Notes: I used different Garch Models for return series and conducted the whole Estimation analysis process

Contents


```
clear

clc
```

1. read the price data and transform to log return

```
price = xlsread('PriceSeries1.xls');
ret = price2ret(price);
len = length(ret);
```

2. Pre-Estimation Process

```
% Plot original return data
figure(1)

plot(ret)

index = [1,round(len / 4),round(len * 2 / 4),round(len * 3 / 4),len];

set(gca,'XTick',index)
set(gca,'XTickLabel',index)
% Convert y-axis values to percentage values by multiplication
a=[cellstr(num2str(get(gca,'ytick')'*100))];
% Create a vector of '%' signs
pct = char(ones(size(a,1),1)*'%');
% Append the '%' signs after the percentage values
new_yticks = [char(a),pct];
set(gca,'yTickLabel',new_yticks)
ylabel('Daily Return')
title(' Ticker Daily Return')
% check for correlation in return and plot
```

```
figure(2)
subplot(2,1,1)
autocorr(ret)
title('ACF for daily return series')
subplot(2,1,2)
parcorr(ret)
title('PACF for daily return series')
% check for correlation in the squared return and plot
figure(3)
subplot(2,1,1)
autocorr(ret.^2)
title('ACF for daily squared return series')
subplot(2,1,2)
parcorr(ret.^2)
title('PACF for daily squared return series')
% conduct Q TEST
[lbq_ret,p_ret,stat_ret,cri_ret] = lbqtest((ret-
mean(ret)),'Lags',[5,10,15],'Alpha',0.05);
[lbq_ret2,p_ret2,stat_ret2,cri_ret2] = lbqtest((ret-
mean(ret)).^2,'Lags',[5,10,15],'Alpha',0.05);
% conduct Arch Test
[h_arch_ret,p_arch_ret,stat_arch_ret,cri_arch_ret] = archtest((ret-
mean(ret)),'Lags',[5,10,15],'Alpha',0.05);
```

3. Parameter-Estimation Process

```
% use garch(1,1) model
garch11 = garch('GARCHLags',1,'ARCHLags',1);
[fit11,~,L11,~] = estimate(garch11,ret);
% use garch(2,1) model
garch21 = garch('GARCHLags',2,'ARCHLags',1);
[fit21,~,L21,~] = estimate(garch21,ret);
% use garch(1,2) model
garch12 = garch('GARCHLags',1,'ARCHLags',2);
[fit12,~,L12,~] = estimate(garch12,ret);
% find the best model with lowest aic value
inf_cri = aicbic([L11,L12,L21],[3,4,4],[len,len,len]);
```

4. Post-Estimation Process

```
% get the conditional variance and responses(y)
[cv11,res11] = simulate(fit11,len);

% plot conditional variance data
figure(4)
subplot(3,1,1)
plot(cv11)
set(gca,'XTick',index)
set(gca,'XTickLabel',index)
ylabel('Conditional Variances')
title(' Ticker Daily Return Conditional Variances by Garch(1,1)')
% plot residual / innovation data
subplot(3,1,2)
plot(res11 - fit11.Constant)
set(gca,'XTick',index)
set(gca,'XTickLabel',index)
ylabel('Residuals')
title(' Ticker Daily Return Residuals by Garch(1,1)')
% plot Return data
subplot(3,1,3)
plot(res11)
set(gca,'XTick',index)
set(gca,'XTickLabel',index)
ylabel('Return')
title(' Ticker Daily Return by Garch(1,1)')
% check for correlation for standadized residuals
figure(5)
subplot(2,1,1)
autocorr((res11./sqrt(cv11)).^2)
title('ACF for daily squared standadized residuals series')
subplot(2,1,2)
parcorr((res11./sqrt(cv11)).^2)
title('PACF for daily squared standadized residuals series')
% conduct Q TEST for standadized residuals
[lbq_res,p_res,stat_res,cri_res] =
lbqtest((res11./sqrt(cv11)).^2,'Lags',[5,10,15],'Alpha',0.05);
% conduct Arch Test for standadized residuals
[h_arch_res,p_arch_res,stat_arch_res,cri_arch_res] =
archtest((res11./sqrt(cv11)),'Lags',[5,10,15],'Alpha',0.05);
% forecast 1 period ahead conditional variance
fore_vol = forecast(fit11,1,'Y0',ret);
```

Result and plots

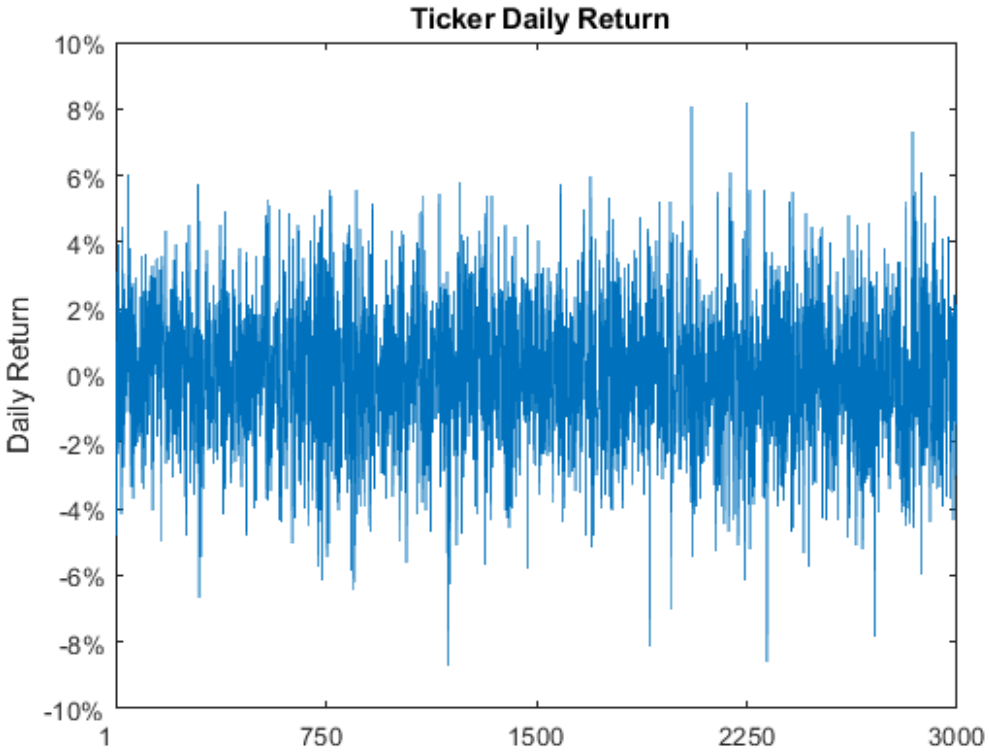

Figure1. Ticker Daily Return

Notes: This is the log return of the original price data

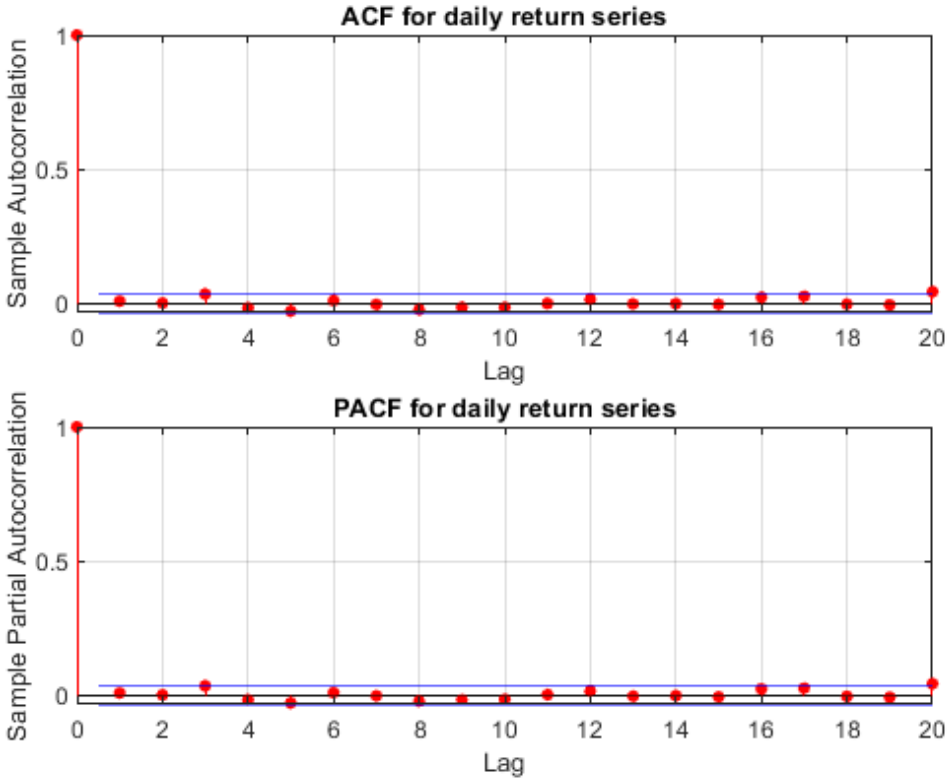

Figure2. ACF and PACF for daily return series

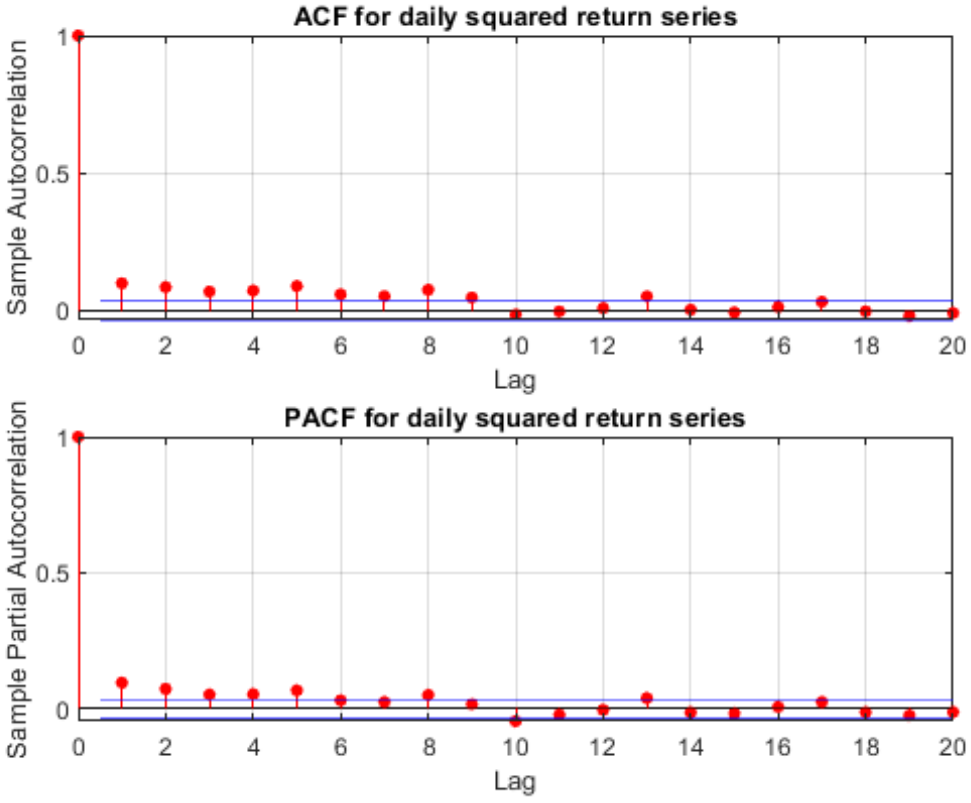

Figure3. ACF and PACF for daily squared return series

Notes: The plots in last page is the ACF / PACF plot for return and squared return. It shows that the squared return series has Auto correlation.

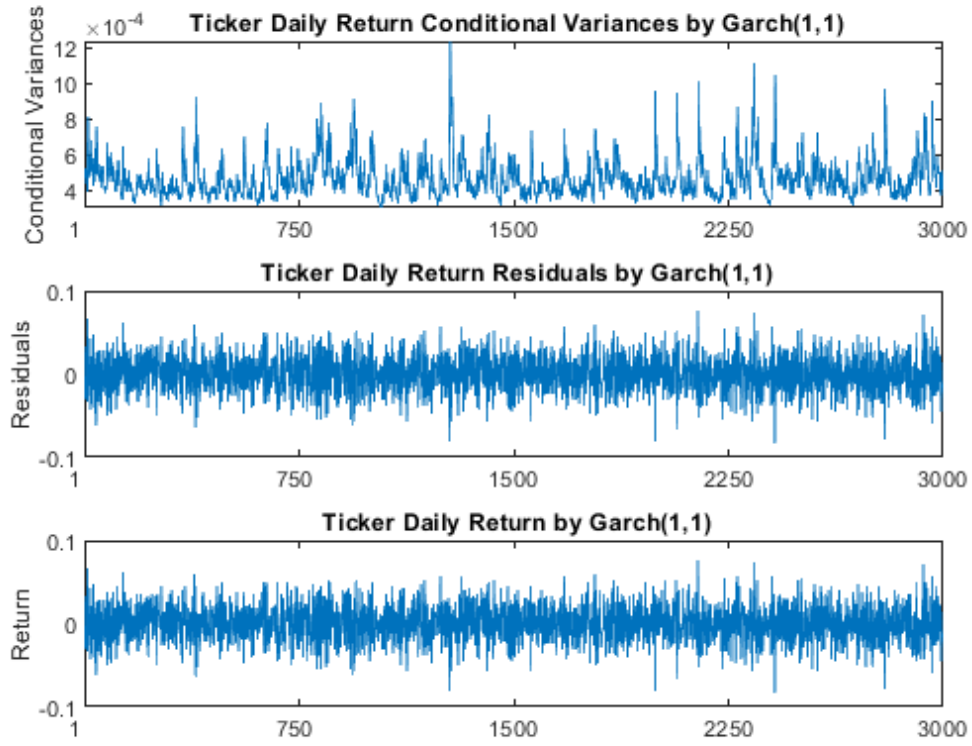

Figure4. Conditional Variance, Residuals, Fitted Return

Notes: This is the Conditional variance, residuals and return series simulated by Garch(1,1) Model which is the best model.

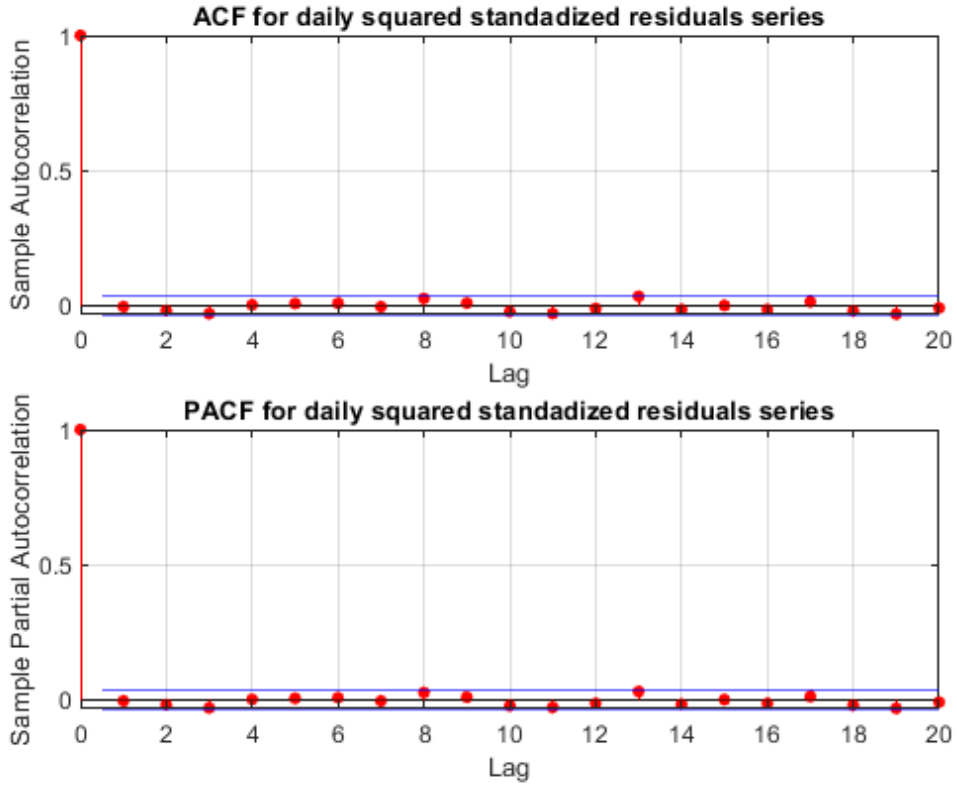

Figure5. ACF and PACF for daily squared standardized residuals series

Notes: This is the ACF / PACF plot for squared return from Garch(1,1) model

GARCH(1,1) Conditional Variance Model (Gaussian Distribution):

	Value	StandardError	TStatistic	PValue
Constant	5.5788e-05	1.6339e-05	3.4144	0.00063914
GARCH{1}	0.80022	0.045269	17.677	6.325e-70
ARCH{1}	0.081521	0.015642	5.2115	1.8729e-07

GARCH(2,1) Conditional Variance Model (Gaussian Distribution):

	Value	StandardError	TStatistic	PValue
Constant	0.00010749	3.0113e-05	3.5696	0.00035756
GARCH{2}	0.67689	0.074272	9.1136	7.9662e-20
ARCH{1}	0.095353	0.019029	5.011	5.4143e-07

GARCH(1,2) Conditional Variance Model (Gaussian Distribution):

	Value	StandardError	TStatistic	PValue
Constant	6.1033e-05	1.9397e-05	3.1465	0.0016525
GARCH{1}	0.79816	0.052096	15.321	5.5477e-53
ARCH{2}	0.072541	0.015818	4.5859	4.5214e-06

Figure6. Garch Model Fit

```
inf_cri =

   1.0e+04 *

   -1.4532   -1.4513   -1.4509
```

Figure7. Garch Model Selection

Notes: This is the estimation result for Garch Models. Since all parameters in various models pass the TTest and the Garch(1,1) has the lowest information value, I select Garch(1,1) as the best model.