13. Derivative Instruments. Forward. Futures. Options. Swaps

Problem 75

Specul Inc. receives a $300,000 from a major contract on December 10. This cash is not needed for six days and, rather than investing it in short-term marketable securities Chief Financial Officer (CFO) wants to use these funds to speculate in pork bellies. He purchases 50 contracts. Each pork belly futures contract is for 40,000 pounds and requires a $2,000 initial margin and $1,500 maintenance margin. The current futures price for December delivery is $0,5500. The contracts are purchased at this price.

(a) What is the initial value of Specul Inc. margin account ?

(b) Immediately after the CFO purchases the contracts, the government issues a major report on dietary fat that is expected to reduce the public's bacon consumption. On succeeding days after the purchase of the contracts, pork belly futures trade at $0,5300, $0,5200, $0,5100, $0,5000, $0,4800, and $0,4500. Compute the changes in the margin account on each of these days.

(c) What is the profit/loss on the speculation ? What is the simple rate on the investment ? What is the effective annualized return ?

(d) Assuming that Specul Inc. will realize the purchase at the end of sixth day (maturity of futures contracts), how much will he pay for pork bellies ?

Solution

(a)

Margin account value = Initial margin per contract * Number of contracts

$2,000 * 50,000 = $100,000

Maintenance margin = $1,500 * 50,000 = $75,000

(b)

Day	Price	Gain or loss	Margin balance	Margin call	Margin account value
0	0,5500			100,000	100,000
1	0,5300	-40,000	60,000	40,000	100,000
2	0,5200	-20,000	80,000	0,000	80,000
3	0,5100	-20,000	60,000	40,000	100,000
4	0,5000	-20,000	80,000	0,000	80,000
5	0,4800	-40,000	40,000	60,000	100,000
6	0,4500	-60,000	40,000	60,000	100,000
	Total			300,000	100,000

(c)

Net loss = -200,000

Loss of cash is equal to -67%.

The simple rate of return is: (-200 : 100) -1 = -200%

The effective annualized rate of return is: (1-200,0%)^(365:6) -1 = -200%.

(d)

The actual futures price * Number of contracts * Pounds = $900,000.

Problem 74

A security currently worth $225 today. You plan to sell it in 360 days.
To hedge against a possible decline in price, you enter into the forward contract to sell the security.The risk-free rate is 4,8 percent.
(a) Calculate the forward price on this contract.
(b) After 120 days, the security sells for $250. Calculate the gain or loss to your position.
(c) At expiration the price of the asset is $240. Calculate the value of the forward contract.

Solution

(a)

The fair value is

$$F(0, T) = S_0(1 + r)^T \quad = \quad 235{,}69$$

(b)

$$V_t(0, T) = S_t - \frac{F(0, T)}{(1 + r)^{T-t}} \quad 21{,}49 \text{ gain to the long, loss to the short}$$

(c)

Gain on asset	240	-	225,00	=	15,00
Value of forward	240	-	235,69	=	4,31 for long
The overall gain					10,69

Problem 75

The forward exchange rate is 4,6400 zł/USD. Life of the contract: 78 days. Current spot exchange rate is: 4,5709zł/USD. Domestic risk-free interest rate is 18,00%, foreign interest rate is 6,00%.
(a) Calculate the "fair" futures price on this contract and the implied repo rate.
What arbitrage positions would create this rate.
(b) It is now 30 days later. The spot exchange rate is 4,5600.
Calculate the forward price and the value of the contract.
(c) What is the value of the forward contract at expiration. The spot exchange rate is 4,5000.

Solution

(a)

The "fair" forward exchange rate is

$$F = S_0 \frac{\left(1 + i^N_{Md} T\right)}{\left(1 + i^N_{Mf} T\right)} \qquad = \quad 4{,}676867 \qquad\qquad 4{,}68822$$

The implied repo rate is

$$i^N_d = \frac{\left[\frac{F_M \left(1 + i^N_f T\right)}{S_0} - 1\right]}{T} \qquad\qquad 13{,}07\%$$

The annualized cost rate is 13,07% plus transaction costs.
An investor should

1. borrow foreign currency at 6,00%,
2. sell currency at the current spot rate.
3. invest local currency at 18,00%,
4. buy cheap currency forward.

Ad 2.

$$W_t = \frac{S_t}{\left(1 + r^f\right)^{T_1}} - \frac{F_0}{\left(1 + r\right)^{T_1}}$$

4,525191 - 4,540096 = -0,0149

Ad 3.

4,5000 - 4,6400 = -0,1400