Time Series Analysis

Lecture 4

Mixed Autoregressive Moving Average (ARMA) Models

Autoregressive Integrated Moving Average (ARIMA) Models

Seasonal ARIMA (SARIMA) Models

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Comparing ARMA Models and AR Models Using Simulated Series Part 2: Model Identification

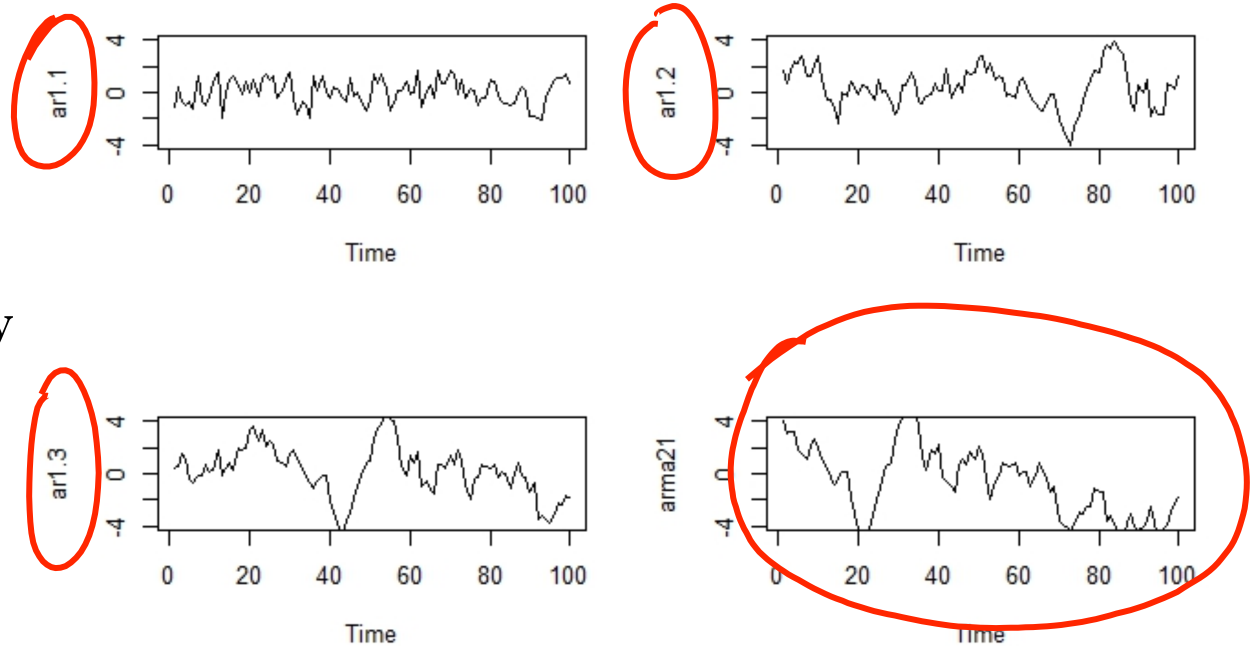
AR vs. ARMA Models: One More Example

Let's try one more example with three AR(1) models and one ARMA(2,1) model.

```
set.seed(898)
ar1.1 <- arima.sim(n = 100, list(ar = c(0.4)))
set.seed(898)
ar1.2 <- arima.sim(n = 100, list(ar = c(0.8)))
set.seed(898)
ar1.3 <- arima.sim(n = 100, list(ar = c(0.9)))
set.seed(898)
arma21 <- arima.sim(n = 100, list(ar = c(0.6, 0.3), ma = c(0.5)))
```

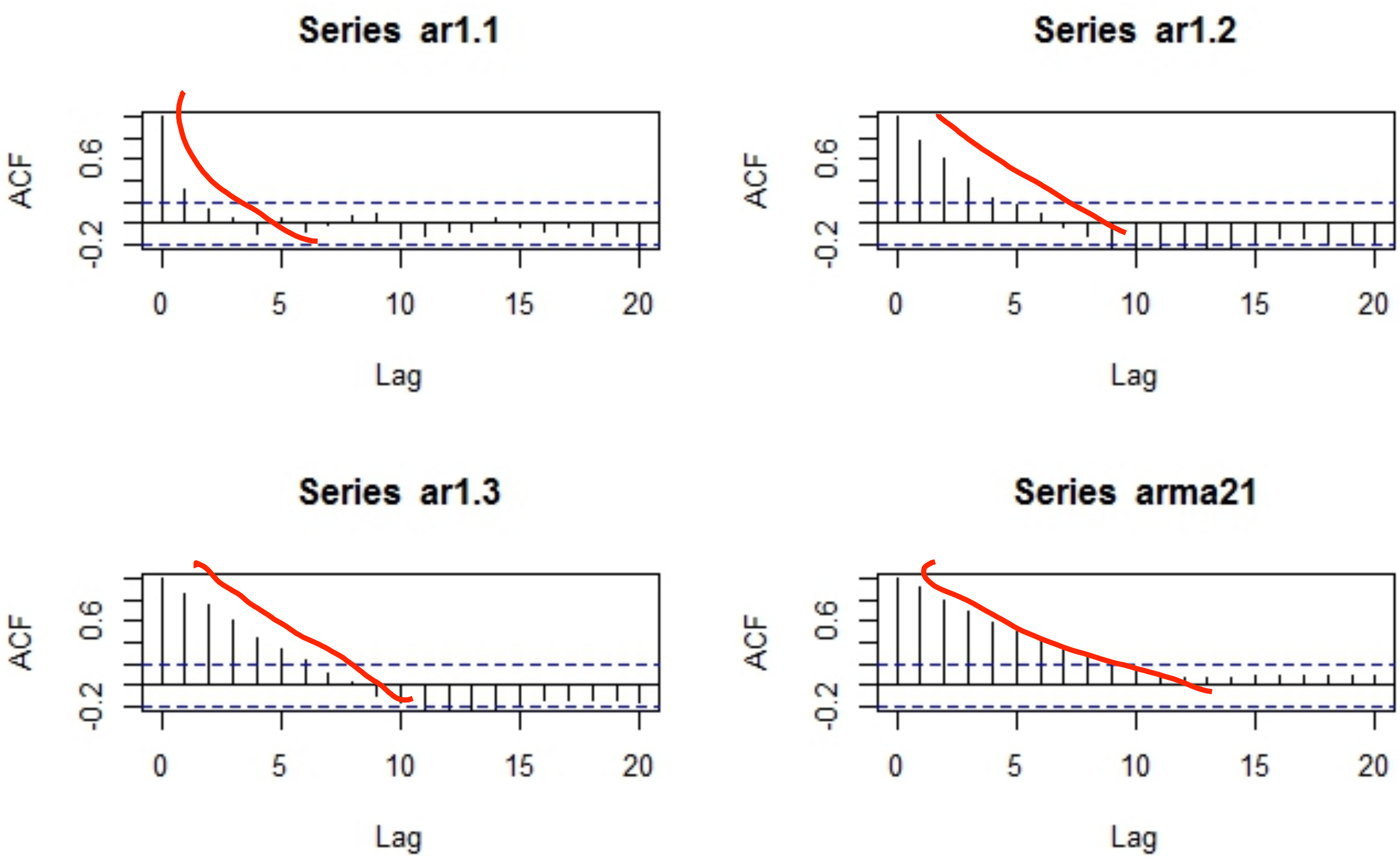
As the AR parameter gets closer to 1, the more persistent the series becomes.

Both AR1(ar=0.9) and ARMA(ar=0.6,ma=0.3) models can produce very persistent series.



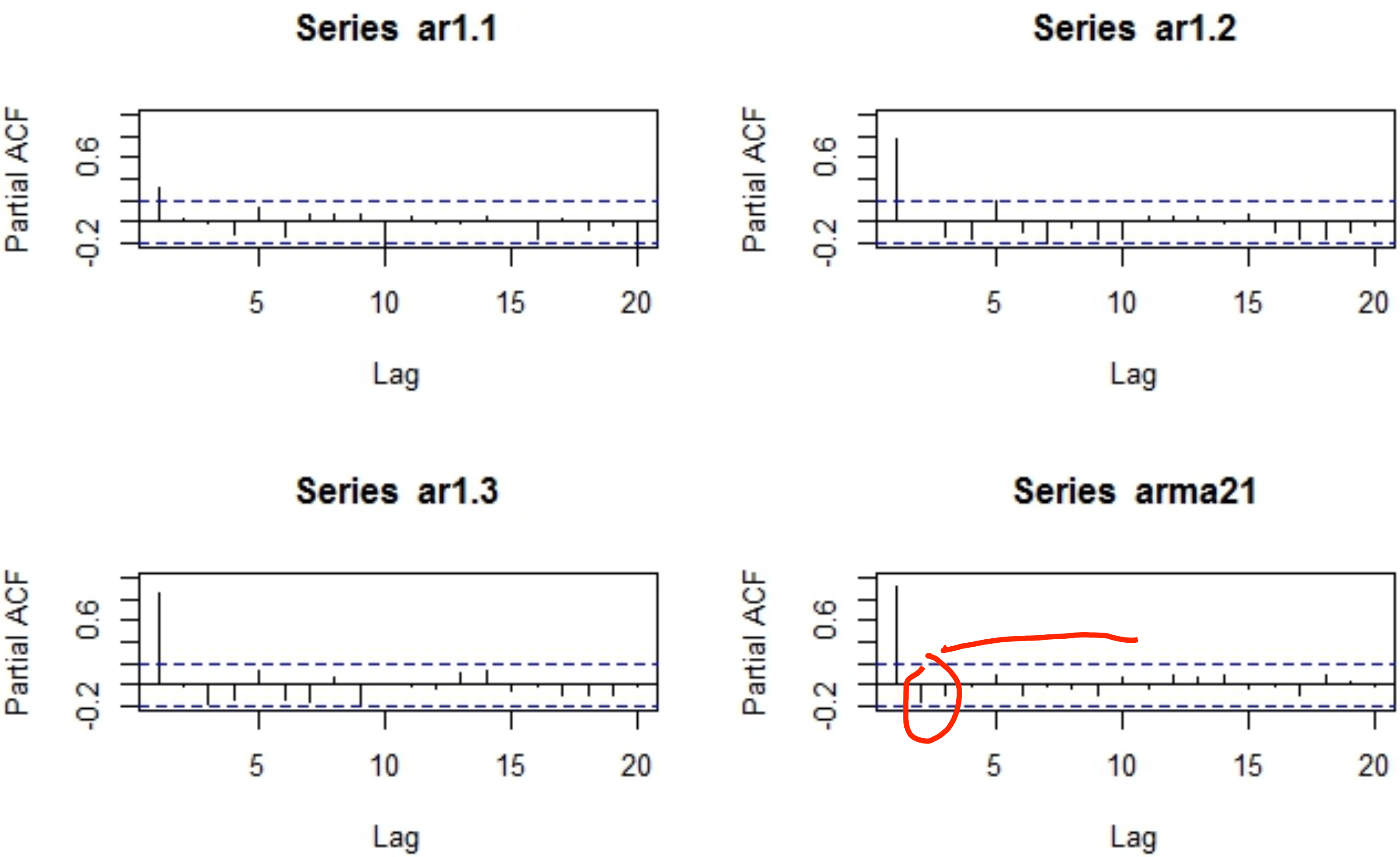
AR vs. ARMA Models: ACF

The ARMA model can produce a longer ACF series than AR models do.



AR vs. ARMA Models: PACF

The PACFs between the AR1.3 and the ARMA21 model are still not indistinguishable.



ARMA-Type Model Identification

In general, the ACF and PACF of AR, MA, and ARMA models have the following characteristics:

	AR(p)	MA(q)	ARMA(p,q)
ACF	Tails off	Cuts off after lag q	Tails off
PACF	Cuts off after lag ~~q~~ p	Tails Off	Tails off

- As we have seen in the simulated examples, these features can be used only to narrow down the possibilities of processes underlying a realization we observe.

- It is typical that in practice we estimate a series of ARMA models of different orders and use various statistics, such as AIC and BICs, and perhaps even forecast performance to choose a model.

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