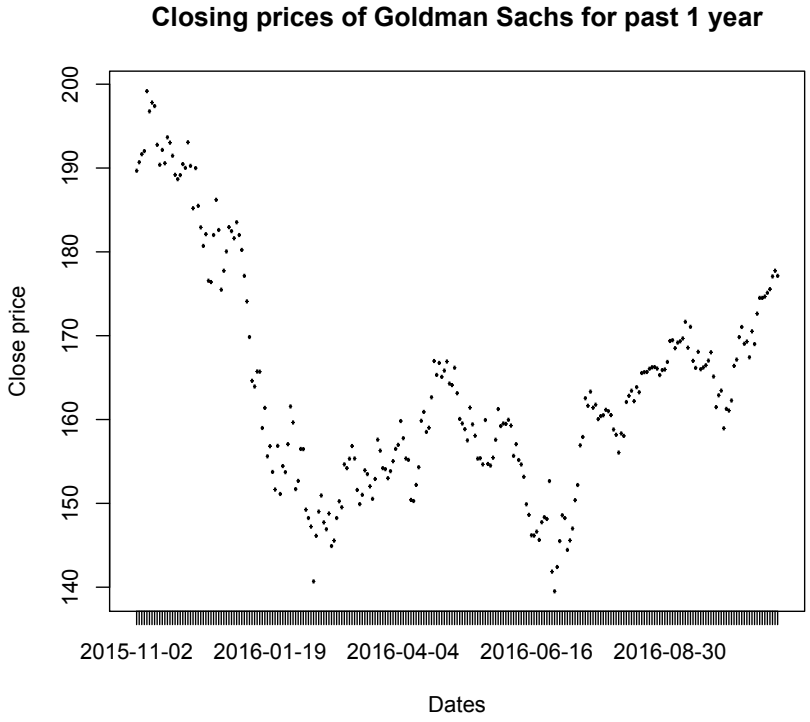
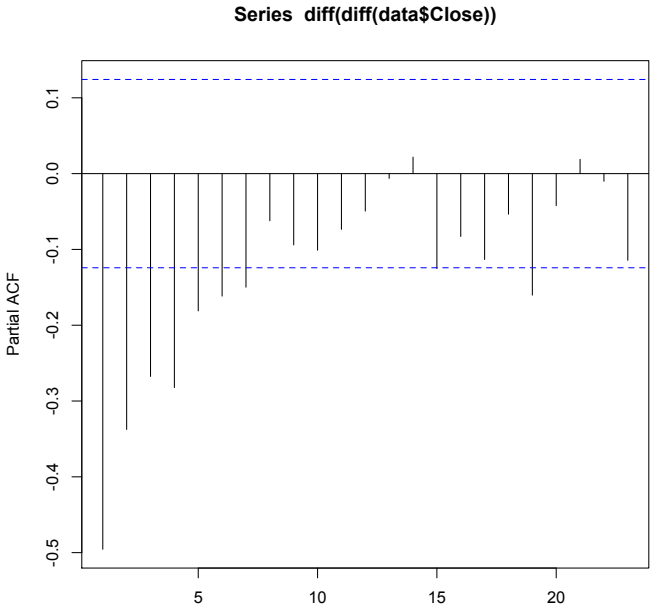
Original data
Plot the original data - Goldman Sachs stock prices over 1 year.

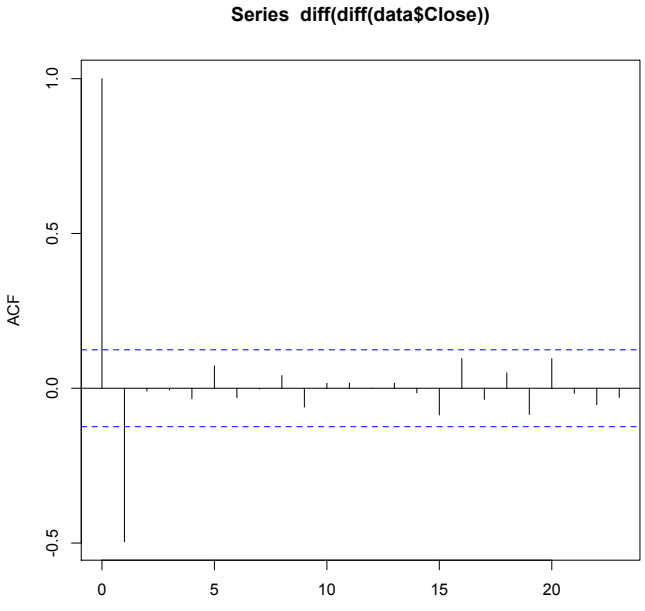


Stationarity
To make the data stationary, we need to difference it.

ARIMA model
We build an ARIMA model of order (p, d, q).

The parameter d equals the number of times we difference the data. In this case, d = 2.
To find p, we plot the partial autocorrelation function (PACF). There is 1 significant lag, after which the function starts tailing off. So p = 1.
To find q, we plot the autocorrelation function (ACF). There is 1 significant lag, after which the function starts tailing off. So q = 1.

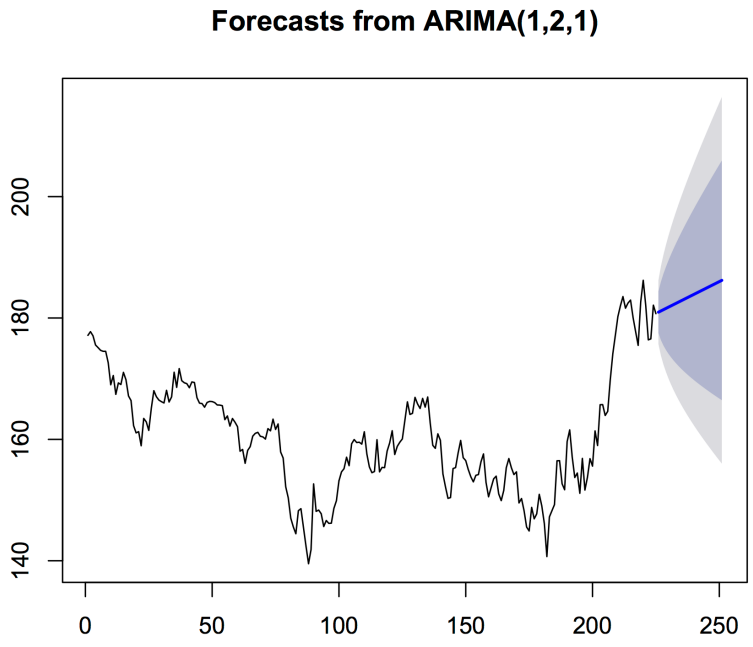




We build an ARIMA model with order(1, 2, 1).

Forecasts
We forecast stock prices for the next 25 days.
Then, we plot the forecasters prices.

	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
226	180.9603	177.5210	184.3995	175.7004	186.2201
227	181.1691	176.3370	186.0011	173.7791	188.5590
228	181.3789	175.4495	187.3084	172.3106	190.4472
229	181.5887	174.7152	188.4623	171.0765	192.1010
230	181.7986	174.0775	189.5196	169.9902	193.6069
231	182.0084	173.5073	190.5095	169.0071	195.0097
232	182.2182	172.9873	191.4492	168.1007	196.3357
233	182.4281	172.5062	192.3499	167.2539	197.6022
234	182.6379	172.0563	193.2194	166.4548	198.8210
235	182.8477	171.6320	194.0635	165.6947	200.0007
236	183.0575	171.2289	194.8862	164.9672	201.1479
237	183.2674	170.8438	195.6910	164.2671	202.2676
238	183.4772	170.4741	196.4803	163.5907	203.3637
239	183.6870	170.1178	197.2563	162.9346	204.4394
240	183.8969	169.7730	198.0207	162.2963	205.4974
241	184.1067	169.4384	198.7750	161.6735	206.5399
242	184.3165	169.1128	199.5202	161.0645	207.5686
243	184.5263	168.7952	200.2575	160.4676	208.5851
244	184.7362	168.4846	200.9877	159.8816	209.5907
245	184.9460	168.1804	201.7116	159.3053	210.5867
246	185.1558	167.8819	202.4298	158.7376	211.5740
247	185.3657	167.5885	203.1429	158.1778	212.5535
248	185.5755	167.2996	203.8514	157.6249	213.5260
249	185.7853	167.0149	204.5557	157.0784	214.4922
250	185.9951	166.7339	205.2563	156.5377	215.4526
251	186.2050	166.4564	205.9536	156.0021	216.4079



Tips
ARIMA models don't work very well for long time series with more than 200 observations. Optimization of the parameters becomes more time consuming because of the number of observations involved.

They are also poor models for long term predictions because after some time in the future the forecasts would tend to the mean of the time series.

Useful references
https://people.duke.edu/~rnau/411arim2.htm