

## Assignment 5

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

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

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

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

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

The result shows p-value = 0.3597 for spot and 0.2971 for future which both greater than 0.05. Therefore, we fail to reject null hypothesis of unit root. However, we found a significant of trend for both spot and future with the p-value of 0.040 and 0.026 respectively. So, the series of spot and future are nonstationary series.

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

. dfuller spot, lags(1) regress

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)	<b>-1.325</b>	<b>-3.430</b>	<b>-2.860</b>

MacKinnon approximate p-value for Z(t) = **0.6176**

D.spot	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
spot						
L1.	<b>-.0004809</b>	<b>.0003629</b>	<b>-1.33</b>	<b>0.185</b>	<b>-.0011923</b>	<b>.0002305</b>
LD.	<b>.0435503</b>	<b>.011401</b>	<b>3.82</b>	<b>0.000</b>	<b>.0212012</b>	<b>.0658993</b>
_cons	<b>.2693479</b>	<b>.1950793</b>	<b>1.38</b>	<b>0.167</b>	<b>-.1130608</b>	<b>.6517565</b>

. dfuller future, lags(1) regress

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)	<b>-1.289</b>	<b>-3.430</b>	<b>-2.860</b>

MacKinnon approximate p-value for Z(t) = **0.6341**

D.future	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
future						
L1.	<b>-.0004968</b>	<b>.0003854</b>	<b>-1.29</b>	<b>0.197</b>	<b>-.0012523</b>	<b>.0002587</b>
LD.	<b>-.0282081</b>	<b>.0114073</b>	<b>-2.47</b>	<b>0.013</b>	<b>-.0505696</b>	<b>-.0058467</b>
_cons	<b>.2758156</b>	<b>.2042151</b>	<b>1.35</b>	<b>0.177</b>	<b>-.1245016</b>	<b>.6761329</b>

From the result, the series are integrated at order 1.

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

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

. generate future =(future/l.future)-1
variable future already defined
r(110);

. generate 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

```
. 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

From the regression, the p-value of return of spot and return of future are 0.0000 and 0.0000 result in a rejection of null hypothesis. Therefore, the series of the return of spot (rspot) and return of future (rfuture) are stationary.