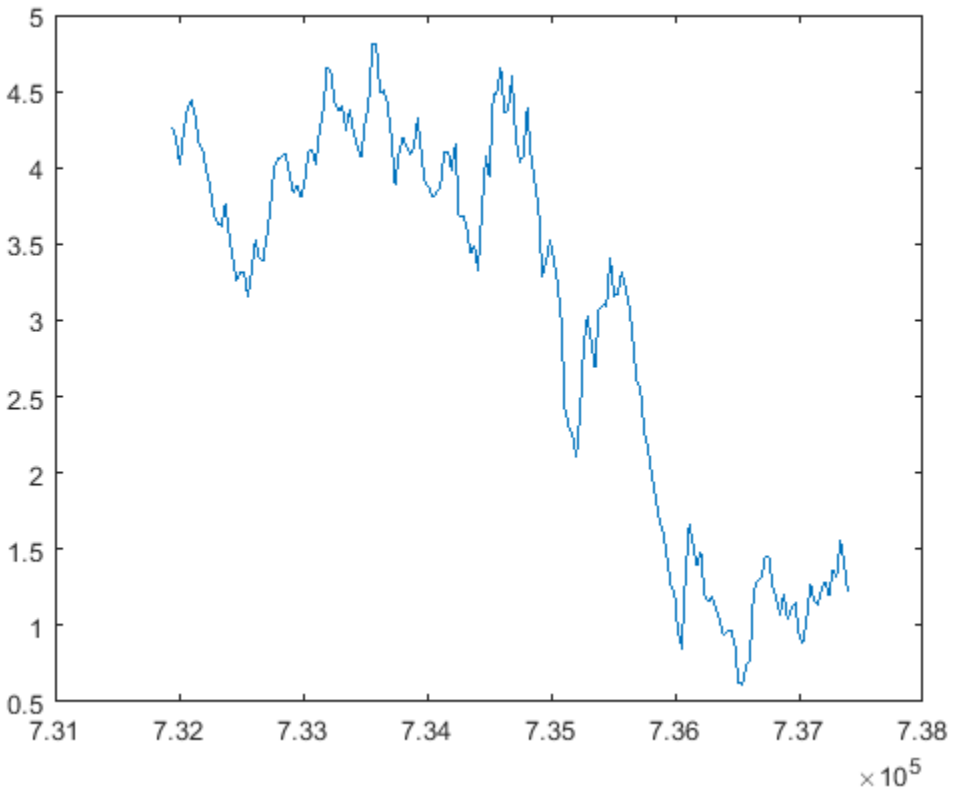
Table of Contents

Part II: Fitting models to empirical Data

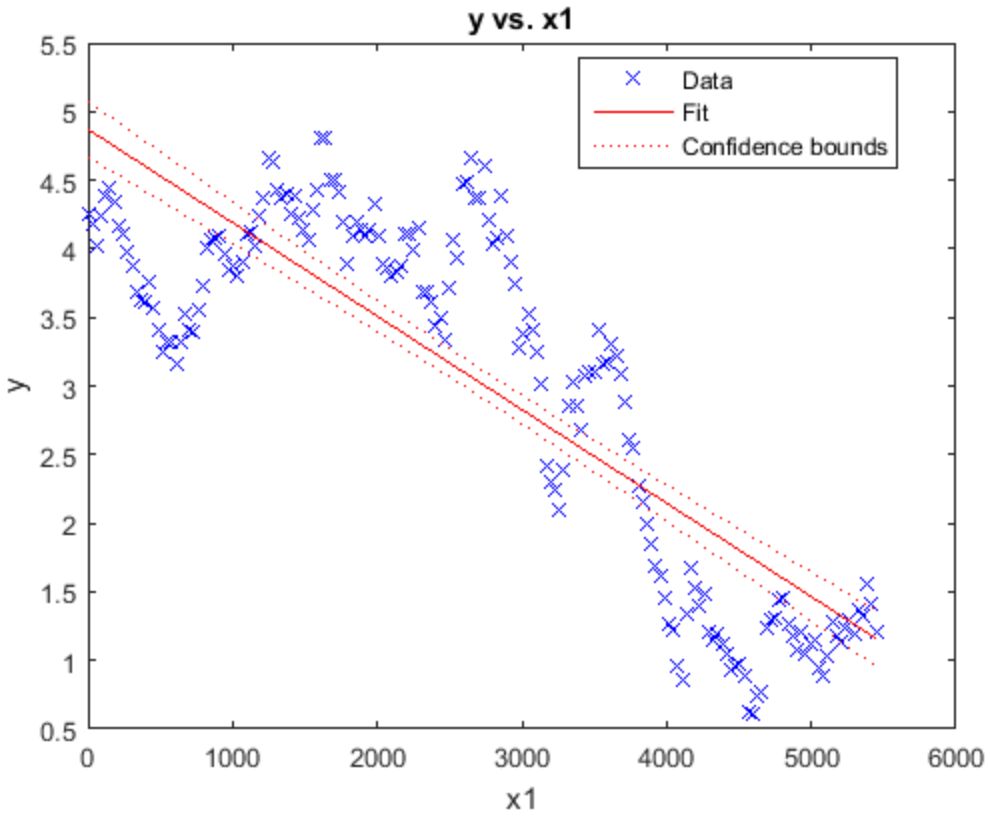
```
% LT Gov Bond Yields US
% LT Gov Bond Yields Euro Area
load LGTERMgovbondyields

% plot data
plot(dates,LTGIVeuro)

%Converts the dates vector into a numeric vector d that contains the
 number
%of days elapsed after the starting date.
d = datenum(dates-dates(1));
```



Fit a model to the data.

```
%how the US Long term Gov Bond yields is trending to estimate the
 future values.
%create a linear regression model named fitModel1 using d as a
 predictor.

%(y ~ 1 + x1)
fitModel1 = fitlm(d,LTGIVeuro)
% plot data and model fit
plot(fitModel1)
```

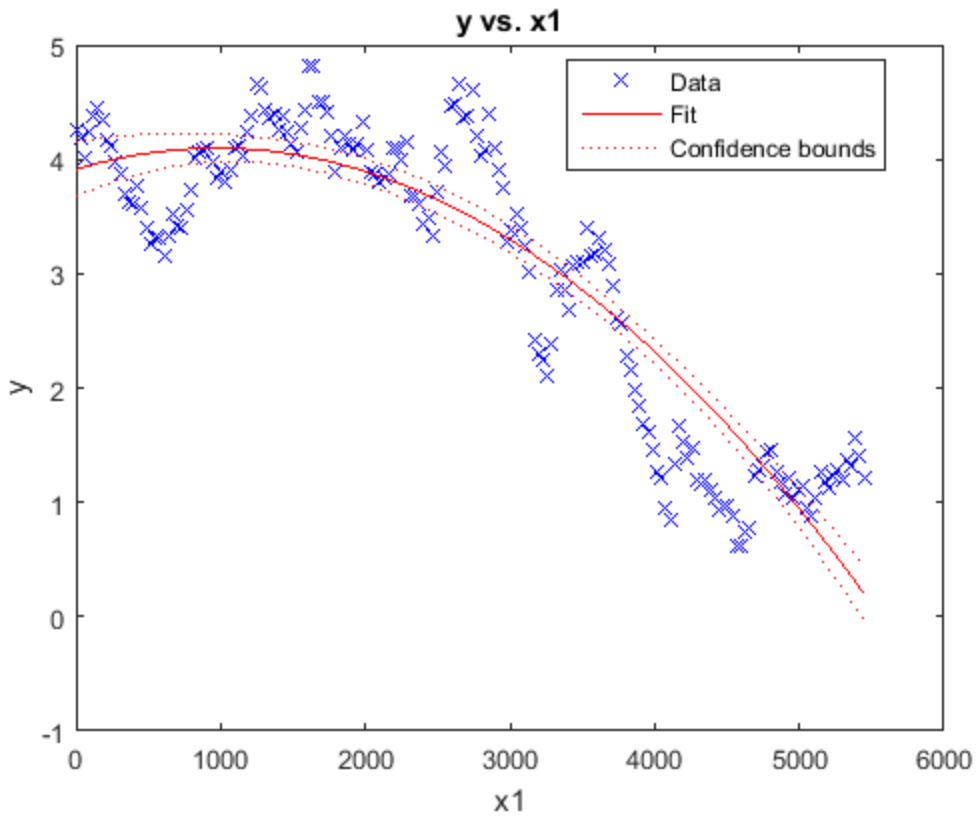
```
fitModel1 =


Linear regression model:
    y ~ 1 + x1

Estimated Coefficients:
                    Estimate          SE          tStat       pValue
                   ____________    ____________    _____    ____________

    (Intercept)         4.8709        0.10345     47.084    2.1024e-102
    x1             -0.00068126    3.2845e-05    -20.742     2.2695e-49


Number of observations: 180, Error degrees of freedom: 178
Root Mean Squared Error: 0.697
R-squared: 0.707,  Adjusted R-Squared 0.706
F-statistic vs. constant model: 430, p-value = 2.27e-49
```



Fit a quadratic model to the data.

```
%(y ~ 1 + x1 + x1^2)
fitModel2 = fitlm(d,LTGIVeuro,'quadratic')
plot(fitModel2)
```

```
fitModel2 =


Linear regression model:
    y ~ 1 + x1 + x1^2

Estimated Coefficients:
                   Estimate        SE         tStat       pValue
                   ________    _________    _______    __________

    (Intercept)       3.9129      0.12016     32.562    1.1795e-76
    x1             0.00037994    0.00010192    3.7279    0.00025961
    x1^2           -1.9479e-07    1.8108e-08    -10.758    4.3557e-21


Number of observations: 180, Error degrees of freedom: 177
Root Mean Squared Error: 0.543
R-squared: 0.823,  Adjusted R-Squared 0.821
F-statistic vs. constant model: 412, p-value = 2.73e-67
```

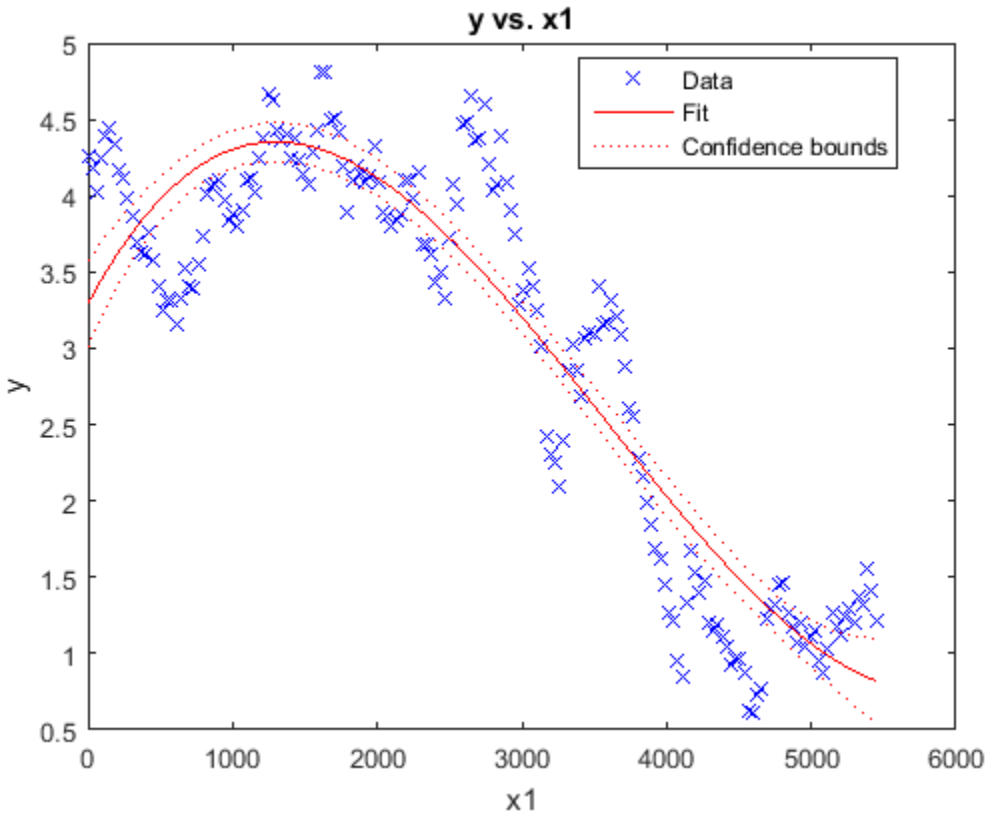


Fit a polynomial of degree 3 to data.

```
%(y ~ 1 + x1 + x1^2 + x1^3)
fitModel3 = fitlm(d,LTGIVeuro,'poly3')
plot(fitModel3)
```

```
fitModel3 =


Linear regression model:
    y ~ 1 + x1 + x1^2 + x1^3

Estimated Coefficients:
                    Estimate        SE          tStat       pValue
                   __________    __________    _______    __________

    (Intercept)       3.2927       0.14213     23.167     2.4422e-55
    x1             0.0017655    0.00022658     7.7919     5.5045e-13
    x1^2           -8.324e-07    9.6801e-08    -8.5991     4.2879e-15
    x1^3           7.8025e-11    1.1678e-11     6.6812     3.0025e-10


Number of observations: 180, Error degrees of freedom: 176
Root Mean Squared Error: 0.487
R-squared: 0.859,  Adjusted R-Squared 0.856
```

F-statistic vs. constant model: 357, p-value = 1.47e-74



View information about the fit

```
info1= fitModel1.Coefficients
info2= fitModel2.Coefficients
info3= fitModel3.Coefficients

info1R2 = fitModel1.Rsquared
info2R2 = fitModel2.Rsquared
info3R2 = fitModel3.Rsquared
```

info1 =

	Estimate	SE	tStat	pValue
(Intercept)	4.8709	0.10345	47.084	2.1024e-102
x1	-0.00068126	3.2845e-05	-20.742	2.2695e-49

info2 =

	Estimate	SE	tStat	pValue

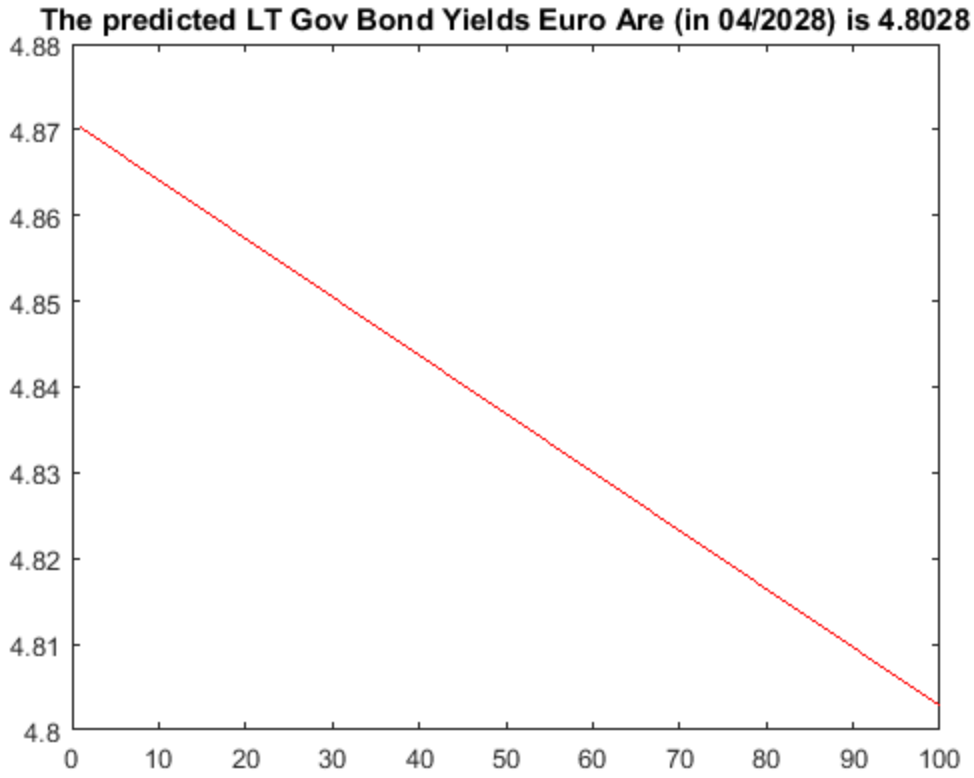
```
    (Intercept)         3.9129       0.12016      32.562     1.1795e-76
    x1               0.00037994    0.00010192     3.7279     0.00025961
    x1^2            -1.9479e-07    1.8108e-08    -10.758     4.3557e-21


info3 =

                      Estimate         SE         tStat       pValue
                    ___________    __________    _______    __________

    (Intercept)         3.2927       0.14213      23.167     2.4422e-55
    x1               0.0017655    0.00022658     7.7919     5.5045e-13
    x1^2            -8.324e-07    9.6801e-08    -8.5991     4.2879e-15
    x1^3             7.8025e-11    1.1678e-11     6.6812     3.0025e-10


info1R2 =

    Ordinary: 0.7073
    Adjusted: 0.7057


info2R2 =

    Ordinary: 0.8230
    Adjusted: 0.8210


info3R2 =

    Ordinary: 0.8588
    Adjusted: 0.8564
```

Predict LT Gov Bond Yields Euro Area for the first 100 days

using fitModel1 and assign the result to ypred1.

```
plot(d,fitModel1.Fitted,'g')

% use predict function to predict the reponse values given any
 predictor values.
ypred1 = predict(fitModel1,(1:100)');

% plot the predicted
plot(1:100,ypred1,'r')

% Extract and report
rate100 = ypred1(end);
```

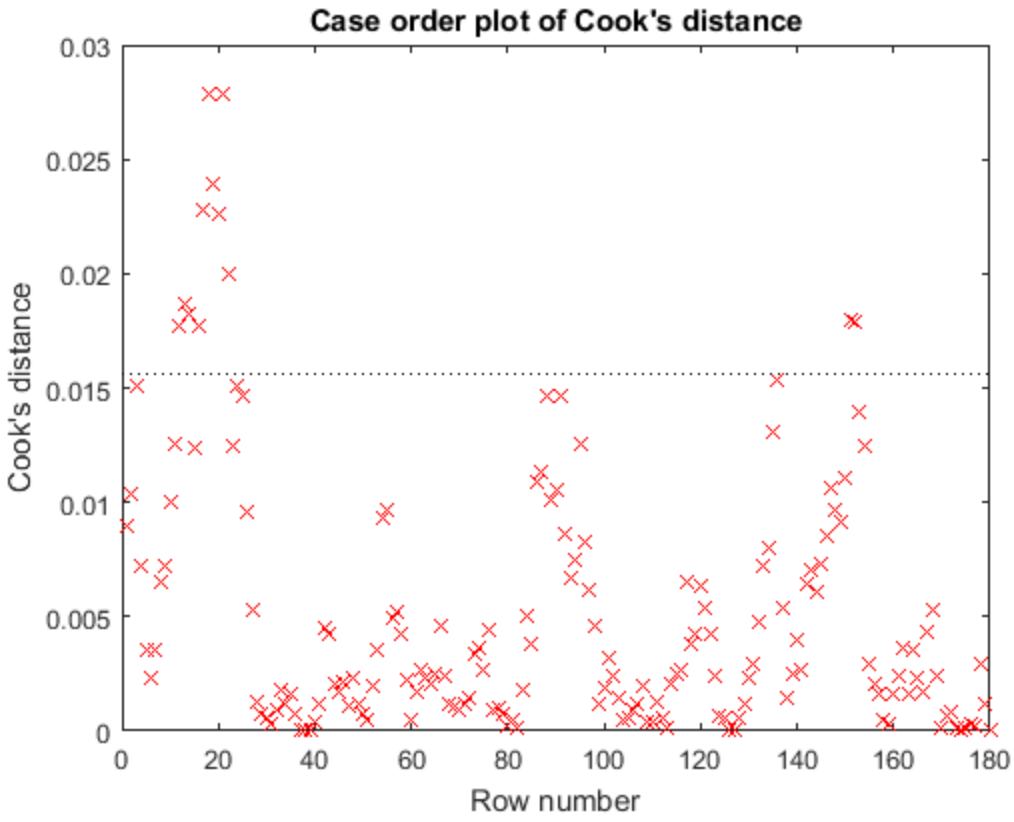
```
title(['The predicted LT Gov Bond Yields Euro Are (in 04/2028) is
 ',num2str(rate100)])
```



Evaluate goodness of fit

plots a histogram of the residuals. the distribution of the residuals of a fit.

```
plotResiduals(fitModel1)

%Diagnostic plots help you to identify outliers and see other problems
 in
%your model or fit
plotDiagnostics(fitModel1,'cookd')

% use predict function with the quadratic model
ypred2 = predict(fitModel2,(1:100)');
% use predict function with polynomial of degree 3
ypred3 = predict(fitModel3,(1:100)');
```



Published with MATLAB® R2015b