A Note on the Estimation of the Nova Scotia Industry Model

Testing OLS versus SURE

Introduction

The paper examines Canmac's estimation of the Nova Scotia Industry Model. The model consists of 60 equations estimating Gross Domestic Product, Employment and Wages by industry for Nova Scotia. We compare model results for ordinary least squares (OLS) and Zellner's seemingly unrelated regression estimates (SURE). The employment block and wage block has a structure amiable to SURE estimation. Appendix A provides a model listing.

Technical Background

Least squares estimation is the standard approach to estimating a multiple regression model. Its standard assumptions are well knowns as is the result that under the appropriate assumptions, OLS estimators are BLUE – best linear unbiased estimators. The seemingly unrelated equations model is a special type of multi-equation system for models. It occurs when each equation in the model is specified as a function of exogenous variables but the error terms are correlate across the equations. When this is the cast, OLS estimation is no longer BLUE but it is consistent. One can increase the efficiency of the estimation using the SURE technique. For ordinary least squares the estimation formula is:

$$\hat{B} = (x'x)^{-1} x'_y$$

for SURE estimation, the formula is

$$\hat{\hat{B}} = (x'\Omega^{-1}x)^{-1} x'\Omega^{-1} y$$

Where Ω is the covariance matrix of the error across equations.

In practice, SURE estimation is done in two steps. In step 1 each equation in the model is estimated by OLS. The residuals are used to then estimate Ω – the covariance matrix across equations. In step 2 we apply generalized least squares with Ω estimated from step 1.

Estimation Comparison

An examination of the OLS and SURE estimation results provided in Appendix A reveal the estimated parameters are close in magnitude

One does not have to conduct a statistical verification of the results. The casual observer can see that coefficients are very close without the need to undertake further testing.

The second performance measure employed for the alternative estimators was the out-of-sample performance. The GDP block was re-established leaving five observations outside the estimation samples. A comparison of the equation prediction with actuals shows the forecast performance for either OLS or SURE were equal with SURE performing best in 50% of the cases and OLS performing best in 50%.

Appendix A

Nova Scotia Industry Sub Models

OLS, SURE Estimates

(contact Canmac for detailed tables)