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# Long-run exclusion and the determination of cointegrating rank: Monte Carlo evidence

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**Abstract**

This note investigates long-run exclusion in a cointegrated vector autoregressive (VAR) model from the viewpoint of finite-sample statistical inference. Monte Carlo experiments show that, in various circumstances, a mis-specified partial VAR model, which is justified by the existence of a long-run excluded variable, can lead to better finite-sample inference for cointegrating rank than a fully specified VAR model. Implications of long-run exclusion for econometric modelling are then considered based on the Monte Carlo study.


*JEL classification:* C32; C52; C63

*Keywords:* Long-run exclusion; Cointegrating rank; Cointegrated vector autoregressive model; Monte Carlo experiment

## 1. Introduction

The objective of this note is to investigate long-run exclusion in a cointegrated vector autoregressive (VAR) model from the viewpoint of finite-sample statistical inference. Various Monte Carlo experiments are conducted for this purpose. The introductory section defines the concept of long-run exclusion using a cointegrated VAR model and then describes what needs to be investigated in the Monte Carlo study.

Let us consider a $p$-dimensional cointegrated VAR($k$) model for $X_t$:

$$\Delta X_t = \alpha\beta' X_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta X_{t-i} + \varepsilon_t, \quad \text{for } t = 1, \ldots, T, \tag{1}$$

where a sequence of innovations $\varepsilon_t$ has independent and identical normal $N(0, \Omega)$ distributions conditional on $X_{-k+1}, \ldots, X_0$, and the parameters are defined such that $\alpha, \beta \in \mathbf{R}^{p\times r}$ for $r<p$ and $\Gamma_i \in \mathbf{R}^{p\times p}$. The cointegrated VAR model is developed by Johansen [6,7] for the purpose of modelling non-stationary time series data. The parameters $\alpha$ are called adjustment vectors, while $\beta$ are referred to as cointegrating vectors. The relationships $\beta' X_{t-1}$ are called cointegrating relationships, representing $r$-dimensional stationary linear combinations of non-stationary variables, and $r$ is referred

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