**Ques 1: Use the wti-remit-cpi.xlsx data to model the following relationship using cointegration methods (Engle-Granger and Johansen cointegration tests)**

**Ans:**

**First setting the time variables**

****

**To apply the mentioned regression equation, transforming the variable:**

****

**Regression result looks as follows:**

****

**To modelling the long run relationship, we need to fast check, are the variables unit root or not.**

****

**From the graph we can see that, all 3 variables follow stochastic trend.**

**Applying more formal test to check the are the variables unit root or stationary. Here I have chosen dfgls test.**

**Here,**

****

**According to SIC and MAIC, it suggests lag 2 and lag 9.** **For variable lcpi, we can see that test statistics is lower than 5% critical value for both lag, therefore we cannot reject the null hypothesis. So it has unit root.**

****

**According to SIC and MAIC, it suggests lag 1 and lag 7.** **For variable lremit, we can see that test statistics is lower than 5% critical value for both lags, therefore we cannot reject the null hypothesis. So, it has unit root.**

****

**According to SIC and MAIC, it suggests lag 1 and lag 2.** **For variable lwit, we can see that test statistics is lower than 5% critical value for both lags, therefore we cannot reject the null hypothesis. So, it has unit root.**

**First, I am testing is there any cointegration between lcpi with lremit and lwti (checking long run relationship)**

**In the Engle granger cointegration test,**

****

**From the result, we can see that test statistics is lower than the 5% critical value, therefore we cannot reject the null hypothesis and conclude that there are no cointegration.**

**To interpret the relationship, we need to regress, where the dependent variable is lcpi.**

****

**lremit: In the long run, If lremit increase by 1%, lcpi increase by .506% and the variable is statistically significant at 95% confidence interval**

**lwti: In the long run, If lwti increase by 1%, lcpi decrease by .258% and the variable is statistically significant at 95% confidence interval.**

**In the short run, we can see, it has negative relationship.**

**Testing the error correction model by the following command:**

****

**From the result, we can see \_eresid L1 (alpha) is negative, so we can say it has error correction model. So it does have long term relationship.**

**From the ecm (alpha) we can determine half life, we can estimate that if there are any shock in the model, how much time it will take to eliminate the shock.**

**Johansen Cointegration test**

**First determining the lag length**

****

**According to AIC and HQIC, optimal lag is 2**

**Selecting the rank**

****

**Here we can see, it suggests one unique relationship where t < critical value.**

****

**Ans. 2**

**Here, to set the time, we need to exclude weekdays, obtain the result by following command**

****

****

**Generating the daily return of dsex stock**

****

****

**ARCH model**

**arch return, arch(1)**

**est store ARCH**

**arch return, arch(1) vce(robust)**

**est store ARCH\_rob**

**arch return, arch(1) vce(robust) distribution(t)**

**est store ARCH\_t**

**arch return, arch(1) vce(robust) distribution(ged)**

**est store ARCH\_ged**

****

**From all of the distribution, it almost gives the same result for alpha, here alpha, w is greater than 0 and arch L1 (alpha) is less than 1. So we can say 43% of variance of the return can be explained by the past day’s news.**

****

**From the distribution, we can see that, among them ARCH\_t is the best distribution where AIC is the lowest.**

**By selecting the ARCH\_t distribution and here we are allowing 5 lags to see the weekly news effects on the current volatility of the return.**

****

**From the result we can see that, 5 days earlier news also impact the current return, but it slows gradually.**

**Garch model**

****

**Here, we can see that w, alpha and beta is greater than 0 and alpha + beta < 1. But it is very close to 1, so it’s likely that the shock will remain in the system for very long time.**

****

****

**Higher variance during COVID-19**