1 Using Waveletes in Statistics

Dominique Picard et Gerard Kerkyacharian, LPMA Paris-7,10

2 Approximations for SDE's driven by Lévy processes

Arturo Kohatsu-Higa (arturokohatsu@gmail.com), Osaka University

3 PRICING RULES UNDER ASYMMETRIC INFORMATION

Monique Pontier, IMT, Université de Toulouse, France

4 Noncausal Problems in Mathematical Physiscs

Shigeyoshi Ogawa, Ritsumeikan University, Japan

5 Malliavin Calculus in Cross Hedging Problem

Peter Imkeller, Humboldt Univ. Berlin BRD

1 Using Waveletes in Statistics

Dominique Picard et Gerard Kerkyacharian, LPMA Paris-7,10

Abstract

In this course we present two topics about the application of the Wavelets theory to statistics. Here is our plan of lectures

I First Topics
Dominique Picard:

1. In this course, we begin with a review of several examples of nonparametric problems including density es- timation, functional regression, data mining, statistical learning problems as well various classical 'inverse problems' such as de- convolution, Wicksell problem and Radon transform which occur for instance in signal processing, stereology, biology and tomogra- phy.
2. We briefly explain the main difficulties arising in such problems and detail the 'minimax framework'. We give examples of lower and upper bound results in this setting.
3. We foccus on orthogonal series methods and give in this setting upper and lower bound results as well as standard associated functional spaces (Sobolev spaces and ellipsoids) using the Fourier ba- sis.

Gerard Kerkyacharian :

1 . We investigate the Haar and Schauder bases and the associated Besov body spaces with their relation with HNolder spaces.
2. We investigate the classical Littlewood Paley theory and the wavelet contruction.

(II) Second Topics
Dominique Picard :
1. We introduce thresholding algorithms in the wavelet context and investigate their adaptation properties.
2. We define the maxiset point of view and relate its results to the minimax framework.
3. We come back more precisely to inverse problems and detail their genuine difficulties.
4. We define the SVD basis associated to a specified inverse problem.

Gerard Kerkyacharian :
1. We construct a 'needlet' system asso- ciated to the SVD basis associated to a specified inverse, or more generally to a specified decomposition.
2. We use the needlet system to construct a localized and adaptive estimation in various examples of inverse problems as well in the Cosmological Microwave Background.

2 Approximations for SDE's driven by Lévy processes

Arturo Kohatsu-Higa (arturokohatsu@gmail.com), Osaka University

Abstract

Weak approximations have been developed to calculate the expectation value of functionals of stochastic differential equations, and various numerical discretization schemes (Euler, Milshtein) have been studied by many authors. We present first an error study of a scheme with random time partition for SDE's driven by pure jump Lévy processes which shows that due to the concentration of jumps around zero one can define schemes with fast convergence rate. On the other hand, we define other schemes that consider few jumps which combined with Euler-like schemes lead to methods where the error due to each approximation (Brownian and jump part) contribute the same to the error. In order to do this, we study an operator decomposition method applicable to jump driven SDE's. This leads to alternative schemes and a clear decomposition of the error analysis.

3 PRICING RULES UNDER ASYMMETRIC INFORMATION

Monique Pontier, IMT, Université de Toulouse, France

We first introduce some elements on enlargement of filtration, filtering, optimal control, and Bellman principle [5, 7, 2]. Then we present Kyle and Back's point of view about "insider trading and rational anticipation" [1, 9]: the aim is to set the existence of an equilibrium price when there exists not only market maker and noise traders but also an insider trader. A second chapter concerns an extension of this insider trading whith nonlinear equilibria and risk aversion instead of risk neutrality, following El Karoui and Cho [3, 4]. This work is then extended in [11] to **strategic** noise traders. Finally, we quickly present some other points of view (e.g. Campi and Cetin, Jouini and Napp, Schweizer, Hillairet.... cf. some lectures in AMaMef workshop-Toulouse January 2007 or [8, 10]).

References

[1] Kerry BACK, "Insider trading in continuous time", The Review of Financial Studies 1992 Vol. 5 (3), 387-409.

[2] J. JACOD, "Grossissement initial, Hypothèse H' et Théorème de Girsanov", M. CHALEYAT-MAUREL et T. JEULIN, "Grossissement gaussien de la filtration brownienne", M. YOR, "Grossissement de filtrations et absolue continuité de noyaux", Séminaire de Calcul Stochastique 1982-83, Paris, Lecture Notes in Mathematics 1118, Springer-Verlag, 1985.

[3] K.H.CHO and N. EL KAROUI, "Insider trading and nonlinear equilibria:uniqueness: single auction case" Annales d'économie et de statistique, 60, 21-41, 2000.

[4] K.H.CHO, "Continuous auctions and insider trading :uniqueness and risk aversion", Finance and Stochastics, 7-1, 47-71, 2003.

[5] Nicole EL KAROUI, Les aspects probabilistes du contrôle stochastique, L. N. in Maths, Ecole d'été de Saint Flour 1979, Springer, Berlin, 1981.

[6] H. FÖLLMER and P. IMKELLER, "Anticipation cancelled by a Girsanov transformation : a paradox on Wiener space", Ann. Inst. Henri Poincaré, 29(4), 1993, 569-586.

[7] W. H. FLEMING and R. W. RISHEL, Deterministic and Stochastic Optimal Control, Springer, Berlin, 1975.

[8] Caroline HILLAIRET, “A competitive equilibrium with different asymmetric information”, thesis 2004, university of Toulouse.

[9] Albert KYLE, “Continuous auctions and insider trading”, Econometrica Vol. 53(6), 1315-1335.

[10] G. LASSERRE, Quelques modèles d'équilibre avec asymétrie d'information, Thèse soutenue à l'université de PARIS VII, le 16 décembre 2003.

[11] Shigeyoshi OGAWA and Monique PONTIER, “Pricing rules under asymmetric information”, ESAIM PS 2006

4 Noncausal Problems in Mathematical Physiscs

Shigeyoshi Ogawa, Ritsumeikan University, Japan

Abstract

Beginning from the discussion on the original problem that had guided the author to open the Noncausal Theory, we are going to try to give a unified introduction to the theory of noncausal calculus and give some concrete examples from its application domains.

5 Malliavin Calculus in Cross Hedging Problem

Peter Imkeller, Humboldt Univ. Berlin BRD

Malliavin's calculus and cross hedging

P. Imkeller
Humboldt-Universität zu Berlin

Abstract

A financial market model is considered on which agents (e.g. insurers) are subject to an exogenous, for instance climate-based, financial risk, which they trade by issuing a risk bond. Buyers of the bond are able to invest in a market asset correlated with the exogenous risk. We investigate their optimal investment problem, and calculate bond prices using utility indifference. This hedging concept is interpreted by means of martingale optimality, and solved with backward stochastic differential equations (BSDE) and Malliavin's calculus tools. In this short course we will

- develop concepts of Malliavin's calculus,
- develop concepts of BSDE,
- combine them to solve the optimal investment problem.