ARIMA model identification [duplicate]

This question already has an answer here:

Estimate ARMA coefficients through ACF and PACF inspection *2 answers*

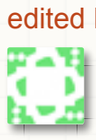
Having a bit of difficulty identifying the appropriate ARIMA model by looking at ACF/PACFs.

I know that AR(1) models, the ACF has a geometric progression from its highest value at lag 1 and the PACF has a spike at lag 1 and then then cuts off afterwards.

Could someone possibly explain how I identify the rest? AR and MA please?!?

time-series self-study linear-model arma

edited May 5 '14 at 1:40



Glen_b ♦
192k 21 351 676

asked Jan 25 '14 at 14:50

James
26 1 2

marked as duplicate by Greenparker, whuber ♦ Jun 9 '16 at 14:16

This question has been asked before and already has an answer. If those answers do not fully address your question, please ask a new question.

2 Pure AR(p) will have a cut off at lag p in the PACF. Pure MA(q) will have a cut off at lag q in the ACF. ARMA(p,q) will (eventually) have a decay in both; you often can't immediately tell p and q immediately from empirical ACF and PACF though with some practice you can get better at it. – Glen_b ♦ Jan 26 '14 at 3:03

1 Note that even in the case of simple MA or AR, the sample ACF and PACF may be quite unclear as far as suggesting a model. – Glen_b ♦ Jan 26 '14 at 5:10

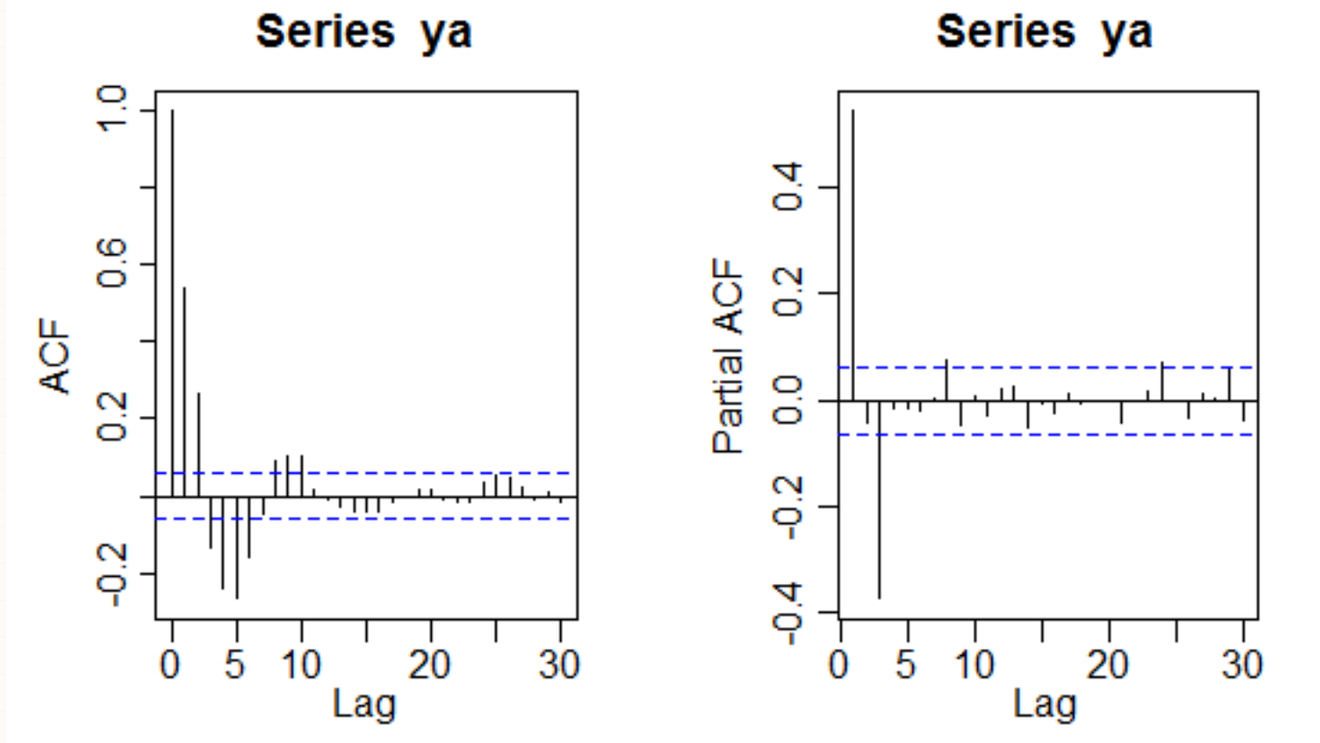
2 To build on @Glen_b's useful comments. Also bear in mind that it's not a one shot game; that is, model identification is part of an *iterative process*, which involves model identification, estimation, diagnostic checking, and possibly a return to model identification if certain criteria (stationarity, invertibility, white noise residuals, parsimony) are not satisfied. – Graeme Walsh Jan 26 '14 at 11:53

Have a look at standard time series econometrics textbook like Hamilton (1994) or Enders (2005). – Metrics May 7 '14 at 16:49

1 thanks, @Metrics, Do you happen to have the page numbers or roughly what section in the two books? – Tim May 7 '14 at 17:14

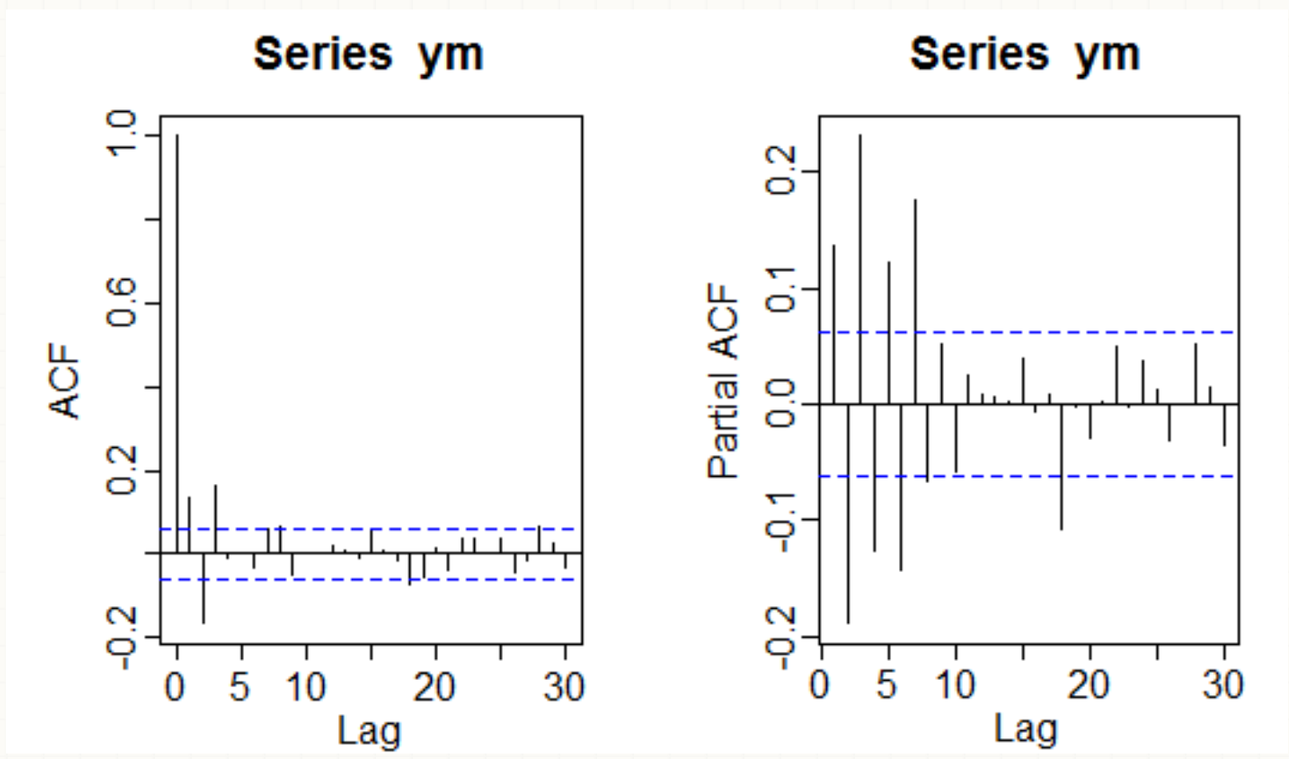
2 Answers

1) A pure AR(p) will have a cut off at lag p in the PACF:



ACF and PACF of a long AR(3) process

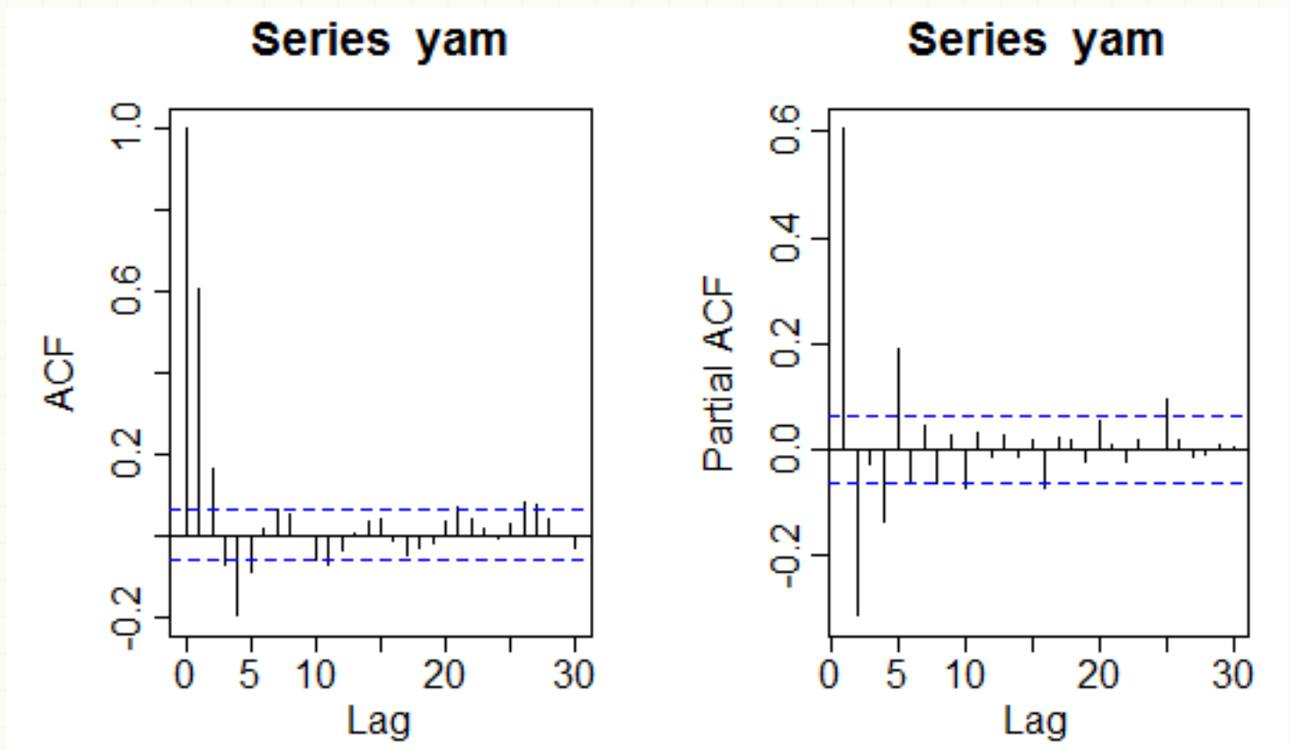
2) A pure MA(q) will have a cut off at lag q in the ACF.



ACF and PACF of a long MA(3) process

3) ARMA(p,q) will (eventually) have a decay in both; you often can't immediately tell p and q from empirical ACF and PACF -- though with some practice you can get better at it.

As Graeme Walsh points out, model identification is part of an iterative process (explicitly so in Box and Jenkins).



The ACF plot above suggests perhaps an MA(4) while the PACF plot might suggest an AR(5). One might instead try say an ARMA(1,1) and see what was "left over". There are other tools than the ACF and PACF, but they're usually even harder to interpret in practice (and may require even larger sample sizes to give a reliable indication).

edited Oct 26 '16 at 20:31

answered May 5 '14 at 2:05

Glen_b ♦

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About the ACF and PACF of ARMA(p,q) one can say: ACF tails off after lag (q-p) and PACF tails off after lag (p-q) [e.g. Wei (2005), S. 109], which makes it difficult to identify the orders p and q. Usually one uses the information criteria like the AIC, BIC, FPE, ... One estimates severeal models with different orders p and q and selects the one with the smallest value of the respective criterion.

answered May 7 '14 at 16:57

DatamineR
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thanks. (1)what kind of tail-off after lag (q-p) in ACF and after lag(p-q) in PACF? Exponentially? (2) If p>q, q-p < 0, so what does lag (q-p) in ACF mean? If q>p, what does lag (p-q) in PACF mean? – Tim May 7 '14 at 17:13

(3) what does ACF look like within lag(q-p)? What does PACF look like within lag(p-q)? – Tim May 7 '14 at 17:15

Right, the formulation is a little bit confusing. But anyway, the the ACF and PACF do not cut off after some point like they do for AR(p)- or MA(q)-models, wherefore the ic are used for identification of ARMA-order. – DatamineR May 7 '14 at 17:32