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# Determining the number of factors in fractionally integrated factor models

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This paper proposes three different approaches to overcome limitations for factor selection in fractionally integrated factor models. Two of our methods for determining the number of factors include the approach of Zhang, Robinson and Yao (2019, JASA) that was designed for identifying the cointegration rank in VAR models. We extend their model selection approach by generalizing it to fractionally integrated factor models. In our two-step procedure we first estimate the cointegration rank as in Zhang, Robinson and Yao (2019, JASA) to obtain the non-stationary fractional factors. In the second step we generalize the model selection criteria by Bai and NG (2002, ECTA) to fractionally integrated factors with memory smaller  $1/2$  to obtain the number of asymptotically stationary factors. Before carrying out the second step the non-stationary factors need to be removed from the data. We investigate two alternatives: i) subtract the estimated non-stationary part from the observable variables, ii) project out the non-stationary factors. In our third approach we directly consider the model selection criteria of Bai and NG (2002, ECTA) without prior removing the non-stationary variation in the observable data. In the Monte-Carlo simulations all three methods show satisfactory results, in particular the third approach performs surprisingly well.