```
. tsset t
        time variable:  t, 1 to 7684
                delta:  1 unit

. dfuller spot, trend lags(1) regress

Augmented Dickey-Fuller test for unit root         Number of obs   =      7682

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -2.438            -3.960            -3.410            -3.120
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.3597

------------------------------------------------------------------------------
D.spot          |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
        spot    |
         L1.    |   -.001489   .0006108    -2.44   0.015    -.0026862   -.0002917
         LD.    |   .0440347   .0114011     3.86   0.000     .0216855    .0663839
      _trend    |   .0000171   8.32e-06     2.05   0.040     7.62e-07    .0000334
       _cons    |   .7447753    .302873     2.46   0.014     .1510615    1.338489
------------------------------------------------------------------------------
```

The result shows p-value=0.3597 (fail to reject null hypothesis of unit root). Then, check whether trend is significant and find out that p-value=0.040 so we accept the null hypothesis. This means there must be time trend.

Since the series are not integrated at order 0, next step is to test whether the series are integrated at order 1 or not by perform unit root test of d.spot

```
. dfuller d.spot, trend lags(1) regress

Augmented Dickey-Fuller test for unit root         Number of obs   =      7681

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)            -63.765            -3.960            -3.410            -3.120
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
D2.spot         |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
      D.spot    |
         L1.    |  -1.005364   .0157667   -63.77   0.000    -1.036271    -.974457
         LD.    |   .0508571    .011398     4.46   0.000     .0285139    .0732003
      _trend    |   7.82e-07   4.94e-06     0.16   0.874    -8.90e-06    .0000105
       _cons    |   .0088178   .0219189     0.40   0.687    -.0341492    .0517848
------------------------------------------------------------------------------
```

Since p-value=0.0000 which is less than 0.05, we reject the null hypothesis. Therefore, the series are integrated at order 1.

```
. dfuller future, trend lags(1) regress

Augmented Dickey-Fuller test for unit root         Number of obs   =      7682

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -2.563            -3.960            -3.410            -3.120
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.2971

------------------------------------------------------------------------------
D.future        |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
      future    |
         L1.    |   -.001768   .0006898    -2.56   0.010    -.0031202   -.0004159
         LD.    |  -.0275938   .0114077    -2.42   0.016    -.0499561   -.0052315
      _trend    |   .0000222     .00001     2.22   0.026     2.62e-06    .0000418
       _cons    |     .86276   .3338726     2.58   0.010     .2082785    1.517241
------------------------------------------------------------------------------
```

The result shows p-value=0.2971 (fail to reject null hypothesis of unit root). Then, check whether trend is significant and find out that p-value=0.026. Therefore, we accept null hypotesis which means there must be time trend.

Since the series are not integrated at order 0, next step is to test whether the series are integrated at order 1 or not by perform unit root test of d.future

```
. dfuller d.future, trend lags(1) regress

Augmented Dickey-Fuller test for unit root         Number of obs   =      7681

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)            -65.269            -3.960            -3.410            -3.120
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
D2.future       |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------------------------------------------------------------------------
    D.future    |
         L1.    |  -1.067592   .0163567   -65.27   0.000    -1.099655   -1.035528
         LD.    |    .038008   .0114045     3.33   0.001     .0156522    .0603639
      _trend    |   1.01e-06   5.59e-06     0.18   0.856    -9.94e-06    .000012
       _cons    |   .0096235   .0247823     0.39   0.698    -.0389566    .0582036
------------------------------------------------------------------------------
```

Since p-value=0.0000 which is less than 0.05, we reject the null hypothesis. Therefore, the series are integrated at order 1.

```
. g rspot=(spot/l.spot)-1

. dfuller rspot, trend lags(1) regress

Augmented Dickey-Fuller test for unit root         Number of obs   =      7681

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)            -63.787            -3.960            -3.410            -3.120
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
D.rspot         |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------------------------------------------------------------------------
      rspot     |
         L1.    |  -1.005168   .0157581   -63.79   0.000    -1.036058   -.9742776
         LD.    |   .0517018   .0113974     4.54   0.000     .0293598    .0740439
      _trend    |   9.56e-10   9.19e-09     0.10   0.917    -1.71e-08    1.90e-08
       _cons    |   .0000199   .0000408     0.49   0.626      -.00006    .0000998
------------------------------------------------------------------------------
```

Since p-value=0.0000 which is less than 0.05, we reject the null hypothesis. Therefore, the series of the return of spot are nonstationary.

```
. dfuller rfuture, trend lags(1) regress

Augmented Dickey-Fuller test for unit root         Number of obs   =      7681

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)            -65.070            -3.960            -3.410            -3.120
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
D.rfuture       |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------------------------------------------------------------------------
     rfuture    |
         L1.    |  -1.063572   .0163449   -65.07   0.000    -1.095612   -1.031531
         LD.    |    .03575   .0114053     3.13   0.002     .0133924    .0581076
      _trend    |   1.17e-09   1.06e-08     0.11   0.912    -1.96e-08    2.19e-08
       _cons    |   .0000231    .000047     0.49   0.624    -.0000691    .0001152
------------------------------------------------------------------------------
```

Since p-value=0.0000 which is less than 0.05, we reject the null hypothesis. Therefore, the series of the return of future are nonstationary.