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Assignment 5

Due: 15/10/2020

From the data set `Assignment 5-8.dta`:

Requirements:

1. Test whether the series spot and future are stationary series.
2. Determine order of integration of the series spot and future.
3. Generate series of the return of spot (*rspot*) and return of future (*rfuture*) and test whether they are stationary.

1. Test spot

```
. 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

Since p-value = 0.3597 > 0.05, the null hypothesis of unit root is rejected.
For time trend, p-value = 0.04 < 0.05, therefore time trend is significant.
∴ The series are nonstationary

Test future

```
. 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

Since p-value = 0.2971 > 0.05, the null hypothesis of unit root is rejected.
For time trend, p-value = 0.026 < 0.05, therefore time trend is significant.
∴ The series are nonstationary

Another conclusion is that spot and future are not cointegrated at order 0

2. Test cointegration at order 1 : $H_0 : r = 0$

```
. dfuller d.future

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)            -90.171            -3.430            -2.860           -2.570
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

P-value = 0.0000 < 0.05 , so H_0 is rejected.
Therefore, spot is stationary at I(1)

```
. dfuller d.spot

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)            -83.923            -3.430            -2.860           -2.570
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

P-value = 0.0000 < 0.05 , so H_0 is rejected.
Therefore, future is stationary at I(1)

3.

```
. 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
```

	Test Statistic	Interpolated Dickey-Fuller: 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

Since p-value = 0.0000 < 0.05, the null hypothesis of unit root is rejected which means return on spot is stationary.

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

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

	Test Statistic	Interpolated Dickey-Fuller: 1% Critical Value	5% Critical Value	10% Critical 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 < 0.05, the null hypothesis of unit root is rejected which means return on future is stationary.