homework5_2023

March 2, 2023

Chapter 6 Problems: 10

6.10 A) H0: Variance before Oct. 1987 = Variance after Oct. 1987 H1: Variance before Oct. 1987 Variance after Oct. 1987

B) Test statistic = f-stat from the f-test f-stat=larger variance/smaller variance f-stat=22.367/15.795 = 1.416 df1 = 120, df2 = 120

C) critical value = 1.3519 Accept H0, since the critical value < than f-stat.

Python exercise

Compare the performance of the following two mutual funds: Fidelity Magellan, ticker: FMGKX Vanguard 500 Index Fund, ticker:VFINX Read in adjusted close price for both funds from Yahoo finance. Use the earliest date possible when data are available for both funds

[21]:
```
import pandas as pd
import scipy.stats as sst
from pandas_datareader import data as pdr
import yfinance as yf
yf.pdr_override()

tickers = ['FMGKX', 'VFINX']
mydata = pd.DataFrame()

for t in tickers:
    mydata[t] = pdr.get_data_yahoo(t, start='1997-1-1')['Adj Close']
```

```
[**********************100%**********************]  1 of 1 completed
[**********************100%**********************]  1 of 1 completed
```

Calculate the simple daily returns using Adj. Close

[18]:
```
simple_daily_return = mydata/mydata.shift(1)-1
simple_daily_return = simple_daily_return.dropna()
simple_daily_return
```

[18]:

Date	FMGKX	VFINX
2008-05-12	0.009671	0.011091
2008-05-13	0.000000	-0.000155

```
2008-05-14  0.003578  0.004172
2008-05-15  0.014834  0.010772
2008-05-16  0.006799  0.001294
…                 …         …
2023-02-24 -0.013239 -0.010513
2023-02-27  0.001789  0.003188
2023-02-28 -0.003571 -0.002933
2023-03-01 -0.004480 -0.004657
2023-03-02  0.010801  0.007717

[3728 rows x 2 columns]
```

Calculate mean and standard deviation of the daily returns

[19]:
```
simple_daily_return.mean()
```

[19]:
```
FMGKX    0.000398
VFINX    0.000444
dtype: float64
```

[20]:
```
simple_daily_return.std()
```

[20]:
```
FMGKX    0.014501
VFINX    0.013110
dtype: float64
```

Answer the following questions using a 5% signficance interval

Test whether the mean daily return of Fidelity Magellan is equal to 0

H0:statistic $>$ 1.96 H1:statistic $<$ 1.96

[37]:
```
sst.ttest_1samp(a=simple_daily_return['FMGKX'],popmean=0)
```

[37]:
```
Ttest_1sampResult(statistic=1.6777493414565305, pvalue=0.09347988851971453)
```

H1, accept the hypothesis

Test whether the mean daily return of Fidelity Magellan is equal to 0.0004

H0:statistic $>$ 1.96 H1:statistic $<$ 1.96

[31]:
```
sst.ttest_1samp(a=simple_daily_return['FMGKX'],popmean=0.0004)
```

[31]:
```
Ttest_1sampResult(statistic=-0.0064848706195771, pvalue=0.994826205188613)
```

H1, accept the hypothesis

Test whether the mean daily return of Fidelity Maggellan and Vanguard 500 Index are equal

[39]:
```
sst.
  ↪ttest_ind(a=simple_daily_return['FMGKX'],b=simple_daily_return['VFINX'],equal_var=False)
```

[39]:
```
Ttest_indResult(statistic=-0.14326812987498824, pvalue=0.8860823364990635)
```

Test whether the variance of daily return of Fidelity Maggellan are equal to 0.0001

[ ]:
```
H0:chi squared test result > critical value
H1:chi squared test result < critical value
```

[45]:
```
hyp_var=0.0001 #var under the null
```

[48]:
```
FMGKX_var=simple_daily_return['FMGKX'].var()
```

[46]:
```
df_FMGKX=simple_daily_return['FMGKX'].count()-1
```

[50]:
```
chi_squared_stat=df_FMGKX*FMGKX_var/hyp_var
chi_squared_stat
```

[50]:
```
7837.0083431672965
```

[53]:
```
critical_value=sst.chi2.ppf(q=0.95,df=df_FMGKX)
critical_value
```

[53]:
```
3870.1388942776007
```

Reject null hypothesis, chi squared test result > critical value

Test whether the variance of daily return are the same for Fidelity Maggellan and Vanguard 500 Index

[57]:
```
F_stat=max(simple_daily_return['FMGKX'].var()/simple_daily_return['VFINX'].
  ↪var(),
           simple_daily_return['VFINX'].var()/simple_daily_return['FMGKX'].var())
F_stat
```

[57]:
```
1.2234344358668123
```

[59]:
```
sst.f.ppf(0.95,dfn=simple_daily_return['FMGKX'].
  ↪count()-1,dfd=simple_daily_return['VFINX'].count()-1)
```

[59]:
```
1.0553717501623583
```

Reject the null hypothesis, f-stat > critival value

Would your answer change if you use a 10% significance level?

[60]:
```
sst.f.ppf(0.9,dfn=simple_daily_return['FMGKX'].
  ↪count()-1,dfd=simple_daily_return['VFINX'].count()-1)
```

[60]: 1.0428825970065927

No, I would not change my answer.

Calculate the Spearman rank correlation coefficient and its P-value. What do these numbers mean?

[61]:
```
sst.spearmanr(simple_daily_return)
```

[61]: SpearmanrResult(correlation=0.9482965387455784, pvalue=0.0)

Correlation shows how correlated the two stocks are, P-value is the probability that any correlation is due to chance.

Calculate the Pearson correlation coefficient and its P-value. What do these numbers mean?

[62]:
```
sst.pearsonr(simple_daily_return['VFINX'],simple_daily_return['FMGKX'])
```

[62]: PearsonRResult(statistic=0.9717988922081359, pvalue=0.0)

The two stocks have very high correlation and there is high confidence due to the p-value being close to 0.

You are considering investing in one or both of these funds. Do you prefer one fund to the other? Why?

I would invest in VFINX since it has a higher mean and lower standard deviation, so the stock has a higher return for less risk.

Optional challenge: None Please start working on your final project