Book of Abstracts

GHH – Econometrics Conference

in honour of

Grant H. Hillier

University of Southampton

May 21 and 22, 2015

University of Amsterdam

Approximations to the Distribution of Conditional Moment Test Statistics

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Abstract

Conditional moment (CM) tests are frequently used as diagnostic checks on an assumed probability structure for observed data. This paper presents second order Edgeworth-type approximations to the null distribution of the outer-product-of-gradients (OPG) form of CM test statistics in a likelihood framework, providing the first analytic evidence on the poor performance of the OPG form of the test. The magnitude of the second order $O(n^{-1})$ term of the approximation is compared to that obtained for the fully efficient (FE) form of the test considered by Harris (1985) and Chesher and Spady (1991). A number of models are considered in which this term for the OPG form is considerably greater than that for the FE version of the test, the dimension of the test problem being an important factor in determining their relative sizes. Consequently, our results indicate that for many cases considerably larger sample sizes than for FE forms are required for the $O(n^{-1})$ and, therefore, the O(1) approximations for the OPG CM test to be effective and that, in some cases, astronomic sample sizes are necessary.

Second-Order Comparisons for Nonparametric Conditional Moment Restrictions Models

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Abstract

This paper uses local generalized empirical likelihood (GEL) estimation to define a class of estimators and test statistics for a particular nonparametric conditional moment restrictions model. The paper shows that the local empirical likelihood estimator has the smallest second order bias within the class of local GEL estimators, and that local empirical likelihood ratios are the only local GEL statistics admitting a Bartlett correction. The paper also proposes bias corrected local GEL estimators as well as modified GEL statistics that are second order accurate. Monte Carlo simulations illustrate the finite sample properties of three GEL local statistics and compare them with those based on a local GMM estimator. The results suggest that the proposed estimators and test statistics have competitive finite sample properties

Keywords: Coverage accuracy, Edgeworth expansion, Kernel estimation, Stochastic expansion

A General Result on the Identification of Statistical Models

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Abstract

The paper considers a general setup to investigate the observational equivalence of two statistical models. The point of departure from the current literature is the observation that a structural equation imposes restrictions on the distribution of the observables by restricting the sigma-algebra of the observable events. The main result shows the existence of a functional dependence between the structural equations in two observationally equivalent structures. This is used to derive identification conditions for nonparametric simultaneous equations models, additive errors models, multivariate triangular models, etc..

Yet More on the Scope of Application of IV Models

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Abstract

Instrumental variable models typically require unobserved variables to be single-valued functions of observable variables. The restriction holds in the linear IV model studied in Hillier (2006), the additive error nonparametric IV model in Newey and Powell (2003) and the nonadditive error model of Chernozhukov and Hansen (2005). In fact, as shown in Chesher and Rosen (2014), IV models can be employed in the absence of this restriction, for example in cases with discrete endogenous outcomes, in random coefficient models and when structural relationships are defined by inequality restriction as in auction models.
This paper illustrates by characterizing the identifying power of a random coefficients IV model in which endogenous Y_1 and Y_2 are related via $Y_1 = U_1 + U_2 Y_2$ where $U \equiv (U_1 , U_2)$ is $N_2(\mu, \Sigma)$ and U and Z, a vector of instrumental variables, are independently distributed. In this model unobserved U is a set-valued function of observed Y_1 and Y_2.

References

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A Multivariate Stochastic Unit Root Model with an Application to Derivative Pricing

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Revised, September 18, 2014

Abstract

This paper extends recent findings of Lieberman and Phillips (2014) on stochastic unit root (SUR) models to a multivariate case including a comprehensive asymptotic theory for estimation of the model's parameters. The extensions are useful because they lead to a generalization of the Black-Scholes formula for derivative pricing. In place of the standard assumption that the price process follows a geometric Brownian motion, we derive a new form of the Black-Scholes equation that allows for a multivariate time varying coefficient element in the price equation. The corresponding formula for the value of a European-type call option is obtained and shown to extend the existing option price formula in a manner that embodies the effect of a stochastic departure from a unit root. An empirical application reveals that the new model is consistent with excess skewness and kurtosis in the price distribution relative to a lognormal distribution.

Key words and phrases: Autoregression; Derivative; Diffusion; Options; Similarity; Stochastic unit root; Time-varying coefficients.

The effect of the magnitude of covariate (non)stationarity on unit root inferences

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Abstract

It is well known that including covariates, of any order of magnitude and whether they are relevant or not, can significantly affect our ability to successfully determine whether or not there is a unit root in time series regressions. The effects of a linear trend are particularly well documented. It is also the case, however, that inclusion of appropriate stationary covariates can significantly enhance the properties of unit root tests (see, for example, Hansen "Rethinking the univariate approach to unit root testing: using covariates to increase power", ET (1995) and Elliott & Jansson "Testing for unit roots with stationary covariates", Journal of Econometrics (2003)). In this paper the order of magnitude of a covariate is proxied via non-linear trends, i.e. time trends raised to arbitrary powers - including negative values to capture degenerate covariates. Relevant statistical measures such as the Kulback-Leibler divergence and Conditional Information can then be calculated as explicit analytic functions of this power and their properties completely characterised. In particular these measures can be minimised and, for example, in the case where the only covariate is t^b the value of b which minimises Kullback-Leibler is the wonderfully specific value b* = (Sqrt[6]-1)/2.

Wald Tests Under Matrix Normalisation

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Abstract

It is well known that systems of regression equations exhibiting different persistence degrees along each equation do not necessarily conform to standard asymptotic theory of estimation and testing. The key difference with the standard asymptotic framework of inference is that sample moment matrices require matrix-valued normalisations, a complication that may result to a reduction in the asymptotic rank of sample moment estimators and the associated test statistics. In hypothesis testing, an additional complication arises from the interaction between the matrix-valued normalisation and the matrix of restrictions imposed by the null hypothesis, which may lead to further asymptotic degeneracy and non-standard limit distributions for Wald type test statistics. The paper provides sufficient conditions that guarantee standard chi-squared inference for Wald tests in this general multivariate modelling framework. Applications include regression models with deterministic components and cointegrated systems of near-integrated time series with roots that induce potentially different persistence rates.

On Consistency of Approximate Bayesian Computation

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March 25, 2015

Abstract

Approximate Bayesian computation (ABC) methods have become increasingly prevalent of late, facilitating as they do the analysis of intractable, or challenging, statistical problems. With the initial focus being primarily on the practical import of ABC, exploration of its formal statistical properties has begun to attract more attention. The aim of this paper is to establish general conditions under which ABC methods are Bayesian consistent, in the sense of producing draws that yield a degenerate posterior distribution at the true parameter (vector) asymptotically (in the sample size). We derive conditions under which arbitrary summary statistics yield consistent inference, with these conditions linked to the identification of the true parameters. Using simple illustrative examples that have featured in the literature, we demonstrate that identification, and hence consistency, is unlikely to be achieved in many cases, and propose a simple diagnostic procedure that can indicate the presence of this problem. We also touch upon the link between consistency and the use of auxiliary models within ABC, and illustrate the subsequent results in a simple Lotka-Volterra predator-prey model. Lastly, we explore the relationship between consistency and the use of marginalization to obviate the curse of dimensionality.

On Distributions of Ratios

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Abstract

Inversion formulae are derived that express the density and distribution function of a ratio of random variables in terms of the joint characteristic function of numerator and denominator. The resulting expressions are amenable to numerical evaluation and lead to simple asymptotic expansions. The expansions reduce to known results when the denominator is almost surely positive. Two numerical examples demonstrate their accuracy.

Key words: Characteristic Function; Fieller–Creasy Problem; Inversion Formula; Saddlepoint Approximation.

Adjusted MLE for the Spatial Autoregressive Parameter

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February 27 2015

Abstract

It is well known that the maximum likelihood estimator (MLE) of the autoregressive parameter in a spatial autoregression can su_er from substantial bias. One approach to reducing the bias is to recenter the pro_le score. We study properties of the resulting estimator, which we name the adjusted MLE. In particular, we show that the distributions of the MLE and the adjusted MLE have di_erent support, which needs to be taken into account in comparing the performance of the two estimators.

Keywords: bias, spatial autoregression, maximum likelihood estimation, group interaction.

Unbiased Variance Estimation in Simultaneous Equation Models

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February 12, 2015

Abstract

While a good deal of research in simultaneous equation models has been conducted to examine the small sample properties of coefficient estimators there has not been a corresponding interest in the properties of estimators for the associated variances. In this paper we build on Kiviet and Phillips (2000) and explore the biases in variance estimators. This is done for the 2SLS and the MLIML estimators together with an estimator which is a combination of k-class estimators with k<1. The approximations to the bias are then used to develop less biased estimators whose properties are examined and compared in a number of simulation experiments. Also included are two bootstrap estimators one of which is found to perform especially well. The experiments also consider coverage probabilities and test sizes where it is shown that tests based on 2SLS are generally oversized while test sizes based on MLIML are closer to nominal levels.