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Assignment 5

1. Test whether the series spot and future are stationary series.

Spot

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. dfuller spot, trend lags(1) regress
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Augmented Dickey-Fuller test for unit root   Number of obs   =   7682

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical 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

To test whether the series spot is stationary serie or not by using Augmented Dickey-Fuller Test (ADF test), firstly, set the null hypothesis, $H_0 : \gamma = 0$. The MacKinnon approximate p-value for Z(t) is 0.3597 which is greater than 0.05, we failed to reject H_0. However, before we conclude that there is Unit Root, we have to check whether we should drop time trend from our model or not by $H_0 : \alpha = 0$. From the table, t = 2.05 and P-value = 0.040 which p-value is less than 0.05, we reject H_0, time trend is significant so we get the correct model already (model with intercept term, time trend and optimal lag). Therefore, we can conclude that there is a Unit Root or the series spot is nonstationary.

Future

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. dfuller future, trend lags(1) regress
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Augmented Dickey-Fuller test for unit root   Number of obs   =   7682

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical 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

To test whether the series future is stationary serie or not by using Augmented Dickey-Fuller Test (ADF test), firstly, set the null hypothesis, $H_0 : \gamma = 0$. The MacKinnon approximate p-value for Z(t) is 0.2917 which is greater than 0.05, we failed to reject H_0. However, before we conclude that there is Unit Root, we have to check whether we should drop time trend from our model or not by H_0 : $\alpha = 0$. From the table, t = 2.22 and P-value = 0.026 which p-value is less than 0.05, we reject H_0, time trend is significant so we get the correct model already (model with intercept term, time trend and optimal lag). Therefore, we can conclude that there is a Unit Root or the series future is nonstationary.

2. Determine order of integration of the series spot and future.

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
------------------------------------------------------------------------------
```

To determine order of integration of the series spot by setting the null hypothesis, H_0 : $\gamma = 0$. MacKinnon approximate p-value for Z(t) is 0.0000 which is less than 0.05, we reject H_0, there is no Unit Root. The series spot is stationary at 1st difference or integrated series of order 1 or I(1).

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
------------------------------------------------------------------------------
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To determine order of integration of the series future by setting the null hypothesis, H_0 : $\gamma = 0$. MacKinnon approximate p-value for Z(t) is 0.0000 which is less than 0.05, we reject H_0, there is no Unit Root. The series future is stationary at 1st difference or integrated series of order 1 or I(1).

3. Generate series of the return of spot (rspot) and return of future (rfuture) and test whether they are stationary.

rSpot

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

. g rfuture=(future/l.future)-1
(1 missing value generated)

. dfuller rspot, trend lags(1) regress

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

		Interpolated Dickey-Fuller		
	Test Statistic	1% Critical Value	5% Critical Value	10% Critical 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

To test whether the series of rspot is stationary or not by using Augmented Dickey-Fuller Test (ADF test), firstly, set the null hypothesis, H_0 : $\gamma = 0$. The MacKinnon approximate p-value for Z(t) is 0.000 which is less than 0.05, we reject H_0. There is no Unit Root or the series of rspot is stationary.

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rFuture

```
. 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
------------------------------------------------------------------------------
```

To test whether the series of rfuture is stationary or not by using Augmented Dickey-Fuller Test (ADF test), firstly, set the null hypothesis, $H_0 : \gamma = 0$. The MacKinnon approximate p-value for Z(t) is 0.000 which is less than 0.05, we reject H_0. There is no Unit Root or the series of rfuture is stationary.