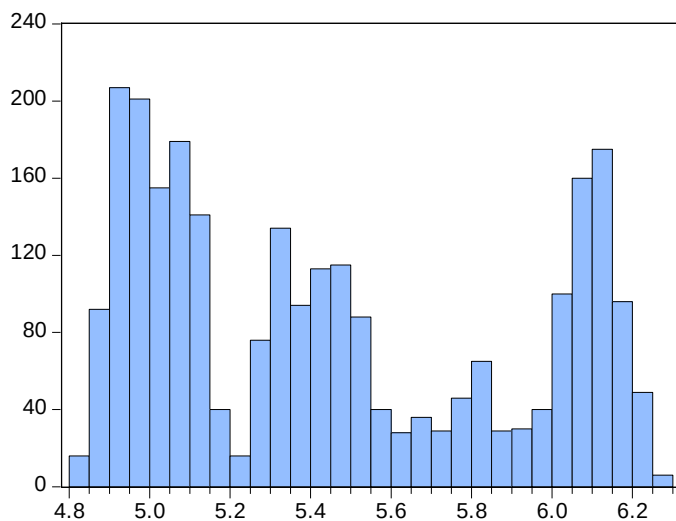


## Brief Sketch of Solutions: Tutorial 1

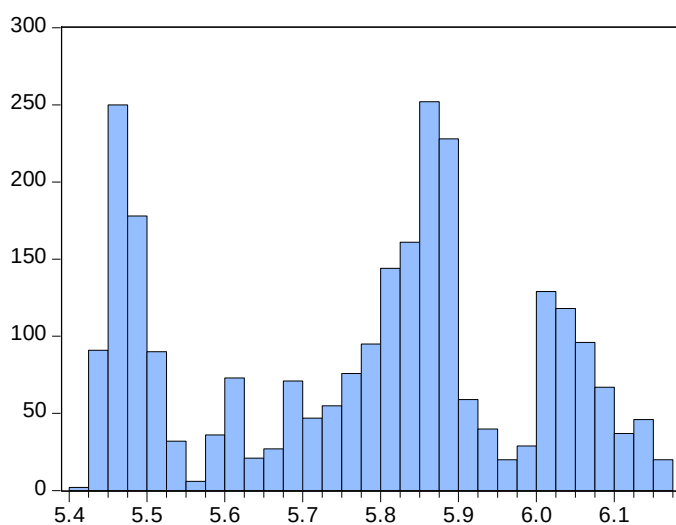
### 2) descriptive statistics and correlogram



Series: LGCSI  
Sample 12/31/1999 12/11/2009  
Observations 2596

|           |          |
|-----------|----------|
| Mean      | 5.454379 |
| Median    | 5.368426 |
| Maximum   | 6.285272 |
| Minimum   | 4.812266 |
| Std. Dev. | 0.446596 |
| Skewness  | 0.370062 |
| Kurtosis  | 1.679259 |

|             |          |
|-------------|----------|
| Jarque-Bera | 247.9331 |
| Probability | 0.000000 |



Series: LJPM  
Sample 12/31/1999 12/11/2009  
Observations 2596

|           |           |
|-----------|-----------|
| Mean      | 5.777320  |
| Median    | 5.826102  |
| Maximum   | 6.173178  |
| Minimum   | 5.422359  |
| Std. Dev. | 0.211030  |
| Skewness  | -0.195040 |
| Kurtosis  | 1.872872  |

|             |          |
|-------------|----------|
| Jarque-Bera | 153.8758 |
| Probability | 0.000000 |

## Correlogram of lgcsi

Date: 07/12/11 Time: 08:58  
Sample: 12/31/1999 12/11/2009  
Included observations: 2596

| Autocorrelation | Partial Correlation |    | AC    | PAC    | Q-Stat | Prob  |
|-----------------|---------------------|----|-------|--------|--------|-------|
| *****           | *****               | 1  | 0.999 | 0.999  | 2594.4 | 0.000 |
| *****           |                     | 2  | 0.998 | 0.054  | 5185.6 | 0.000 |
| *****           |                     | 3  | 0.998 | 0.007  | 7773.8 | 0.000 |
| *****           |                     | 4  | 0.997 | 0.013  | 10359. | 0.000 |
| *****           |                     | 5  | 0.996 | -0.018 | 12941. | 0.000 |
| *****           |                     | 6  | 0.995 | -0.010 | 15520. | 0.000 |
| *****           |                     | 7  | 0.994 | -0.001 | 18096. | 0.000 |
| *****           |                     | 8  | 0.994 | -0.009 | 20668. | 0.000 |
| *****           |                     | 9  | 0.993 | -0.007 | 23237. | 0.000 |
| *****           |                     | 10 | 0.992 | 0.003  | 25803. | 0.000 |

## Correlogram of ljpgm

Date: 07/12/11 Time: 08:57  
Sample: 12/31/1999 12/11/2009  
Included observations: 2596

| Autocorrelation | Partial Correlation |    | AC    | PAC    | Q-Stat | Prob  |
|-----------------|---------------------|----|-------|--------|--------|-------|
| *****           | *****               | 1  | 0.999 | 0.999  | 2592.6 | 0.000 |
| *****           |                     | 2  | 0.998 | -0.013 | 5179.8 | 0.000 |
| *****           |                     | 3  | 0.996 | 0.001  | 7761.4 | 0.000 |
| *****           |                     | 4  | 0.995 | 0.001  | 10338. | 0.000 |
| *****           |                     | 5  | 0.994 | -0.001 | 12908. | 0.000 |
| *****           |                     | 6  | 0.993 | -0.004 | 15473. | 0.000 |
| *****           |                     | 7  | 0.991 | -0.011 | 18033. | 0.000 |
| *****           |                     | 8  | 0.990 | -0.022 | 20587. | 0.000 |
| *****           |                     | 9  | 0.989 | -0.013 | 23134. | 0.000 |
| *****           |                     | 10 | 0.987 | -0.001 | 25676. | 0.000 |

## Correlogram of differences of lgsci

Date: 07/12/11 Time: 08:59  
Sample: 12/31/1999 12/11/2009  
Included observations: 2595

| Autocorrelation | Partial Correlation | AC       | PAC    | Q-Stat | Prob  |
|-----------------|---------------------|----------|--------|--------|-------|
| *               | *                   | 1 -0.071 | -0.071 | 13.129 | 0.000 |
|                 |                     | 2 -0.024 | -0.029 | 14.574 | 0.001 |
|                 |                     | 3 -0.011 | -0.015 | 14.882 | 0.002 |
|                 |                     | 4 0.030  | 0.028  | 17.242 | 0.002 |
|                 |                     | 5 0.009  | 0.013  | 17.465 | 0.004 |
|                 |                     | 6 -0.009 | -0.006 | 17.654 | 0.007 |
|                 |                     | 7 0.004  | 0.004  | 17.698 | 0.013 |
|                 |                     | 8 0.022  | 0.022  | 18.961 | 0.015 |
|                 |                     | 9 0.009  | 0.011  | 19.157 | 0.024 |
|                 |                     | 10 0.006 | 0.009  | 19.251 | 0.037 |

## Correlogram of differences of ljpgm

Date: 07/12/11 Time: 09:00  
Sample: 12/31/1999 12/11/2009  
Included observations: 2595

| Autocorrelation | Partial Correlation | AC       | PAC    | Q-Stat | Prob  |
|-----------------|---------------------|----------|--------|--------|-------|
|                 |                     | 1 0.030  | 0.030  | 2.3355 | 0.126 |
|                 |                     | 2 -0.027 | -0.028 | 4.2951 | 0.117 |
|                 |                     | 3 -0.015 | -0.013 | 4.8628 | 0.182 |
|                 |                     | 4 0.010  | 0.010  | 5.1106 | 0.276 |
|                 |                     | 5 0.012  | 0.011  | 5.5059 | 0.357 |
|                 |                     | 6 -0.042 | -0.042 | 10.039 | 0.123 |
|                 |                     | 7 0.056  | 0.059  | 18.064 | 0.012 |
|                 |                     | 8 0.025  | 0.019  | 19.644 | 0.012 |
|                 |                     | 9 0.022  | 0.022  | 20.850 | 0.013 |
|                 |                     | 10 0.018 | 0.020  | 21.685 | 0.017 |

## 3) Unit Root Test

Null Hypothesis: LGCSI has a unit root  
Exogenous: Constant  
Lag Length: 1 (Automatic based on SIC, MAXLAG=27)

|                                        | t-Statistic | Prob.* |
|----------------------------------------|-------------|--------|
| Augmented Dickey-Fuller test statistic | -0.624641   | 0.8627 |
| Test critical values:                  |             |        |
| 1% level                               | -3.432678   |        |
| 5% level                               | -2.862454   |        |
| 10% level                              | -2.567302   |        |

\*MacKinnon (1996) one-sided p-values.

#### Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LGCSI)

Method: Least Squares

Date: 07/12/11 Time: 09:02

Sample (adjusted): 1/04/2000 12/11/2009

Included observations: 2594 after adjustments

| Variable           | Coefficient | Std. Error            | t-Statistic | Prob.     |
|--------------------|-------------|-----------------------|-------------|-----------|
| LGCSI(-1)          | -0.000420   | 0.000672              | -0.624641   | 0.5323    |
| D(LGCSI(-1))       | -0.070871   | 0.019603              | -3.615376   | 0.0003    |
| C                  | 0.002611    | 0.003679              | 0.709695    | 0.4780    |
| R-squared          | 0.005205    | Mean dependent var    |             | 0.000300  |
| Adjusted R-squared | 0.004438    | S.D. dependent var    |             | 0.015319  |
| S.E. of regression | 0.015285    | Akaike info criterion |             | -5.522712 |
| Sum squared resid  | 0.605352    | Schwarz criterion     |             | -5.515934 |
| Log likelihood     | 7165.958    | Hannan-Quinn criter.  |             | -5.520256 |
| F-statistic        | 6.778980    | Durbin-Watson stat    |             | 2.003436  |
| Prob(F-statistic)  | 0.001158    |                       |             |           |

Null Hypothesis: D(LGCSI) has a unit root

Exogenous: None

Lag Length: 0 (Automatic based on SIC, MAXLAG=27)

|                                        | t-Statistic | Prob.* |
|----------------------------------------|-------------|--------|
| Augmented Dickey-Fuller test statistic | -54.64749   | 0.0001 |
| Test critical values:                  |             |        |
| 1% level                               | -2.565854   |        |
| 5% level                               | -1.940946   |        |
| 10% level                              | -1.616617   |        |

\*MacKinnon (1996) one-sided p-values.

#### Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LGCSI,2)

Method: Least Squares

Date: 07/12/11 Time: 09:04

Sample (adjusted): 1/04/2000 12/11/2009

Included observations: 2594 after adjustments

| Variable           | Coefficient | Std. Error            | t-Statistic | Prob.     |
|--------------------|-------------|-----------------------|-------------|-----------|
| D(LGCSI(-1))       | -1.070717   | 0.019593              | -54.64749   | 0.0000    |
| R-squared          | 0.535250    | Mean dependent var    |             | 6.26E-06  |
| Adjusted R-squared | 0.535250    | S.D. dependent var    |             | 0.022419  |
| S.E. of regression | 0.015284    | Akaike info criterion |             | -5.523664 |
| Sum squared resid  | 0.605709    | Schwarz criterion     |             | -5.521404 |
| Log likelihood     | 7165.192    | Hannan-Quinn criter.  |             | -5.522845 |
| Durbin-Watson stat | 2.003391    |                       |             |           |

Null Hypothesis: LJPM has a unit root  
 Exogenous: Constant, Linear Trend  
 Lag Length: 0 (Automatic based on SIC, MAXLAG=27)

|                                        | t-Statistic | Prob.* |
|----------------------------------------|-------------|--------|
| Augmented Dickey-Fuller test statistic | -2.529574   | 0.3136 |
| Test critical values:                  |             |        |
| 1% level                               | -3.961580   |        |
| 5% level                               | -3.411539   |        |
| 10% level                              | -3.127633   |        |

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation  
 Dependent Variable: D(LJPM)  
 Method: Least Squares  
 Date: 07/12/11 Time: 09:06  
 Sample (adjusted): 1/03/2000 12/11/2009  
 Included observations: 2595 after adjustments

| Variable           | Coefficient | Std. Error            | t-Statistic | Prob.     |
|--------------------|-------------|-----------------------|-------------|-----------|
| LJPM(-1)           | -0.004722   | 0.001867              | -2.529574   | 0.0115    |
| C                  | 0.025791    | 0.010123              | 2.547831    | 0.0109    |
| @TREND(12/31/1999) | 1.35E-06    | 5.26E-07              | 2.565440    | 0.0104    |
| R-squared          | 0.002540    | Mean dependent var    |             | 0.000259  |
| Adjusted R-squared | 0.001771    | S.D. dependent var    |             | 0.004596  |
| S.E. of regression | 0.004592    | Akaike info criterion |             | -7.928007 |
| Sum squared resid  | 0.054647    | Schwarz criterion     |             | -7.921231 |
| Log likelihood     | 10289.59    | Hannan-Quinn criter.  |             | -7.925552 |
| F-statistic        | 3.300672    | Durbin-Watson stat    |             | 1.934319  |
| Prob(F-statistic)  | 0.037013    |                       |             |           |

Null Hypothesis: D(LJPM) has a unit root  
 Exogenous: Constant  
 Lag Length: 0 (Automatic based on SIC, MAXLAG=27)

|                                        | t-Statistic | Prob.* |
|----------------------------------------|-------------|--------|
| Augmented Dickey-Fuller test statistic | -49.37942   | 0.0001 |
| Test critical values:                  |             |        |
| 1% level                               | -3.432678   |        |
| 5% level                               | -2.862454   |        |
| 10% level                              | -2.567302   |        |

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation  
 Dependent Variable: D(LJPM,2)  
 Method: Least Squares  
 Date: 07/12/11 Time: 09:06  
 Sample (adjusted): 1/04/2000 12/11/2009  
 Included observations: 2594 after adjustments

| Variable           | Coefficient | Std. Error            | t-Statistic | Prob.     |
|--------------------|-------------|-----------------------|-------------|-----------|
| D(LJPM(-1))        | -0.969979   | 0.019643              | -49.37942   | 0.0000    |
| C                  | 0.000250    | 9.04E-05              | 2.766011    | 0.0057    |
| R-squared          | 0.484725    | Mean dependent var    |             | -4.58E-06 |
| Adjusted R-squared | 0.484527    | S.D. dependent var    |             | 0.006400  |
| S.E. of regression | 0.004595    | Akaike info criterion |             | -7.926973 |
| Sum squared resid  | 0.054725    | Schwarz criterion     |             | -7.922454 |
| Log likelihood     | 10283.28    | Hannan-Quinn criter.  |             | -7.925335 |
| F-statistic        | 2438.327    | Durbin-Watson stat    |             | 1.997223  |
| Prob(F-statistic)  | 0.000000    |                       |             |           |

4)

Dependent Variable: DGCSI  
Method: Least Squares  
Date: 06/20/11 Time: 18:32  
Sample (adjusted): 1/04/2000 12/11/2009  
Included observations: 2594 after adjustments  
Convergence achieved after 3 iterations

| Variable           | Coefficient | Std. Error            | t-Statistic | Prob.     |
|--------------------|-------------|-----------------------|-------------|-----------|
| AR(1)              | -0.070717   | 0.019593              | -3.609275   | 0.0003    |
| R-squared          | 0.004618    | Mean dependent var    |             | 0.000300  |
| Adjusted R-squared | 0.004618    | S.D. dependent var    |             | 0.015319  |
| S.E. of regression | 0.015284    | Akaike info criterion |             | -5.523664 |
| Sum squared resid  | 0.605709    | Schwarz criterion     |             | -5.521404 |
| Log likelihood     | 7165.192    | Hannan-Quinn criter.  |             | -5.522845 |
| Durbin-Watson stat | 2.003391    |                       |             |           |
| Inverted AR Roots  | -.07        |                       |             |           |

Date: 07/12/11 Time: 09:08  
Sample: 1/04/2000 12/11/2009  
Included observations: 2594  
Q-statistic  
probabilities adjusted  
for 1 ARMA term(s)

| Autocorrelation | Partial Correlation | AC       | PAC    | Q-Stat | Prob  |
|-----------------|---------------------|----------|--------|--------|-------|
|                 |                     | 1 -0.002 | -0.002 | 0.0155 |       |
|                 |                     | 2 -0.030 | -0.030 | 2.2947 | 0.130 |
|                 |                     | 3 -0.011 | -0.011 | 2.5833 | 0.275 |
|                 |                     | 4 0.030  | 0.029  | 4.9719 | 0.174 |
|                 |                     | 5 0.011  | 0.010  | 5.2814 | 0.260 |
|                 |                     | 6 -0.008 | -0.006 | 5.4331 | 0.365 |
|                 |                     | 7 0.005  | 0.006  | 5.5025 | 0.481 |
|                 |                     | 8 0.023  | 0.022  | 6.8945 | 0.440 |
|                 |                     | 9 0.011  | 0.010  | 7.1934 | 0.516 |
|                 |                     | 10 0.007 | 0.009  | 7.3146 | 0.604 |

5) and 6)

Dependent Variable: DJPM

Method: Least Squares

Date: 06/20/11 Time: 18:39

Sample (adjusted): 1/04/2000 12/11/2009

Included observations: 2594 after adjustments

Convergence achieved after 12 iterations

MA Backcast: 1/03/2000

| Variable           | Coefficient | Std. Error            | t-Statistic | Prob.     |
|--------------------|-------------|-----------------------|-------------|-----------|
| AR(1)              | -0.759831   | 0.187964              | -4.042428   | 0.0001    |
| MA(1)              | 0.786551    | 0.178543              | 4.405380    | 0.0000    |
| R-squared          | -0.001526   | Mean dependent var    |             | 0.000258  |
| Adjusted R-squared | -0.001912   | S.D. dependent var    |             | 0.004596  |
| S.E. of regression | 0.004600    | Akaike info criterion |             | -7.924547 |
| Sum squared resid  | 0.054858    | Schwarz criterion     |             | -7.920028 |
| Log likelihood     | 10280.14    | Hannan-Quinn criter.  |             | -7.922910 |
| Durbin-Watson stat | 1.984174    |                       |             |           |
| Inverted AR Roots  | -.76        |                       |             |           |
| Inverted MA Roots  | -.79        |                       |             |           |

Date: 07/12/11 Time: 09:09

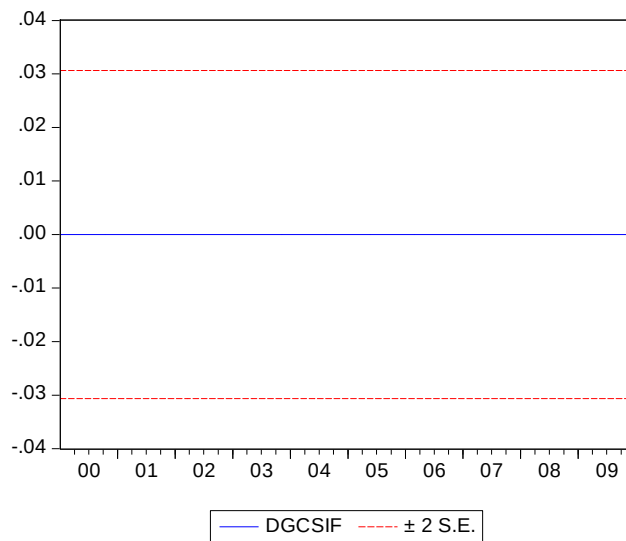
Sample: 1/04/2000 12/11/2009

Included observations: 2594

Q-statistic  
probabilities adjusted  
for 2 ARMA term(s)

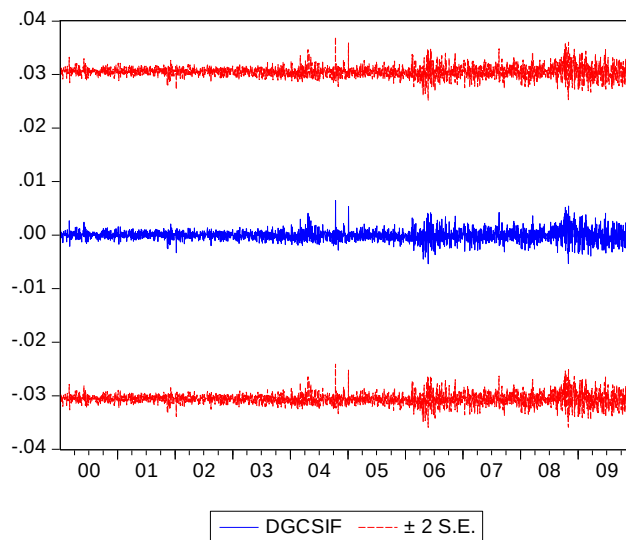
| Autocorrelation | Partial Correlation | AC       | PAC    | Q-Stat | Prob  |
|-----------------|---------------------|----------|--------|--------|-------|
|                 |                     | 1 0.004  | 0.004  | 0.0461 |       |
|                 |                     | 2 -0.008 | -0.008 | 0.1957 |       |
|                 |                     | 3 -0.029 | -0.029 | 2.3506 | 0.125 |
|                 |                     | 4 0.020  | 0.021  | 3.4350 | 0.180 |
|                 |                     | 5 0.004  | 0.004  | 3.4815 | 0.323 |
|                 |                     | 6 -0.035 | -0.036 | 6.6763 | 0.154 |
|                 |                     | 7 0.050  | 0.052  | 13.254 | 0.021 |
|                 |                     | 8 0.027  | 0.026  | 15.152 | 0.019 |
|                 |                     | 9 0.018  | 0.017  | 16.034 | 0.025 |
|                 |                     | 10 0.020 | 0.025  | 17.090 | 0.029 |

7) (keep in mind: poor forecast quality)



Forecast: DGCSIF  
Actual: DGCSI  
Forecast sample: 12/31/1999 12/11/...  
Adjusted sample: 1/04/2000 12/11/2009  
Included observations: 2594

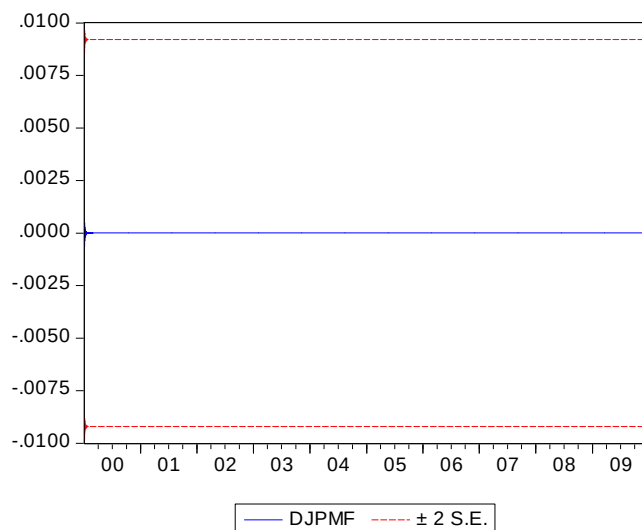
|                              |          |
|------------------------------|----------|
| Root Mean Squared Error      | 0.015319 |
| Mean Absolute Error          | 0.010832 |
| Mean Abs. Percent Error      | 94.60293 |
| Theil Inequality Coefficient | 1.000000 |
| Bias Proportion              | 0.000383 |
| Variance Proportion          | 0.999617 |
| Covariance Proportion        | 0.000000 |



Forecast: DGCSIF  
Actual: DGCSI  
Forecast sample: 12/31/1999 12/11/...  
Adjusted sample: 1/04/2000 12/11/2009  
Included observations: 2594

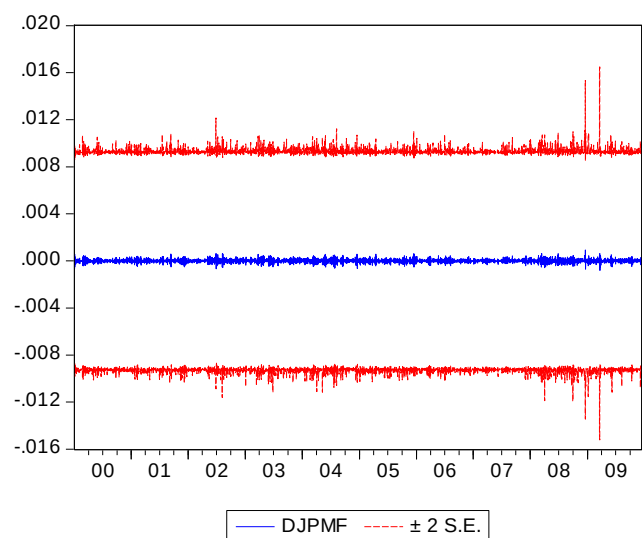
|                              |          |
|------------------------------|----------|
| Root Mean Squared Error      | 0.015281 |
| Mean Absolute Error          | 0.010815 |
| Mean Abs. Percent Error      | 103.7651 |
| Theil Inequality Coefficient | 0.931630 |
| Bias Proportion              | 0.000440 |
| Variance Proportion          | 0.867601 |
| Covariance Proportion        | 0.131960 |





Forecast: DJPMF  
 Actual: DJPM  
 Forecast sample: 12/31/1999 12/11/...  
 Adjusted sample: 1/04/2000 12/11/2009  
 Included observations: 2594

|                              |          |
|------------------------------|----------|
| Root Mean Squared Error      | 0.004603 |
| Mean Absolute Error          | 0.003453 |
| Mean Abs. Percent Error      | 100.9195 |
| Theil Inequality Coefficient | 0.995903 |
| Bias Proportion              | 0.003141 |
| Variance Proportion          | 0.988529 |
| Covariance Proportion        | 0.008330 |



Forecast: DJPMF  
 Actual: DJPM  
 Forecast sample: 12/31/1999 12/11/...  
 Adjusted sample: 1/04/2000 12/11/2009  
 Included observations: 2594

|                              |          |
|------------------------------|----------|
| Root Mean Squared Error      | 0.004599 |
| Mean Absolute Error          | 0.003454 |
| Mean Abs. Percent Error      | 115.3675 |
| Theil Inequality Coefficient | 0.959536 |
| Bias Proportion              | 0.003053 |
| Variance Proportion          | 0.917544 |
| Covariance Proportion        | 0.079403 |