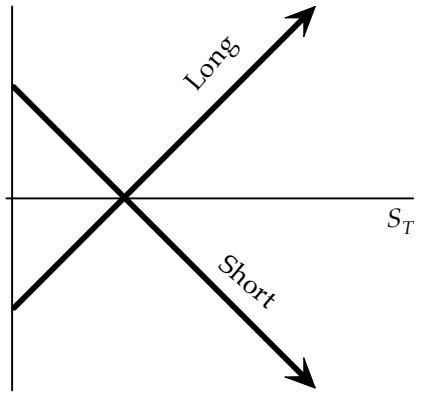
Solutions to practice questions – Study Session 10

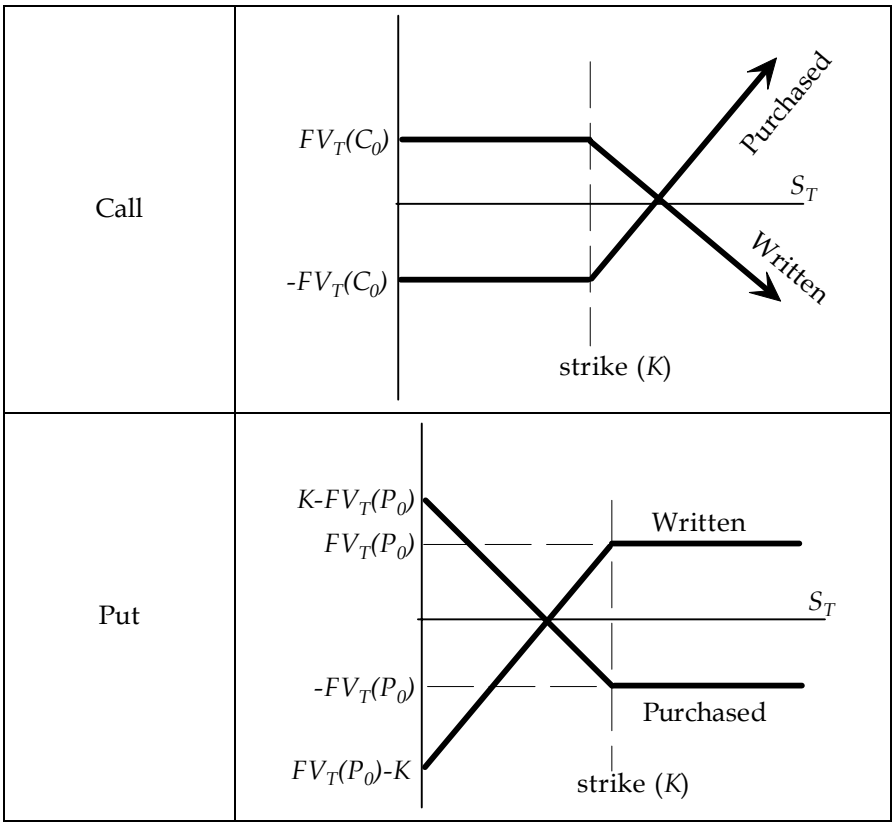
Solution 10.1

Position	Maximum profit	Maximum loss
Long a forward	No maximum	$-F_{0,T}$
Purchased a call	No maximum	$-FV_T(C_0)$
Purchased a put	$K - FV_T(P_0)$	$-FV_T(P_0)$
Short a forward	$F_{0,T}$	No maximum
Written a call	$FV_T(C_0)$	No maximum
Written a put	$FV_T(P_0)$	$FV_T(P_0) - K$

➔ *Note: that each maximum profit is equal to the maximum loss of the counterparty to that position (ie you really only need to derive half of the table!).*

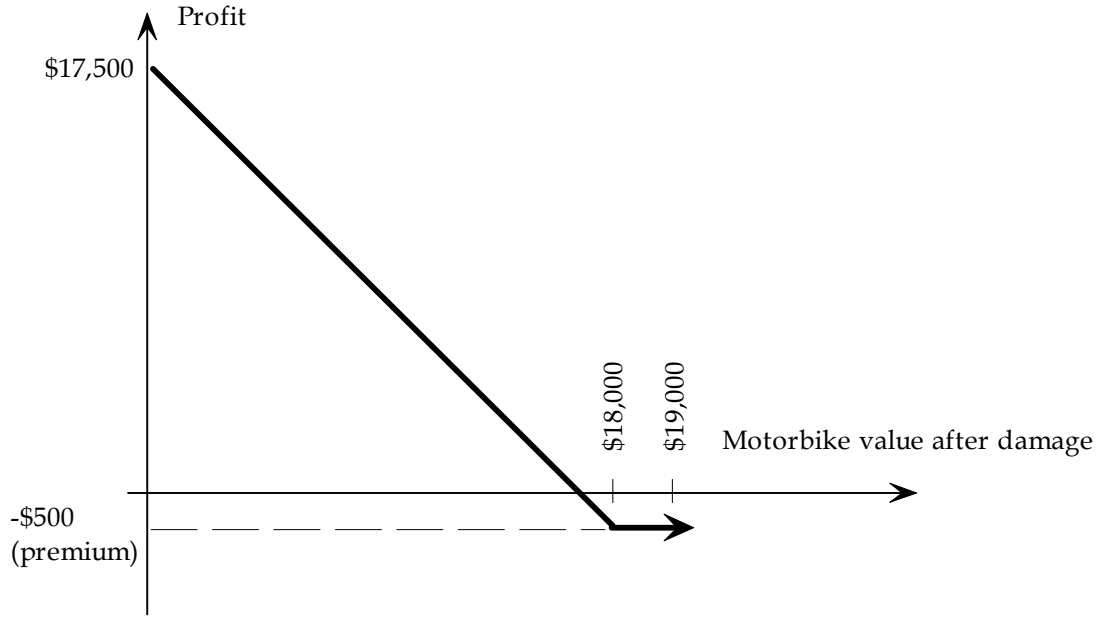
Solution 10.2

Position	Profit graph
Forward	 The x-ais intercept is where $S_T = F_{0,T}$



For each graph, the x-axis is S_T and the y-axis is profit.

Solution 10.3



So the insurance company has essentially sold you a put option.

Solution 10.4

If the stock price turns out to be \$9 at expiration, Investor A will suffer a loss of \$1, equating to a loss of 10% of their initial investment. Investor B, however, will lose 100% of their investment, as the call option will expire unexercised and worthless.

If the stock price turns out to be \$10 at expiration, Investor A will enjoy neither a profit nor a loss. However, Investor B will again lose 100% of their investment, as the call option will once more expire unexercised and worthless.

If the stock price turns out to be \$11 at expiration, Investor A will enjoy a profit of \$1, or 10%. As the option is in-the-money at expiration, Investor B will receive a payoff of \$0.50, which, for an initial investment of \$1, corresponds to a loss of \$0.50, or 50%.

If the stock price turns out to be \$12 at expiration, then Investor A will enjoy a profit of \$2, or 20% of their initial investment. As the option is again in-the-money at expiration, Investor B will receive a payoff of \$1.50, which corresponds to a profit of \$0.50, or 50%.

If the stock price turns out to be \$13 at expiration, then Investor A will enjoy a profit of \$3, or 30% of their initial investment. As the option is again in-the-money at expiration, Investor B will receive a payoff of \$2.50, which corresponds to a profit of \$1.50, or 150%.

The results are summarized in the table below.

Stock price at expiry, S_T	Investor A's percentage profit	Investor B's percentage profit
\$9	–10%	–100%
\$10	0%	–100%
\$11	10%	–50%
\$12	20%	50%
\$13	30%	150%

The returns to Investor B are much more sensitive to the stock price at expiration than the returns to Investor A. This is because they are highly leveraged, due to the fact they are achieved in return for only a relatively small investment of the option premium of \$1, rather than the full stock price of \$10.

Solution 10.5

$$15,000 \times \left[0.75 \times \left(\frac{I_5}{1350} - 1 \right) + 1 \right] = 15,100$$

$$I_5 = 1362$$

Solution 10.6

Answer: **B**

Entering into a long forward position would produce a profit if the index goes up, which would broadly offset the increased cost of the stocks. Equally, should the stock market instead fall, then the loss on the forward would offset the lower cost of the stocks.

Entering into a long call position would likewise produce a profit if the index goes up, which would broadly offset the increased cost of the stocks. However, in this case, should the stock market instead fall, then the loss on the option would be limited to the cost of the option premium.

Entering into a short call position would yield a loss if the index goes up, which would reinforce the increased cost of the stocks, rather than hedge it. It would, however, produce a profit equal to the option premium should the stock market instead fall.

➔ *Note*: T*he profit on the forward would generally not exactly offset the increased costs of the stocks purchased, as they are unlikely to be identical to the constituents of the S&P 500 index.*

