

**Assignment 13**  
**Properties Time Series – Unit Root Test**  
**Guideline Solutions**

From the data set `assign_timeseries.dta`:

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

```
. tsset t
      time variable: time, 1 to 795
      delta: 1 unit
```

```
. dfuller spot, trend lag(1) regress
```

Augmented Dickey-Fuller test for unit root                      Number of obs =                      793

	Test Statistic	----- 1% Critical Value	----- Interpolated Dickey-Fuller 5% Critical Value	----- 10% Critical Value
Z(t)	-1.339	-3.960	-3.410	-3.120

Mackinnon approximate p-value for Z(t) = 0.8780

D.spot	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
spot						
L1.	-.0042396	.0031666	-1.34	0.181	-.0104556	.0019764
LD.	.0832853	.035481	2.35	0.019	.013637	.1529337
_trend	-.000739	.0014208	-0.52	0.603	-.0035281	.00205
_cons	2.253569	1.884627	1.20	0.232	-1.445907	5.953046

```
. dfuller spot, lag(1) regress
```

Augmented Dickey-Fuller test for unit root                      Number of obs =                      793

	Test Statistic	----- 1% Critical Value	----- Interpolated Dickey-Fuller 5% Critical Value	----- 10% Critical Value
Z(t)	-1.238	-3.430	-2.860	-2.570

Mackinnon approximate p-value for Z(t) = 0.6570

D.spot	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
spot						
L1.	-.0034926	.002821	-1.24	0.216	-.0090301	.0020448
LD.	.0828543	.035455	2.34	0.020	.0132572	.1524514
_cons	1.597051	1.39888	1.14	0.254	-1.14891	4.343012

```
. dfuller spot, nocon lag(1) regress
```

Augmented Dickey-Fuller test for unit root                      Number of obs =                      793

	Test Statistic	----- 1% Critical Value	----- Interpolated Dickey-Fuller 5% Critical Value	----- 10% Critical Value
Z(t)	-0.585	-2.580	-1.950	-1.620

D.spot	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
spot						
L1.	-.0003419	.0005845	-0.58	0.559	-.0014892	.0008054
LD.	.0811979	.0354321	2.29	0.022	.011646	.1507499

. dfuller future, trend lag(1) regress

Augmented Dickey-Fuller test for unit root                      Number of obs =                      793

	Test Statistic	----- Interpolated Dickey-Fuller -----		
		1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-1.374	-3.960	-3.410	-3.120

Mackinnon approximate p-value for Z(t) = 0.8685

D.future	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
future						
L1.	-.0050243	.0036579	-1.37	0.170	-.0122046	.002156
LD.	-.0335608	.0355846	-0.94	0.346	-.1034125	.036291
_trend	-.0009128	.0016705	-0.55	0.585	-.0041919	.0023663
_cons	2.67398	2.183399	1.22	0.221	-1.611978	6.959937

. dfuller future, lag(1) regress

Augmented Dickey-Fuller test for unit root                      Number of obs =                      793

	Test Statistic	----- Interpolated Dickey-Fuller -----		
		1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-1.264	-3.430	-2.860	-2.570

Mackinnon approximate p-value for Z(t) = 0.6453

D.future	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
future						
L1.	-.0041054	.0032469	-1.26	0.206	-.0104789	.0022682
LD.	-.0340903	.0355556	-0.96	0.338	-.103885	.0357044
_cons	1.866323	1.606292	1.16	0.246	-1.286783	5.019429

. dfuller future, nocon lag(1) regress

Augmented Dickey-Fuller test for unit root                      Number of obs =                      793

	Test Statistic	----- Interpolated Dickey-Fuller -----		
		1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-0.609	-2.580	-1.950	-1.620

D.future	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
future						
L1.	-.0004181	.0006863	-0.61	0.543	-.0017653	.0009291
LD.	-.0360006	.0355254	-1.01	0.311	-.1057359	.0337347

- *spot and future are nonstationary.*

2. From spot and future, generate spot return (rspot) and future return (rfuture) and test whether they are stationary.

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

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

```
. dfuller rspot, trend lag(1) regress
```

Augmented Dickey-Fuller test for unit root                      Number of obs =                      792

	Test Statistic	----- 1% Critical Value	Interpolated Dickey-Fuller 5% Critical Value	----- 10% Critical Value
Z(t)	-17.710	-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.	-.8597466	.048545	-17.71	0.000	-.9550394	-.7644539
LD.	-.0798976	.0355137	-2.25	0.025	-.1496103	-.0101849
_trend	1.03e-06	2.89e-06	0.36	0.721	-4.64e-06	6.71e-06
_cons	-.0004573	.0013254	-0.35	0.730	-.0030591	.0021445

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

Augmented Dickey-Fuller test for unit root                      Number of obs =                      792

	Test Statistic	----- 1% Critical Value	Interpolated Dickey-Fuller 5% Critical Value	----- 10% Critical Value
Z(t)	-19.613	-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.	-1.008595	.0514258	-19.61	0.000	-1.109543	-.9076473
LD.	-.0327739	.0356244	-0.92	0.358	-.1027038	.037156
_trend	1.36e-06	3.42e-06	0.40	0.690	-5.35e-06	8.07e-06
_cons	-.000539	.0015671	-0.34	0.731	-.0036152	.0025373

- *rspot and rfuture are stationary or I(0).*