**Assignment 6**

**Presented by: Qi (Daniel) ZHENG G44426724, Sizhe WU G26890251, Ruibo WANG G24256043, Yingyu LIN G48092483, Xinyue ZHAO G27620695**

**Part 1**

The REG Procedure

Model: MODEL1

Dependent Variable: NIKKEIDIFF

|  |  |
| --- | --- |
| **Number of Observations Read** | 132 |
| **Number of Observations Used** | 131 |
| **Number of Observations with Missing Values** | 1 |

| **Analysis of Variance** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Value** | **Pr > F** |
| **Model** | 2 | 9078283 | 4539142 | 3.52 | 0.0324 |
| **Error** | 128 | 164923103 | 1288462 |  |  |
| **Corrected Total** | 130 | 174001387 |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Root MSE** | 1135.10429 | **R-Square** | 0.0522 |
| **Dependent Mean** | -97.33221 | **Adj R-Sq** | 0.0374 |
| **Coeff Var** | -1166.21645 |  |  |

| **Parameter Estimates** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **DF** | **Parameter Estimate** | **Standard Error** | **t Value** | **Pr > |t|** |
| **Intercept** | **1** | 2409.73805 | 951.70013 | 2.53 | 0.0125 |
| **TIME** | **1** | -7.57578 | 3.66169 | -2.07 | 0.0406 |
| **NIKKEILAG** | **1** | -0.11003 | 0.04176 | -2.63 | 0.0095 |

| **Dickey-Fuller Unit Root Tests** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Type** | **Lags** | **Rho** | **Pr < Rho** | **Tau** | **Pr < Tau** | **F** | **Pr > F** |
| **Zero Mean** | **0** | -0.8890 | 0.4911 | -1.24 | 0.1958 |  |  |
| **Single Mean** | **0** | -6.5157 | 0.3013 | -1.64 | 0.4584 | 1.82 | 0.6075 |
| **Trend** | **0** | -14.4145 | 0.1893 | -2.63 | 0.2657 | 3.52 | 0.4734 |

**Dickey-Fuller τ-test for stationarity**

H0: δ = 0, the series has unit root.

Ha: δ < 0, the series does not have unit root

Firstly, it is crucial to mention that we cannot use ANOVA t-test (P = 0.0095 < 0.05) to test for unit root, only because no longer follows t-distribution. Instead, by observing the Dickey-Fuller table, we obtain that the P-value of the τ-statistics is 0.2657, which is greater than 0.05; therefore, we retain the null hypothesis at 95% confidence level, and conclude that the original series has unit root on a statistical basis. Consequently, the Nikkei series is not stationary.

**Dickey-Fuller F-test for trend stationarity**

H0: δ =0; β = 0, the series is not trend stationary.

H1: δ < 0 or β ≠ 0, the series is trend stationary.

According to the Dickey-Fuller unit root test table, we obtain the P-value of the F is 0.4734, which is greater than 0.05; therefore, we retain the null hypothesis at 95% confidence level. This means the original series is neither stationary nor trend stationary, instead, the series is a random walk. In this case, Nikkei would be difference stationary and not trend stationary; the necessary order of differencing to make original Nikkei series stationary would be one.

**Part 2**

(1)

(a)

Original model:

(1.1)

To calculate , substitute , thus getting:

(1.2)

where the estimated future error , and historical errors are obtained by calculating their deviation from their most recent estimates, i.e.,

(1.3)

Similarly,

(1.4)

(1.5)

(b) .

Substitute n = 100 into (1.3), thus getting

Substitute n = 100 into (1.4), thus getting

Substitute n = 100 into (1.5), thus getting

Substitute n = 101 into (1.3), thus getting

(2)

Original model:

Data input gives

Historical error is the deviation between actual data and its estimate, therefore,

Forecast :

where

Therefore, forecast :