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Question 1.

suppose the stock price after 3 month is S_2

① the profit of buying 100 shares and of buying 2000 call options are. P_1, P_2

$P_1 = 100 \times (S_2 - 94)$, $P_2 = 2000(\overset{S_2}{\cancel{95}} - 95) - 2000 \times (4.70)$

let $P_2 \geq P_1$

$2000(S_2 - 99.7) \geq 100(S_2 - 94)$

$S_2 \geq 100$

②. if the stock price falls,

the loss of the two ways are L_1, L_2

$L_1 = (94 - S_2) \times 100$, $L_2 = 2000 \times 4.70$

$L_1 \geq L_2$

$S_2 \leq 0$,

If they predict the stock price will rise over \$100, the option strategy will be more profitable.

But it will also cause more loss, if the stock price fall.

Question 2.

② 1)

① suppose the price of the futures is P

$$(P-7.50)\times 5000 \geq 3000-2000$$

$$P \geq 7.70$$

∴ when the price rises above 770 cents per bushel, it will lead to a margin call

② similarly,

$$(7.50-P)\times 5000 \geq 1500$$

$$P \leq 7.2$$

∴ when the price falls below 720 cents per bushel, $1500 could be withdrawn

Question 3.

1. Borrow $50 from bank

2. Buy the June future contract in long position and be in the short position of the December contract.

3. For each contracts, the arbitrager can make profits

if. calculate as single interests: $P = 56 - 50\times(1+\frac{4\%}{2}) = \$5$

if calculate as countinuous interest: $P = 56 - 50\times e^{\frac{4\%}{2}} \approx \$4.9899$

由 扫描全能王 扫描创建

Question 4.

Calculated by Excel.

$\sigma_S = 0.4933$

$\sigma_F = 0.5116$ $\qquad \rho_{SF} = 0.9806$

$$h^* = \rho_{SF} \cdot \frac{\sigma_S}{\sigma_F} \approx 0.9456$$

the minimum variance hedge ratio is 0.9456.

Question 5

a. Index level = 1250

Index future price = 1259

Value of portfolio = 5000000

risk-free rate = 6% per annum

dividend yield on index = 3% per annum

Beta of portfolio = 0.87

$\therefore V_S = 50000000$, $V_F = 250 \times 1259$. $N = \beta \cdot \frac{V_S}{V_F} = 138.2 \approx 138$

the ~~stock~~ portfolio manager should take short position, the numbers of futures contract ~~that~~ is 138.

b. the level of the market in two month is P_{I_2},

the level of the 1-month future prices is F_{I_2}.

P_{I_2}	1000	1100	1200	1300	1400	
F_{I_2}	1002.5	1102.75	1203	1303.25	1403.5	
gain/loss on Futures	8849250	5390625	1932000	-1526625	-4985250	$= 138 \times (1259 - F_{I_2}) \times 250$
gain/loss on Index	-20%	-12%	-4%	4%	12%	$= (P_{I_2} - 1250)/1250 \times 100\%$
consider dividends	-19.5%	-11.5%	-3.5%	4.5%	12.5%	$= (P_{I_2} - 1250)/1250 + 3\%/6$
Expected return on Portfolio	-16.835%	-9.875%	-2.915%	4.045%	11.005%	$= 6\%/6 + 0.87(\text{Return on index} - 6\%/6)$
Expected value of Portfolio	41582500	45062500	48542500	52022500	55502500	$= 50000000 \times (\text{Expected return on portfolio} + 1)$
Expected value of hedger's position	50431750	50453125	50474500	50495875	50517250	= (gain/loss on Futures) + (Expected value of Portfolio)

$\therefore$ So the value of hedgers

1000	1100	1200	1300	1400
~~50431750~~	~~50453125~~	~~50474500~~	~~50495875~~	~~50517250~~

50431750 50453125 50474500 50495875 50517250