From the data set `assign_timeseries.dta`:

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

spot rate test

```
dfuller spot, trend 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)             -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
------------------------------------------------------------------------------
```

FTR then check for misspecification

```
. dfuller spot, 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)             -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
------------------------------------------------------------------------------
```

FTR then check for misspecification

```
. 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
------------------------------------------------------------------------------
```

Test statistics is less than the critical value
Then FTR which mean that we have unit root => non-stationary

Future rate test

```
. dfuller future, trend 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)             -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
------------------------------------------------------------------------------
```

FTR then check for misspecification

```
. dfuller future, 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)             -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
------------------------------------------------------------------------------
```

FTR then check for misspecification

```
. dfuller future, 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)             -0.609            -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
------------------------------------------------------------------------------
```

Test statistics is less than the critical value
Then FTR which mean that we have unit root => non-stationary

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

Generate spot,future return

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

. gen rfuture = future - l.future
(1 missing value generated)

. replace rspot = rspot/spot
(793 real changes made)

. replace rfuture = rfuture/future
(792 real changes made)
```

Test spot return

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


. dfuller rspot, trend lags(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)            -17.551            -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. |  -.8498297   .0484217   -17.55   0.000    -.9448804    -.754779
         LD. |  -.0868715   .0354939    -2.45   0.015    -.1565453   -.0171976
      _trend |   3.77e-07   2.92e-06     0.13   0.897    -5.36e-06    6.11e-06
       _cons |  -.0004939   .0013394    -0.37   0.712    -.0031231    .0021353
------------------------------------------------------------------------------
```

Test statistics is greater than the critical value
Then reject null hypothesis which mean that we don't have unit root => stationary

Test future return

```
. dfuller rfuture, trend lags(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)            -19.435            -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. |  -.9983341   .0513682   -19.43   0.000    -1.099169   -.8974994
         LD. |  -.0409981    .035614    -1.15   0.250    -.1109077    .0289115
      _trend |   1.76e-07   3.44e-06     0.05   0.959    -6.58e-06    6.93e-06
       _cons |  -.0005515   .0015772    -0.35   0.727    -.0036475    .0025446
------------------------------------------------------------------------------
```

Test statistics is greater than the critical value
Then reject null hypothesis which mean that we don't have unit root => stationary