Checks of Adequacy and Modeling Procedure

Let A_0 be the RSS of the unrestricted model (H_1)

Let A_1 be the RSS of the restricted model (H_0)

Then, let us define ratio

$$F = \frac{(A_1 - A_0)/s}{A_0/(N-r)}$$

where:

s - number of restricted parameters

N - number of samples

r - number of estimated parameters

If both ARMA(2n+2, 2n+1) and ARMA(2n, 2n-1) are adequate, then $F \sim$ Fischer distr $(s, N-r)$

Hence, reduction in RSS is significant if

$$F > F_{s, N-r, \alpha}$$

α - Confidence rate, usually set to 0.95 or 0.99

you can get it from table D (pp. 508-513)

If $F > F_{s, N-r, \alpha}$ => I must continue fitting higher and higher orders

If $F < F_{s, N-r, \alpha}$ the new model did NOT improve RSS significantly and the old model can be considered adequate

Problem The test is correct ONLY if both models are adequate! $\Rightarrow$ you can get a bogus small RSS just because theoretically, the test is off!

That's why you'll do that last check to see if $\hat{\rho}_k$-s are small ($\hat{\rho}_k \le \frac{2}{\sqrt{N}}$) i.e. if residuals are indeed white!

So, when I have N-samples and am testing

ARMA $(2n+2, 2n+1)$ vs ARMA $(2n, 2n-1)$

A_0 A_1

# of restricted params $s = 4$

# of estimated params for unrestricted model?

$$r = \underbrace{2n+2}_{\phi\text{-s}} + \underbrace{2n+1}_{\theta\text{-s}} + \underbrace{1}_{\mu} = 4n+4$$