

Assignment 5

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

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. 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

For Spot, we have to test with all terms first (intercept, trend, and lags). The result shows p-value=0.3597. So, it fails to reject null hypothesis of unit root. In order to check whether trend is significant, we find that p-value=0.040 which is lower than 0.05. So, it can conclude that there is unit root and the series spot are nonstationary series.

```
. 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

For future, we have to test with all terms first (intercept, trend, and lags). The result shows p-value=0.2971. So, it fails to reject null hypothesis of unit root. In order to check whether trend is significant, we find that p-value=0.026 which is lower than 0.05. So, it can conclude that there is unit root and the series spot are nonstationary series.

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

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. dfuller d.spot
```

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

	Test Statistic	Interpolated 1% Critical Value	Dickey-Fuller 5% Critical Value	10% Critical Value
Z(t)	-83.923	-3.430	-2.860	-2.570

MacKinnon approximate p-value for Z(t) = 0.0000

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 Δy or D.y.

The hypothesis that we have to set is $H_0: \gamma = 0$. For spot, the p-value from the result equals to 0.0000 which is less than 0.05. So, null hypothesis is rejected. The series is stationary at I(1).

```
. dfuller d.future
```

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

	Test Statistic	1% Critical Value	Interpolated Dickey-Fuller 5% Critical Value	10% Critical Value
Z(t)	-90.171	-3.430	-2.860	-2.570

MacKinnon approximate p-value for Z(t) = 0.0000

For future, the p-value from the result equals to 0.0000 which is less than 0.05. So, null hypothesis is rejected. The series is stationary at $I(1)$.

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

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

```
. g rfuture=(future/l.spot)-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

For the return of spot, the result shows p-value=0.0000 which is less than 0.05. So, it reject null hypothesis of unit root. It can conclude that it has no unit root and the series of the return of 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)	-15.760	-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.	-.0845954	.0053678	-15.76	0.000	-.0951177	-.0740731
LD.	-.3078496	.0108584	-28.35	0.000	-.3291351	-.286564
_trend	1.98e-07	1.76e-08	11.26	0.000	1.64e-07	2.33e-07
_cons	-.0020118	.000139	-14.47	0.000	-.0022843	-.0017393

For the return of future, the result shows p-value=0.0000 which is less than 0.05. So, it reject null hypothesis of unit root. It can conclude that it has no unit root and the series of the return of future is stationary.