Time Series Analysis

Lecture 3

Autoregressive Models and Moving Average Models

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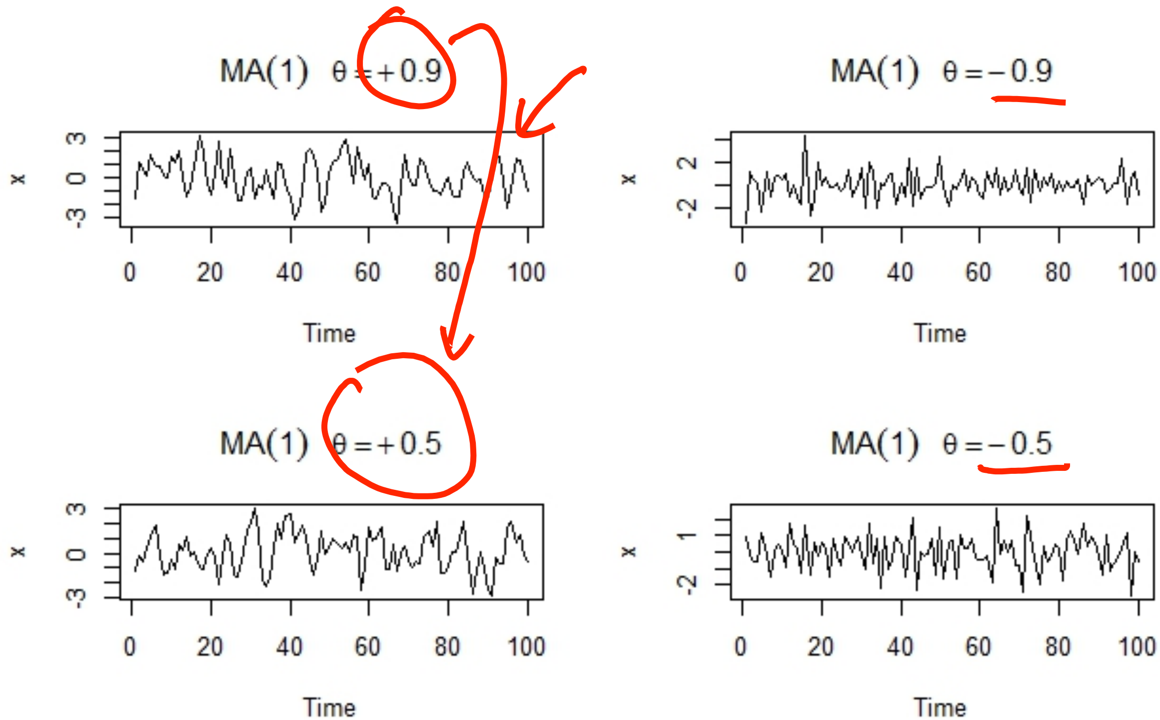
Moving Average Models,

Simulation of MA(q) Models

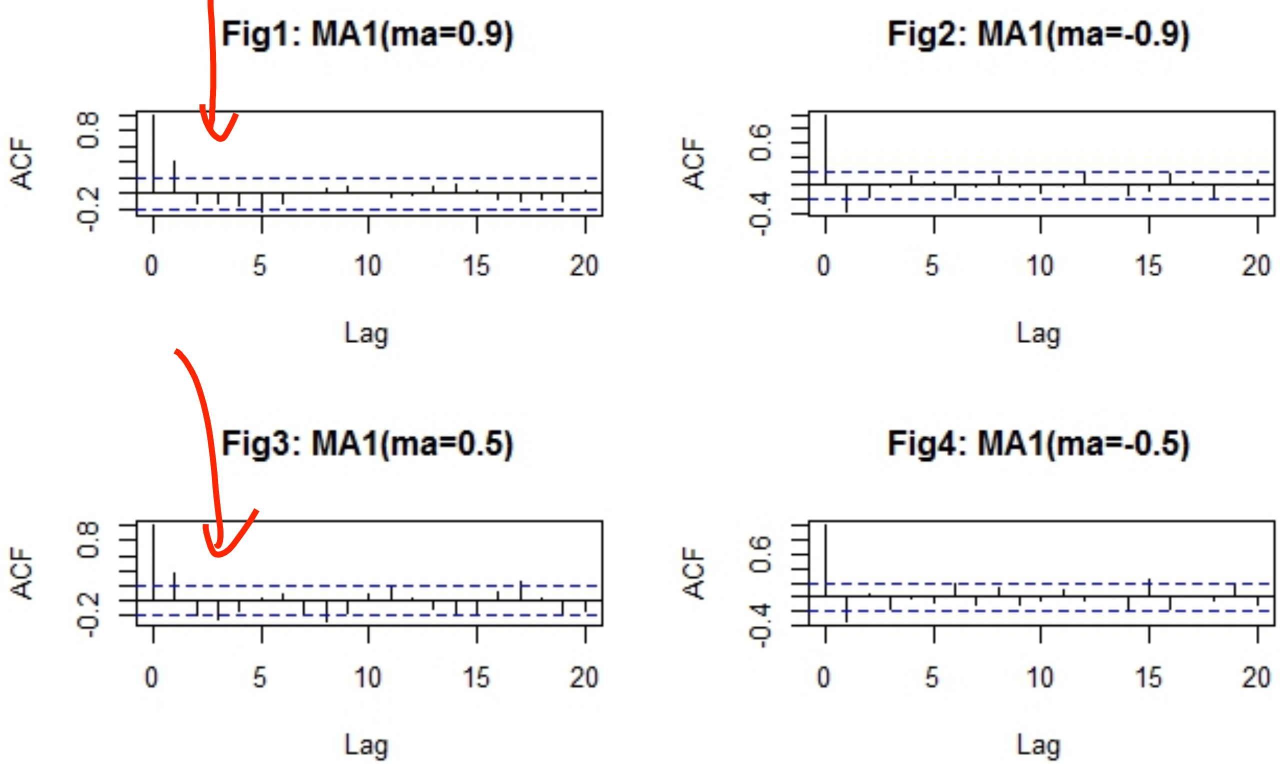
MA(1) Models: Time Series Plots

- MA models in general have “limited” memory, which can be seen from the functional form of its autocorrelation.
- For MA(1) models, its memory only lasts for one period.
- As a result, the difference in dynamic is not as big as those in AR(1) models when the AR parameter values are very different.
- The different dynamic of the MA models with positive and negative coefficients come from the positive and negative autocorrelation.



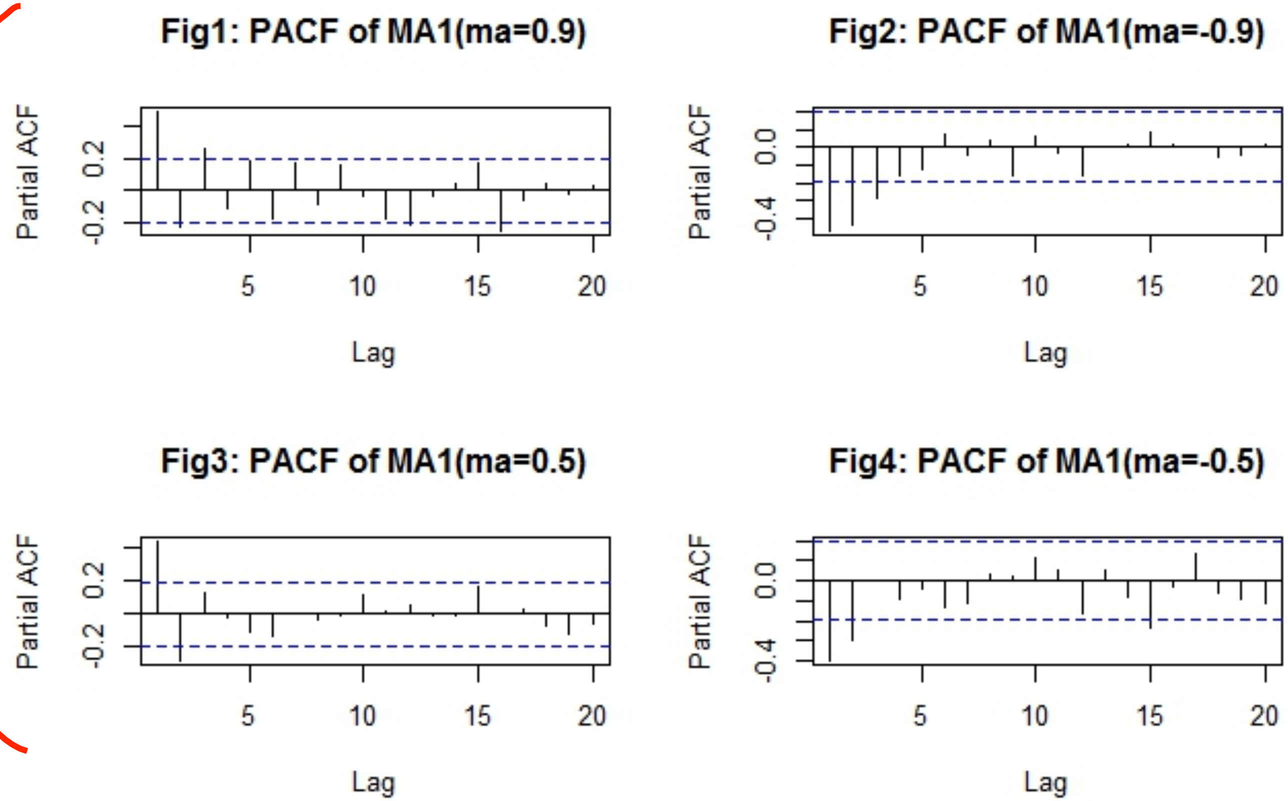
MA(1) Models: ACF Plots

1. The ACF sharply drops off after the first lag.
2. This pattern holds regardless of the value of MA parameter.
3. For MA(1) models, positive MA parameter value leads to a positive correlation and negative parameter value leads to a negative correlation.



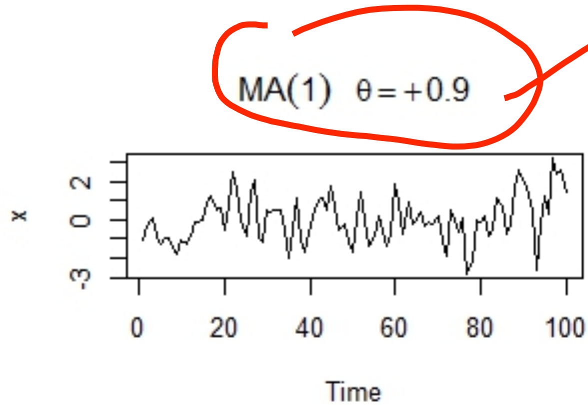
MA(1) Models: PACF Plots

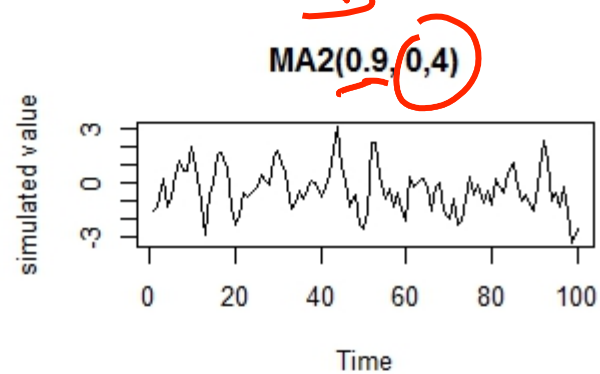
1. Unlike its ACF, the PACF of MA models decay gradually to zero.
2. This can be seen from the infinite autoregressive representation of the MA(1) process.
3. For MA(1) model, if the MA parameter is positive, the decay oscillates to zero. If the parameter is negative, the decay is “mostly” one-sided.

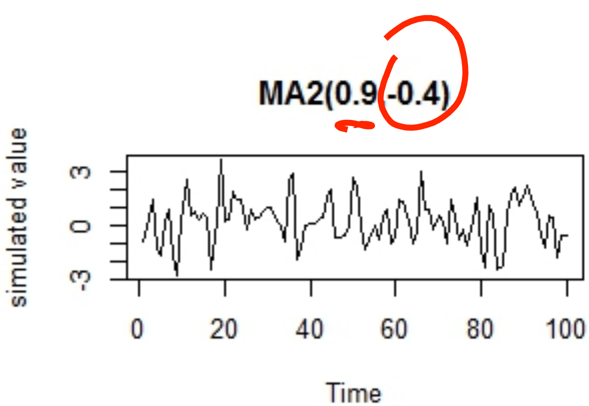


MA(2) Models: Time Series Plots 1

- MA(2) models can allow for richer dynamics than those of MA(1) models, which can be exploited to improve forecast.
- Based solely on the time series plots, it is, however, not easy to distinguish between a MA(1) and MA(2) models if they have the same value on the first MA parameter.

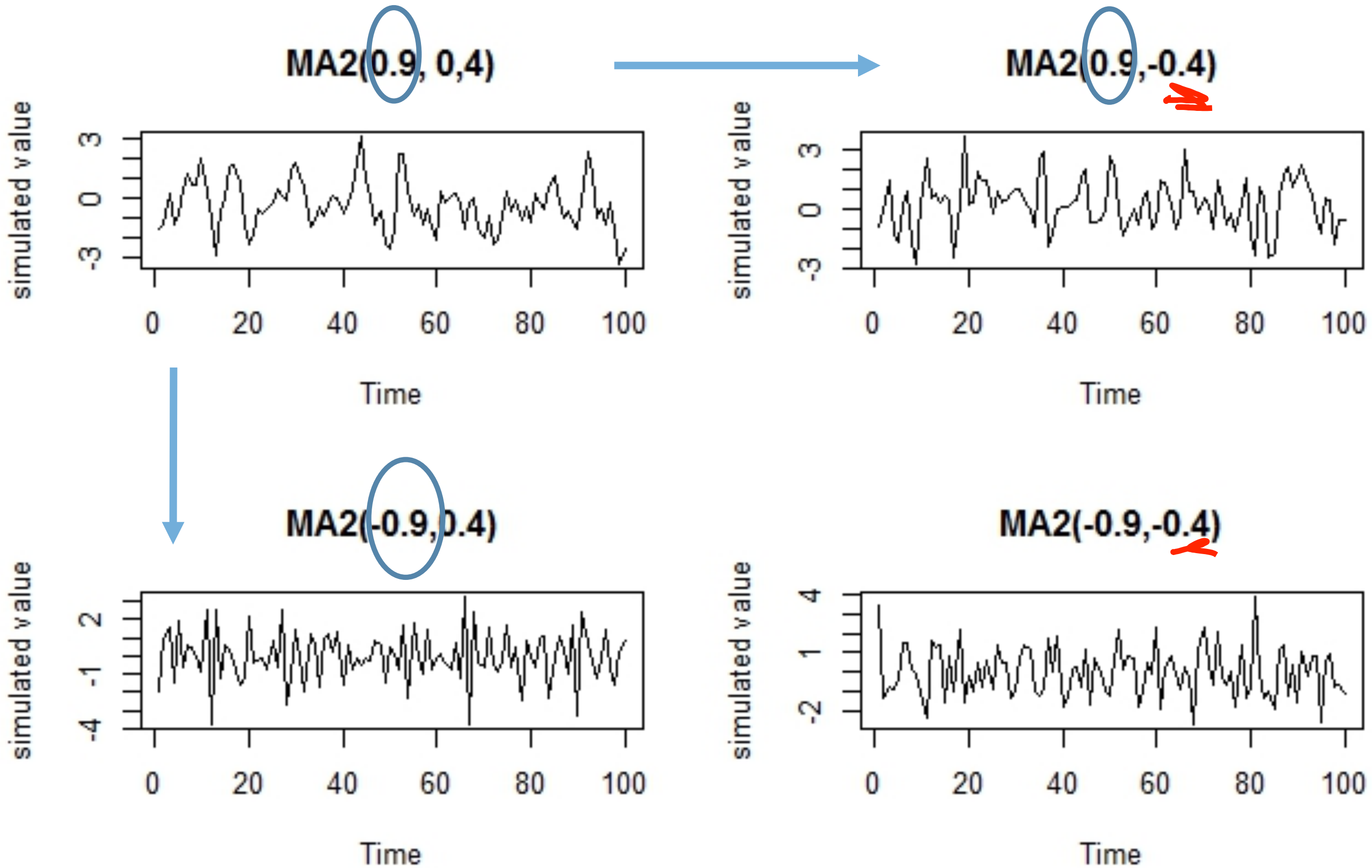






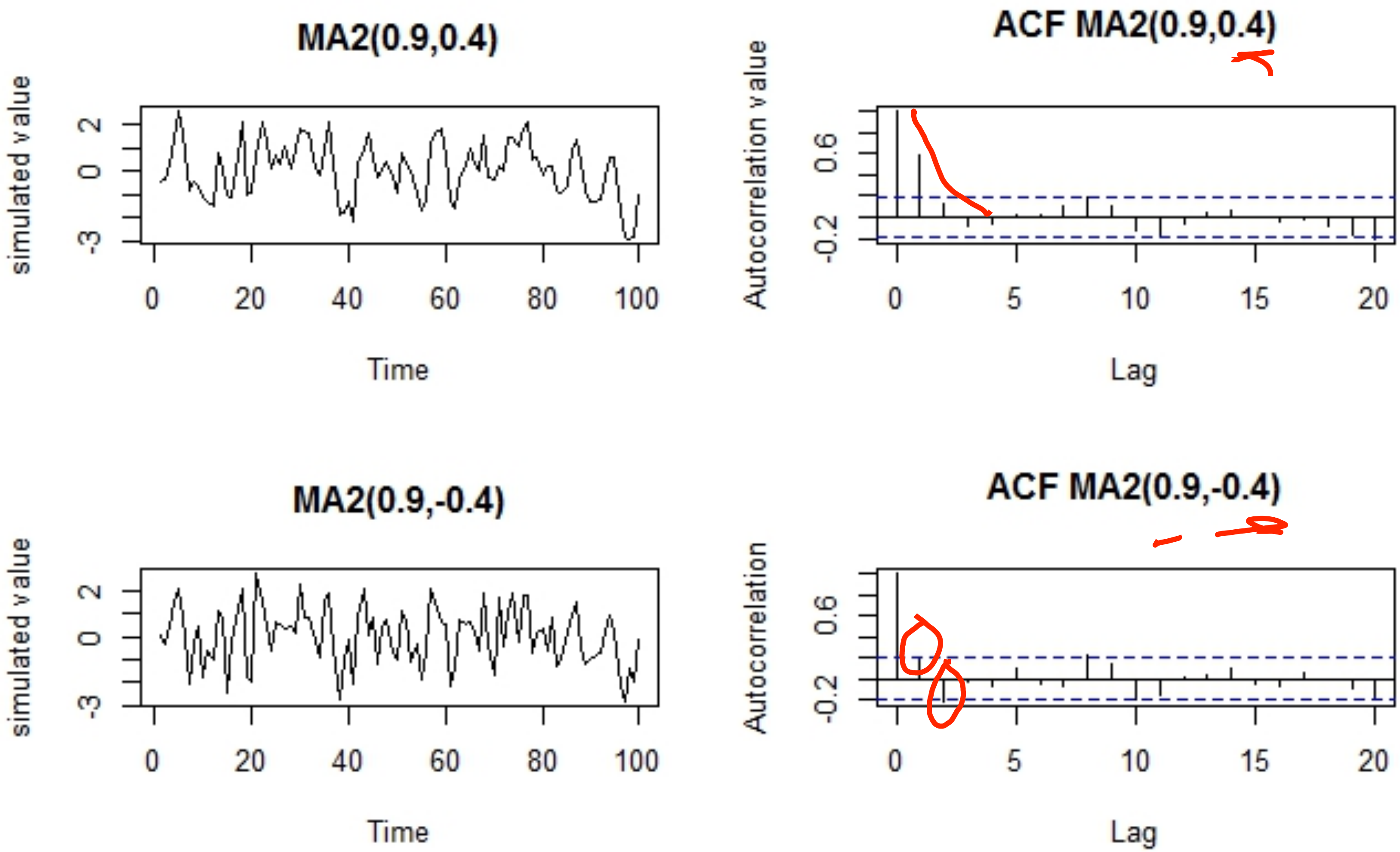
MA(2) Models: Time Series Plots 2

1. Negative MA parameters produce more volatile series.
2. The first MA parameter has a larger impact on the volatility than the second parameter.



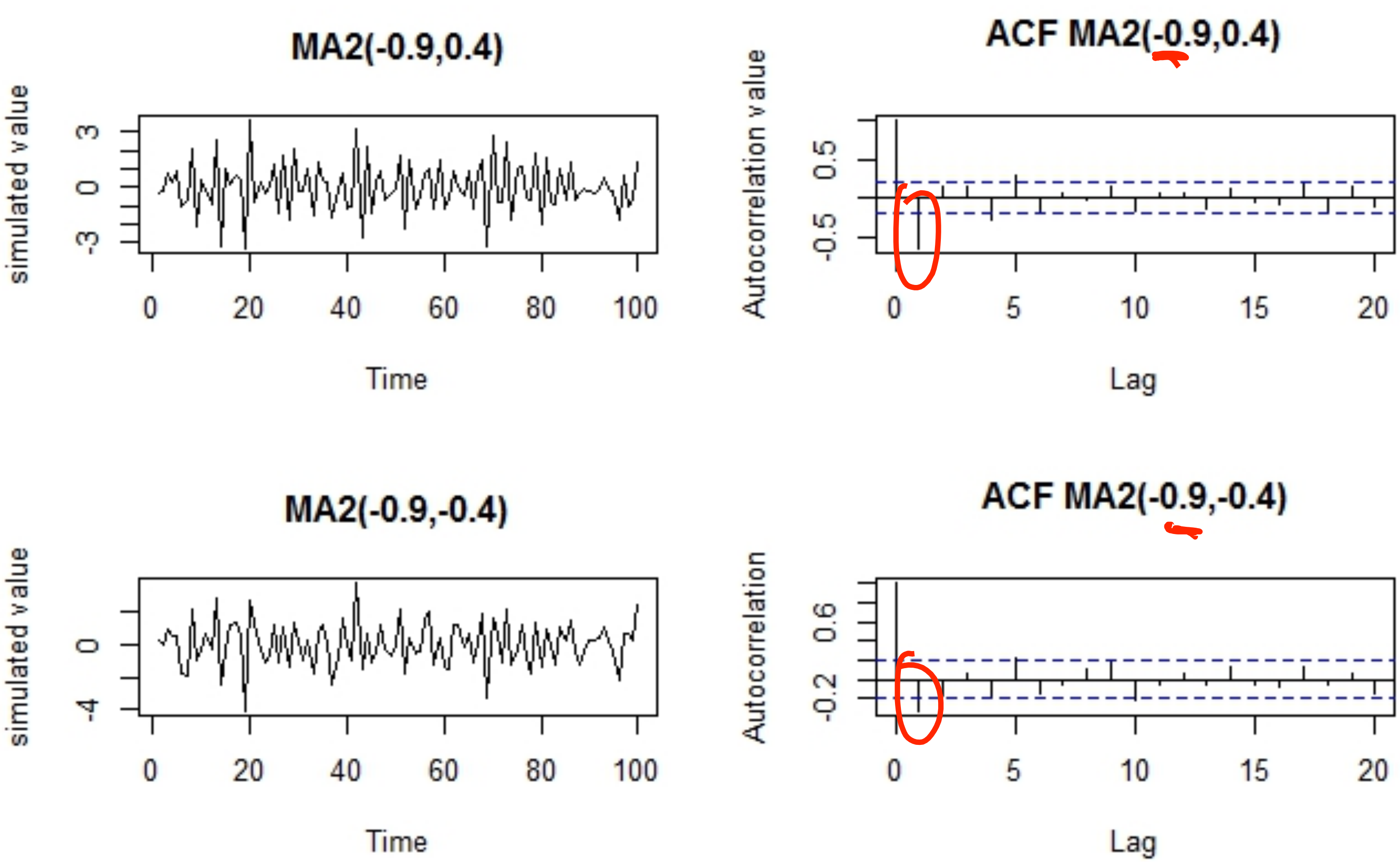
MA(2) Models: Time Series and ACF Plots 1

Observe the impact the second MA parameter has on autocorrelation.



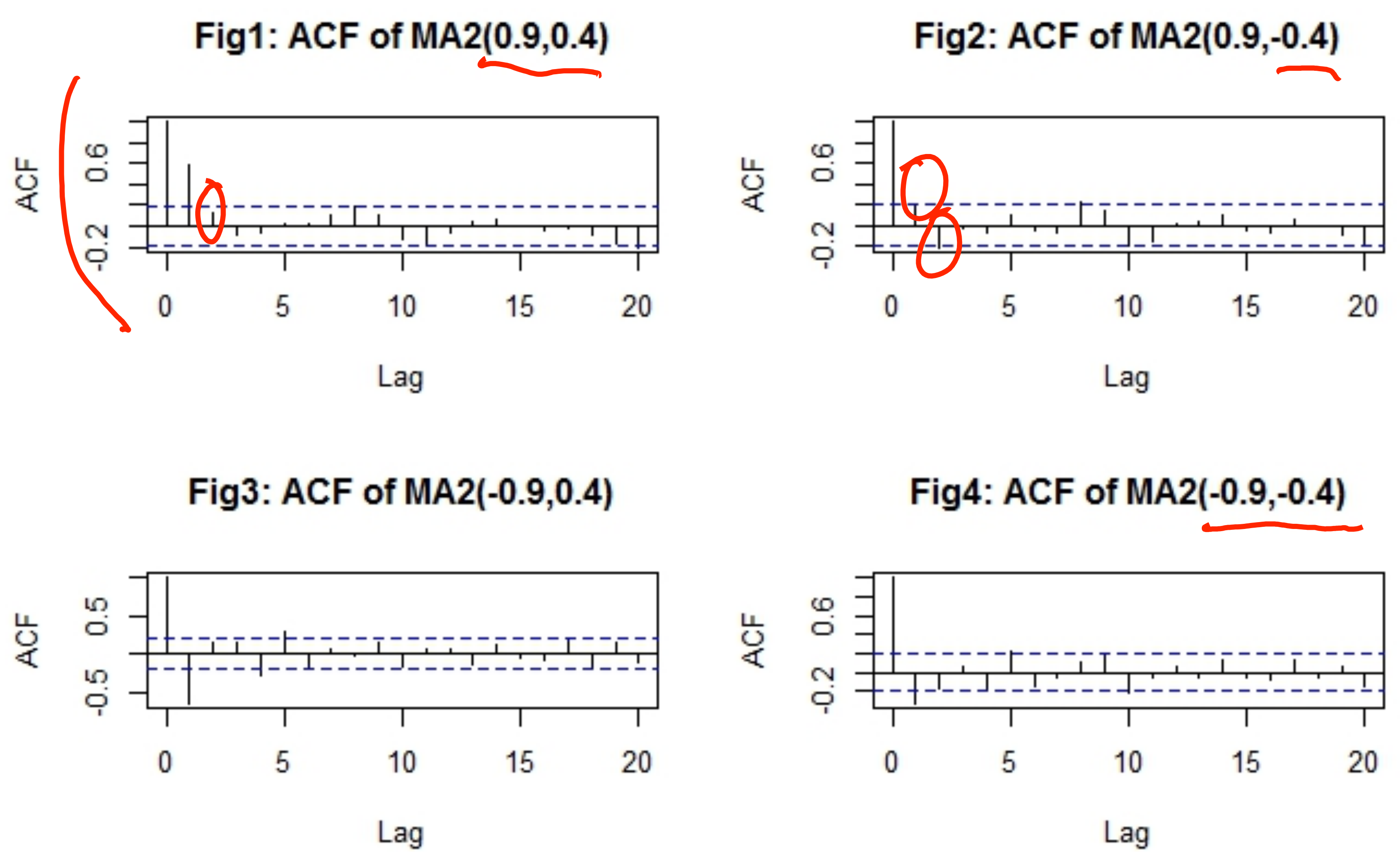
MA(2) Models: Time Series Plots 3

- The first autocorrelation is negative, as influenced by the MA parameters of the models.



MA(2) Models – Time Series Plots 3

Comparing the ACF of four different MA(2) models:



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