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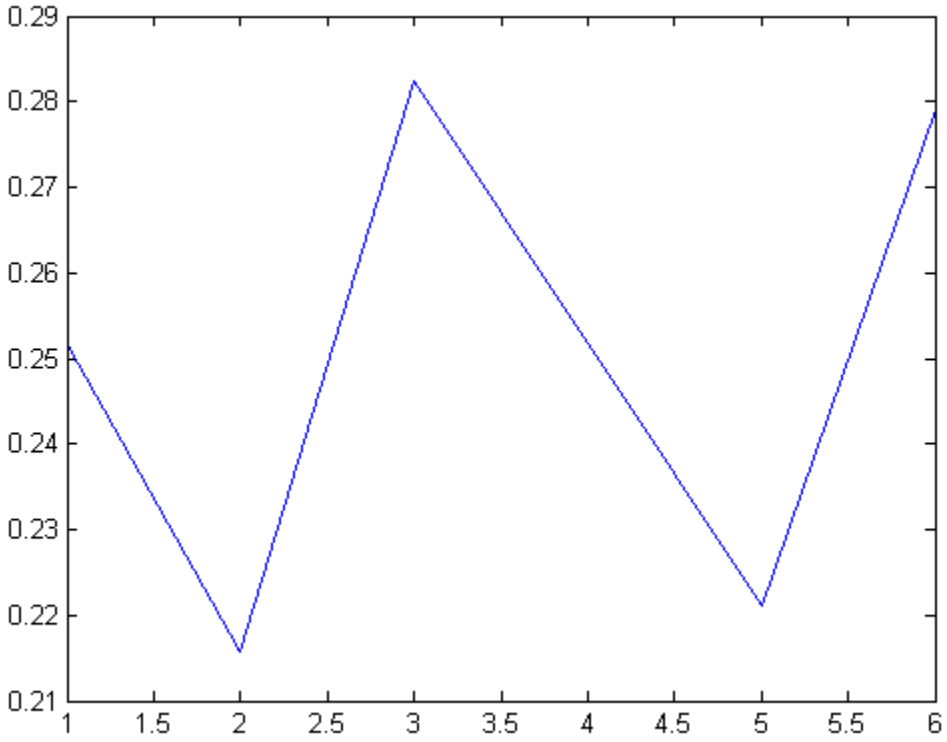
part1

```
clear
clc
load('mgmsp5008.mat');
GM=mgmsp5008(:,2);
GM=log(GM+1);
load 'part1.mat'
lag =1;
flag=modelsetup1;
spec=garchset('R',flag(lag,1),'M',flag(lag,2),'P',flag(lag,3),'Q',flag(lag,4),'Dis
[Coeff1,Errors1,LLF1,Innovations1,Sigmas1,Summary1] = garchfit(spec,GM);

% *fit result*
garchdisp(Coeff1,Errors1);


% *6 step forecast  *
[SigmaForecast1,MeanForecast1,SigmaTotal1,MeanRMSE1] = garchpred(Coeff1,GM,6);
plot(SigmaForecast1);
```

```
Warning: GARCHSET will be removed in a future release. Use ARIMA, GARCH, E
and GJR models instead.
Warning: GARCHFIT will be removed in a future release. Use ESTIMATE of ARI
GARCH, EGARCH, and GJR models instead.
Warning: GARCHDISP will be removed in a future release. Use ARIMA, GARCH,
EGARCH, and GJR models instead.

  Mean: ARMAX(2,3,0); Variance: GARCH(3,3)

  Conditional Probability Distribution: Gaussian
  Number of Model Parameters Estimated: 13

                              Standard          T
  Parameter       Value         Error       Statistic
 -----------   -----------   ------------   -----------
           C    0.0067529     0.0017858        3.7814
      AR(1)     1.1784        0.012928         91.1553
      AR(2)     -0.95611      0.014015        -68.2201
      MA(1)     -1.1195       0.042782        -26.1683
      MA(2)     0.88553       0.051762         17.1077
      MA(3)     0.0943        0.041572         2.2683
           K    0.00014971    0.00010593       1.4133
   GARCH(1)     0             0.060912         0.0000
```

```
    GARCH(2)     0              0.063182         0.0000

    GARCH(3)     0.74823        0.07019         10.6600
     ARCH(1)     0.03763        0.031234         1.2048
     ARCH(2)     0.047183       0.024962         1.8902
     ARCH(3)     0.16696        0.040194         4.1538
Warning: GARCHPRED will be removed in a future release. Use FORECAST of AR
GARCH, EGARCH, and GJR models instead.
```



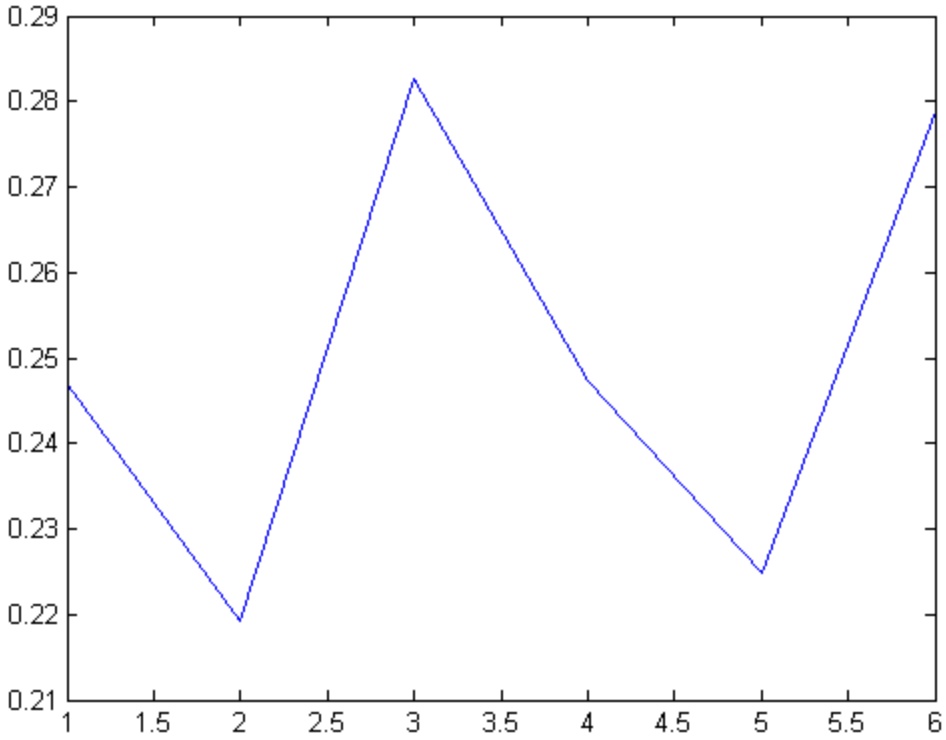
part2

```
clear
clc
load('mgmsp5008.mat');
GM=mgmsp5008(:,2);
GM=log(GM+1);
load 'part2.mat'
lag =1;
flag=modelsetup2;
spec=garchset('VarianceModel','GARCH','R',flag(lag,1),'M',flag(lag,2),'P',flag(lag
[Coeff2,Errors2,LLF2,~,~,~] = garchfit(spec,GM);

% *fit result*
garchdisp(Coeff2,Errors2);

% *forecast*
[SigmaForecast2,MeanForecast2,SigmaTotal2,MeanRMSE2] = garchpred(Coeff2,GM,6);
```

```
plot(SigmaForecast2);

% *test*
% HO: v=6
% _1:reject ; 0 : can not reject_
t_test=(Coeff2.DoF-6)/Errors2.DoF;
H_t=t_test > tinv(0.95,garchcount(spec));
H_t

% H0 : v=6   likelihood ratio test
spec_test=garchset('AR',zeros(1,flag(lag,1)),'MA',zeros(1,flag(lag,2)),'GARCH',zer
[Coeff2_test,Errors2_test,LLF2_test,~,~,~] = garchfit(spec_test,GM);
garchdisp(Coeff2_test,Errors2_test);

% _1:reject ; 0 : can not reject_
[H_LR, pValue, Stat, CriticalValue] = lratiotest(LLF2, LLF2_test, 1, 0.05);

H_LR
```

```
Warning: GARCHSET will be removed in a future release. Use ARIMA, GARCH, E
and GJR models instead.
Warning: GARCHFIT will be removed in a future release. Use ESTIMATE of ARI
GARCH, EGARCH, and GJR models instead.
Warning: GARCHDISP will be removed in a future release. Use ARIMA, GARCH,
EGARCH, and GJR models instead.

  Mean: ARMAX(2,3,0); Variance: GARCH(3,3)

  Conditional Probability Distribution: T
  Number of Model Parameters Estimated: 14

                              Standard          T
  Parameter       Value         Error       Statistic
 -----------   -----------   ------------   -----------
           C    0.0066487      0.001671         3.9789
      AR(1)     1.1797         0.013417        87.9228
      AR(2)    -0.95884        0.014099       -68.0062
      MA(1)    -1.1246         0.04071        -27.6252
      MA(2)     0.89072        0.049178        18.1120
      MA(3)     0.089975       0.039318         2.2884
          K     0.00015364     0.00013877       1.1072
  GARCH(1)      0.009774       0.076131         0.1284
  GARCH(2)      0              0.091072         0.0000
  GARCH(3)      0.74223        0.093797         7.9131
   ARCH(1)      0.029547       0.036305         0.8139
   ARCH(2)      0.056974       0.033764         1.6874
   ARCH(3)      0.16147        0.050629         3.1894
       DoF      9.7886         4.021            2.4343
Warning: GARCHPRED will be removed in a future release. Use FORECAST of AR
GARCH, EGARCH, and GJR models instead.
Warning: GARCHCOUNT will be removed in a future release.

H_t =
```

```
     0

Warning: GARCHSET will be removed in a future release. Use ARIMA, GARCH, E
and GJR models instead.
Warning: GARCHFIT will be removed in a future release. Use ESTIMATE of ARI
GARCH, EGARCH, and GJR models instead.
Warning: GARCHDISP will be removed in a future release. Use ARIMA, GARCH,
EGARCH, and GJR models instead.

  Mean: ARMAX(2,3,0); Variance: GARCH(3,3)

  Conditional Probability Distribution: T
  Number of Model Parameters Estimated: 13

                            Standard          T
  Parameter       Value       Error       Statistic
 -----------   -----------   ------------   -----------
           C    0.0012597     0.0028876        0.4362
      AR(1)    -0.035579     0.24681         -0.1442
      AR(2)    0.84121       0.22052          3.8146
      MA(1)    0.10773       0.24693          0.4363
      MA(2)    -0.87938      0.22164         -3.9675
      MA(3)    -0.050652     0.042255        -1.1987
           K    0.0002853     0.00020594       1.3854
   GARCH(1)    0.021603      0.12151          0.1778
   GARCH(2)    0             0.13406          0.0000
   GARCH(3)    0.67691       0.12943          5.2298
    ARCH(1)    0.03907       0.048007         0.8138
    ARCH(2)    0.08165       0.045584         1.7912
    ARCH(3)    0.18077       0.064133         2.8186
        DoF    6             Fixed            Fixed

H_LR =

     1
```



part3

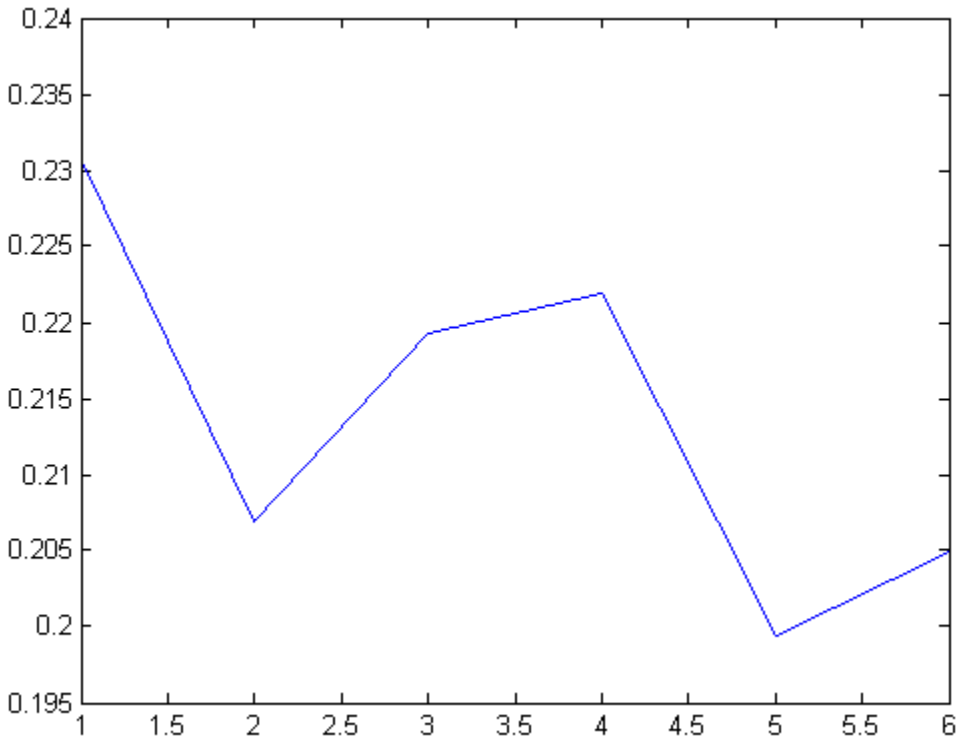
```
clear
clc
load('mgmsp5008.mat');
GM=mgmsp5008(:,2);
GM=log(GM+1);
load 'part3.mat'
lag =1;
flag=modelsetup3;
spec=garchset('VarianceModel', 'EGARCH','R',flag(lag,1),'M',flag(lag,2),'P',flag(l
[Coeff3,Errors3,LLF3,~,~,~] = garchfit(spec,GM);
% *fit result*
garchdisp(Coeff3,Errors3);
% *forecast*
[SigmaForecast3,MeanForecast1,SigmaTotal1,MeanRMSE1] = garchpred(Coeff3,GM,6);
plot(SigmaForecast3);
```

```
Warning: GARCHSET will be removed in a future release. Use ARIMA, GARCH, E
and GJR models instead.
Warning: GARCHFIT will be removed in a future release. Use ESTIMATE of ARI
GARCH, EGARCH, and GJR models instead.
Warning: GARCHDISP will be removed in a future release. Use ARIMA, GARCH,
EGARCH, and GJR models instead.

  Mean: ARMAX(3,3,0); Variance: EGARCH(3,3)
```

```
Conditional Probability Distribution: Gaussian
Number of Model Parameters Estimated: 17
```

Parameter	Value	Standard Error	T Statistic
C	0.003227	0.0016249	1.9860
AR(1)	0.95774	0.38637	2.4788
AR(2)	-0.064337	0.60209	-0.1069
AR(3)	-0.59803	0.38564	-1.5507
MA(1)	-0.90005	0.37216	-2.4185
MA(2)	-0.007737	0.57634	-0.0134
MA(3)	0.65009	0.37174	1.7488
K	-0.22907	0.13885	-1.6497
GARCH(1)	0.21934	0.022973	9.5478
GARCH(2)	-0.17669	0.025539	-6.9183
GARCH(3)	0.91139	0.020134	45.2661
ARCH(1)	0.087312	0.055531	1.5723
ARCH(2)	0.32553	0.050329	6.4680
ARCH(3)	0.043318	0.056515	0.7665
Leverage(1)	-0.084953	0.025526	-3.3281
Leverage(2)	-0.025117	0.028534	-0.8802
Leverage(3)	0.0026252	0.022856	0.1149

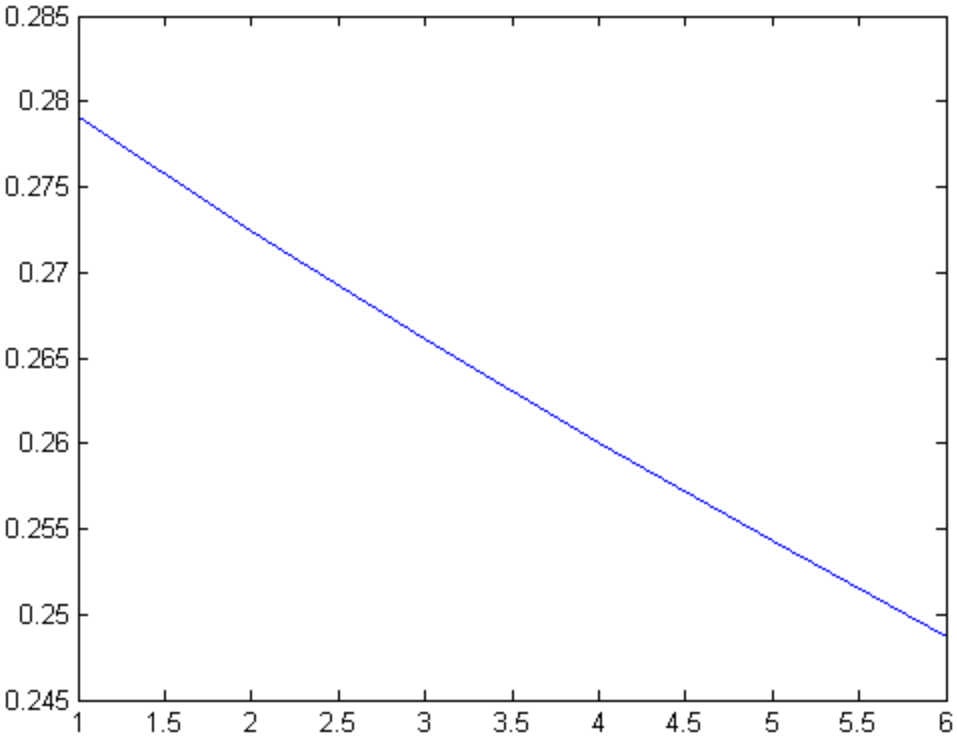
```
Warning: GARCHPRED will be removed in a future release. Use FORECAST of AR
GARCH, EGARCH, and GJR models instead.
```



part4

```
clear
clc
load('mgmsp5008.mat');
GM=mgmsp5008(:,2);
GM=log(GM+1);
load 'part4.mat'
lag =1;
flag=modelsetup4;
spec=garchset('VarianceModel', 'EGARCH','C',0,'FixC',1,'AR',zeros(1,flag(lag,1)),'
[Coeff4,Errors4,LLF4,~,~,~] = garchfit(spec,GM);
% *fit result*
garchdisp(Coeff4,Errors4);
% *forecast*
[SigmaForecast4,MeanForecast1,SigmaTotal1,MeanRMSE1] = garchpred(Coeff4,GM,6);
plot(SigmaForecast4);
```

```
Warning: GARCHSET will be removed in a future release. Use ARIMA, GARCH, E
and GJR models instead.
Warning: GARCHFIT will be removed in a future release. Use ESTIMATE of ARI
GARCH, EGARCH, and GJR models instead.
Warning: GARCHDISP will be removed in a future release. Use ARIMA, GARCH,
EGARCH, and GJR models instead.

  Mean: ARMAX(2,2,0); Variance: EGARCH(1,1)

  Conditional Probability Distribution: T
  Number of Model Parameters Estimated: 8

                              Standard          T
  Parameter       Value         Error       Statistic
 -----------   -----------   ------------   -----------
           C    0              Fixed            Fixed
      AR(1)    0.35421        0.2493           1.4208
      AR(2)    0.64579        0.24913          2.5922
      MA(1)    -0.28935       0.23115         -1.2518
      MA(2)    -0.71025       0.23086         -3.0765
           K    -0.098389      0.069556        -1.4145
   GARCH(1)    0.98024        0.013317        73.6076
    ARCH(1)    0.17863        0.046844         3.8133
 Leverage(1)    -0.068026     0.030047        -2.2640
         DoF    6.5            Fixed            Fixed
Warning: GARCHPRED will be removed in a future release. Use FORECAST of AR
GARCH, EGARCH, and GJR models instead.
```



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