The three most important elements in snowball terms are knock-in level, knock-out level and coupon rate. After investors sign the snowball contract, the following three scenarios may occur:

(1) If the closing price of the underlying index on any trading day during the contract period is lower than the knock-in level, the payout will be equivalent to selling a put option, and no coupon is obtained.

(2) If the closing price of the underlying index on any observation day during the contract period is higher than the knock-out level, the contract will terminate early and the investor will get the annualized coupon yield based on the accrual days. Here if the index knocks in first and then knocks out, the payout follows the knock-out terms.

(3) If the underlying index neither knocks out nor knocks in during the contract period, the investor will get the full annualized coupon yield.

After we analyze the payout characteristics of snowball products, we can price the snowball by incorporating Monte Carlo simulation of the underlying index price.

Here we use the Black-Scholes model to simulate the price of the underlying index . We define delta t = 1 day because the interval is quite large, so Euler discretization is not applicable. We use exact discretization here: where r ~ N(mu, sigma^2).