Group project 3

Predictability of stock returns

Variables:

retdny: monthly return on the value-weighted market portfolio

retdny12: yearly return on the value-weighted market portfolio

retdny36: 3-year return on the value-weighted market portfolio

dyny : dividend to price ratio

bmny: book-to market ratio

tbill : 1-month treasury bill

```
%rename variables
retdny = predict{ : ,2};
retdny12 = predict{ : ,3};
retdny36 = predict{ : ,4};
dyny = predict{ : ,5};
bmny = predict{ : ,6};
tbill = predict{ : ,7};
```

Q1. Run the regression of retdny as predicted by the first lag of dyny.

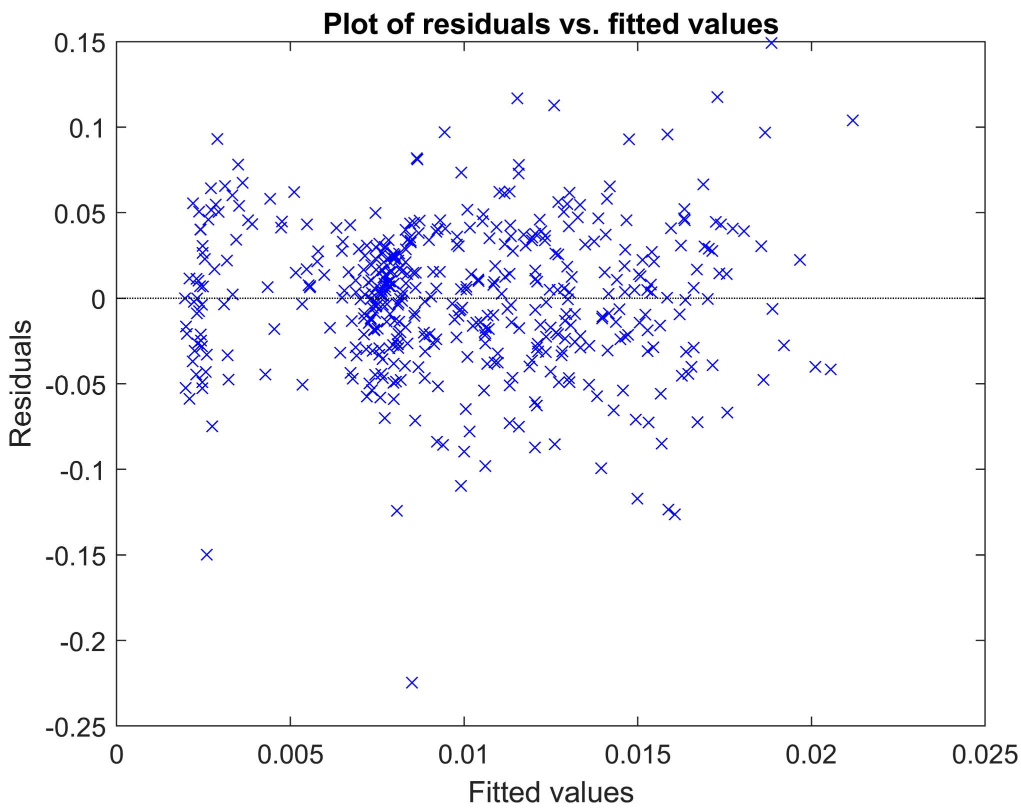
Is the coefficient of dyny significant? Is the overall regression significant?

```
% create lag value of dyny
dynyL1 = lagmatrix(dyny,[1]);
x = table(dynyL1,retdny);
lm1 = fitlm(x)
```

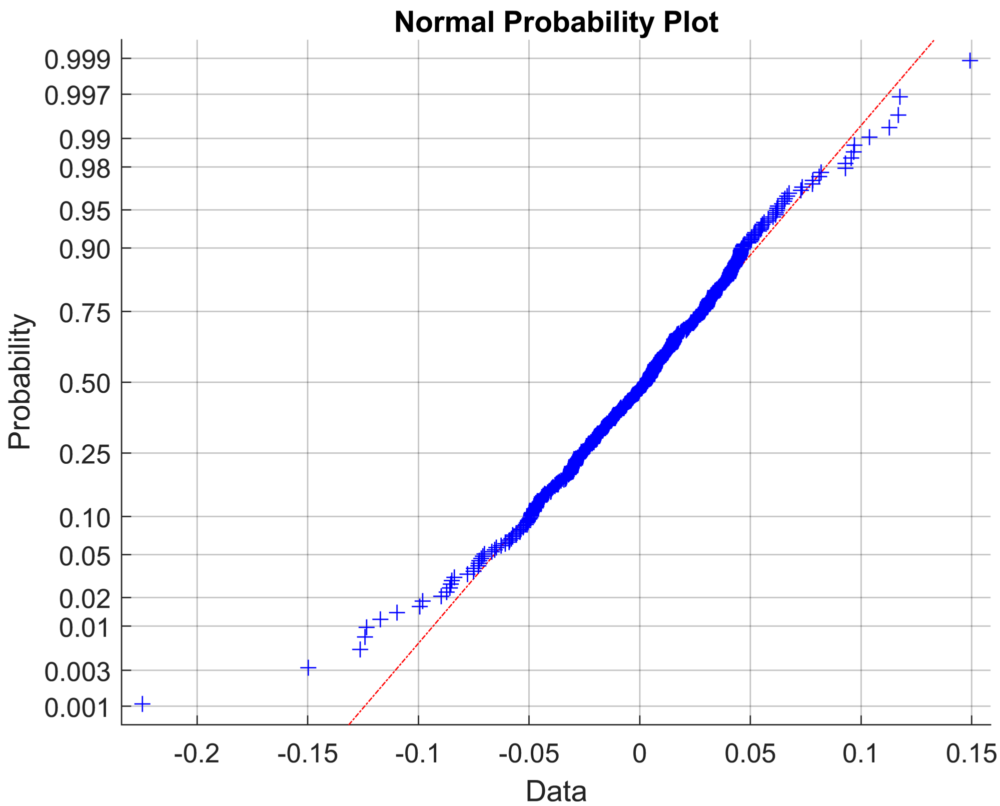
```
lm1 =
Linear regression model:
    retdny ~ 1 + dynyL1

Estimated Coefficients:
                    Estimate       SE         tStat       pValue
                   __________    _________    ________    ________

    (Intercept)    -0.0038191    0.0066616    -0.57329     0.56673
    dynyL1             0.3989      0.18688      2.1345    0.033325


Number of observations: 463, Error degrees of freedom: 461
Root Mean Squared Error: 0.0423
R-squared: 0.00979,  Adjusted R-Squared: 0.00764
F-statistic vs. constant model: 4.56, p-value = 0.0333
```

Q2. Do the residuals of this regression appear to be distributed normally, exhibit heteroskedasticity and autocorrelation?

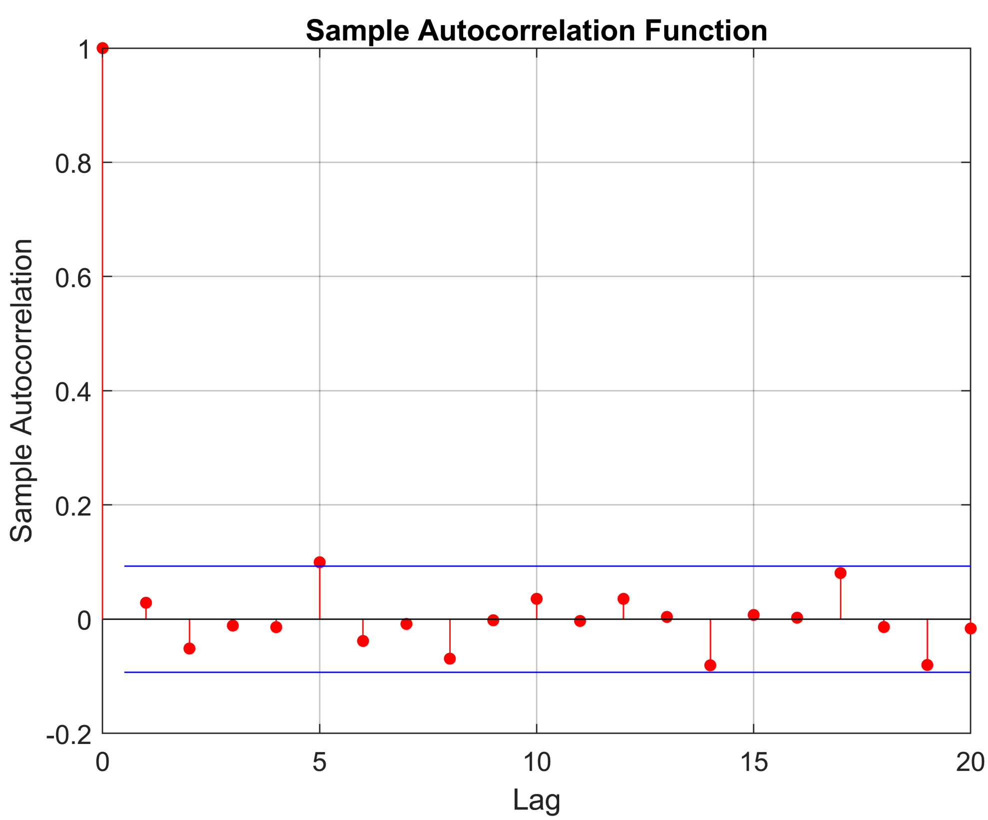
```
Mdl = fitlm(x);
plotResiduals(Mdl,'fitted')
```




```
resid = Mdl.Residuals.Raw(~isnan(Mdl.Residuals.Raw));
normplot(resid)
```




```
autocorr(resid)
```



Q3. Run the regression of retdny as predicted by the first lag of bmny

Is the coefficient of bmny significant? Is the overall regression significant?

```
% create lag value of bmny
bmnyL1 = lagmatrix(bmny,[1]);
y = table(bmnyL1,retdny);
lm1 = fitlm(y)
```

```
lm1 =
Linear regression model:
    retdny ~ 1 + bmnyL1

Estimated Coefficients:
                    Estimate        SE          tStat       pValue
                   ___________    _________    _________    ________

    (Intercept)    -0.00044224    0.0059865    -0.073872     0.94114
    bmnyL1            0.019145     0.010602       1.8058    0.071597


Number of observations: 463, Error degrees of freedom: 461
Root Mean Squared Error: 0.0424
R-squared: 0.00702,  Adjusted R-Squared: 0.00487
F-statistic vs. constant model: 3.26, p-value = 0.0716
```

Q4. Run the regression of retdny as predicted by the first lag of dnny and bmny

Are the coefficients of the predicting variables significant?

Is the overall regression significant?

```
x = table(dynyL1,bmnyL1,retdny);
lm1 = fitlm(x)
```

```
lm1 =
Linear regression model:
    retdny ~ 1 + dynyL1 + bmnyL1

Estimated Coefficients:
                    Estimate        SE         tStat       pValue
                   __________    _________    ________    _______

    (Intercept)    -0.0051285    0.0068493    -0.74876    0.45438
    dynyL1            0.91655      0.65308      1.4034    0.16116
    bmnyL1          -0.030607     0.036999    -0.82725    0.40853


Number of observations: 463, Error degrees of freedom: 460
Root Mean Squared Error: 0.0423
R-squared: 0.0113,  Adjusted R-Squared: 0.00696
F-statistic vs. constant model: 2.62, p-value = 0.074
```

Q5. What could account for the result in Q4?

```
corrcoef(dyny,bmny)
```

```
ans = 2×2
    1.0000    0.9580
    0.9580    1.0000
```

Q6. Run the regression of retdny as predicted by 2 lags of dnny.

Are the coefficients of the predicting variables significant?

Is the overall regression significant?

What can explain the difference of results using 1 instead of 2 lags of dyny?

```
dynyL2 = lagmatrix(dyny,[2]);
x = table(dynyL1,retdny);
lm1 = fitlm(x)
```

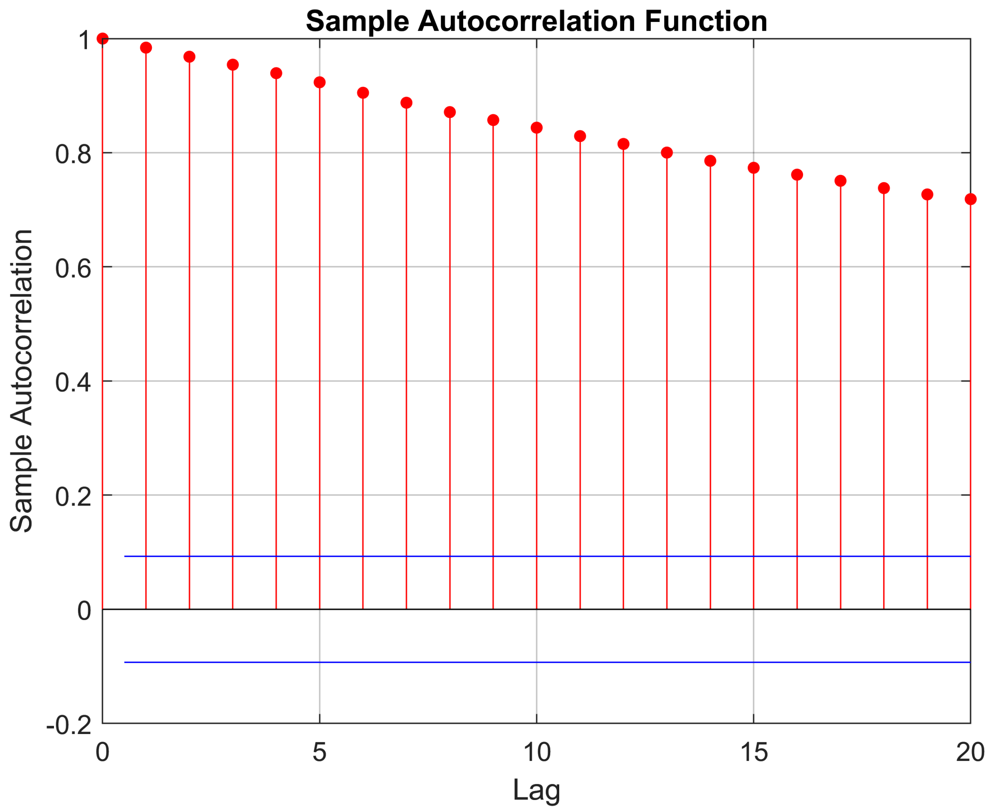
```
lm1 = 
Linear regression model:
    retdny ~ 1 + dynyL1

Estimated Coefficients:
                    Estimate        SE        tStat       pValue 
                   __________    _________    ________    ________

    (Intercept)    -0.0038191    0.0066616    -0.57329     0.56673
    dynyL1             0.3989      0.18688      2.1345    0.033325


Number of observations: 463, Error degrees of freedom: 461
Root Mean Squared Error: 0.0423
R-squared: 0.00979,  Adjusted R-Squared: 0.00764
F-statistic vs. constant model: 4.56, p-value = 0.0333
```

```
x = table(dynyL1,dynyL2,retdny);
lm1 = fitlm(x)
```

```
lm1 = 
Linear regression model:
    retdny ~ 1 + dynyL1 + dynyL2

Estimated Coefficients:
                    Estimate        SE        tStat       pValue
                   __________    _________    ________    _______

    (Intercept)    -0.0040684    0.0067066    -0.60662     0.5444
    dynyL1            -0.2427       1.1685     -0.2077    0.83555
    dynyL2            0.65001       1.1718     0.55471    0.57936


Number of observations: 462, Error degrees of freedom: 459
```

```
Root Mean Squared Error: 0.0424
R-squared: 0.0104,  Adjusted R-Squared: 0.00606
F-statistic vs. constant model: 2.4, p-value = 0.0914
```

```
autocorr(dyny)
```



Q7. Run the regression of retdny12 as predicted by the 12th lag of dyny, check normality, heteroskedasticty and autocorrelation of residuals, and compute HAC standard errors.

Has predictability increased?

Is there eveidence of non-normality, heteroskedasticty and autocorrelation of residuals?

What is t-stat using the HAC standard errors? Is the coefficient of dyny12 significant?

```
dynyL12 = lagmatrix(dyny,[12])
```

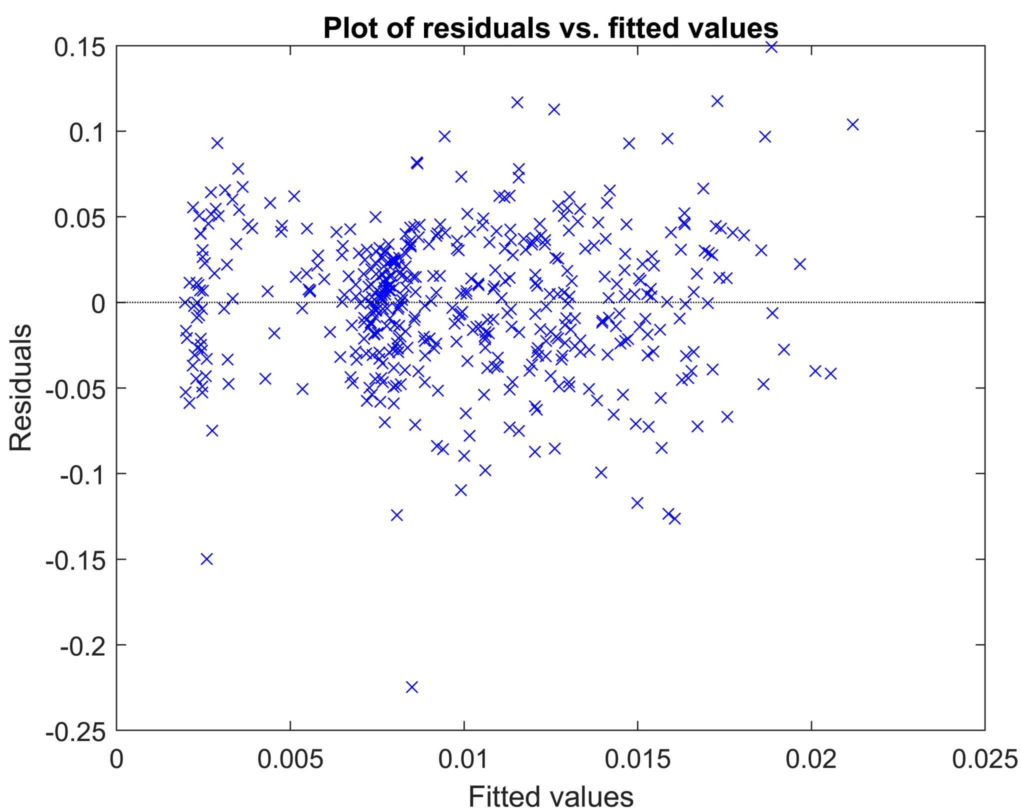
```
dynyL12 = 464×1
   NaN
   NaN
   NaN
   NaN
   NaN
   NaN
   NaN
   NaN
```

```
    NaN
    NaN
     ⋮
```

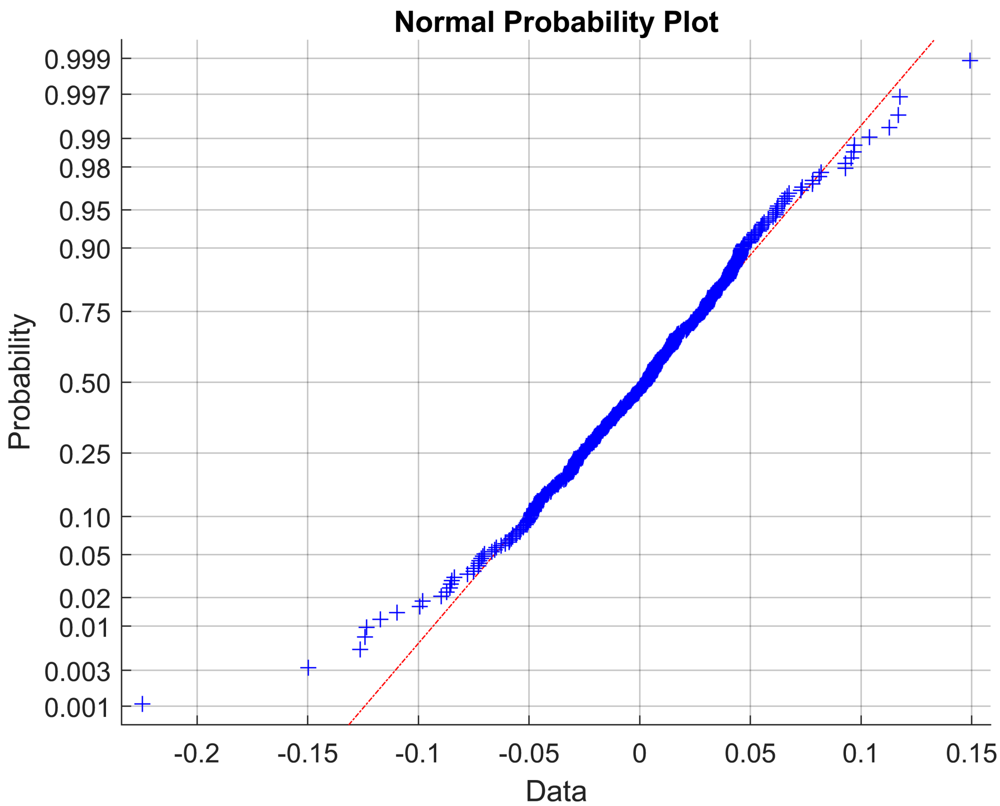
```
x = table(dynyL12,retdny12);
Md1 = fitlm(x)
```

```
Md1 = 
Linear regression model:
    retdny12 ~ 1 + dynyL12

Estimated Coefficients:
                   Estimate       SE        tStat       pValue  
                   _________    ________    _______    __________

    (Intercept)    -0.022293    0.019023    -1.1719       0.24185
    dynyL12           2.9194     0.52856     5.5233    5.6356e-08


Number of observations: 452, Error degrees of freedom: 450
Root Mean Squared Error: 0.115
R-squared: 0.0635,  Adjusted R-Squared: 0.0614
F-statistic vs. constant model: 30.5, p-value = 5.64e-08
```

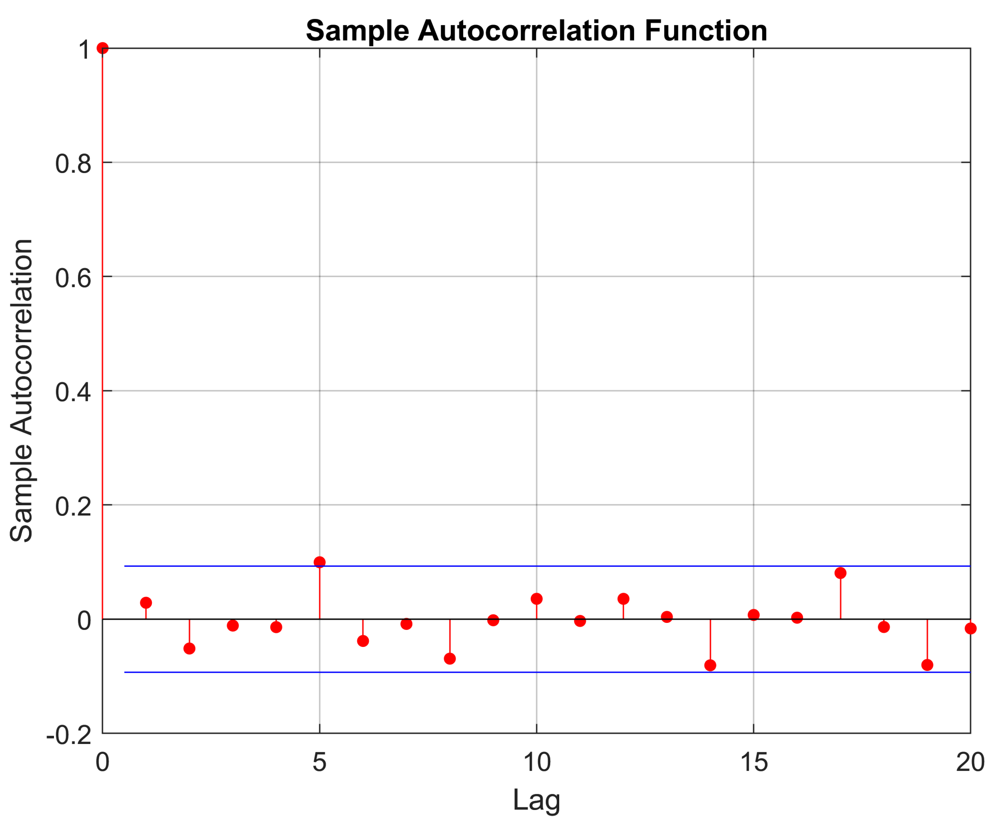
```
plotResiduals(Mdl,'fitted')
```




```
resid = Mdl.Residuals.Raw(~isnan(Mdl.Residuals.Raw));
normplot(resid)
```




```
autocorr(resid)
```



```
[EstCov,se,coeff] = hac(Md1)
```

```
Estimator type: HAC
Estimation method: BT
Bandwidth: 28.7741
Whitening order: 0
Effective sample size: 452
Small sample correction: on

Coefficient Covariances:

         |  Const   dynyL12
----------------------------
 Const   |  0.0028  -0.0666
 dynyL12 | -0.0666   1.6153
EstCov = 2×2
    0.0028   -0.0666
   -0.0666    1.6153
se = 2×1
    0.0533
    1.2709
coeff = 2×1
   -0.0223
    2.9194
```

Q8. Run the regression of retdny36 as predicted by the 36th lag of dyny, check normality, heteroskedasticty and autocorrelation of residuals, and compute HAC standard errors.

Has predictability increased?

Is there eveidence of non-normality, heteroskedasticty and autocorrelation of residuals?

What is t-stat using the HAC standard errors? Is the coefficient of dyny36 significant?

```
dynyL36 = lagmatrix(dyny,[36])
```

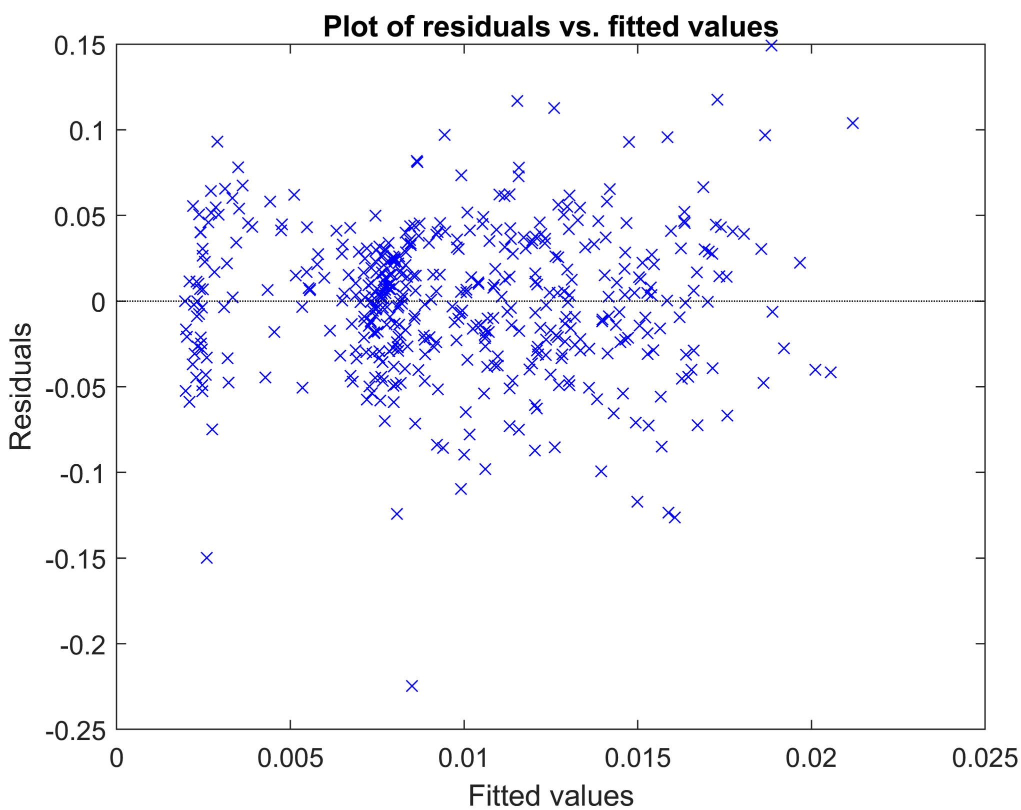
```
dynyL36 = 464×1
   NaN
   NaN
   NaN
   NaN
   NaN
   NaN
   NaN
   NaN
   NaN
   NaN
      ⋮
```

```
x = table(dynyL36,retdny36);
Md1 = fitlm(x)
```

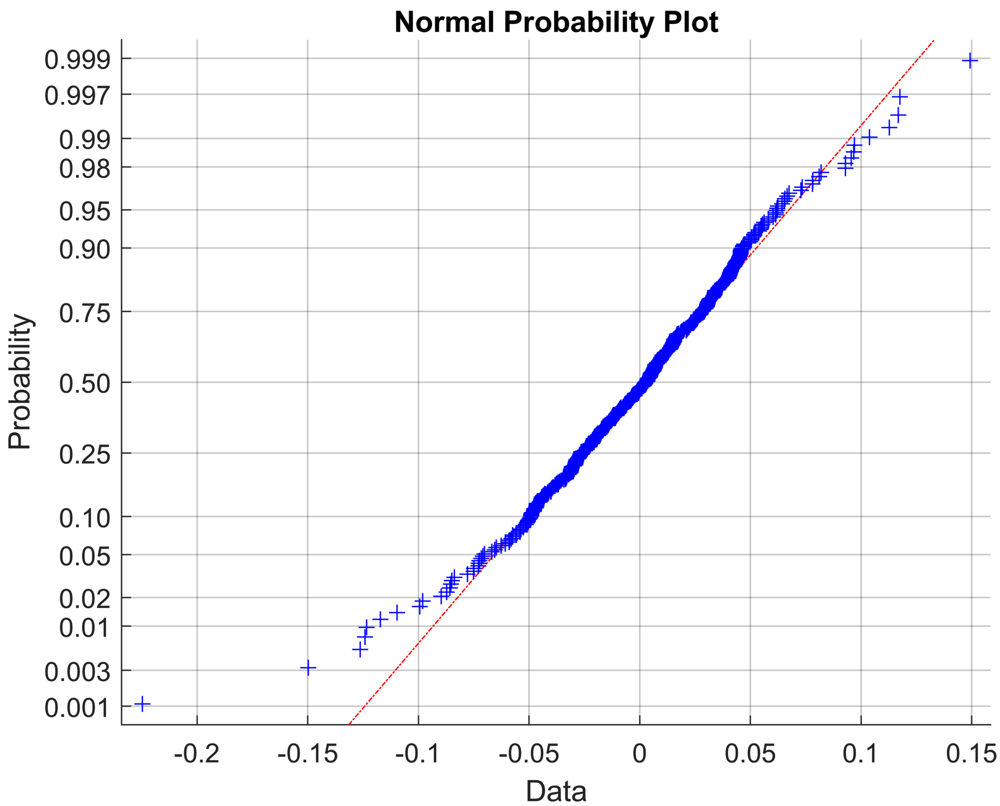
```
Md1 =
Linear regression model:
```

```
    retdny36 ~ 1 + dynyL36

Estimated Coefficients:
                   Estimate       SE        tStat       pValue  
                   ________    ________    ______    _________

    (Intercept)    0.072532    0.063863    1.1357      0.25671
    dynyL36          4.5498      1.7353     2.622    0.0090554


Number of observations: 428, Error degrees of freedom: 426
Root Mean Squared Error: 0.34
R-squared: 0.0159,  Adjusted R-Squared: 0.0136
F-statistic vs. constant model: 6.87, p-value = 0.00906
```

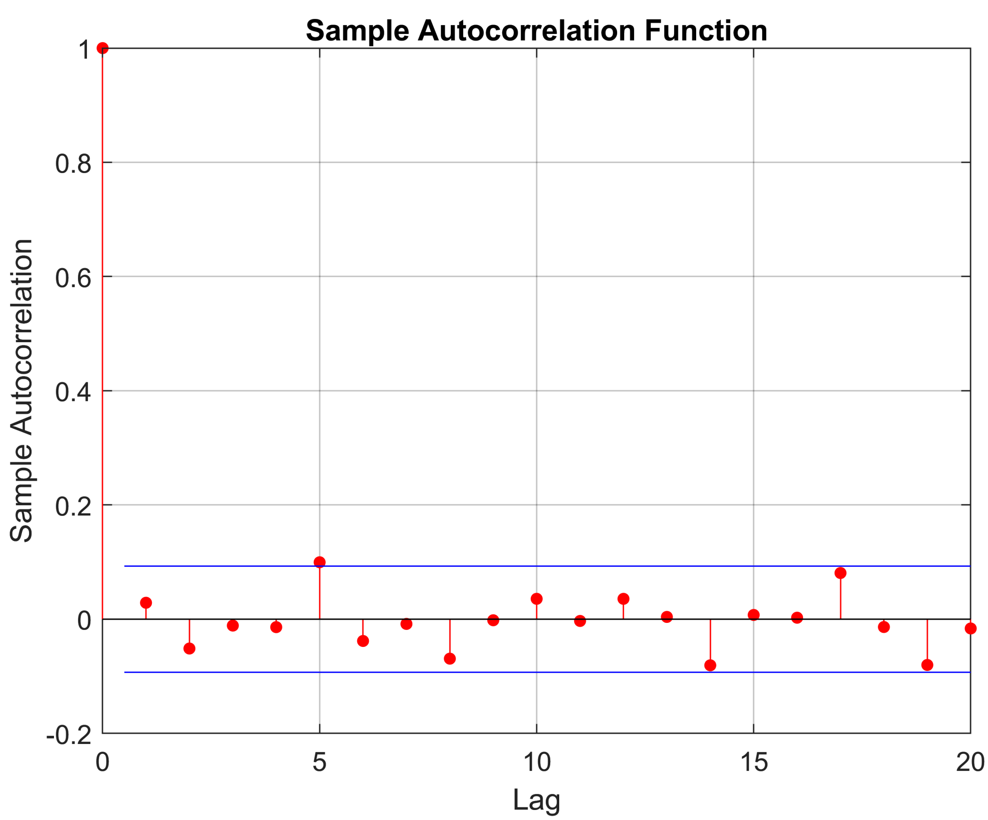
```
plotResiduals(Mdl,'fitted')
```




```
resid = Mdl.Residuals.Raw(~isnan(Mdl.Residuals.Raw));
normplot(resid)
```




```
autocorr(resid)
```



```
[EstCov,se,coeff] = hac(Md1)
```

```
Estimator type: HAC
Estimation method: BT
Bandwidth: 57.3264
Whitening order: 0
Effective sample size: 428
Small sample correction: on

Coefficient Covariances:

         |  Const   dynyL36
----------------------------
 Const   |  0.0180  -0.4370
 dynyL36 | -0.4370  11.4312
EstCov = 2×2
    0.0180   -0.4370
   -0.4370   11.4312
se = 2×1
    0.1343
    3.3810
coeff = 2×1
    0.0725
    4.5498
```