19BAE710-FINANCIAL DERIVATIVES

Options Pricing Models

Options pricing models are mathematical models used to estimate the fair value of options. They play a crucial role in financial markets by helping investors and traders evaluate and make decisions regarding options trading. Two widely used options pricing models are the Black-Scholes model and the Binomial model. Here's a brief overview of each:

Black-Scholes Model:

1. **Developers:**

   - Developed by economists Fischer Black and Myron Scholes, with contributions from Robert Merton. The model was published in 1973.

2. **Assumptions:**

   - The model makes several key assumptions, including constant volatility, efficient markets, risk-free interest rates, and log-normal distribution of stock prices.

3. **Components:**

   - The Black-Scholes formula calculates the theoretical price of European-style options and considers the following components:

     - Underlying Stock Price (S): The current market price of the stock.

     - Strike Price (K): The agreed-upon price at which the option can be exercised.

     - Time to Expiration (T): The time remaining until the option's expiration.

     - Risk-Free Interest Rate (r): The interest rate with no risk of financial loss.

     - Volatility (σ): The measure of the stock price's variability.

4. **Limitations:**

   - The Black-Scholes model assumes constant volatility, which may not always reflect real market conditions. It's also designed for European-style options and does not account for dividends.

Binomial Model (Cox-Ross-Rubinstein Model):

1. **Developers:**

   - Developed by financial economists John Cox, Stephen Ross, and Mark Rubinstein in 1979.

2. **Approach:**

   - The binomial model takes a discrete-time approach, dividing the option's life into multiple time steps. It models the possible price movements of the underlying asset at each step.

3. **Components:**

   - The key components of the binomial model include the current stock price, the strike price, the risk-free interest rate, time to expiration, and the number of time steps.

4. **Flexibility:**

   - The binomial model is more flexible than the Black-Scholes model, accommodating various option types, including American-style options, and it can handle changing volatility over time.

5. **Convergence to Black-Scholes:**

   - As the number of time steps increases in the binomial model, the results converge to the values obtained from the continuous-time Black-Scholes model.

Both the Black-Scholes model and the Binomial model are essential tools for options pricing, and they provide insights into the factors influencing option prices. Traders and investors often use these models to assess the fair value of options and make informed decisions in the derivatives market.