Waseda Statistical Symposium on Time Series and Related Topics

---A Satellite Meeting of IMS-APRM 2012---

Date : 5 – 7 July, 2012

Venue : Waseda University

- Waseda campus, International conference center (Building 18), Conference room 3 (5 – 6 July)
  http://www.waseda.jp/eng/campus/map.html

- Nishiwaseda campus, Building 55-S,
  Conference room 3 (7 July)
  http://www.waseda.jp/eng/campus/map03.html

Organizers :

- Masanobu TANIGUCHI (Waseda University)
- Hiroaki OGATA (Waseda University)

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◆◆◆◆ 5 July (Thu.) ◆◆◆◆

Session I (Chaired by Cathy W.S. CHEN)

13:30 – 14:00 : Alex PETKOVIC (Waseda University)
Pricing and hedging Asian Basket Spread Options
(Joint work with Griselda Deelstra and Michèle Vanmaele)

14:00 – 14:30 : Hiroaki OGATA (Waseda University)
Marginal quantiles for stationary processes
(Joint work with Yves Dominicy, Siegfried Hörmann and David Veredas)

14:30 – 15:00 : Junichi HIRUKAWA (Niigata University)
Ruin probabilities for locally stationary time series premium model
(Joint work with Takeyuki Suzuki)

☕☕☕☕ *Coffee break* ☕☕☕☕

Session II (Chaired by Ingrid Van KEILEGOM)

15:30 – 16:00 : Aurore DELAIGLE (The University of Melbourne)
Component-wise classification of functional data

16:00 – 16:30 : Ming-Yen CHENG (National Taiwan University)
An unified and reliable approach to adapting to sparse design in univariate and multivariate local linear regression
(Joint work with Jyh-Shyang Wu, Yao-Hsiang Yang and Lu-Hung Chen)

Session III (Chaired by Ming-Yen CHENG)

16:30 – 17:00 : Yoshihiko MAESONO (Kyusyu University)
Asymptotic distributions of kernel type estimators

17:00 – 17:30 : Valentin PATILEA (CREST-Ensai & IRMAR)
Projection-based nonparametric goodness-of-fit testing with functional data

■■■■ 6 July (Fri.) ■■■■

Session IV (Chaired by Sangyeol LEE)

9:30 – 10:00 : Yoichi NISHIYAMA (Institute of Statistical Mathematics)
Moment convergence of *Z*-estimators and *Z*-process method for change point problems

10:00 – 10:30 : Yoshihide KAKIZAWA (Hokkaido University)
Asymptotic expansions for several GEL-based test statistics

Session V (Chaired by Yoshihide KAKIZAWA)

11:00 – 11:30 : Cathy W.S. CHEN (Feng Chia University)
Bayesian unit root test in double threshold heteroskedastic models
(Joint work with Shu-Yu Chen and Sangyeol Lee)

11:30 – 12:00 : Sangyeol LEE (Seoul National University)
Parameter change test for Poisson autoregressive model

Session VI (Chaired by Aurore DELAIGLE)

13:30 – 14:00 : Katsuto TANAKA (Hitotsubashi University)
Distributions of quadratic functionals of the fractional Brownian motion based on a martingale approximation

14:00 – 14:30 : Liudas GIRAITIS (Queen Mary University of London)
On asymptotic distributions of weighted sums of periodograms
(Joint work with H. Koul)

Session VII (Chaired by Valentin PATILEA)

14:30 – 15:00 : Ingrid Van KEILEGOM (Université Catholique de Louvain)
Boundary estimation in the presence of measurement error with unknown variance
(Joint work with Alois Kneip and Leopold Simar)

15:00 – 15:30 : Masanobu TANIGUCHI (Waseda University)
Shrinkage estimation and prediction for time series
(Joint work with Kenta Hamada)

☕☕☕☕ ***Coffee break*** ☕☕☕☕

Special Invited Session

(Chaired by Masanobu TANIGUCHI)

16:00 – 17:00 : Peter HALL (The University of Melbourne)
Distribution approximation, Roth's theorem, and looking for insects in shipping containers

 **Dinner** 

●●●● 7 July (Sat.) ●●●●

Session VIII (Chaired by Liudas GIRAITIS)

9:00 – 9:30 : Hiroyuki TANIAI (Waseda University)
Efficient inference for regression quantiles via *Z*-estimation

9:30 – 10:00 : Keiko YAMAGUCHI (Waseda University)
A simple test of long memory versus structural breaks
(Joint work with Katsumi Shimotsu)

10:00 – 10:30 : Hiroshi SHIRAISHI (Jikei Medical University)
Shrinkage estimation of optimal portfolio

☕☕☕☕ ***Coffee break*** ☕☕☕☕

Session IX (Chaired by Junichi HIRUKAWA)

11:00 – 11:30 : Yasutaka SHIMIZU (Osaka University)
Edgeworth-type expansion of ruin probability under Lévy insurance risk model

11:30 – 12:00 : Takashi YAMASHITA (GPIF)
Asymmetric properties of portfolio diversification

12:00 – 12:30 : Tomoyuki AMANO (Wakayama University)
Estimating function estimator for financial time series models

Pricing and hedging Asian Basket Spread Options

Alex PETKOVIC (Waseda University)
(Joint work with Griselda Deelstra and Michèle Vanmaele)

Abstract

We consider a security market consisting of m risky assets and a risk-less asset with rate of return r. We assume that under the risk-neutral measure the price process dynamics are given by

$$dS_{jt} = r\, S_{jt}\, dt + \sigma_j\, S_{jt}\, dB_{jt} \tag{1}$$

where $\{B_{jt} : t \geq 0\}$ is a standard Brownian motion associated with asset j. Further we assume that the asset prices are correlated according to

$$\mathrm{corr}(B_{jtv}, B_{its}) = \rho_{ji} \min(t_v, t_s). \tag{2}$$

Given the above dynamics, the price of the j^{th} asset at time t_i equals

$$S_{jt_i} = S_j(0) e^{(r-\sigma_j^2/2)t_i} + \sigma_j B_{jt_i} \tag{3}$$

With this in hand we can define an Asian basket spread as

$$\mathbb{S} = \frac{1}{n} \sum_{i=1}^{n} \sum_{j=1}^{m} \varepsilon_j a_j S_{jt_i} \tag{4}$$

where a_j is the weight given to asset j and ε_j its sign in the spread. We assume that $\varepsilon_j = 1$ for $j = 1, \ldots, p$, $\varepsilon_j = -1$ for $j = p+1, \ldots, m$, where p is an integer such that $1 \leq p \leq m-1$ and $t_0 < t_1 < t_2 < \ldots < t_n = \mathrm{T}$. The price of an Asian basket spread with exercise price K at $t_0 = 0$ can be defined as

$$e^{-rt} E_Q(\mathbb{S} - K)_+ \tag{5}$$

where E_Q represents the expectation taken with respect to the risk-neutral measure Q. In what follows we will simply write E for the expectation under the risk-neutral measure.

Examples of such contracts can be found in the energy markets. The basket spread part may for example be used to cover refinement margin (crack spread) or the cost of converting fuel into energy (spark spread). While the Asian part (the temporal average) avoids the problem common to the European options, namely that speculators can increase gain from the option by manipulating the price of the assets near maturity.

Since the density function of a sum of non-independent log-normal random variables has no closed-form representation, there is no closed-form solution for the price of a security whenever $m > 1$ or $n > 1$ within the Black and Scholes framework. Therefore one has to use an approximation method when valuating such a security. It is always possible to use Monte Carlo techniques to get an approximation of the price. However such techniques are rather time-consuming. Furthermore financial institutions also need approximations of the hedge parameters in order to control the risk, which further increases the computation time. This explains why the research for a closed-form

approximation has become an active area.

Some special cases of the above formula have been extensively studied. For example if we set $m = 1$ and $n > 1$ we have an Asian option. Approximation formulae for this kind of derivatives can be found in Kaas et al. (2000), Thompson (2002), Nielsen and Sandmann (2003), Vanmaele et al. (2006), Vyncke et al. (2004), Lord (2006) and Zhou and Wang (2007). If $m > 1$ and $n = 1$ we have a basket option. See Deelstra et al. (2004), Vanmaele et al. (2004) and Zhou and Wang (2007) for basket options where all the assets have a positive weight. And Borovkova et al. (2007), Castellacci and Siclari (2003) for the case of basket spread options. Finally setting $m = 2$ and $n = 1$ and $p = 1$ we end up with a spread option. Pretty accurate approximation formulae for spread options can be found in the paper of Alexander and Scourse (2004), Bjerksund and Stensland (2006), Carmona and Durrleman (2003a, 2003b), and Li et al. (2006). However few papers develop methods that can be used in the case of an Asian basket spread. Castellacci and Siclari (2003), Borovkova et al. (2007) and Carmona and Durrleman (2005) are the only we are aware of.

In this paper we start by deriving approximation formulae for expression (5) using comonotonic bounds. We derive four different approximations: the upper, the improved upper, the lower and the intermediary bound. We also try to approximate the security price with the help of moment matching techniques. We improve the hybrid moment matching method of Castellacci and Siclari (2003) and propose an extension of the method developed by Borovkova et al. (2007). We explain which method should be used depending on the basket characteristics. We also provide closed-form formulae for the Greeks of our selected approximation techniques. We explain how our results can be adapted in order to deal with options written in foreign currency (compo and quanto options).

Marginal quantiles for stationary processes

Hiroaki OGATA (Waseda University)
(Joint work with Yves Dominicy, Siegfried Hörmann and David Veredas)

Abstract

We establish the asymptotic normality of marginal sample quantiles for vector stationary processes. We assume that the processes are *S*-mixing, a type of weak dependence for the process introduced by Berkes et al. (2009). Results of some Monte Carlo simulations are given.

Ruin probabilities for locally stationary time series premium model

Junichi HIRUKAWA (Niigata University)
(Joint work with Takeyuki Suzuki)

Abstract

We call subjects (ex. Insurance company) the portfolio. We are interested in the surplus process (risk process) of portfolio, which has a ruin possibility. The surplus process is the surplus if portfolio's all contracts have been finished at that time. Thus, if the surplus becomes negative, the portfolio becomes ruined. In this talk we consider the case that the claim amount process is locally stationary process, which is the total amount of claim. Furthermore, we consider the case that the premium process is also stochastic process, which is the total amount of premium. Namely, we deal with the case that both claim amount and premium are locally stationary processes.

Component-wise classification of functional data

Aurore DELAIGLE (The University of Melbourne)

Abstract

The infinite dimension of functional data can challenge conventional methods for classification. A variety of techniques have been introduced to address this problem, particularly in the case of prediction, but the structural models that they involve can be too inaccurate, or too abstract, or too difficult to interpret. We introduce approaches to adaptively choose components, enabling classification to be reduced to finite-dimensional problems. Our techniques involve methods for estimating classifier error rate, and for choosing both the number of components, and their locations, to optimise these quantities. A major attraction of this approach is that it allows identification of parts of the function domain that convey important information for classification. It also permits us to determine regions that are relevant to one of these analyses but not the other.

An unified and reliable approach to adapting to sparse design in univariate and multivariate local linear regression

Ming-Yen CHENG (National Taiwan University)
(Joint work with Jyh-Shyang Wu, Yao-Hsiang Yang and Lu-Hung Chen)

Abstract

Local linear regression is popular tool for nonparametric regression and has been implemented widely in applications. Moreover, it enjoys many appealing theoretical properties such as automatic boundary correction and linear minimax optimality. However, in finite sample cases, the local least squares problem in local linear estimation becomes ill-posed when the design is sparse or highly clustered, which occurs often in practice. As a result, the local linear estimator either does not exist or exhibits drastic roughness in the sparse design regions. Many methods have been proposed to address this serious problem in the univariate case, and a few in the bivariate case. Beyond that, it becomes a difficult problem. We introduce two new approaches to tackle this problem in the univariate and the general multivariate cases. Both methods are computationally simple and one of them does not involve any extra tuning parameters, like all the existing ones do. The finite sample variances of the resulting modified local linear estimators are shown to be bounded above. We further prove that they both have the same asymptotic mean squared error as the original local linear estimator. Numerical studies demonstrate that, when compared to existing commonly used ones, our methods have superior finite sample performance when the sample size is small or moderate, and all the methods including the original one perform equally well when the sample size is large.

Asymptotic distributions of kernel type estimators

Yoshihiko MAESONO (Kyusyu University)

Abstract

Using the kernel estimator of the p-th quantile of a distribution brings about improvement in comparison to the sample quantile estimator. The size and order of this improvement is revealed when studying the Edgeworth expansion of the kernel estimator. The investigation is non-standard since the influence function explicitly depends on the sample size. We obtain the expansion and demonstrate the numerical gains in using it. We also derive the Edgeworth expansion for the studentized version of the kernel quantile estimator. Inverting the expansion allows us to get very accurate confidence intervals for the p-th quantile under general conditions. The results are applicable in practice to improve inference for quantiles when sample sizes are moderate.

Projection-based nonparametric goodness-of-fit testing with functional data

Valentin PATILEA (CREST-Ensai & IRMAR)

Abstract

The problem of nonparametric testing for the effect of a random functional covariate on a real-valued or functional error term is studied. The functional variables take values in $L^2[0,1]$, the Hilbert space of the square-integrable real-valued functions on the unit interval. The error term could be directly observed as a response or estimated from a functional parametric model, like for instance the functional linear regression. Our test is based on the remark that checking the no-effect of the functional covariate is equivalent to checking the nullity of the conditional expectation of the error term given a sufficiently rich set of projections of the covariate. Such projections could be on elements of norm 1 from finite-dimension subspaces of $L^2[0,1]$. Next, the idea is to search a finite-dimension element of norm 1 that is, in some sense, the least favorable for the null hypothesis. Finally, it remains to perform a nonparametric check of the nullity of the conditional expectation of the error term given the scalar product between the covariate and the selected least favorable direction. For such finite-dimension search and nonparametric check we use a kernel-based approach. As a result, our test statistic is a quadratic form based on univariate kernel smoothing and the asymptotic critical values are given by the standard normal law. The test is able to detect nonparametric alternatives, including the polynomial ones. The error term could present heteroscedasticity of unknown form. We do not require the law of the covariate X to be known. The test could be implemented quite easily and performs well in simulations and real data applications. We illustrate the performance of our test for checking the functional linear regression model.

Moment convergence of *Z*-estimators and *Z*-process method for change point problems

Yoichi NISHIYAMA (Institute of Statistical Mathematics)

Abstract

The problem to establish not only the asymptotic distribution results for statistical estimators but also the moment convergence of the estimators has been recognized as an important issue in advanced theories of statistics. There is an authorized theory dealing with this problem for some *M*-estimators by Ibragimov and Has'minskii (1981, Springer book), and a method to prove a large deviation inequality which was assumed in Ibragimov and Has'minskii's theory has been developed recently by Yoshida (2011, Ann. Inst. Statist. Math.). One of the main purposes of this paper is to present a simple theory to derive the moment convergence of *Z*-estimators, avoiding large deviation type inequalities. Another goal of this paper is develop a general, unified approach, based on some partial estimation functions which we call "*Z*-process", to the change point problems not only for ergodic models but also for some models where the Fisher information matrix is random. Some examples are discussed.

Asymptotic expansions for several GEL-based test statistics

Yoshihide KAKIZAWA (Hokkaido University)

Abstract

Higher-order accurate inference is a long-standing problem. For the standard parametric case, an adjustment of the likelihood ratio (LR) test statistic was first exploited by Bartlett (1937) in his test for homogeneity of variances and became widely known as the Bartlett correctability of the LR after Lawley (1956) (see also Hayakawa (1977)).

Empirical likelihood (EL) method facilitates a likelihood-type inference in nonparametric setting. Remarkably, the EL ratio (ELR) is Bartlett correctable as in the parametric likelihood:

(1) DiCiccio et al. (1991) for smooth function of the mean vectors,

(2) Chen (1993, 1994) and Bravo (2002) for linear regression models in the absence/presence of the nuisance parameters, and

(3) Chen and Cui (2006, 2007) for testing a parameter subvector or full vector in the case of the just/over-identified moment restrictions.

As shown in Newey and Smith (2004), generalized empirical likelihood (GEL) includes as special cases EL and exponential tilting (ET). In this talk, we consider, in a unified way, asymptotic expansions for several GEL-based test statistics for testing a parameter subvector in the over-identified case. We show that the ELR is, in general, the only member within the empirical Cressie & Read-based test statistics that is Bartlett correctable, which is a substantial extension of Baggerly (1998) for smooth function of the mean vectors (see also Jing and Wood (1996), Corcoran (1998) and Bravo (2006)) to the GEL framework, including the GEL-based score and Wald test statistics. We also discuss their Bartlett-type adjustments.

Bayesian unit root test in double threshold heteroskedastic models

Cathy W.S. CHEN (Feng Chia University)
(Joint work with Shu-Yu Chen and Sangyeol Lee)

Abstract

In this study, a Bayesian test is developed to test for the unit root in multi-regime threshold generalized autoregressive conditional heteroscedasticity (GARCH) models. To implement a test, a new posterior odds analysis is proposed. Particularly, a mixture prior is used to alleviate the identifiability problem that occurs when the AR(1) parameter tends to 1. This method allows reliable inference by providing a proper posterior despite of the non-integrability problem of the likelihood function. A simulation study and two real data analysis are conducted for illustration. Keywords: Bayesian hypothesis testing; threshold autoregressive model; GARCH; unitroot test; Markov chain Monte Carlo; posterior odds ratio.

Parameter change test for Poisson autoregressive model

Sangyeol LEE (Seoul National University)

Abstract

In this paper, we consider the problem of testing for a parameter change in Poisson autoregressive model. As a test, cumulative sum (CUSUM) test based on parameter estimates and residuals are considered. It is shown that under regularity conditions, the CUSUM test has the limiting null distribution of a functional of a Brownian bridge. Some empirical results are provided for illustration.

Distributions of quadratic functionals of the fractional Brownian motion based on a martingale approximation

Katsuto TANAKA (Hitotsubashi University)

Abstract

We discuss some computational problems associated with distributions of statistics arising from the fractional Brownian motion (fBm). In particular, we deal with (ratios of) its quadratic functionals. While it is easy in principle to deal with the standard Bm, the fBm is difficult to analyze because of its non-semimartingale nature. Here we suggest how to derive and compute the distributions of such functionals by using a martingale approximation. For this purpose we employ the Fredholm theory concerning the integral equations, illustrating how to compute the characteristic function via the Fredholm determinant. We also apply the present methodology to compute the fractional unit root distribution, and demonstrate some interesting moment properties.

On asymptotic distributions of weighted sums of periodograms

Liudas GIRAITIS (Queen Mary University of London)
(Joint work with H. Koul)

Abstract

We establish asymptotic normality of weighted sums of periodograms of a stationary linear process where weights depend on the sample size. Such sums appear in numerous statistical applications and can be regarded as discretized versions of the quadratic forms involving integrals of weighted periodograms. Conditions for asymptotic normality of these weighted sums are simple, minimal, and resemble Lindeberg-Feller condition for weighted sums of independent and identically distributed random variables. Our results are valid for short, long or negative memory processes. The proof is based on sharp bounds derived for Bartlett type approximation of these sums by the corresponding sums of weighted periodograms of independent and identically distributed random variables. Local linear regression is popular tool for nonparametric regression and has been implemented widely in applications. Moreover, it enjoys many appealing theoretical properties such as automatic boundary correction and linear minimax optimality. However, in finite sample cases, the local least squares problem in local linear estimation becomes ill-posed when the design is sparse or highly clustered, which occur occurs often in practice. As a result, the local linear estimator either does not exist or exhibits drastic roughness in the sparse design regions. Many methods have been proposed to address this serious problem in the univariate case, and a few in the bivariate case. Beyond that, it becomes a difficult problem. We introduce two new approaches to tackle this problem in the univariate and the general multivariate cases. Both methods are computationally simple and one of them does not involve any extra tuning parameters, like all the existing ones do. The finite sample variances of the resulting modified local linear estimators are shown to be bounded above. We further prove that they both have the same asymptotic mean squared error as the original local linear estimator. Numerical studies demonstrate that, when compared to existing commonly used ones, our methods have superior finite sample performance when the sample size is small or moderate, and all the methods including the original one perform equally well when the sample size is large.

Boundary estimation in the presence of measurement error with unknown variance

Ingrid Van KEILEGOM (Université Catholique de Louvain)
(Joint work with Alois Kneip and Leopold Simar)

Abstract

Boundary estimation appears naturally in economics in the context of productivity analysis. The performance of a firm is measured by the distance between its achieved output level (quantity of goods produced) and an optimal production frontier which is the locus of the maximal achievable output given the level of the inputs (labor, energy, capital, etc.). Frontier estimation becomes difficult if the outputs are measured with noise and most approaches rely on restrictive parametric assumptions. This paper contributes to the direction of nonparametric approaches.

We consider a general setup with unknown frontier and unknown variance of a normally distributed error term, and we propose a nonparametric method which allows to identify and estimate both quantities simultaneously.

The asymptotic consistency and the rate of convergence of our estimators are established, and simulations are carried out to verify the performance of the estimators for small samples. We also apply our method on a dataset concerning the production output of American electricity utility companies.

Shrinkage Estimation and Prediction for Time Series

Masanobu TANIGUCHI (Waseda University)
(Joint work with Kenta HAMADA)

Abstract

For independent samples, shrinkage estimation theory has been developed systematically. Although shrinkage estimators are biased, they improve the MSE of unbiased ones. In view of this, we will develop shrinkage estimation theory and prediction for dependent samples. First, we propose a shrinkage estimator for the coefficients of AR model, which improves the MSE of the least squares estimator. Second, we discuss the problem of shrinkage prediction, and propose a shrinkage predictor which improves the prediction error of the best linear predictor with finite lag length. The results are applied to portfolio estimation etc. We provide numerical studies, which show some interesting features of shrinkage problems in time series analysis.

Distribution approximation, Roth's theorem, and looking for insects in shipping containers

Peter HALL (The University of Melbourne)

Abstract

Methods for distribution approximation, including the bootstrap, do not perform well when applied to lattice-valued data. For example, the inherent discreteness of lattice distributions confounds both the conventional normal approximation and the standard bootstrap when used to construct confidence intervals. However, in certain problems involving lattice-valued random variables, where more than one sample is involved, this difficulty can be overcome by ensuring that the ratios of sample sizes are quite irregular. For example, at least one of the ratios of sample sizes could be a reasonably good rational approximation to an irrational number. Results from number theory, in particular Roth's theorem (which applies to irrational numbers that are the roots of polynomials with rational coefficients), can be used to demonstrate theoretically the advantages of this approach. This project was motivated by a problem in risk analysis involving quarantine searches of shipping containers for insects and other environmental hazards, where confidence intervals for the sum of two binomial proportions are required.

Efficient inference for regression quantiles via *Z*-estimation

Hiroyuki TANIAI (Waseda University)

Abstract

In this talk, we observe the regression quantile process, a process of Quantile Regression (QR) estimators indexed by the probability values of interest, in view of *Z*-estimation. There it will be emphasized that the QR method is of a semiparametric nature. Accordingly, we try to investigate its asymptotic properties using theory of empirical processes, and discuss some issues on semiparametric efficiency.

A simple test of long memory versus structural breaks

Keiko YAMAGUCHI (Waseda University)
(Joint work with Katsumi Shimotsu)

Abstract

This paper proposes a simple test that is based on certain time domain properties of $I(d)$ processes. If a time series follows an $I(d)$ process, then its dth differenced series follows an $I(0)$ process. Simple as it may sound, its properties provides useful tools to distinguish the true and spurious $I(d)$ processes. We estimate d, use the estimate to take the dth difference of the sample, and apply the KPSS test to the differenced data and its partial sum. The KPSS test is applicable to both stationary and nonstationary $I(d)$ processes. The spurious long memory processes are essentially $I(0)$ or $I(1)$ in their nature, and taking their dth difference magnifies their non-$I(d)$ properties. We derive its limiting distribution and show that the test is consistent. The limiting distribution of these test statistics depends on d, and its simulated critical values are provided. Simulations show that the proposed tests have good power against the spurious long memory models considered in the literature.

Shrinkage estimation of optimal portfolio

Hiroshi SHIRAISHI (Jikei Medical University)

Abstract

Shrinkage estimation theory introduced by James and Stein (1961) has been developed in many fields of statistic problem. Taniguchi and Hirukawa (2005) investigated the Stein-James type estimator for the mean when the observations are generated from a Gaussian vector stationary process. We expand their result into the portfolio selection problem. Assuming asset returns are generated from a non-Gaussian vector stationary process with some moment conditions, we first construct an n-consistent portfolio weight estimator. Then, by using this estimator, we propose a shrinkage portfolio weight estimator which is one of Stein-James type estimators. Moreover, we give a sufficient condition for the shrinkage estimator to improve upon the n-consistent estimator in terms of the spectral density matrix around the origin.

Edgeworth-type expansion of ruin probability under Lévy insurance risk model

Yasutaka SHIMIZU (Osaka University)

Abstract

An asymptotic expansion formula of the ultimate ruin probability under Lévy insurance risks is given as the loading factor tends to zero. The formula is obtained via the Edgeworth type expansion of the compound geometric random sum. We give higher-order expansions of the ruin probability with the validity. This allows us to evaluate quantile of the ruin function, which is nicely applied to estimate the VaR-type risk measure due to ruin.

Asymmetric properties of portfolio diversification

Takashi YAMASHITA (GPIF)

Abstract

In finance, we expected that portfolio improves the investment risk characteristics. It is on the basis of the "Portfolio Diversification" effect. However, some researchers say that this effect has been declining gradually. I will show the behavior by using some statistical methods.

Estimating function estimator for financial time series models

Tomoyuki AMANO (Wakayama University)

Abstract

There has been proposed many financial time series models in order to represent behaviours of data in the finance and many researchers have investigated these models.

One of the most fundamental estimators for financial time series models is the conditional least squares estimator (CL estimator). CL estimator has two advantages; it can be calculated easily and it does not need the knowledge of the innovation. Hence CL estimator has been widely used. However Amano and Taniguchi (2008) showed CL estimator is not asymptotically optimal in general for ARCH model.

On the other hand Chandra and Taniguchi (2001) constructed the optimal estimating function estimator (G estimator) for ARCH model based on Godambe's optimal estimating function and showed G estimator is better than CL estimator in the sense of the sample mean squared error by simulation.

In this talk we apply CL and G estimators to famous financial time series models (ARCH, GARCH, CHARN) and show G estimator is better than CL estimator in the sense of the efficiency theoretically. Furthermore we derive the condition of the asymptotical optimality of G estimator based on LAN.