

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 lags(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)	-1.339	-3.960	-3.410

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

the series is nonstationary. However, the time trend (α_1) is insignificant because p-value = 0.603 > 0.05, so test again.

```
. dfuller spot, lags(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)	-1.238	-3.430	-2.860

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

the series is nonstationary. However, the intercept (α_0) is insignificant because p-value = 0.254 > 0.05, so test again.

. dfuller spot, nocon lags(1) regress

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

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

Now, it can be concluded that the spot series is nonstationary.

. dfuller future, trend lag(1) regress

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

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

```

```

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

```

```

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

```
-----
```

Now, it can be concluded that the future series is nonstationary.

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

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

```
----- Interpolated Dickey-Fuller -----
```

Test	1% Critical	5% Critical	10% Critical
Statistic	Value	Value	Value
Z(t)	-17.710	-3.960	-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

```
-----
```

it can be concluded that rspot series is stationary.

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

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

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

```
it can be concluded that rfuture series is stationary.
```