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Why bankers need to know convex analysis

Maximizing (expected) concave utility functions has been a traditional model in economic and financial decision making. In early 1970s the work by Black and Scholes on option pricing lead to a 'revolution'. The paradigm shifted to price financial assets with replicating portfolio. Later Cox and Ross proposed simpler computation method using risk-neutral probability which became a default in the financial industry. However, the result is less than idea. In this talk we argue that the Black-Scholes method is a special case of concave utility maximization and the Cox-Ross formula is the natural result of its dual. Moreover, in the system of Black-Scholes and Cox-Ross, the analysis of sensitivity to model perturbation is dangerously inadequate. After many financial crises, it is perhaps time to return to the time tested method of utility maximization in which convex analysis plays an essential role.