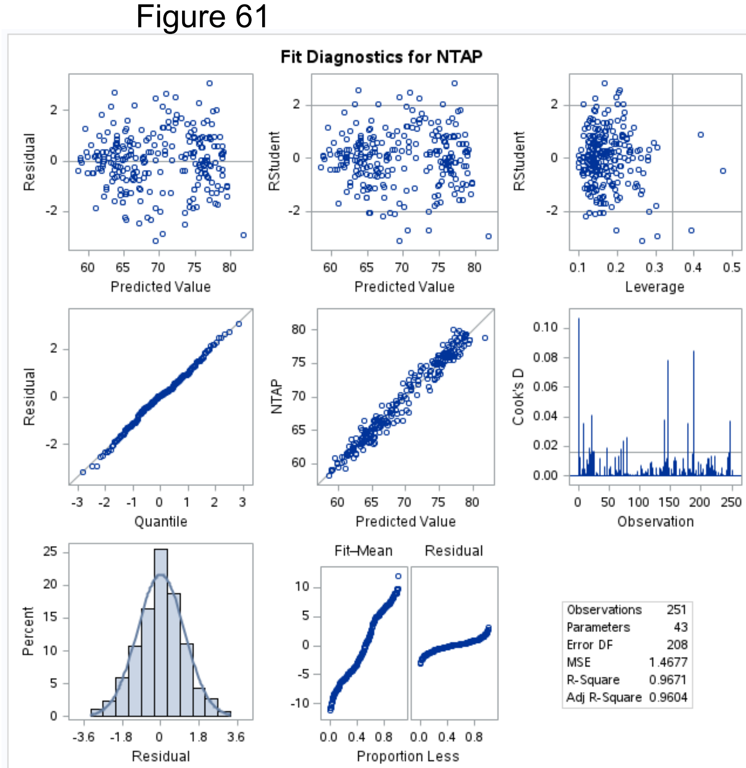

Figure 62

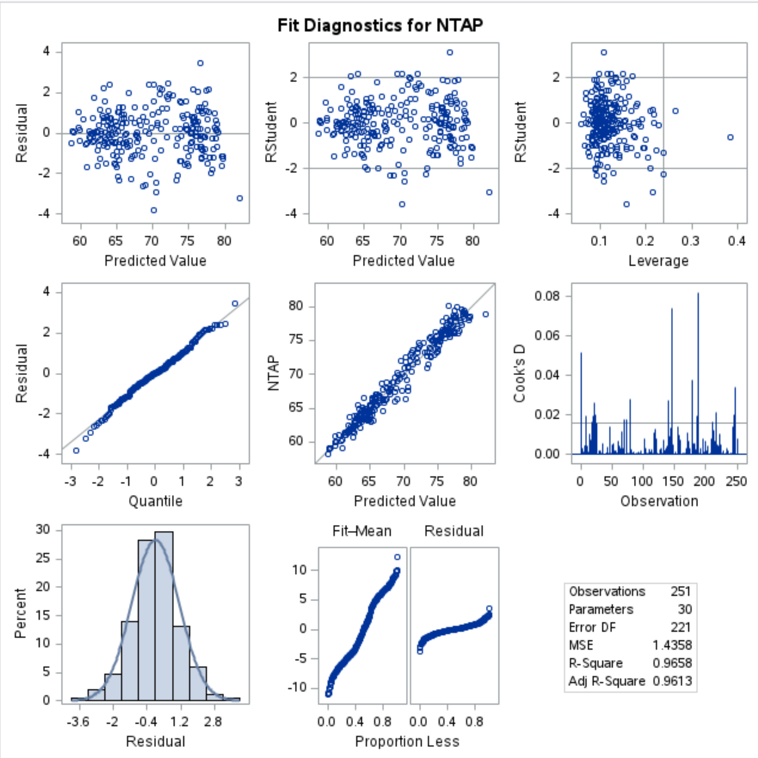

Figure 63

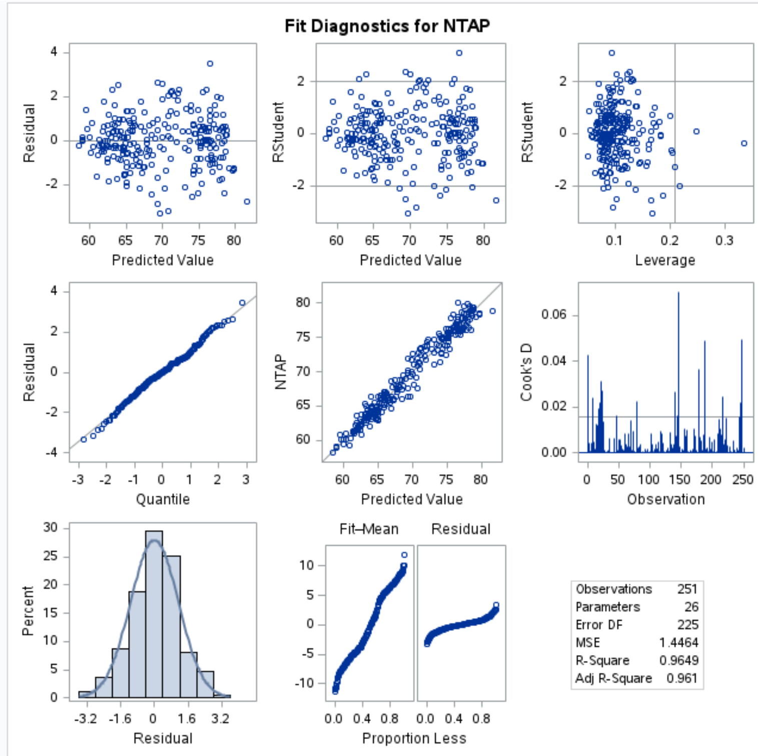

Figure 64

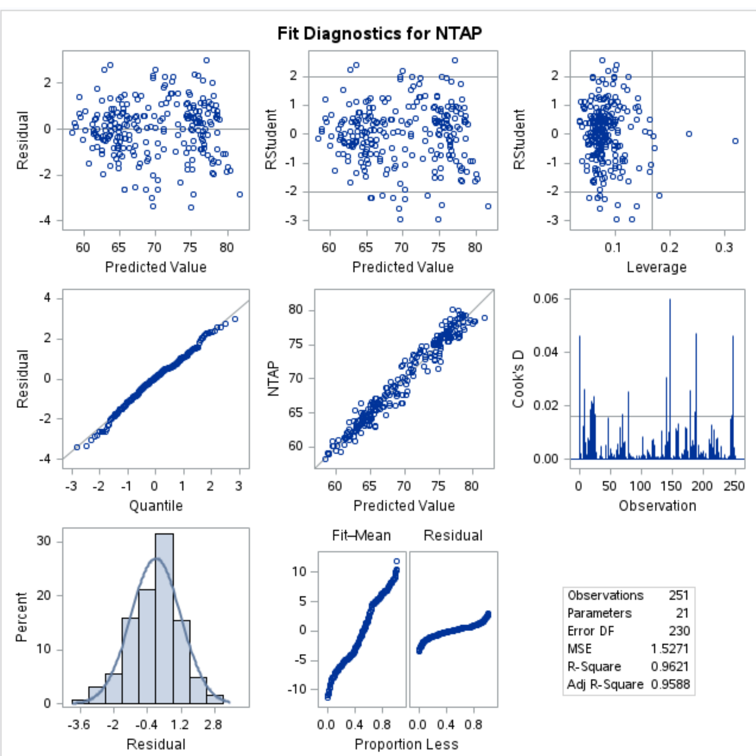

Figure 65

Parameter Estimates							
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	Intercept	1	-10.09421	5.06064	-1.99	0.0473	0
AKAM	AKAM	1	0.14094	0.03617	3.90	0.0001	20.85693
AMD	AMD	1	-0.12930	0.02373	-5.45	<.0001	28.64779
ANET	ANET	1	0.05189	0.01398	3.71	0.0003	18.08141
ADSK	ADSK	1	0.04288	0.01477	2.90	0.0040	3.45413
ENPH	ENPH	1	0.02733	0.00633	4.32	<.0001	25.00721
FFIV	FFIV	1	0.11057	0.02994	3.69	0.0003	8.58602
FICO	FICO	1	-0.02213	0.00411	-5.38	<.0001	34.53879
INTU	INTU	1	-0.07535	0.00823	-9.15	<.0001	27.45726
JNPR	JNPR	1	-0.65859	0.11676	-5.64	<.0001	9.37836
LRCX	LRCX	1	-0.02463	0.00662	-3.72	0.0003	51.52123
MU	MU	1	0.30159	0.04544	6.64	<.0001	10.29512
ON	ON	1	0.15006	0.03106	4.83	<.0001	21.31601
ORCL	ORCL	1	0.14688	0.02663	5.52	<.0001	23.49193
PANW	PANW	1	0.03659	0.00848	4.31	<.0001	15.98672
ROP	ROP	1	0.05234	0.01451	3.61	0.0004	25.02764
CRM	CRM	1	0.04406	0.01398	3.15	0.0018	26.75888
NOW	NOW	1	0.02242	0.00728	3.08	0.0023	42.67408
SEDG	SEDG	1	-0.02628	0.00617	-4.26	<.0001	30.76649
TEL	TEL	1	0.27415	0.03303	8.30	<.0001	8.88052

Figure 66

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	Intercept	1	-9.02880	5.19026	-1.74	0.0833	0
AKAM	AKAM	1	0.14690	0.03712	3.96	0.0001	20.81606
AMD	AMD	1	-0.16635	0.02212	-7.52	<.0001	23.59619
ANET	ANET	1	0.04321	0.01416	3.05	0.0025	17.57715
ADSK	ADSK	1	0.04715	0.01513	3.12	0.0021	3.43320
ENPH	ENPH	1	0.03048	0.00644	4.73	<.0001	24.56040
FFIV	FFIV	1	0.09070	0.03026	3.00	0.0030	8.31242
FICO	FICO	1	-0.01884	0.00413	-4.56	<.0001	32.94035
INTU	INTU	1	-0.07800	0.00843	-9.26	<.0001	27.25147
JNPR	JNPR	1	-0.45742	0.10628	-4.30	<.0001	7.36391
MU	MU	1	0.25827	0.04511	5.72	<.0001	9.61811
ON	ON	1	0.11534	0.03043	3.79	0.0002	19.38976
ORCL	ORCL	1	0.11155	0.02555	4.37	<.0001	20.50056
PANW	PANW	1	0.04344	0.00851	5.11	<.0001	15.23387
ROP	ROP	1	0.04067	0.01455	2.79	0.0056	23.85703
CRM	CRM	1	0.05719	0.01389	4.12	<.0001	25.05047
NOW	NOW	1	0.01829	0.00739	2.48	0.0140	41.67747
SEDG	SEDG	1	-0.02867	0.00630	-4.55	<.0001	30.43157
TEL	TEL	1	0.24942	0.03323	7.51	<.0001	8.52049

Figure 67

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	Intercept	1	-9.88013	5.23555	-1.89	0.0604	0
AKAM	AKAM	1	0.18308	0.03450	5.31	<.0001	17.58880
AMD	AMD	1	-0.15637	0.02199	-7.11	<.0001	22.81231
ANET	ANET	1	0.04050	0.01427	2.84	0.0050	17.47215
ADSK	ADSK	1	0.05107	0.01521	3.36	0.0009	3.39571
ENPH	ENPH	1	0.02683	0.00634	4.23	<.0001	23.27469
FFIV	FFIV	1	0.10489	0.03004	3.49	0.0006	8.01423
FICO	FICO	1	-0.01731	0.00412	-4.20	<.0001	32.19893
INTU	INTU	1	-0.07422	0.00838	-8.86	<.0001	26.35876
JNPR	JNPR	1	-0.46894	0.10734	-4.37	<.0001	7.34977
MU	MU	1	0.24992	0.04548	5.50	<.0001	9.56438
ON	ON	1	0.09626	0.02976	3.23	0.0014	18.14670
ORCL	ORCL	1	0.13729	0.02360	5.82	<.0001	17.10636
PANW	PANW	1	0.05006	0.00816	6.13	<.0001	13.72607
ROP	ROP	1	0.02923	0.01395	2.10	0.0372	21.45102
CRM	CRM	1	0.06538	0.01364	4.79	<.0001	23.62720
SEDG	SEDG	1	-0.02715	0.00634	-4.28	<.0001	30.14248
TEL	TEL	1	0.27200	0.03231	8.42	<.0001	7.87910

Figure 68

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	Intercept	1	-9.73608	5.41799	-1.80	0.0736	0
AKAM	AKAM	1	0.14911	0.03470	4.30	<.0001	16.61970
AMD	AMD	1	-0.16163	0.02272	-7.11	<.0001	22.73826
ANET	ANET	1	0.02309	0.01413	1.63	0.1037	15.99626
ADSK	ADSK	1	0.04894	0.01573	3.11	0.0021	3.39191
ENPH	ENPH	1	0.04449	0.00490	9.08	<.0001	12.99800
FFIV	FFIV	1	0.08122	0.03053	2.66	0.0084	7.73176
INTU	INTU	1	-0.08279	0.00841	-9.84	<.0001	24.79329
JNPR	JNPR	1	-0.34431	0.10675	-3.23	0.0014	6.78689
MU	MU	1	0.29718	0.04560	6.52	<.0001	8.97770
ON	ON	1	0.08219	0.03061	2.69	0.0078	17.91606
ORCL	ORCL	1	0.13544	0.02441	5.55	<.0001	17.10036
PANW	PANW	1	0.03836	0.00794	4.83	<.0001	12.12311
ROP	ROP	1	0.01331	0.01389	0.96	0.3389	19.86560
CRM	CRM	1	0.07581	0.01388	5.46	<.0001	22.84221
SEDG	SEDG	1	-0.04342	0.00519	-8.36	<.0001	18.87217
TEL	TEL	1	0.30404	0.03249	9.36	<.0001	7.43870

Figure 69

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	Intercept	1	7.58303	6.08090	1.25	0.2136	0
AKAM	AKAM	1	0.15128	0.04118	3.67	0.0003	16.61903
AMD	AMD	1	-0.05527	0.02372	-2.33	0.0206	17.59785
ANET	ANET	1	-0.04495	0.01463	-3.07	0.0024	12.17136
ADSK	ADSK	1	0.00896	0.01803	0.50	0.6197	3.16585
ENPH	ENPH	1	0.05082	0.00577	8.82	<.0001	12.77442
FFIV	FFIV	1	0.05620	0.03611	1.56	0.1210	7.67817
JNPR	JNPR	1	-0.43208	0.12623	-3.42	0.0007	6.73955
MU	MU	1	0.24308	0.05372	4.53	<.0001	8.84732
ON	ON	1	0.00990	0.03526	0.28	0.7792	16.88474
ORCL	ORCL	1	0.09780	0.02861	3.42	0.0007	16.68100
PANW	PANW	1	0.03070	0.00937	3.27	0.0012	12.00655
ROP	ROP	1	-0.05014	0.01461	-3.43	0.0007	15.59056
CRM	CRM	1	0.05759	0.01632	3.53	0.0005	22.43575
SEDG	SEDG	1	-0.04538	0.00616	-7.37	<.0001	18.84429
TEL	TEL	1	0.35793	0.03800	9.42	<.0001	7.22752

Figure 70

Parameter Estimates							
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	Intercept	1	8.81610	6.21641	1.42	0.1575	0
AKAM	AKAM	1	0.14118	0.04206	3.36	0.0009	16.53881
AMD	AMD	1	-0.03940	0.02385	-1.65	0.0999	16.96485
ANET	ANET	1	-0.02550	0.01388	-1.84	0.0674	10.44387
ADSK	ADSK	1	0.00953	0.01846	0.52	0.6061	3.16559
ENPH	ENPH	1	0.04628	0.00575	8.04	<.0001	12.13654
FFIV	FFIV	1	0.00697	0.03410	0.20	0.8383	6.53188
JNPR	JNPR	1	-0.43032	0.12925	-3.33	0.0010	6.73945
MU	MU	1	0.31756	0.05058	6.28	<.0001	7.48131
ON	ON	1	0.02803	0.03572	0.78	0.4333	16.52598
ORCL	ORCL	1	0.11048	0.02907	3.80	0.0002	16.41795
PANW	PANW	1	0.03381	0.00956	3.54	0.0005	11.90030
ROP	ROP	1	-0.04423	0.01486	-2.98	0.0032	15.38584
SEDG	SEDG	1	-0.04238	0.00624	-6.79	<.0001	18.48564
TEL	TEL	1	0.37786	0.03848	9.82	<.0001	7.06778

Figure 71

Parameter Estimates							
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	Intercept	1	10.65390	6.77566	1.57	0.1172	0
AKAM	AKAM	1	0.26593	0.04128	6.44	<.0001	13.38283
AMD	AMD	1	-0.11947	0.02261	-5.28	<.0001	12.81597
ANET	ANET	1	0.02239	0.01304	1.72	0.0873	7.74580
ADSK	ADSK	1	-0.01876	0.01962	-0.96	0.3399	3.00426
ENPH	ENPH	1	0.02576	0.00534	4.82	<.0001	8.78994
FFIV	FFIV	1	0.06355	0.03608	1.76	0.0795	6.14181
JNPR	JNPR	1	-0.80723	0.12735	-6.34	<.0001	5.49626
MU	MU	1	0.27379	0.05473	5.00	<.0001	7.35974
ON	ON	1	-0.00955	0.03850	-0.25	0.8042	16.12897
ORCL	ORCL	1	0.12924	0.03157	4.09	<.0001	16.26954
PANW	PANW	1	0.05509	0.00985	5.59	<.0001	10.62029
ROP	ROP	1	-0.07035	0.01566	-4.49	<.0001	14.35411
TEL	TEL	1	0.38327	0.04197	9.13	<.0001	7.06476

Figure 72

Parameter Estimates							
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	Intercept	1	1.80518	6.63087	0.27	0.7857	0
AKAM	AKAM	1	0.31265	0.04097	7.63	<.0001	12.36015
AMD	AMD	1	-0.08266	0.02143	-3.86	0.0001	10.79038
ANET	ANET	1	0.00811	0.01297	0.63	0.5326	7.19139
ADSK	ADSK	1	-0.02432	0.02021	-1.20	0.2301	2.98988
ENPH	ENPH	1	0.01672	0.00502	3.33	0.0010	7.28749
FFIV	FFIV	1	0.04952	0.03708	1.34	0.1831	6.08639
JNPR	JNPR	1	-0.63267	0.12391	-5.11	<.0001	4.88009
MU	MU	1	0.24459	0.05603	4.36	<.0001	7.23475
ON	ON	1	-0.00305	0.03972	-0.08	0.9389	16.10148
PANW	PANW	1	0.06591	0.00980	6.73	<.0001	9.85587
ROP	ROP	1	-0.04970	0.01531	-3.25	0.0013	12.86476
TEL	TEL	1	0.42715	0.04190	10.19	<.0001	6.60387

Figure 73

Parameter Estimates							
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	Intercept	1	1.96236	6.29349	0.31	0.7555	0
AKAM	AKAM	1	0.31354	0.03920	8.00	<.0001	11.36732
AMD	AMD	1	-0.08343	0.01890	-4.42	<.0001	8.42841
ANET	ANET	1	0.00801	0.01288	0.62	0.5347	7.12163
ADSK	ADSK	1	-0.02468	0.01963	-1.26	0.2098	2.83078
ENPH	ENPH	1	0.01672	0.00501	3.34	0.0010	7.28744
FFIV	FFIV	1	0.04848	0.03445	1.41	0.1607	5.27487
JNPR	JNPR	1	-0.62857	0.11155	-5.63	<.0001	3.97209
MU	MU	1	0.24463	0.05591	4.38	<.0001	7.23400
PANW	PANW	1	0.06588	0.00977	6.74	<.0001	9.83807
ROP	ROP	1	-0.04993	0.01498	-3.33	0.0010	12.37088
TEL	TEL	1	0.42565	0.03697	11.51	<.0001	5.16323

Figure 74

Parameter Estimates							
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	Intercept	1	-13.15307	4.45615	-2.95	0.0035	0
AKAM	AKAM	1	0.23445	0.03186	7.36	<.0001	7.20521
AMD	AMD	1	-0.07554	0.01914	-3.95	0.0001	8.29634
ANET	ANET	1	0.00520	0.01312	0.40	0.6924	7.09110
ADSK	ADSK	1	0.00632	0.01765	0.36	0.7204	2.19537
ENPH	ENPH	1	0.02479	0.00448	5.53	<.0001	5.59001
FFIV	FFIV	1	0.04601	0.03516	1.31	0.1919	5.27244
JNPR	JNPR	1	-0.59896	0.11352	-5.28	<.0001	3.94692
MU	MU	1	0.24455	0.05708	4.28	<.0001	7.23400
PANW	PANW	1	0.06206	0.00990	6.27	<.0001	9.70329
TEL	TEL	1	0.35862	0.03167	11.32	<.0001	3.63617

Figure 75

Parameter Estimates							
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	Intercept	1	-12.44381	4.39203	-2.83	0.0050	0
AKAM	AKAM	1	0.27253	0.02084	13.08	<.0001	3.07736
AMD	AMD	1	-0.08168	0.01800	-4.54	<.0001	7.33184
ENPH	ENPH	1	0.02370	0.00426	5.57	<.0001	5.03500
JNPR	JNPR	1	-0.53755	0.10748	-5.00	<.0001	3.53354
MU	MU	1	0.25578	0.05271	4.85	<.0001	6.16148
PANW	PANW	1	0.06425	0.00821	7.82	<.0001	6.66501
TEL	TEL	1	0.37875	0.02305	16.43	<.0001	1.92289

Figure 76

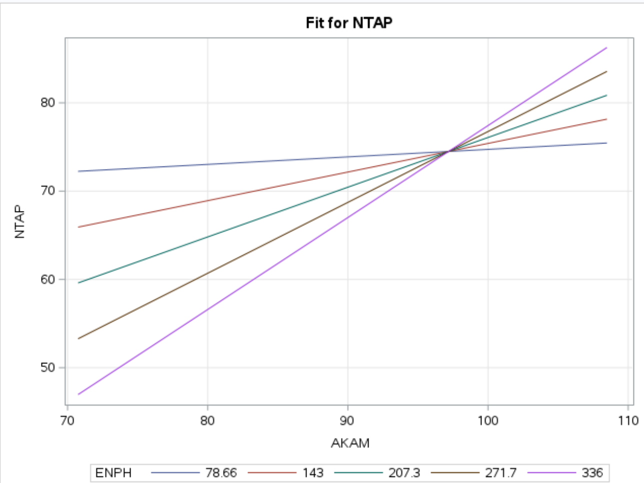

Figure 77

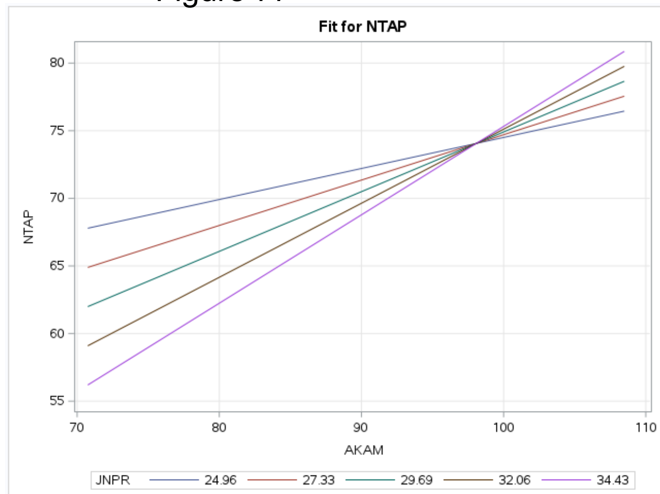

Figure 78

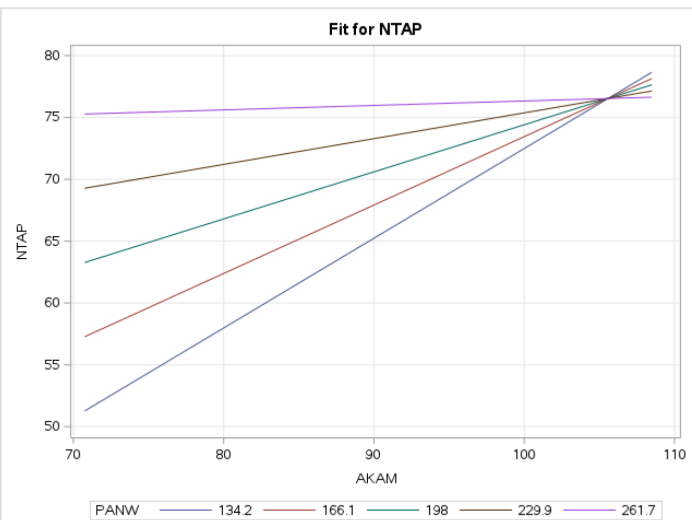

Figure 79

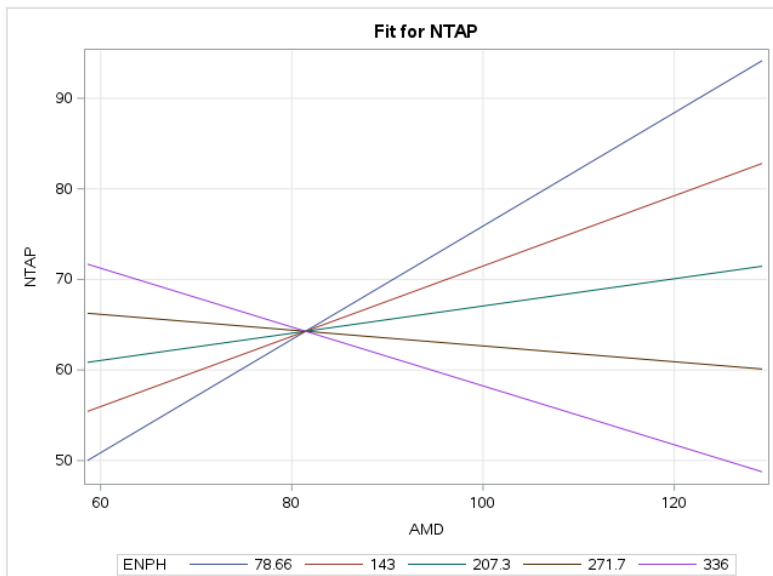

Figure 80

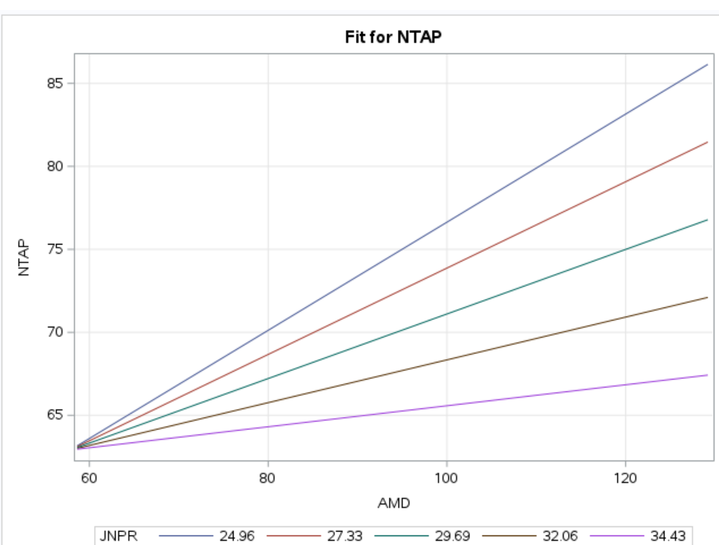

Figure 81

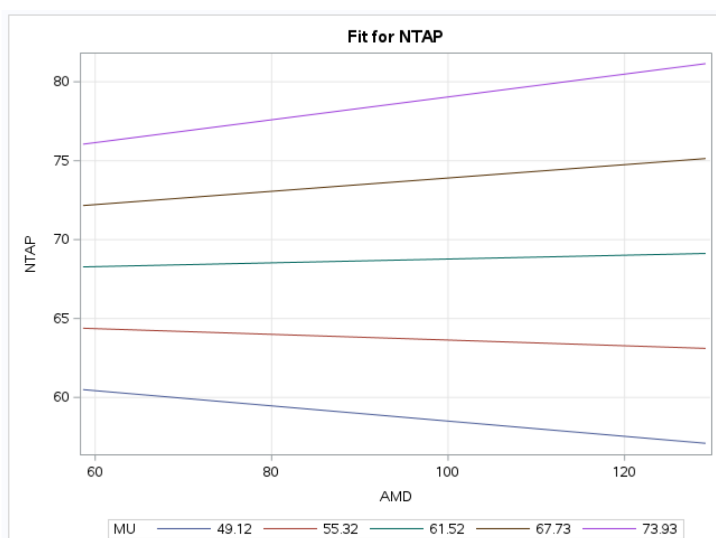

Figure 82

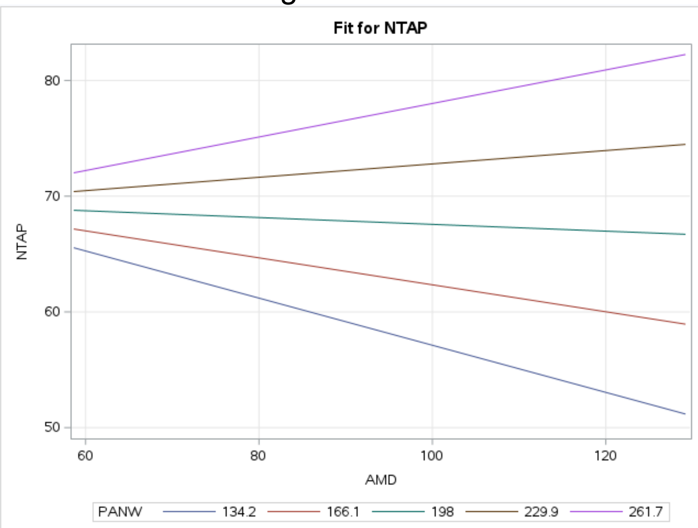

Figure 83

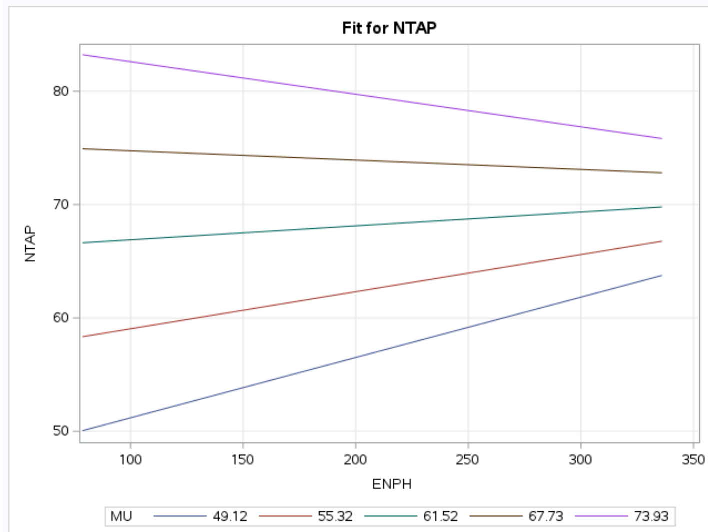

Figure 84

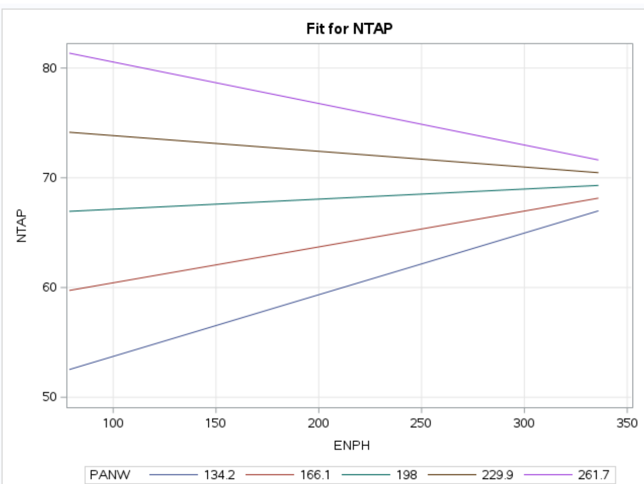

Figure 85

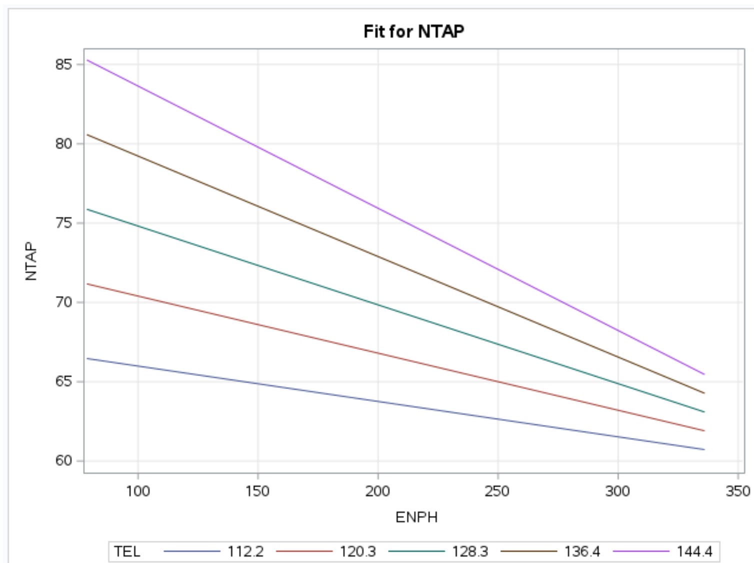

Figure 86

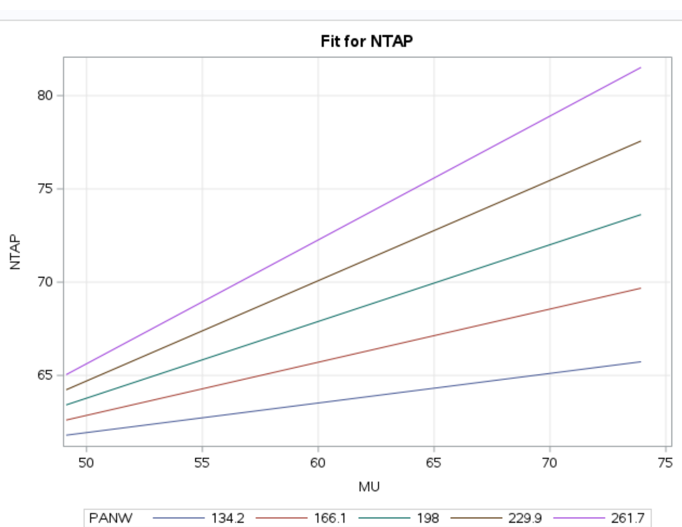

Figure 87

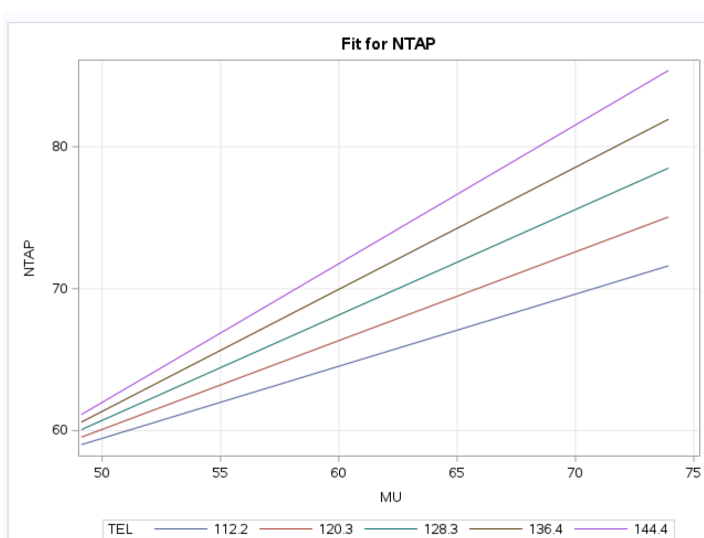

Figure 88

Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	144.76127	68.35970	2.12	0.0353
AKAM	AKAM	1	-0.02108	0.40047	-0.05	0.9581
AMD	AMD	1	-0.23031	0.36695	-0.63	0.5309
ENPH	ENPH	1	-0.15876	0.09490	-1.67	0.0957
JNPR	JNPR	1	-3.28463	0.85579	-3.84	0.0002
MU	MU	1	-1.39759	0.79178	-1.77	0.0789
PANW	PANW	1	-0.12915	0.17223	-0.75	0.4541
TEL	TEL	1	0.24879	0.50751	0.49	0.6245
AKAM_ENPH		1	-0.00107	0.00063535	-1.68	0.0938
AKAM_JNPR		1	0.01067	0.01011	1.05	0.2926
AKAM_PANW		1	0.00089799	0.00111	0.81	0.4200
AMD_ENPH		1	-0.00388	0.00061432	-6.32	<.0001
AMD_JNPR		1	0.02277	0.00678	3.36	0.0009
AMD_MU		1	0.00289	0.00405	0.71	0.4766
AMD_PANW		1	-0.00005494	0.00055308	-0.10	0.9210
ENPH_MU		1	0.00663	0.00122	5.44	<.0001
ENPH_PANW		1	0.00045797	0.00025389	1.80	0.0726
ENPH_TEL		1	0.00085656	0.00074166	1.15	0.2493
MU_PANW		1	0.00064615	0.00280	0.23	0.8176
MU_TEL		1	-0.00055510	0.00642	-0.09	0.9311

Figure 89

Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	87.13112	19.07715	4.57	<.0001
AKAM	AKAM	1	0.25576	0.02518	10.16	<.0001
AMD	AMD	1	-1.00850	0.18739	-5.38	<.0001
ENPH	ENPH	1	0.09059	0.04219	2.15	0.0328
JNPR	JNPR	1	-4.33257	0.58179	-7.45	<.0001
MU	MU	1	0.24745	0.04927	5.02	<.0001
PANW	PANW	1	0.04500	0.00797	5.65	<.0001
TEL	TEL	1	0.33530	0.08281	4.05	<.0001
AMD_ENPH		1	-0.00179	0.00040281	-4.45	<.0001
AMD_JNPR		1	0.04167	0.00602	6.92	<.0001
ENPH_TEL		1	0.00057716	0.00048337	1.19	0.2336

Figure 90

Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	78.54800	17.68667	4.44	<.0001
AKAM	AKAM	1	0.26623	0.02362	11.27	<.0001
AMD	AMD	1	-1.06266	0.18198	-5.84	<.0001
ENPH	ENPH	1	0.13415	0.02121	6.32	<.0001
JNPR	JNPR	1	-4.30806	0.58194	-7.40	<.0001
MU	MU	1	0.25490	0.04891	5.21	<.0001
PANW	PANW	1	0.04783	0.00761	6.28	<.0001
TEL	TEL	1	0.43074	0.02170	19.85	<.0001
AMD_ENPH		1	-0.00144	0.00027023	-5.31	<.0001
AMD_JNPR		1	0.04107	0.00600	6.84	<.0001

Figure 91

Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	90.30109	18.50786	4.88	<.0001
AKAM	AKAM	1	0.32690	0.02181	14.99	<.0001
AMD	AMD	1	-1.16443	0.19087	-6.10	<.0001
ENPH	ENPH	1	0.02331	0.00401	5.82	<.0001
JNPR	JNPR	1	-3.96330	0.60996	-6.50	<.0001
MU	MU	1	0.20181	0.05050	4.00	<.0001
PANW	PANW	1	0.05609	0.00786	7.14	<.0001
TEL	TEL	1	0.39808	0.02195	18.13	<.0001
AMD_JNPR		1	0.03550	0.00623	5.70	<.0001

Figure 92

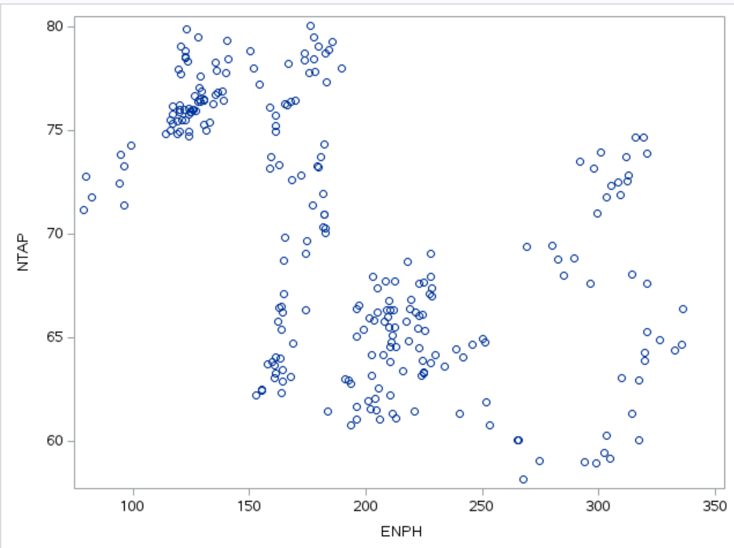

Figure 93

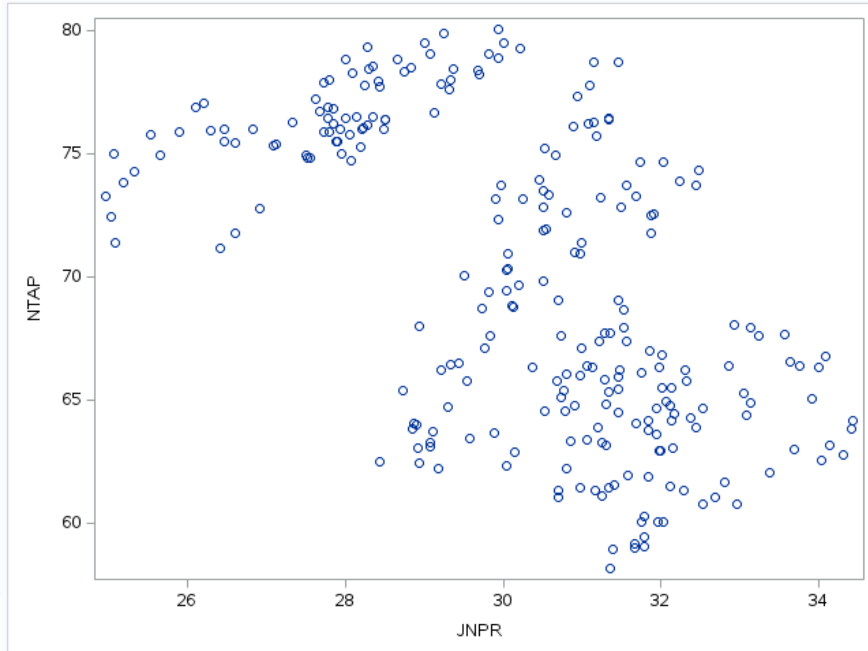

Figure 94

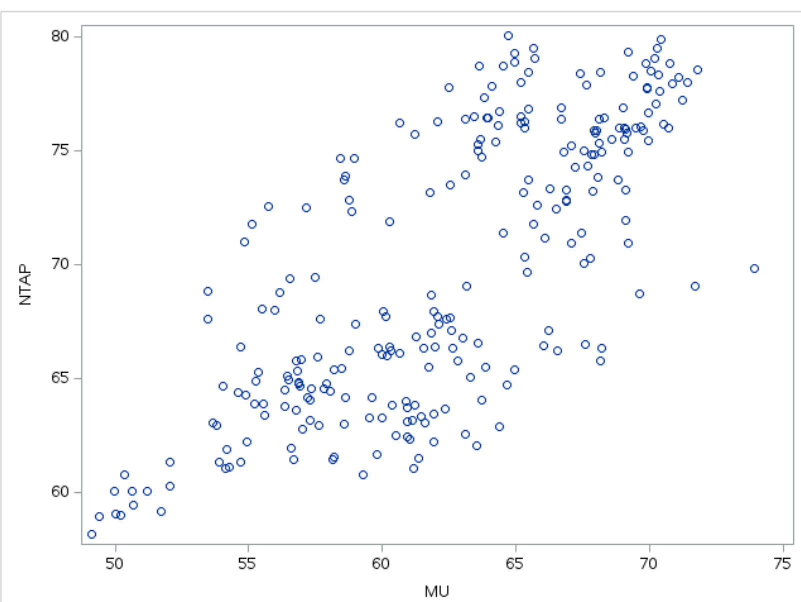

Figure 95

Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-151.49069	29.68784	-5.10	<.0001
AKAM	AKAM	1	0.29797	0.02463	12.10	<.0001
AMD	AMD	1	-0.09251	0.01805	-5.12	<.0001
ENPH	ENPH	1	0.02410	0.02461	0.98	0.3285
JNPR	JNPR	1	6.05154	1.59249	3.80	0.0002
MU	MU	1	1.64535	0.48291	3.41	0.0008
PANW	PANW	1	0.07925	0.00924	8.58	<.0001
TEL	TEL	1	0.32061	0.02696	11.89	<.0001
JNPRSQ		1	-0.10786	0.02590	-4.16	<.0001
MUSQ		1	-0.01140	0.00393	-2.90	0.0041
ENPHSQ		1	-0.00000164	0.00005214	-0.03	0.9749

Figure 96

Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-151.55350	29.55919	-5.13	<.0001
AKAM	AKAM	1	0.29756	0.02075	14.34	<.0001
AMD	AMD	1	-0.09242	0.01774	-5.21	<.0001
ENPH	ENPH	1	0.02334	0.00420	5.55	<.0001
JNPR	JNPR	1	6.06092	1.56109	3.88	0.0001
MU	MU	1	1.64522	0.48189	3.41	0.0008
PANW	PANW	1	0.07914	0.00851	9.30	<.0001
TEL	TEL	1	0.32090	0.02532	12.67	<.0001
JNPRSQ		1	-0.10800	0.02546	-4.24	<.0001
MUSQ		1	-0.01140	0.00392	-2.91	0.0040

Figure 97

Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-97.44524	23.30761	-4.18	<.0001
AKAM	AKAM	1	0.28436	0.02056	13.83	<.0001
AMD	AMD	1	-0.09603	0.01797	-5.34	<.0001
ENPH	ENPH	1	0.02122	0.00420	5.05	<.0001
JNPR	JNPR	1	5.23004	1.55811	3.36	0.0009
MU	MU	1	0.25264	0.05139	4.92	<.0001
PANW	PANW	1	0.07506	0.00852	8.81	<.0001
TEL	TEL	1	0.34676	0.02406	14.41	<.0001
JNPRSQ		1	-0.09423	0.02540	-3.71	0.0003

Figure 98

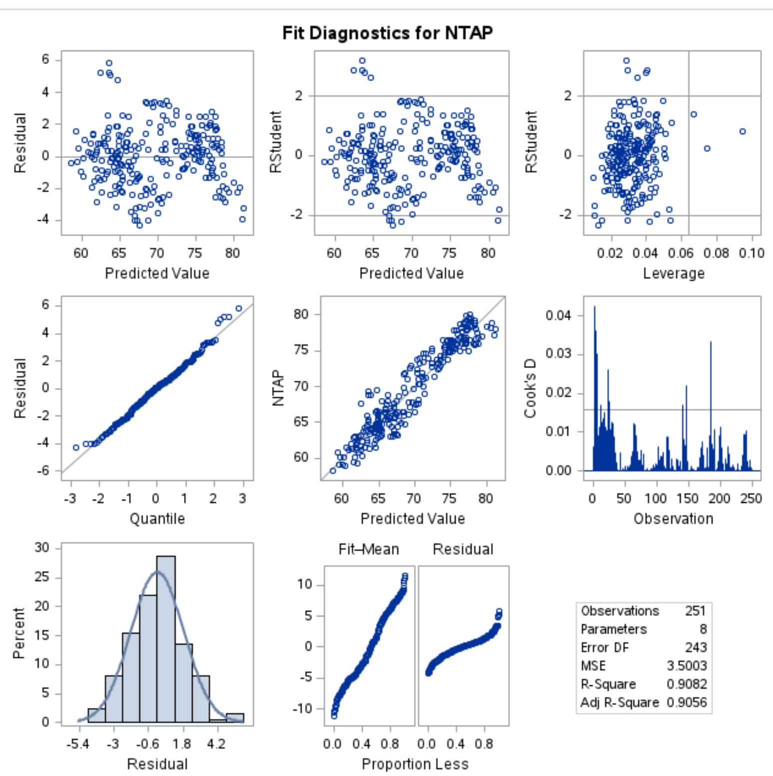

Figure 99

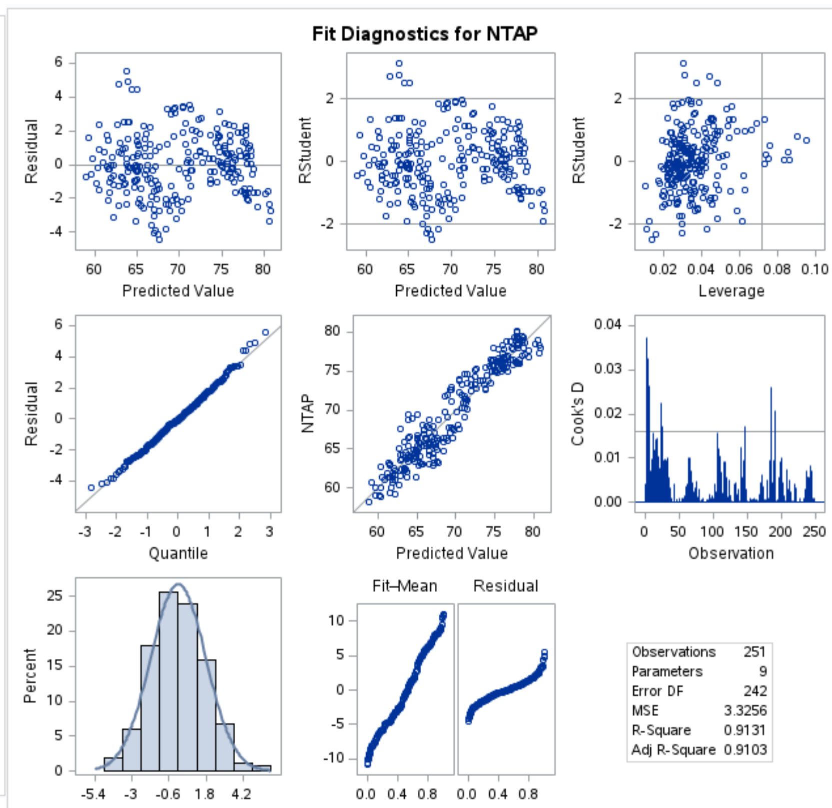

Figure 100

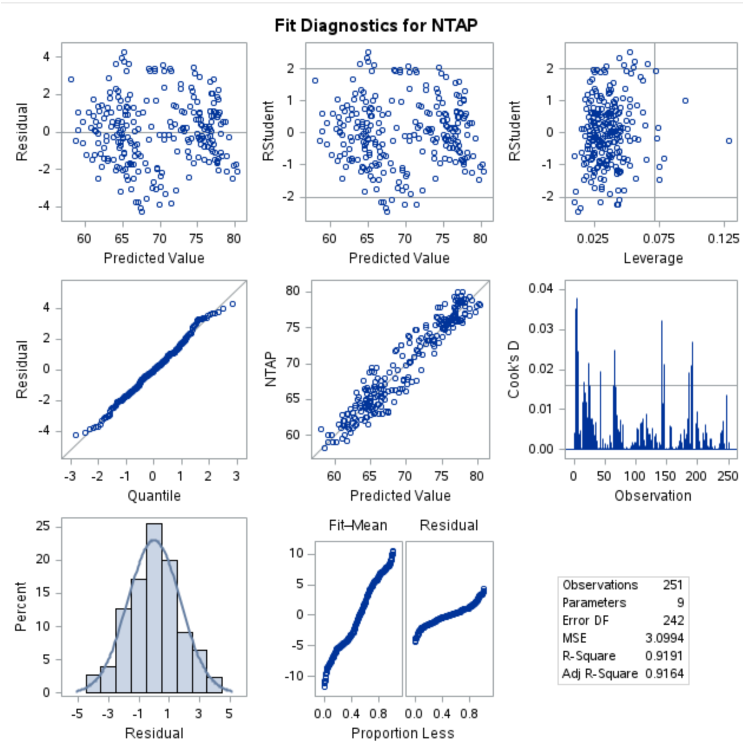

Figure 101

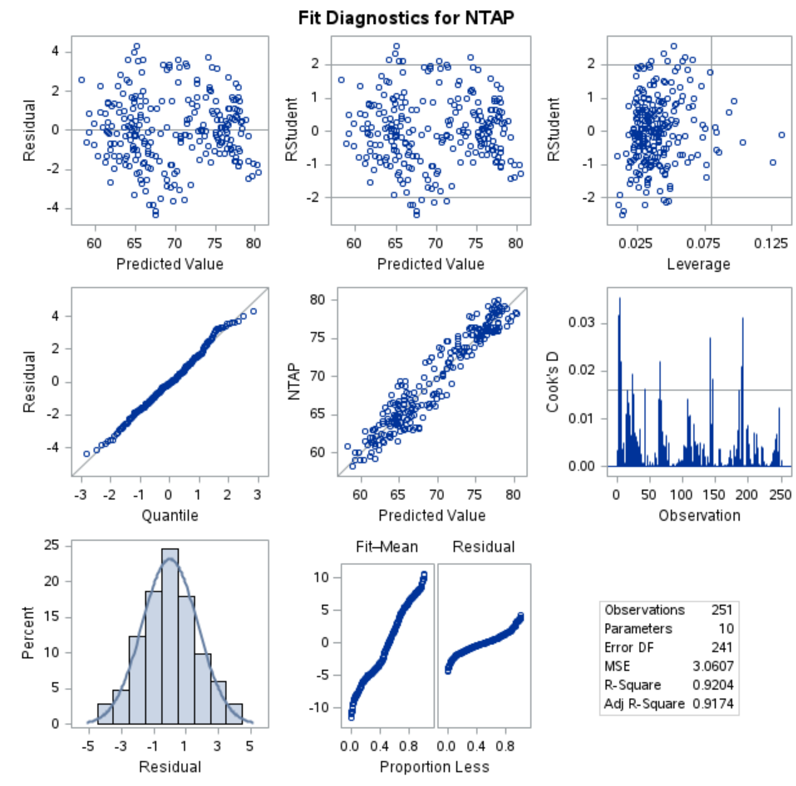

Figure 102

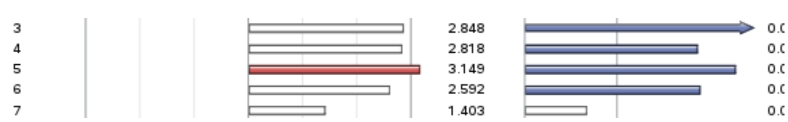

Figure 103

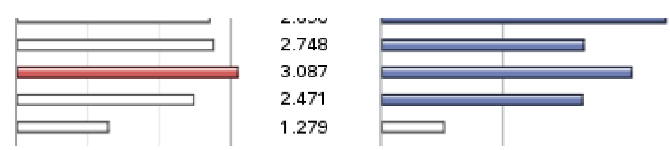

Figure 104

Parameter Estimates						
Variable	**Label**	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	Intercept	1	29.88361	35.19728	0.85	0.3967
AKAM	AKAM	1	0.32644	0.02167	15.06	<.0001
AMD	AMD	1	-1.03255	0.20067	-5.15	<.0001
ENPH	ENPH	1	0.02198	0.00404	5.45	<.0001
JNPR	JNPR	1	-0.32176	1.90763	-0.17	0.8662
MU	MU	1	0.20704	0.05025	4.12	<.0001
PANW	PANW	1	0.06314	0.00856	7.38	<.0001
TEL	TEL	1	0.37784	0.02402	15.73	<.0001
AMD_JNPR		1	0.03091	0.00660	4.68	<.0001
JNPRSQ		1	-0.05226	0.02598	-2.01	0.0452

CODE:

```
/* Generated Code (IMPORT) */
/* Source File: Fall 2023 Lab #3 Closing Prices.xlsx */
/* Source Path: /home/u63542550/sasuser.v94 */
/* Code generated on: 11/21/23, 12:10 PM */

%web_drop_table(WORK.IMPORT);


FILENAME REFFILE '/home/u63542550/sasuser.v94/Fall 2023 Lab #3 Closing Prices.xlsx';

PROC IMPORT DATAFILE=REFFILE
	DBMS=XLSX
	OUT=WORK.stock;
	GETNAMES=YES;
RUN;

PROC CONTENTS DATA=WORK.stock; RUN;


%web_open_table(WORK.IMPORT);

proc print data = stock (OBS=10); run;
/* ACN ADBE AKAM AMD APH */
proc sgplot data=stock;
	series x = date y = NTAP/legendlabel="NTAP";
	series x = date y = ACN/legendlabel="ACN";
	series x = date y = ADBE/legendlabel="ADBE";
	series x = date y = AKAM/legendlabel="AKAM";
	series x = date y = AMD/legendlabel="AMD";
	series x = date y = APH/legendlabel="APH";
	yaxis label="Price of Share";
	title "Plot of Prices Over Time for Dependent variable and First 5 Potential Independent
Variables";
RUN;
/* ADI ANSS AAPL AMAT ANET*/
proc sgplot data=stock;
	series x = date y = NTAP/legendlabel="NTAP";
	series x = date y = ADI/legendlabel="ADI";
	series x = date y = ANSS/legendlabel="ANSS";
	series x = date y = AAPL/legendlabel="AAPL";
	series x = date y = AMAT/legendlabel="AMAT";
	series x = date y = ANET/legendlabel="ANET";
	title "Scatter Plot of Prices Over Time for Dependent variable and Next 5 Potential
Independent Variables";
RUN;
/* ADSK AVGO CDNS CDW CSCO */
proc sgplot data=stock;
	series x = date y = NTAP/legendlabel="NTAP";
	series x = date y = ADSK/legendlabel="ADSK";
	series x = date y = AVGO/legendlabel="AVGO";
	series x = date y = CDNS/legendlabel="CDNS";
	series x = date y = CDNS/legendlabel="CDW";
	series x = date y = CSCO/legendlabel="CSCO";
```

```
			yaxis label="Price of Share";
			title "Plot of Prices Over Time for Dependent variable and Next 5 Potential Independent 
Variables";
		RUN;
		/*CTSH GLW ENPH EPAM FFIV*/
		proc sgplot data=stock;
			series x = date y = NTAP/legendlabel="NTAP";
			series x = date y = CTSH/legendlabel="CTSH";
			series x = date y = GLW/legendlabel="GLW";
			series x = date y = ENPH/legendlabel="ENPH";
			series x = date y = EPAM/legendlabel="EPAM";
			series x = date y = FFIV/legendlabel="FFIV";
			yaxis label="Price of Share";
			title "Plot of Prices Over Time for Dependent variable and Next 5 Potential Independent 
Variables";
		RUN;
		/*FICO FSLR FTNT IT GEN */
		proc sgplot data=stock;
			series x = date y = NTAP/legendlabel="NTAP";
			series x = date y = FICO/legendlabel="FICO";
			series x = date y = FSLR/legendlabel="FSLR";
			series x = date y = FTNT/legendlabel="FTNT";
			series x = date y = IT/legendlabel="IT";
			series x = date y = GEN/legendlabel="GEN";
			yaxis label="Price of Share";
			title "Scatter Plot of Prices Over Time for Dependent variable and Next 5 Potential 
Independent Variables";
		RUN;
		/* HPE HPQ IBM INTC INTU */
		proc sgplot data=stock;
			series x = date y = NTAP/legendlabel="NTAP";
			series x = date y = HPE/legendlabel="HPE";
			series x = date y = HPQ/legendlabel="HPQ";
			series x = date y = IBM/legendlabel="IBM";
			series x = date y = INTC/legendlabel="INTC";
			series x = date y = INTU/legendlabel="INTU";
			yaxis label="Price of Share";
			title "Plot of Prices Over Time for Dependent variable and Next 5 Potential Independent 
Variables";
		RUN;
		/* JNPR KEYS KLAC LRCX MCHP  */
		proc sgplot data=stock;
			series x = date y = NTAP/legendlabel="NTAP";
			series x = date y = JNPR/legendlabel="JNPR";
			series x = date y = KEYS/legendlabel="KEYS";
			series x = date y = KLAC/legendlabel="KLAC";
			series x = date y = LRCX/legendlabel="LRCX";
			series x = date y = MCHP/legendlabel="MCHP";
			yaxis label="Price of Share";
			title "Plot of Prices Over Time for Dependent variable and Next 5 Potential Independent 
Variables";
		RUN;
		/*  MU MSFT MPWR MSI NVDA   */
		proc sgplot data=stock;
			series x = date y = NTAP/legendlabel="NTAP";
			series x = date y = MU/legendlabel="MU";
```

```
		series x = date y = MSFT/legendlabel="MSFT";
		series x = date y = MPWR/legendlabel="MPWR";
		series x = date y = MSI/legendlabel="MSI";
		series x = date y = NVDA/legendlabel="NVDA";
		yaxis label="Price of Share";
		title "Plot of Prices Over Time for Dependent variable and Next 5 Potential Independent 
Variables";
	RUN;
	/*  NXPI ON ORCL PANW PTC */
	proc sgplot data=stock;
		series x = date y = NTAP/legendlabel="NTAP";
		series x = date y = NXPI/legendlabel="NXPI";
		series x = date y = ON/legendlabel="ON";
		series x = date y = ORCL/legendlabel="ORCL";
		series x = date y = PANW/legendlabel="PANW";
		series x = date y = PTC/legendlabel="PTC";
		yaxis label="Price of Share";
		title "Plot of Prices Over Time for Dependent variable and Next 5 Potential Independent 
Variables";
	RUN;
		/*QRVO QCOM ROP CRM STX */
	proc sgplot data=stock;
		series x = date y = NTAP/legendlabel="NTAP";
		series x = date y = QRVO/legendlabel="QRVO";
		series x = date y = QCOM/legendlabel="QCOM";
		series x = date y = ROP/legendlabel="ROP";
		series x = date y = CRM/legendlabel="CRM";
		series x = date y = STX/legendlabel="STX";
		yaxis label="Price of Share";
		title "Plot of Prices Over Time for Dependent variable and Next 5 Potential Independent 
Variables";
	RUN;
		/*NOW SWKS SEDG SNPS TEL */
	proc sgplot data=stock;
		series x = date y = NTAP/legendlabel="NTAP";
		series x = date y = NOW/legendlabel="NOW";
		series x = date y = SWKS/legendlabel="SWKS";
		series x = date y = SEDG/legendlabel="SEDG";
		series x = date y = SNPS/legendlabel="SNPS";
		series x = date y = TEL/legendlabel="TEL";
		yaxis label="Price of Share";
		title " Plot of Prices Over Time for Dependent variable and Next 5 Potential Independent 
Variables";
	RUN;
		/*TDY TER TXN TRMB TYL */
	proc sgplot data=stock;
		series x = date y = NTAP/legendlabel="NTAP";
		series x = date y = TDY/legendlabel="TDY";
		series x = date y = TER/legendlabel="TER";
		series x = date y = TXN/legendlabel="TXN";
		series x = date y = TRMB/legendlabel="TRMB";
		series x = date y = TYL/legendlabel="TYL";
		yaxis label="Price of Share";
		title "Plot of Prices Over Time for Dependent variable and Next 5 Potential Independent 
Variables";
	RUN;
```

```
		/*VRSN WDC ZBRA*/
	proc sgplot data=stock;
		series x = date y = NTAP/legendlabel="NTAP";
		series x = date y = VRSN/legendlabel="VRSN";
		series x = date y = WDC/legendlabel="WDC";
		series x = date y = ZBRA/legendlabel="ZBRA";
		yaxis label="Price of Share";
		title "Plot of Prices Over Time for Dependent variable and Next 5 Potential Independent
Variables";
	RUN;

	/*proc corr to get a strating point */
	proc corr data=stock;
		var NTAP;
		with ACN ADBE AKAM AMD APH
		ADI ANSS AAPL AMAT ANET
		ADSK AVGO CDNS CDW CSCO
		CTSH GLW ENPH EPAM FFIV
		FICO FSLR FTNT IT GEN
		HPE HPQ IBM INTC INTU
		JNPR KEYS KLAC LRCX MCHP
		MU MSFT MPWR MSI NVDA
		NXPI ON ORCL PANW PTC
		QRVO QCOM ROP CRM STX
		NOW SWKS SEDG SNPS TEL
		TDY TER TXN TRMB TYL
		VRSN WDC ZBRA;
		run;
	/*proc corr with all potential varibles to get graphs*/
	proc corr data=stock;
		var NTAP;
		with ACN ADBE AKAM AMD APH
		AAPL AMAT ANET ADSK AVGO
		CDNS CSCO CTSH ENPH EPAM
		FFIV FICO IT HPE INTC
		INTU JNPR KEYS KLAC LRCX
		MU MSFT MPWR NVDA NXPI
		ON ORCL PANW PTC ROP
		CRM NOW SEDG SNPS TEL
		TYL WDC;
		run;
	/*1-5 graphs*/
	proc corr data=stock plots=scatter(nvar = all);
		var NTAP;
		with ACN ADBE AKAM AMD APH;
		run;
	/*6-10 graphs*/
	proc corr data=stock plots=scatter(nvar = all);
		var NTAP;
		with AAPL AMAT ANET ADSK AVGO;
		run;
	/*11-15 graphs*/
	proc corr data=stock plots=scatter(nvar = all);
		var NTAP;
		with CDNS CSCO CTSH ENPH EPAM;
		run;
```

```
/*16-20 graphs*/
proc corr data=stock plots=scatter(nvar = all);
	var NTAP;
	with FFIV FICO IT HPE INTC;
	run;
/*21-25 graphs*/
proc corr data=stock plots=scatter(nvar = all);
	var NTAP;
	with INTU JNPR KEYS KLAC LRCX;
	run;
/*26-30 graphs*/
proc corr data=stock plots=scatter(nvar = all);
	var NTAP;
	with MU MSFT MPWR NVDA NXPI;
	run;
/*31-35 graphs*/
proc corr data=stock plots=scatter(nvar = all);
	var NTAP;
	with ON ORCL PANW PTC ROP;
	run;
/*36-40 graphs*/
proc corr data=stock plots=scatter(nvar = all);
	var NTAP;
	with CRM NOW SEDG SNPS TEL;
	run;
/*41-42 graphs*/
proc corr data=stock plots=scatter(nvar = all);
	var NTAP;
	with TYL WDC;
	run;

/*multiple Regression*/
/*STEPWISE*/
proc reg data=stock;
	model NTAP=ACN ADBE AKAM AMD APH
	AAPL AMAT ANET ADSK AVGO
	CDNS CSCO CTSH ENPH EPAM
	FFIV FICO IT HPE INTC
	INTU JNPR KEYS KLAC LRCX
	MU MSFT MPWR NVDA NXPI
	ON ORCL PANW PTC ROP
	CRM NOW SEDG SNPS TEL
	TYL WDC/selection=stepwise SLENTRY=0.05;
	run;

/*STEPWISE MODEL*/
proc reg data=stock;
	model NTAP=AKAM AMD ANET ADSK
	ENPH FFIV FICO INTU JNPR
	LRCX MU ON ORCL PANW
	ROP CRM NOW SEDG TEL;
	run;

/*FORWARD*/
proc reg data=stock;
	model NTAP=ACN ADBE AKAM AMD APH
```

```
            AAPL AMAT ANET ADSK AVGO
            CDNS CSCO CTSH ENPH EPAM
            FFIV FICO IT HPE INTC
            INTU JNPR KEYS KLAC LRCX
            MU MSFT MPWR NVDA NXPI
            ON ORCL PANW PTC ROP
            CRM NOW SEDG SNPS TEL
            TYL WDC/selection=forward SLENTRY=0.05;
            run;

/*FORWARDS MDOEL*/
proc reg data=stock;
            model NTAP=ACN JNPR TEL AKAM FICO
            PANW SEDG MU MSFT INTU
            CRM ENPH CTSH ORCL AMD
            ON ANET FFIV AMAT ADSK
            ROP NOW TYL;
            run;

/*BACKWARD*/
proc reg data=stock;
            model NTAP=ACN ADBE AKAM AMD APH
            AAPL AMAT ANET ADSK AVGO
            CDNS CSCO CTSH ENPH EPAM
            FFIV FICO IT HPE INTC
            INTU JNPR KEYS KLAC LRCX
            MU MSFT MPWR NVDA NXPI
            ON ORCL PANW PTC ROP
            CRM NOW SEDG SNPS TEL
            TYL WDC/selection=backward SLENTRY=0.05;
            run;

/*BACKWRDS MODEL*/
proc reg data=stock;
            model NTAP=AKAM AMD APH AAPL AMAT
            ANET ADSK ENPH FFIV FICO
            INTC INTU JNPR MU MSFT
            NXPI ON ORCL PANW ROP
            CRM NOW SEDG SNPS TEL
            TYL;
            run;

/*R^2*/
proc reg data=stock;
            model NTAP=ACN ADBE AKAM AMD APH
            AAPL AMAT ANET ADSK AVGO
            CDNS CSCO CTSH ENPH EPAM
            FFIV FICO IT HPE INTC
            INTU JNPR KEYS KLAC LRCX
            MU MSFT MPWR NVDA NXPI
            ON ORCL PANW PTC ROP
            CRM NOW SEDG SNPS TEL
            TYL WDC/selection=rsquare;
            run;

/*r^2 MODEL*/
```

```
proc reg data=stock;
	model NTAP = ACN ADBE AKAM AMD APH
	AAPL AMAT ANET ADSK AVGO
	CDNS CSCO CTSH ENPH EPAM
	FFIV FICO IT HPE INTC
	INTU JNPR KEYS KLAC LRCX
	MU MSFT MPWR NVDA NXPI
	ON ORCL PANW PTC ROP
	CRM NOW SEDG SNPS TEL
	TYL WDC;
	RUN;

/*ADJ R^2 */
proc reg data=stock;
	model NTAP=ACN ADBE AKAM AMD APH
	AAPL AMAT ANET ADSK AVGO
	CDNS CSCO CTSH ENPH EPAM
	FFIV FICO IT HPE INTC
	INTU JNPR KEYS KLAC LRCX
	MU MSFT MPWR NVDA NXPI
	ON ORCL PANW PTC ROP
	CRM NOW SEDG SNPS TEL
	TYL WDC/selection=adjrsq;
	run;

/* ADJ R^2 MODEL */
proc reg data=stock;
	model NTAP = ADBE AKAM AMD APH
	AAPL AMAT ANET ADSK AVGO
	ENPH FFIV FICO IT INTC
	INTU JNPR MU MSFT NXPI
	ON ORCL PANW ROP CRM
	NOW SEDG SNPS TEL TYL;
	RUN;

/*cp*/
proc reg data=stock;
	model NTAP=ACN ADBE AKAM AMD APH
	AAPL AMAT ANET ADSK AVGO
	CDNS CSCO CTSH ENPH EPAM
	FFIV FICO IT HPE INTC
	INTU JNPR KEYS KLAC LRCX
	MU MSFT MPWR NVDA NXPI
	ON ORCL PANW PTC ROP
	CRM NOW SEDG SNPS TEL
	TYL WDC/selection=cp;
	run;

/* CP MODEL */
proc reg data=stock;
	model NTAP=AKAM AMD AAPL AMAT ANET
	ADSK AVGO ENPH FFIV FICO
	INTU JNPR KEYS MU NXPI
	ON ORCL PANW PTC ROP
	CRM NOW SEDG SNPS TEL
	TYL WDC;
```

```
	run;

/*press*/
proc glmselect data=stock;
	model NTAP=ACN ADBE AKAM AMD APH
	AAPL AMAT ANET ADSK AVGO
	CDNS CSCO CTSH ENPH EPAM
	FFIV FICO IT HPE INTC
	INTU JNPR KEYS KLAC LRCX
	MU MSFT MPWR NVDA NXPI
	ON ORCL PANW PTC ROP
	CRM NOW SEDG SNPS TEL
	TYL WDC/selection=stepwise (choose=press);
	run;

/* PRESS MODEL*/
proc reg data=stock;
	model NTAP=AKAM AMD ANET ADSK AVGO
	ENPH FFIV FICO INTU JNPR
	LRCX MU ON ORCL PANW
	ROP CRM NOW SEDG TEL;
	run;

/* best model from stepwise*/
/*test for multicolinearity*/
proc reg data=stock;
	model NTAP=AKAM AMD ANET ADSK
	ENPH FFIV FICO INTU JNPR
	LRCX MU ON ORCL PANW
	ROP CRM NOW SEDG TEL/vif;
	run;
/* took out highest vif value over 10 */
proc reg data=stock;
	model NTAP=AKAM AMD ANET ADSK
	ENPH FFIV FICO INTU JNPR
	MU ON ORCL PANW ROP
	CRM NOW SEDG TEL/vif;
	run;
/* took out highest vif value over 10 */
proc reg data=stock;
	model NTAP=AKAM AMD ANET ADSK
	ENPH FFIV FICO INTU JNPR
	MU ON ORCL PANW
	ROP CRM SEDG TEL/vif;
	run;
/* took out highest vif value over 10 */
proc reg data=stock;
	model NTAP=AKAM AMD ANET ADSK
	ENPH FFIV INTU JNPR
	MU ON ORCL PANW
	ROP CRM SEDG TEL/vif;
	run;
/* took out highest vif value over 10 */
proc reg data=stock;
	model NTAP=AKAM AMD ANET ADSK
	ENPH FFIV JNPR
```

```
            MU ON ORCL PANW
            ROP CRM SEDG TEL/vif;
            run;
/* took out highest vif value over 10 */
proc reg data=stock;
            model NTAP=AKAM AMD ANET ADSK
            ENPH FFIV JNPR
            MU ON ORCL PANW
            ROP SEDG TEL/vif;
            run;
/* took out highest vif value over 10 */
proc reg data=stock;
            model NTAP=AKAM AMD ANET ADSK
            ENPH FFIV JNPR
            MU ON ORCL PANW
            ROP TEL/vif;
            run;
/* took out highest vif value over 10 */
proc reg data=stock;
            model NTAP=AKAM AMD ANET ADSK
            ENPH FFIV JNPR
            MU ON PANW
            ROP TEL/vif;
            run;
/* took out highest vif value over 10 */
proc reg data=stock;
            model NTAP=AKAM AMD ANET ADSK
            ENPH FFIV JNPR
            MU PANW
            ROP TEL/vif;
            run;
/* took out highest vif value over 10 */
proc reg data=stock;
            model NTAP=AKAM AMD ANET ADSK
            ENPH FFIV JNPR
            MU PANW TEL/vif;
            run;
/*take out insignifigant indep vars*/
/*model after taking out insignifigant terms and terms causing issues with multicolinearity*/
proc reg data=stock;
            model NTAP=AKAM AMD ENPH JNPR
            MU PANW TEL/vif;
            run;

/*quad terms*/
proc sgplot data=STOCK;
  scatter x=akam y=NTAP;
run;

proc sgplot data=stock;
  scatter x=amd y=NTAP;
run;

proc sgplot data=STOCK;
  scatter x=enph y=NTAP;
run;
```

```
proc sgplot data=stock;
   scatter x=jnpr y=NTAP;
run;

proc sgplot data=STOCK;
   scatter x=mu y=NTAP;
run;

proc sgplot data=stock;
   scatter x=panw y=NTAP;
run;

proc sgplot data=stock;
   scatter x=tel y=NTAP;
run;
/*enph, jnpr, mu looks like potential quad terms*/

/*interaction terms*/
/*AKAM*/
proc glm data=stock;
 model ntap=akam | amd / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=akam sliceby=amd);
run;

proc glm data=stock;
 model ntap=akam | enph / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=akam sliceby=enph);
run;

proc glm data=stock;
 model ntap=akam | JNPR / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=akam sliceby=JNPR);
run;

proc glm data=stock;
 model ntap=akam | MU / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=akam sliceby=MU);
run;
```

```
proc glm data=stock;
 model ntap=akam | PANW / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=akam sliceby=PANW);
run;

proc glm data=stock;
 model ntap=akam | TEL / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=akam sliceby=TEL);
run;
/*AMD*/
proc glm data=stock;
 model ntap=AMD | ENPH / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=AMD sliceby=ENPH);
run;

proc glm data=stock;
 model ntap=AMD | JNPR / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=AMD sliceby=JNPR);
run;

proc glm data=stock;
 model ntap=AMD | MU / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=AMD sliceby=MU);
run;

proc glm data=stock;
 model ntap=AMD | PANW / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=AMD sliceby=PANW);
run;

proc glm data=stock;
 model ntap=AMD | TEL / solution;
```

```
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=AMD sliceby=TEL);
run;

/*ENPH */
proc glm data=stock;
 model ntap=ENPH | JNPR / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=ENPH sliceby=JNPR);
run;

proc glm data=stock;
 model ntap=ENPH | MU / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=ENPH sliceby=MU);
run;

proc glm data=stock;
 model ntap=ENPH | PANW / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=ENPH sliceby=PANW);
run;

proc glm data=stock;
 model ntap=ENPH | TEL / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=ENPH sliceby=TEL);
run;
/*JNPR*/
proc glm data=stock;
 model ntap=JNPR | MU / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=JNPR sliceby=MU);
run;

proc glm data=stock;
 model ntap=JNPR | PANW / solution;
 store GLMModel;
```

```
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=JNPR sliceby=PANW);
run;

proc glm data=stock;
 model ntap=JNPR | TEL / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=JNPR sliceby=TEL);
run;
/*MU*/
proc glm data=stock;
 model ntap=MU| PANW / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=MU sliceby=PANW);
run;

proc glm data=stock;
 model ntap=MU | TEL / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=MU sliceby=TEL);
run;
/*PANW */
proc glm data=stock;
 model ntap=PANW | TEL / solution;
 store GLMModel;
 run;

proc plm restore=GLMModel noinfo;
   effectplot slicefit(x=PANW sliceby=TEL);
run;
/*TEL ALL ALREADY GRAPHED*/
/*new set with quad and interaction terms*/
Data stock2;
	set stock;
	ENPHSQ = ENPH*ENPH;
	JNPRSQ = JNPR*JNPR;
	MUSQ = MU*MU;
	AKAM_ENPH = AKAM*ENPH;
	AKAM_JNPR = AKAM*JNPR;
	AKAM_PANW = AKAM*PANW;
	AMD_ENPH = AMD*ENPH;
	AMD_JNPR = AMD*JNPR;
	AMD_MU = AMD*MU;
	AMD_PANW = AMD*PANW;
	ENPH_MU = ENPH*MU;
```

```
        ENPH_PANW = ENPH*PANW;
        ENPH_TEL = ENPH*TEL;
        MU_PANW = MU*PANW;
        MU_TEL = MU*TEL;
run;
/*testing quadratic terms */
proc reg data=stock2;
        model NTAP=AKAM AMD ENPH JNPR MU PANW TEL
        JNPRSQ MUSQ ENPHSQ;
        run;
/*remove insignifigant terms*/
proc reg data=stock2;
        model NTAP=AKAM AMD ENPH JNPR MU PANW TEL
        JNPRSQ MUSQ;
        run;
/*quad model */
proc reg data=stock2;
        model NTAP=AKAM AMD ENPH JNPR MU PANW TEL
        JNPRSQ;
        run;
/*testin potential interatction terms */
proc reg data=stock2;
        model NTAP=AKAM AMD ENPH JNPR MU PANW TEL
        AKAM_ENPH AKAM_JNPR AKAM_PANW
        AMD_ENPH AMD_JNPR AMD_MU AMD_PANW
        ENPH_MU ENPH_PANW ENPH_TEL
        MU_PANW MU_TEL;
        run;
/*remove insignifignat terms */
proc reg data=stock2;
        model NTAP=AKAM AMD ENPH JNPR MU PANW TEL
        AMD_ENPH AMD_JNPR ENPH_TEL;
        run;
/*remove insignifignat terms */
proc reg data=stock2;
        model NTAP=AKAM AMD ENPH JNPR MU PANW TEL
        AMD_ENPH AMD_JNPR;
        run;
/*best interaction model */
proc reg data=stock2;
        model NTAP=AKAM AMD ENPH JNPR MU PANW TEL
        AMD_JNPR;
        run;
/*model with interaction and one quad term*/
proc reg data=stock2;
        model NTAP=AKAM AMD ENPH JNPR MU PANW TEL
        AMD_JNPR JNPRSQ;
        run;

/*/all*/
/*first order model */
proc reg data=stock;
        model NTAP=AKAM AMD ENPH JNPR
        MU PANW TEL/all;
        run;
/*quad model */
```

```
proc reg data=stock2;
	model NTAP=AKAM AMD ENPH JNPR MU PANW TEL
	JNPRSQ/all;
	run;
/*best interaction model */
proc reg data=stock2;
	model NTAP=AKAM AMD ENPH JNPR MU PANW TEL
	AMD_JNPR/all;
	run;
/*model with interaction and one quad term*/
proc reg data=stock2;
	model NTAP=AKAM AMD ENPH JNPR MU PANW TEL
	AMD_JNPR JNPRSQ/all;
	run;
```