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A new perspective on Quantum Finance using the Black-Scholes pricing model LAMINE DIENG, Rutgers University — Options are known to be divided into two types, the first type is called a call option and the second type is called a put option and these options are offered to stock holders in order to hedge their positions against risky fluctuations of the stock price. It is important to mention that due to fluctuations of the stock price, options can be found sometimes deep in the money, at the money and out of the money. A deep in the money option is described when the option's holder has a positive expected payoff, at the money option is when the option's holder has a zero expected payoff and an out of the money option is when the payoff is negative. In this work, we will assume the stock price to be described by the well known Black-Scholes model or sometimes called the multiplicative model. Using Ito calculus, Martingale and supermartingale theories, we investigated the Black-Scholes pricing equation at the money (X(stock price)= K (strike price)) when the expected payoff of the options holder is zero. We also hedged the Black-Scholes pricing equation in the limit when delta is zero to obtain the non-relativistic time independent Schroedinger equation in quantum mechanics. We compared the two equations and found the diffusion constant to be a function of the stock price in contrast to the Bachelier model we have worked on earlier. We solved the Schroedinger equation and found a dependence between interest rate, volatility and strike price at the money.

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