APTS Statistical Modelling: Comments on Practical 1

A. C. Davison and J. .J. Forster

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(a) Figure 1 shows the AIC traces for the four different sample sizes. As n increases the initial drop becomes steeper, so that the minimum acceptable order is identified more clearly, but the subsequent increase does not change so much, so that some over-fitting of the model, i.e. choice of autoregressive orders that are too large, remains evident even for large n

(b) Figure 2 shows the AIC traces for the four different sample sizes, when the data are generated from an MA(1) model. This is not within the AR(p) class of models (in fact it is equivalent to an AR(∞) model), so AIC tries to fit models of increasingly higher order to capture this.

(c) Figure 3 shows the BIC and AICC traces for the $n = 20$, 100, when the data are generated from an AR(2) model. Note how the BIC penalises over-complex models more strictly than does the AIC, and how AICC is intermediate, working better for small n, but becomes equivalent to AIC as n increases.

Figure 4 shows the BIC and AICC traces for the $n = 20$, 100, when the data are generated from an MA(1) model but before we fit a succession of AR models. In this case the true MA model is not within the model class being fitted, so as n increases the AIC_c tries to fit models that are larger and larger to allow for this, while the BIC over-penalises and so cannot do so.

(d) Figure 5 shows the traces for the unbiased AIC_u for $n = 20$, 100. This is not very different from the results for AIC_c.

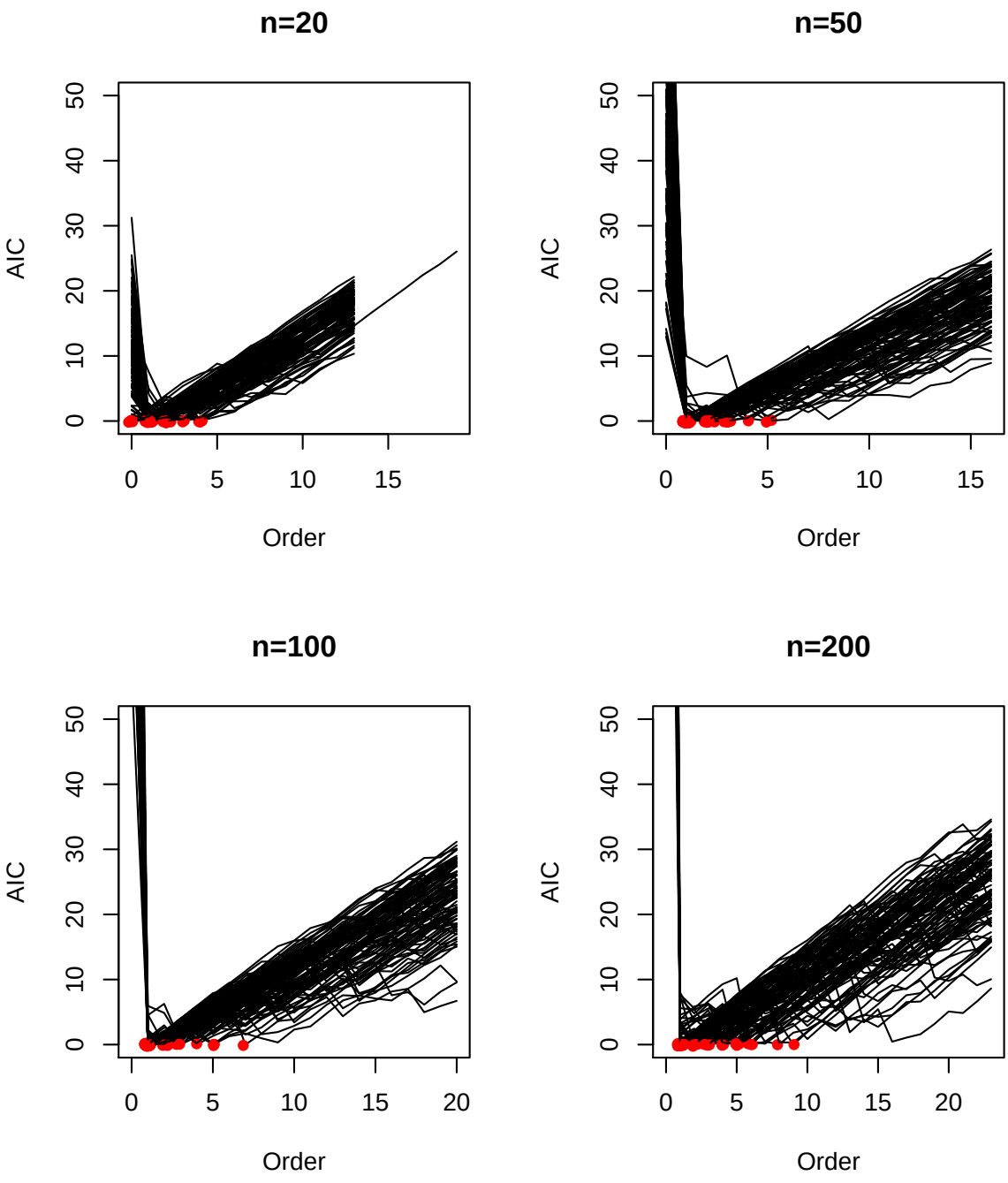

Figure 1: Model selection results for AR(1) models with $n = 20, 50, 100, 200$.

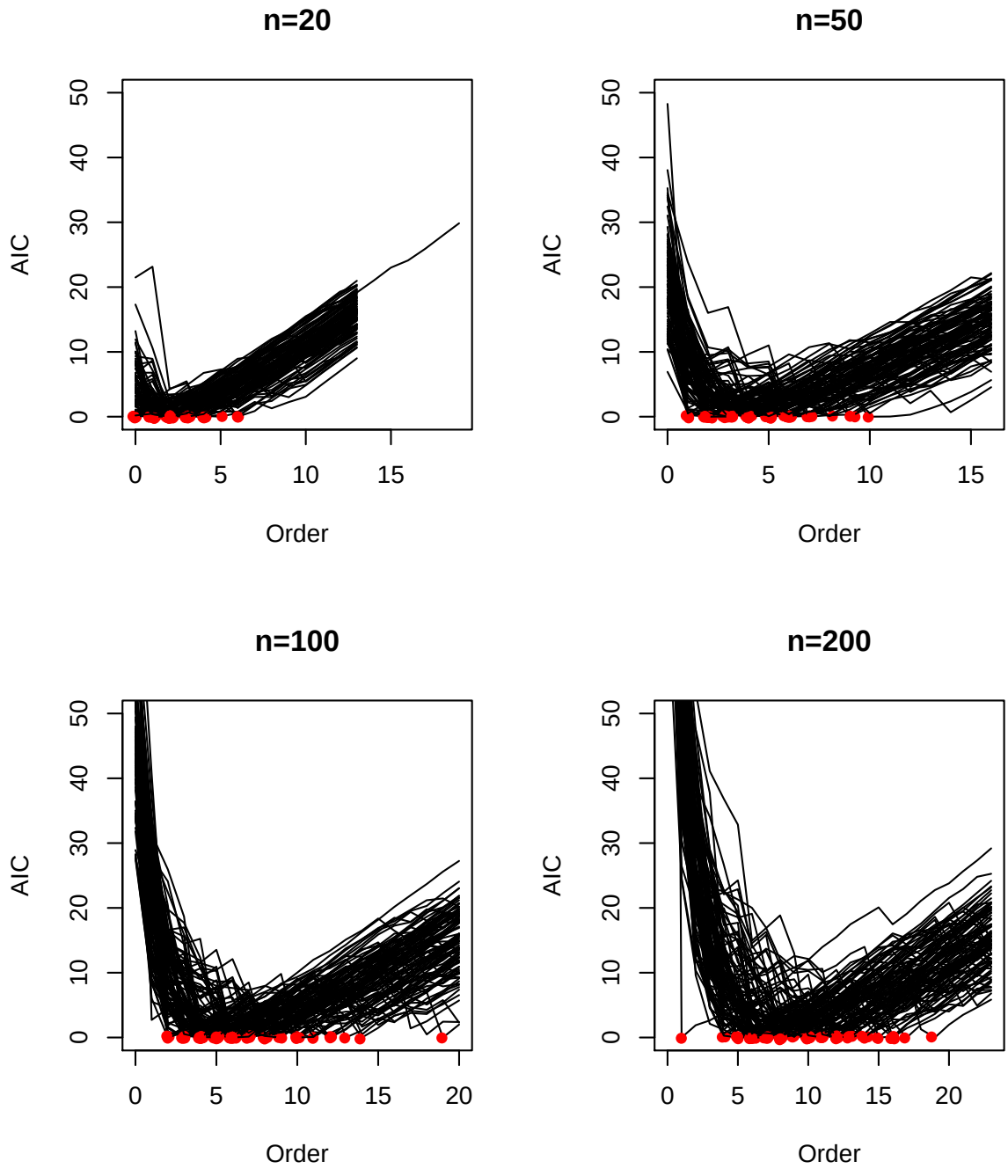

Figure 2: Model selection results when AR models are fitted to MA(1) data with $n = 20$, 50, 100, 200.

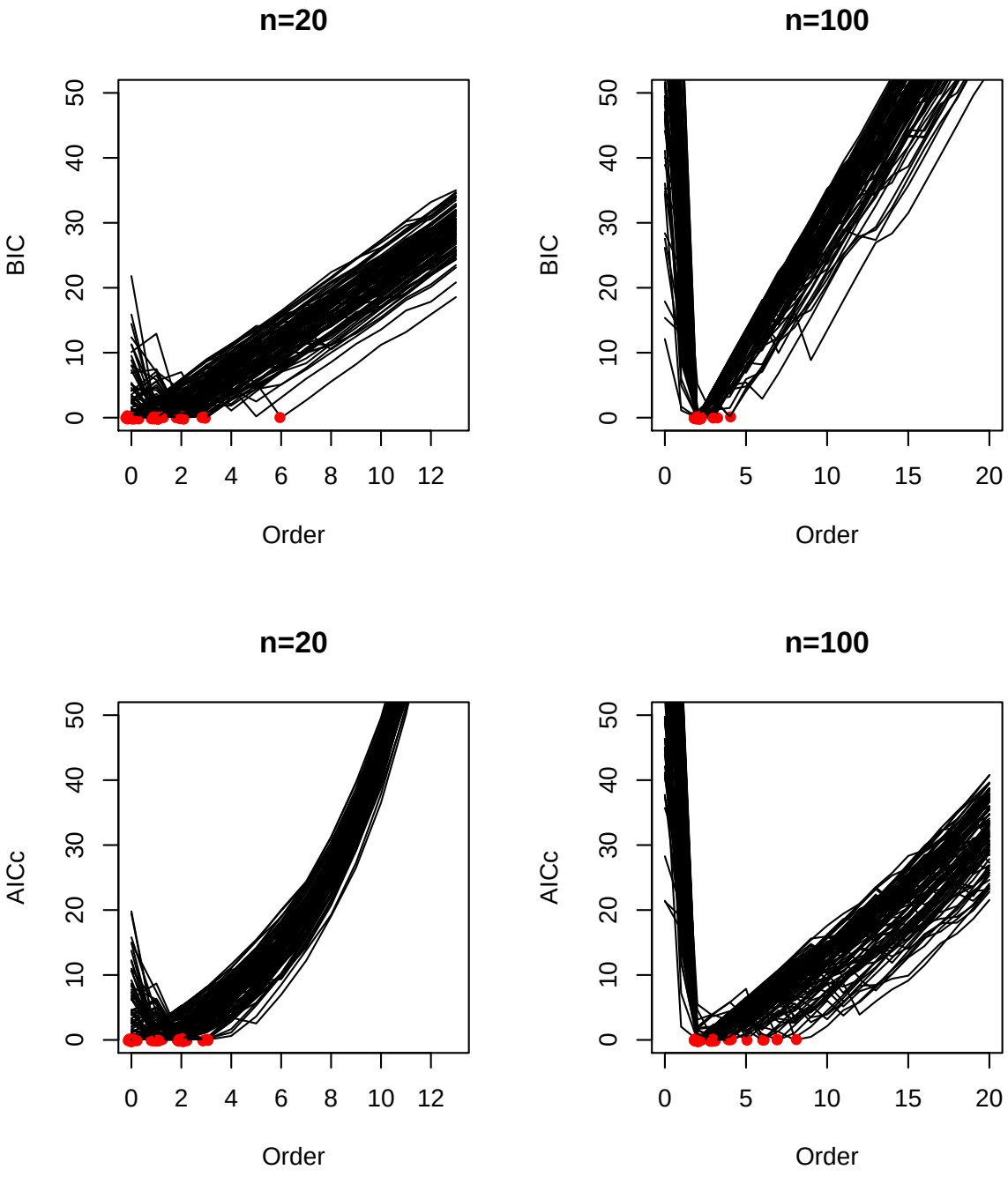

Figure 3: Model selection results, using BIC and AICc, when AR models are fitted to AR(2) data with $n = 20, 100$.

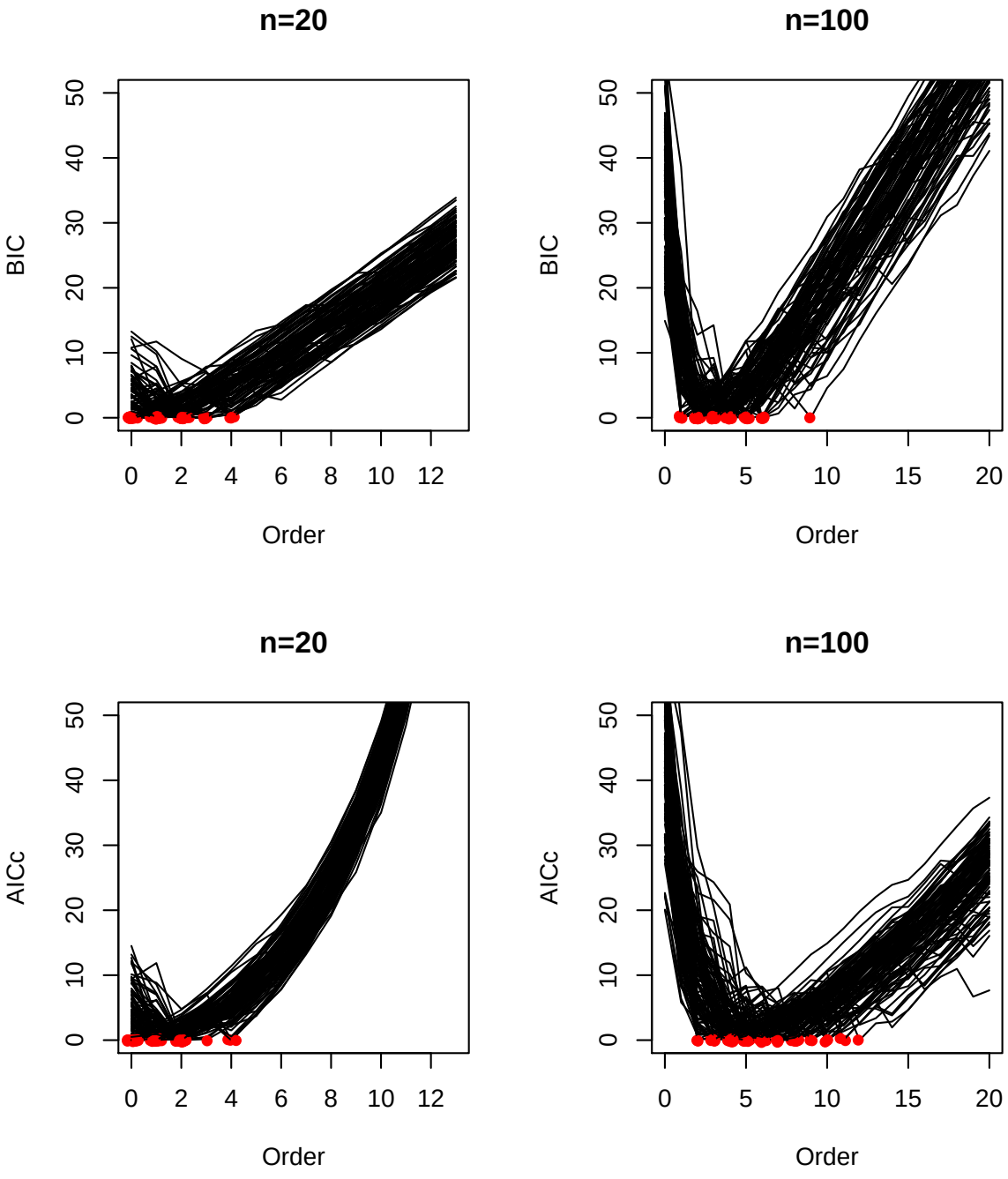

Figure 4: Model selection results, using BIC and AICc, when AR models are fitted to MA(1) data with $n = 20, 100$.

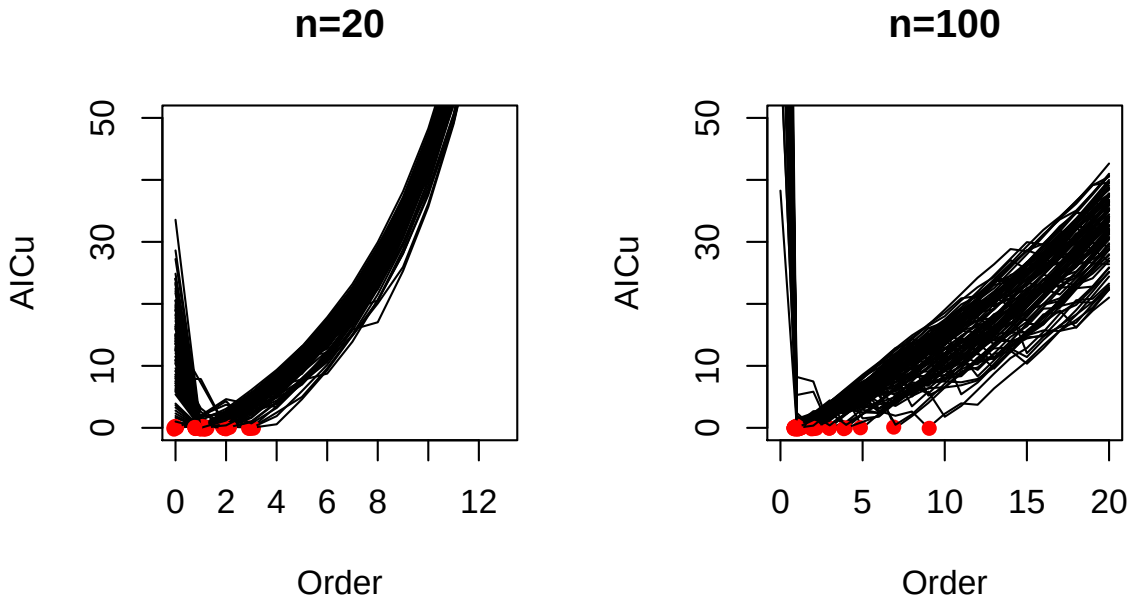

Figure 5: Model selection results, using AIC_u, when AR models are fitted to AR(1) data with $n = 20, 100$.