Part a

Call option has a payoff value equal to Max (St-K, 0)

St is stock price

K is strike price

Security has payoff value of Max (St-40, 0)

Therefore we can assume security to call option with strike price equal to $ 40

(Note: I have assumed security as a call option for explanation purpose we can also calculate the price of security without assuming it to be a call option)

Systematic risk is inherent in the market and cannot be diversified and hence will not affect the price of the security

S0 = 40

St is stock price at maturity.

Increased in stock price = 40%

Decrease in stock price = 20%

Risk free interest rate = 2%

Since the value of the security is Max (St-40, 0) the security can be considered as call option with strike price = $ 40

Let us assume that price of call option is C

We can consider the following portfolio

Suppose we buy δ share of stock and we sell call option on stock.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | **S1 =56** |  |
|  |  | |  |  |
|  | **C=16** |  |
| **S0 =40** |  |  |
| **K=40** |  |  |
|  |  |  |
|  | **S1 = 32** |  |
|  |  |  |
|  |  |  | **C= 0** |  |
|  |  |  |  |  |
|  |  |  |  |  |

If the price of share rise to $ 56 then the worth of the portfolio is equal to = 56\* δ – 16

If the stock price falls to $ 32 then the worth of the portfolio = 32\* δ

Value of δ for riskless portfolio

56\* δ – 16= 32\* δ

δ = 0.6667

We know that if there is No Arbitrage opportunity available then Investor must earn return equal to risk free rate

Value of the portfolio at t=0

S0 = Initial stock price = 40

δ = 0.6667

C0 = Initial Call price

S0\* δ – C0 = 26.668 –C0

Value of portfolio at t= 1 = 32\* δ

If we discount the portfolio to t=0 value of portfolio = 32\* δ\*e (-RT)

Risk free rate R = 2%

T = 1 Year

δ = 0.6667

Discounted Value of portfolio at t=0 = 32\* δ\*e (-RT) = $ 20.911

$ 26.668 –C0 = $ 20.911

C0 = $ 5.76

Part B

Arbitrage Opportunity is available if

C < S0 – K\*e (-RT)

C = Call premium

S0 = 40

K= 40

R = 2%

T = 1 year

C<0.792

Since C that is the price of security = $ 4 which is greater than 0.792. There No arbitrage opportunity available.