The nominal stock returns of alleghany corporation

is the nominal stock price at time t , and is the nominal stock price at time t-1. It is mentionable that without the data of previous month of January 1980, it is not possible to generate the data for February 1980 as NSR shows the change between the two months.

To generate the nominal stock returns (NSR) with time series data, we have used MICROFIT software. The formulas which have been used in generating the data are as follows:

LS = LOG (S)

DLS = LS – LS (-1)

NSR = DLS * 100

where, NSR is calculated in percentage.

(ii) Growth Rate of Industrial Production (GIND):

To generate the growth rate of industrial production (GIND) of Alleghany Corporation, time series data of level of industrial production (IP) on monthly basis for the period of 1980 to December 2009 is used. To calculated the series the following formula has been used.

GIND = (log t – log t-1)*100

I should be stated that it wasn’t possible to figure out the data for GINP for January 1980 for the same reason that has been discussed for the previous case. To generate the GIND series of data, we have used MICROFIT software. The formulas which have been used in generating the data are as below:

LIP = LOG (IP)

DLIP = LIP – LIP (-1)

GNIP = DLIP * 100

Where, GIND is calculated in percentage.

Properties of Dataset:

Graph and Statistical Measures:

Table 1 represents the statistical measures of monthly nominal stock price (S) of Alleghany Corporation, nominal short-term interest which is measured by the effective federal funds rate (FED), the level of industrial production of U. S. (IP), nominal stock return (NSR) and growth rate of industrial production (GIND) for twenty seven years starting from the year of 1980. Table 2 demonstrates the correlation between the independent and dependant variables of the models.

Graph 1 illustrates the increasing or decreasing pattern of monthly nominal stock price (S) of Alleghany Corporation, nominal short-term interest (FED), the level of industrial production of U. S. (IP), nominal stock return (NSR) and growth rate of industrial production (GIND) for the above mentioned periods.

[Table 1]

Location:

Minimum, maximum, mean and median are the statistical measures which are used to know the location of the given dataset of Alleghany Corporation.

Minimum and Maximum:

Minimum value of nominal stock price (S) of Alleghany Corporation for the period of February 1880 to December 2009 is 4. 8 where as the maximum value of S is 392. 19. During the same period, the maximum growth rate of industrial production (GNIP) is 2. 1227%

For the period of February 1880 to December 2009, the maximum of nominal stock returns (NSR) is 32. 1244%.

Mean and Median:

For time series data mean or average do not affect that much in analyzing data. However, mean of nominal stock price (S) of Alleghany Corporation is 112. 90 during the period of February 1880 to December 2009. After analyzing the dataset, we see that in the very beginning of the sample period the nominal stock price is very lower than of mean. However, from the Graph 1, we can say that the nominal stock price tends to increase more on monthly basis though there is some huge fluctuation in few periods. This fluctuation may arise from economical issues which will be discussed later in this report.

Although short term interest rate is one of the vital issues for this case, still the mean of short term interest rate of 6% do not imply any consequences for this case.

The monthly average nominal stock return (NSR) for the corporation is 1. 02%. As the mean is influenced by outliers like maximum and minimum values of NSR, we can say that this is not a robust statistical measure. On

the other hand, median of NSR is 0. 98% which is less than mean, can reduce the importance to be attached with the outliers.

The median of growth rate of industrial production is 0. 209864% whereas the mean of GINP is 0. 1560% which is pretty closer to median. Although, the average growth rate is positive, it is not as higher as it should have been.

Dispersion:

Range, standard deviation, coefficient of variation and standard error are used to measure the dispersion of the sample.

Range:

From the table: we can see that the range of S, FED, IP, NSR and GINP are 387. 39, 18. 98%, 54. 1, 0. 7724% and 0. 0613% respectively. These values can be misleading as the maximum or minimum values of the variables are turned out to be rare. Thus it does not represent the entire distribution.

Standard Deviation:

Standard deviation of nominal short term interest rates is 3. 7714 shows that the dispersion from the average is quite low which indicates that the data points tend to be very close to the mean. As the standard deviation of the FED is quite low, we can say that the rate is not volatile. From the graph 2, it can be seen that the nominal interest rates is fall as time passes though there is high and low fluctuation in few periods. However, these fluctuations are not very high.

From the standard deviation of nominal stock returns we can analyze that return on the fund hasn’t deviated that much that of the expected normal

returns. Similarly, standard deviation of GIND is 0. 0071 interprets that though there is positive growth change, it hasn’t affected the return that much.

Coefficient of Variation:

Nominal short term interest rates’ coefficient of variation of 0. 6286 is comparatively low than of nominal stock returns of 5. 8695. As the FED’s coefficient of variation is quite low, it represents that the risk-return tradeoffs is better.

Standard Error:

The standard error of nominal stock returns is 0. 0032 shows that the sample mean has deviated 0. 3167% from the actual mean of the population. We know that standard error is inversely proportional to the sample size. As the standard error is smaller; we can say that the statistic has approached near to actual value due to large sample size.

The standard error of the growth rate of industrial production is 0. 0004 represents that the deviation between sample mean and actual mean of the population is only 0. 0372. As the standard error is so small, it shows more representative sample size.

Shape:

To know the shape of the curves following statistical measures are used:

Sample Variance:

One of the major dispersion measures is sample variance as it shows a set of data points around their mean value. The variance of nominal short term

interest rate, 14. 2236 presents the volatility of FED. Nominal stock return's variance is 36. 0212 which is quite volatile. On the other hand the variance for GIND is 0. 4971 which indicates the volatility of the GIND is very lower compared to NSR.

Kurtosis:

The kurtosis measure is used to describe the distribution of observed data around the mean which shows the volatility of volatility. The kurtosis of nominal stock price is very low that is -0. 206182.

If the kurtosis of FED is observed, it can be noticed that it is also quite low and is only 1. 6965. Thus, it portrays a chart with skinny tails and a distribution concentrated toward the mean. Hence, in the figure 1, it can be seen that the shape tends to have a flat top near the mean rather than a sharp peak.

[Figure 1]

On the other hand, the kurtosis of nominal stock returns shows a quite higher kurtosis than of FED. Thus, it tends to have a distinct peak near the mean, decline rather rapidly and have heavy tails. The histogram showed in figure 2 exhibits the same as discussed.

[Figure 2]

The kurtosis of industrial production is -1. 5170. However, contrary to IP kurtosis the kurtosis of growth rate of industrial production is higher that is 4. 2214.

[Figure 3]

Skewness:

Skewness is used as a dispersion measure as statistical measure for this case as it describes asymmetry from the probability distribution of a real valued random variable. The skewness of FED is 1. 0789 that shows a positive value. Hence, it indicates that the tail on right side is lower than the left side and the bulk of the values lie to the left of the mean. Nominal stock return's skewness is -1. 1232 which is negative and interprets that the tail on the left side of the probability density function is longer than the right side and the bulk of the values lie to the right of the mean. Likewise, the skewness for GIND is -0. 935714 which shows negative value.

(i) Using the Ordinary Least Squares (OLS), we can estimate the below mentioned regression model.

Model 1:

In the regression model, nominal stock return (NSR) is dependent variable and nominal short-term interest rate, measured by effective federal funds rate (FED) is independent variable. To generate the result using OLS method, MICROFIT software has been used.

[Figure: 4]

After running the regression, the following nominal stock returns equation is found:

From the equation it can be interpreted that over the monthly period February 1980 to December 2009, there is positive relationship between

nominal stock returns (NSR) and nominal short term interest rate (FED) as the slope coefficient (is positive. It interprets that if the nominal short term interest rate goes up by 1%, on average, nominal stock returns increases by about 0. 0366%. Moreover, the value of constant (indicates that if nominal short term interest rate is zero, the average nominal stock returns will be about 0. 8029%.

(ii) To determine whether the estimated slope coefficient (is significantly different from zero at the 5% level of significance either through confidence interval approach or t-test approach, the following hypothesis has been tested at the earlier mentioned significance level.

Null Hypothesis, : = 0

Alternative Hypothesis, : â‰ 0

From table 1. 1, the following data can be observed:

Slope coefficient of FED, = 0. 0366

Standard error of FED, = 0. 0842

Degrees of freedom, df = n-k = 359-2 = 357

Î± = 5 %

Confidence Interval Approach:

The confidence interval for Î²2 can be measured as follows:

2 tÎ±/2

From the t-table (Appendix D, table D. 2, Gujarati) it can be found that for 357 degrees of freedom: tÎ±/2 = t0. 05/2 = 1. 960. Hence, we can attain the outcome by substituting all the known values that the 100(1- Î±) % or 95% confidence interval for Î²2 is:

2 tÎ±/2 = 0. 0366 1. 960 (0. 0842)

= [-0. 1284, 0. 2016]

Given the confidence coefficient of 95%, in the long run, intervals like (-0. 1284, 0. 2016) contains the true value of since Î²2 under the null hypothesis is zero and it lies within the confidence interval, we do not reject the null hypothesis at the 5% level of significance. Therefore, Î²2 is not statistically different from zero and the finding is not statistically significant.

t-test Approach:

The t- statistic can be obtained through the followings

t-statistic, t =

=

= 0. 4347 (same as showed in figure 1. 4)

Critical t- value, = tn-k, Î±/2

= t357, 0. 05/2

= 1. 960

As, | t| = 0. 4347 < tn-k, Î±/2 = t357, 0. 05/2 = 1. 960, we do not reject the null at the 5% level of significance. Thus Î²2 is not statistically different from zero.

Using both the confidence interval approach and t-test approach to test whether the estimate for Î²2 is significantly different from zero at the 5% level of significance, same result has been achieved that is Î²2 is not statistically different from zero.

(iii) As shown in Figure 5, during the period of February 1980 to July 2007, the constant coefficient ( ) is 1. 3900% and slope coefficient of FED ( ) is -0. 0253%.

[Figure 5]

The value of constant indicates that the average value of nominal stock returns is about 1. 3900% when the nominal short term interest rate is zero. Moreover, the coefficient of FED is negative which interprets that when the nominal short term returns increases, the stock returns decreases, which seem to be a normal phenomenon. When short term interest rate increases people tend to invest in FED as its risk free. Hence, if nothing else change, the stock price tends to drop as the required return is higher. Thus, during the period of February 1980 to July 2007, growth of 1% in FED creates a drop of 0. 0253% in nominal stock returns. The correlation between NSR and FED for the mentioned period is -0. 0159 which also indicates that there is negative relationship between NSR and FED. However, the relationship is not perfectly correlated as it varies from -1. However, when the graph is observed for the mentioned period it’s been seen that the relationship

between the NSR and FED is not that proper as at several points NSR and FED haven’t shown negative relationship.

[Graph 6]

Here, p-value is being used to know whether the null hypothesis would be rejected. If the p-value associated with the estimate of is evaluated, it can be noticed that p-value is 0. 774 which is higher than 0. 05 that is level of significance. The higher the p-value, the stronger the evidence is in favour of the null hypothesis. Thus for the model 1, we do not reject the null at the 5% level of significance.

For the period of August 2007 to December 2009, using OLS method it can be seen in the figure 6 that the constant value coefficient ( ) is -0. 9014% and slope coefficient of FED ( ) is -0. 2504%.

[Figure 6]

can be interpreted as like that if the nominal short term interest rate is zero, nominal stock returns is -0. 9014%. So, it shows that if FED is zero, nominal stock return will be negative. The slope coefficient of FED for this sub sample model indicates that similar relationship like previous sub sample model. It indicates 1% increase in FED influences nominal stock returns to decrease by 0. 2504%. Furthermore, the correlation between NSR and FED during this period is – 0. 06057. Likewise the other sub period model, NSR and FED has negative relationship.

If the p-value related with is considered, it can be observed that p-value is 0. 755 which is higher than 0. 05 (level of significance). Similarly, for this sub period model, we do not reject the null at the 5% level of significance.

(i) Using the Ordinary Least Squares (OLS), we can estimate the below mentioned regression model.

Model 2: NSRt = ß1 + ß2 FED t + ß3 GINDt + Î¼t

In the regression model, nominal stock returns (NSR) is dependent variable and nominal short-term interest rate, measured by effective federal funds rate (FED) and growth rate of industrial production (GIND) are the independent variables. To generate the result using OLS method, MICROFIT software has been used.

[Figure: 7]

After running the regression, the following nominal stock returns equation is found:

= 0. 5654 + 0. 0516 FEDt + 0. 9447 GINDt

From the equation it can be interpreted that over the monthly period February 1980 to December 2009, there is positive relationship between nominal stock returns (NSR) and nominal short term interest rate (FED) and growth rate of industrial production as the slope coefficients (ß2, ß3) are positive. The intercept (ß1) of 0. 5654 shows that if nominal short term interest rate and growth rate of industrial product is kept zero, the average nominal stock is about 0. 5654 %. The slope coefficient of FED (ß2) of 0.

0516 interprets that if the intercept and the other slope coefficient is kept zero, a growth of 1% in FED increases the nominal stock returns by about 0. 0516%. Likewise, the slope coefficient of GIND (ß3) of 0. 9447 indicates an increase in growth rate of industrial production by 1% increases the nominal stock returns by 0. 9447% while FED and intercept is zero.

In order to know the fit of the models mentioned earlier, R2 value is used. In model 1, R2 is 0. 0005290 which is very low. It shows that the variation of nominal stock returns can be explained by independent variable of FED.

On the other hand in model 2, R2 is 0. 012758.

R2 implies fit of the regression model. Therefore, in Model 1, R2 is 0. 0022554, implying that about 0. 23% of the variation of nominal stock returns can be explained by independent variables(FED) By contrast, R2 in Model 2. Is 0. 0028381, which indicates that about 0. 28% of the variation in nominal stock returns can be explained by independent variables(FED and GIND). On the basis of the same sample size and dependent variable, these two R2’s can be compared. Since the fit of the model (R2) is said to be “ better” the closer is R2 to 1. In conclusion, Model 2 is better.

(ii) In order to test joint hypothesis, F-statistic is being used and the following hypothesis has been considered at Î± = 5%.

Null Hypothesis, :

Alternative Hypothesis, : Not all slope coefficients are simultaneously zero

Table 1. 5 shows that the value of the F-statistic is 2. 3003 for model 2. To know the critical F-value, (Appendix D, table D. 3, Gujarati) is used.

Critical F- value, = F Î± (k-1, n-k)

= F0. 05(3-1, 359-3)

= F0. 05(2, 356)

= 3. 00

As F-statistic (2. 3003) if either of ur Y or X is non-stationary, then the results may not be valid at all

if both are non-stationary, then sometimes the result may be valid (when they are cointegrated, another difficult concept), and other times the result will not be valid

if u cant do the tests urself, mention in the report that these are time series data and other issues like non-stationarity of data, autoregressive or moving average nature of the errors etc should all be considered mention them as a limitation to your regression model.

perform a dicky fuller test or dicky-fuller augmented test (i think there are more advanced tests now)

well.. time series a unit root rest kora uchit.

but monthly data hole unit root test aro difficult as far as i know

and its quite difficult