4.1

a)

S[0] = 100.5

t[0] = 0

r = 5.5% = 0.055

T = 0.75

F = S[0]\*e^(r\*(T-t[0]))

F = 100.5 \* e^(0.055 \* 0.75)

F = 104.7323

b)

S[0] = 95.5

t[0] = 0

q = 1.1% = 0.011

r = 5.1% = 0.051

T = 0.65

F = S[0]e^((r-q)(T-t[0]))

F = 95.5 \* e^((0.051 - 0.011) \* (0.65))

F = 98.01556

4.2

S[0] = 100.0

t[0] = 0

r = 5% = 0.05

T = 1

F = S[0]e^(r\*(T-t[0]))

F = 100.0 \* e^(0.05 \* 1)

F = 105.1271

1. If the forward price is 105.0 enter into a forward contract to buy the stock.

2. We now sell one share of stock today.

3. We then save the money from the short sell in the bank to earn interest.

4. At time T the forward contract expires and we buy the stock at 105.0;

- this yields 0.1271 profit

1. If the forward price is 106.0 we shall enter into a forward contract to sell the stock.

2. Then we buy the stock today by borrowing cash.

3. The forward contract expires and we sell the stock at 106.0

- this yields 0.8729 profit

4.3.1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| i | S\_i | F\_i | Money Received | Money Paid |
| 1 | 99.5 | 103.3 | 0.0 | 0.0 |
| 2 | 101.3 | 104.1 | 0.8 | 0.0 |
| 3 | 101.3 | 102.1 | 0.0 | 2.0 |
| 4 | 100.2 | 101.3 | 0.0 | 0.8 |
| 5 | 99.3 | 99.3 | 0.0 | 2.0 |

The investor pays 4.8 and in the mark to market account has 0.8 the total the investor has to pay is 4.0

4.3.2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| i | S\_i | F\_i | Money Received | Money Paid |
| 1 | 109.0 | 106.3 | 0.0 | 0.0 |
| 2 | 103.8 | 108.7 | 2.4 | 0.0 |
| 3 | 106.1 | 109.2 | 0.5 | 0.0 |
| 4 | 107.5 | 108.3 | 0.0 | 0.9 |
| 5 | 108.3 | 108.3 | 0.0 | 0.0 |

The investor pays 0.9 and in the mark to market account has 2.9 the total the investor has to pay is -2.0

4.3.3

Q1: Yes the random walk of the future prices affect the total amount paid by the investor

Q2: No the random walk of the stock prices does not affect the total amount paid by the investor.

4.3.5

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| i | S\_i | F\_i | Money Received | Money Paid |
| 1 | 99.5 | 106.3 | 0.0 | 0.0 |
| 2 | 101.3 | 105.1 | 0.0 | 1.2 |
| 3 | 101.3 | 105.8 | 0.7 | 0.0 |
| 4 | 100.1 | 104.2 | 0.0 | 0.0 |
| 5 | 102.3 | 102.3 | 0.0 | 0.0 |

On day 2 the investor takes a loss of 1.2. On day 3 the investor takes a loss of 0.5

4.3.6

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| i | S\_i | F\_i | Money Received | Money Paid |
| 1 | 99.7 | 106.3 | 0.0 | 0.0 |
| 2 | 101.2 | 105.1 | 0.0 | 1.2 |
| 3 | 101.5 | 105.8 | 0.7 | 0.0 |
| 4 | 102.8 | 104.2 | 0.0 | 0.0 |
| 5 | 102.3 | 102.3 | 0.0 | 0.0 |

On day 2 the investor will take a loss of 1.2 and on day 3 the investor will take a loss of 0.5

4.3.7

no the stock prices do not affect the profits or losses.