Pricing financial instruments bridges insurance to PDE

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Abstract:
The main goal of this talk is to show how actuarial sciences can adopt the techniques of quantitative finance to solve some problems related to insurance premiums. We shall start with an example of insurance claim pricing technique to cover expected loss plus the cost of running an insurance business. If a major event occurs the insurance company would need more cash to cover large losses. One solution to manage this risk is to use reinsurance techniques. Indeed if at time T the total value denoted S_T of all claims exceeds a certain level K, the reinsurer pays the insurer $S_T - K$ whenever S_T is larger than K, otherwise the reinsurer pays nothing. This is the payoff of a call option described by $\max(S_T - K, 0)$ where the risky asset corresponds to the total claims and the strike price K corresponds to the level where the reinsurance company kicks in. Hence, there is a need to price this payoff. At this stage one can use quantitative methods to price this type of financial instrument. We shall discuss some mathematical models namely the discrete time model of Cox, Ross and Rubinstein and the classical Black-Scholes model for the continuous time. Further discussions will concern other general continuous time models as well as their connections to PDE and PIDE.