

Ling Xu

## **On Galerkin Approximations for the Zakai Equation with Diffusive and Point Process Observations**

Dissertation

We are interested in a nonlinear filtering problem motivated by an information-based approach for modelling the dynamic evolution of a portfolio of credit risky securities.

We solve this problem by 'change of measure method' and show the existence of the density of the unnormalized conditional distribution which is a solution to the Zakai equation. Zakai equation is a linear SPDE which, in general, cannot be solved analytically. We apply Galerkin method to solve it numerically and show the convergence of Galerkin approximation in mean square. Lastly, we design an adaptive Galerkin filter with a basis of Hermite polynomials and we present numerical examples to illustrate the effectiveness of the proposed method. The work is closely related to the paper Frey and Schmidt (2010).