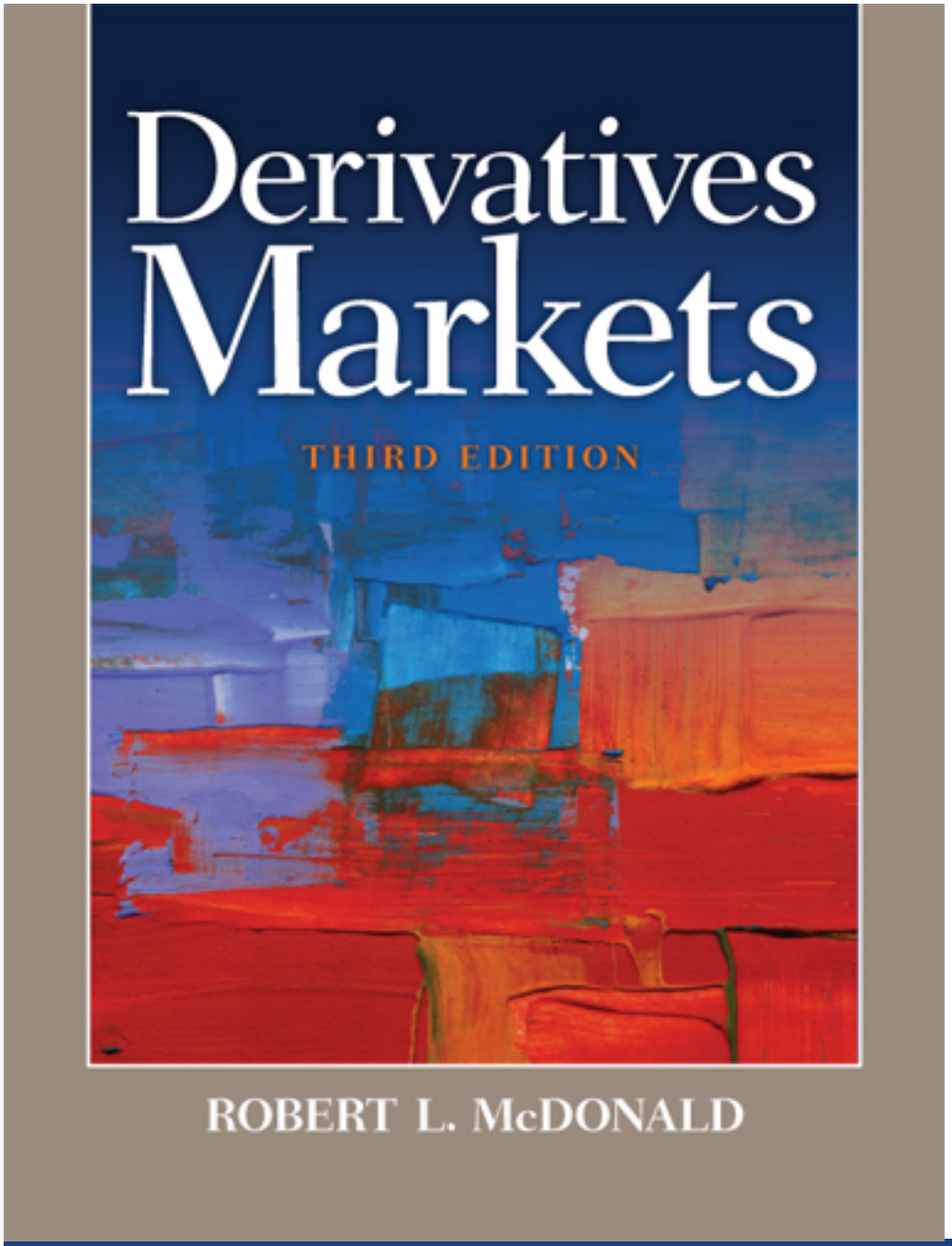


Chapter 3

Insurance, Collars, and Other Strategies

Basic Insurance Strategies

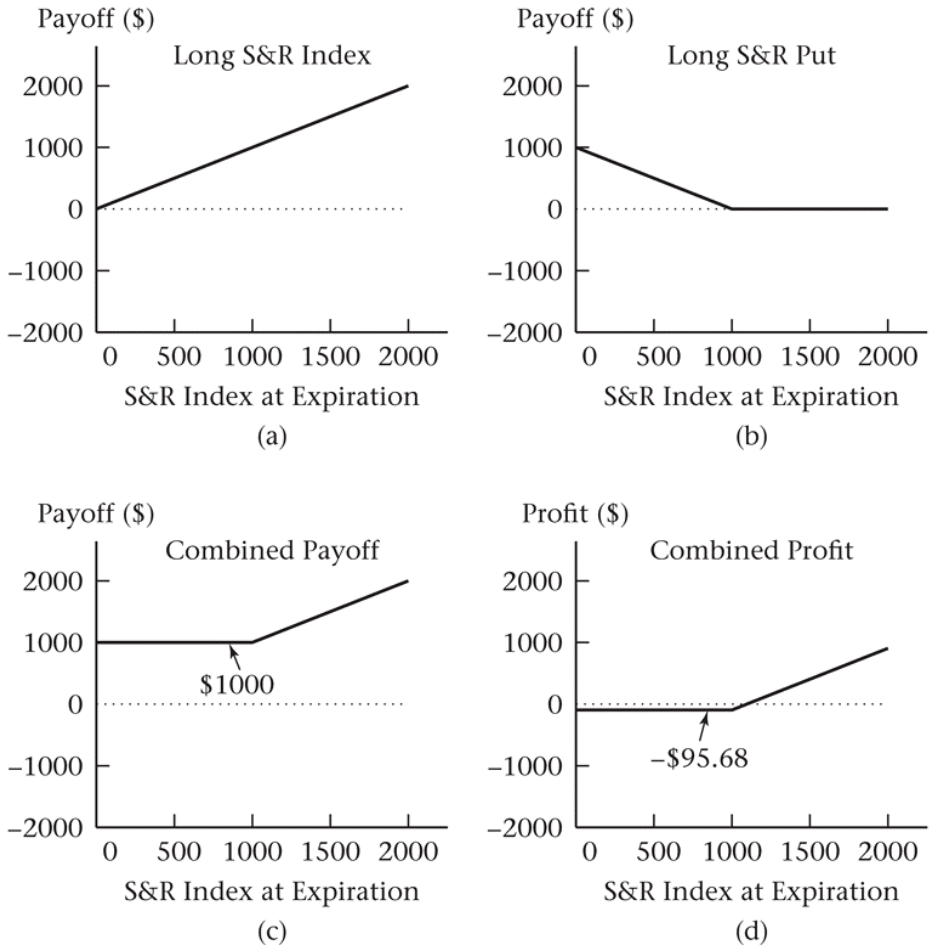
- Options can be
  - Used to insure long positions (floors)
  - Used to insure short positions (caps)
  - Written against asset positions (selling insurance)

Insuring a Long Position: Floors

- A put option is combined with a position in the underlying asset
- Goal: to insure against a fall in the price of the underlying asset

Insuring a Long Position: Floors (cont'd)

- Example: S&R index and an S&R put option with a strike price of $1,000 together



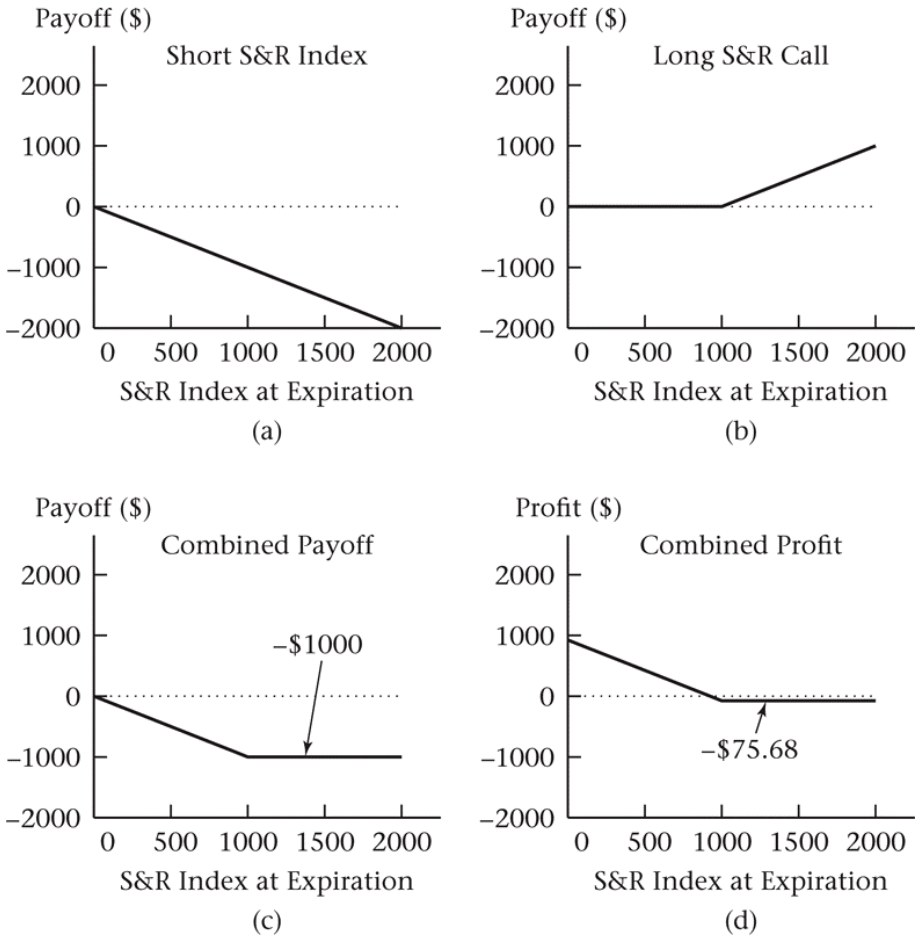
Buying an asset and a put generates a position that looks like a call!

Insuring a Short Position: Caps

- A call option is combined with a position in the underlying asset
- Goal: to insure against an increase in the price of the underlying asset (when one has a short position in that asset)

Insuring a Short Position: Caps (cont'd)

- Example: short-selling the S&R index and holding a S&R call option with a strike price of $1,000



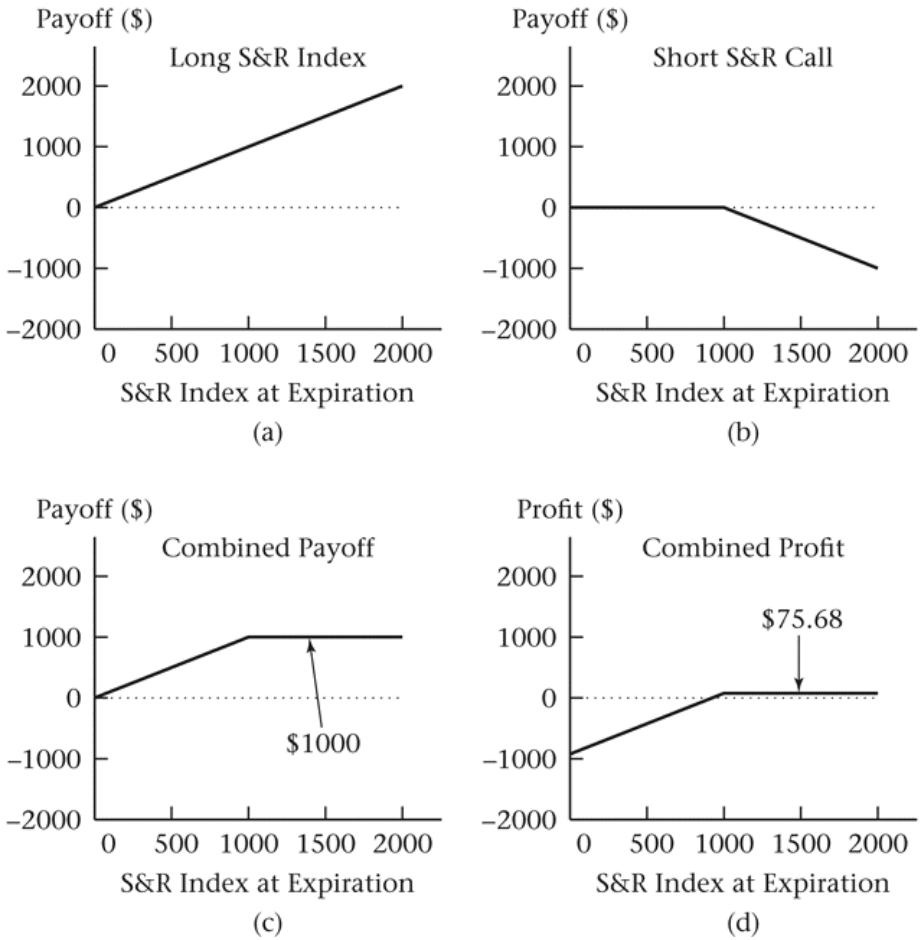
An insured short position looks like a put!

Selling Insurance

- For every insurance buyer there must be an insurance seller
- Strategies used to sell insurance
  - **Covered writing** (option overwriting or selling a covered call) is writing an option when there is a corresponding long position in the underlying asset is called covered writing
  - **Naked writing** is writing an option when the writer does not have a position in the asset

Covered Writing: Covered Calls

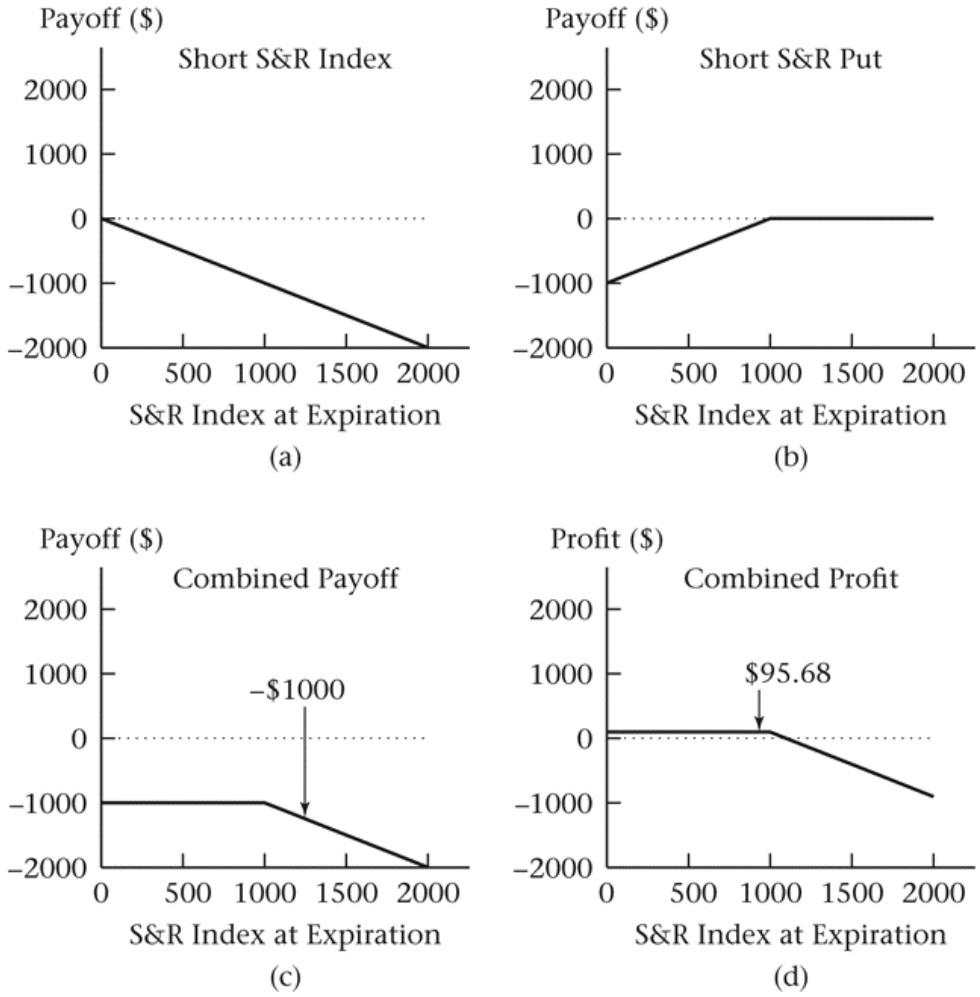
- Example: holding the S&R index and writing a S&R call option with a strike price of $1,000



Writing a covered call generates the same profit as selling a put!

Covered Writing: Covered Puts

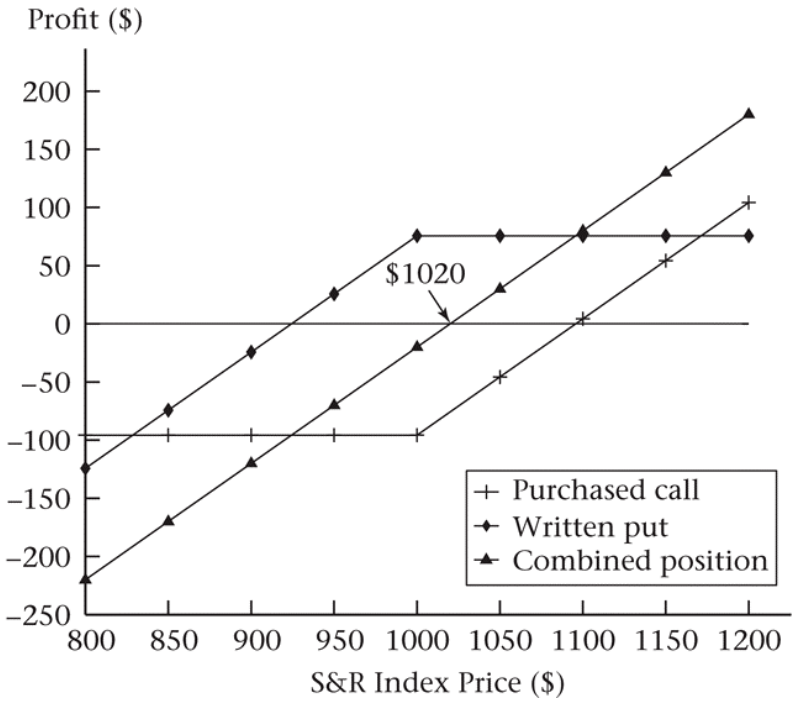
- Example: shorting the S&R index and writing a S&R put option with a strike price of $1,000



Writing a covered put generates the same profit as writing a call!

Synthetic Forwards

- A synthetic long forward contract
  - Buying a call and selling a put on the same underlying asset, with each option having the same strike price and time to expiration
  - Example: buy the $1,000-strike S&R call and sell the $1,000-strike S&R put, each with 6 months to expiration



Synthetic Forwards (cont'd)

- Differences between a synthetic long forward contract and the actual forward
  - The forward contract has a zero premium, while the synthetic forward requires that we pay the net option premium
  - With the forward contract, we pay the forward price, while with the synthetic forward we pay the strike price

Put-Call Parity

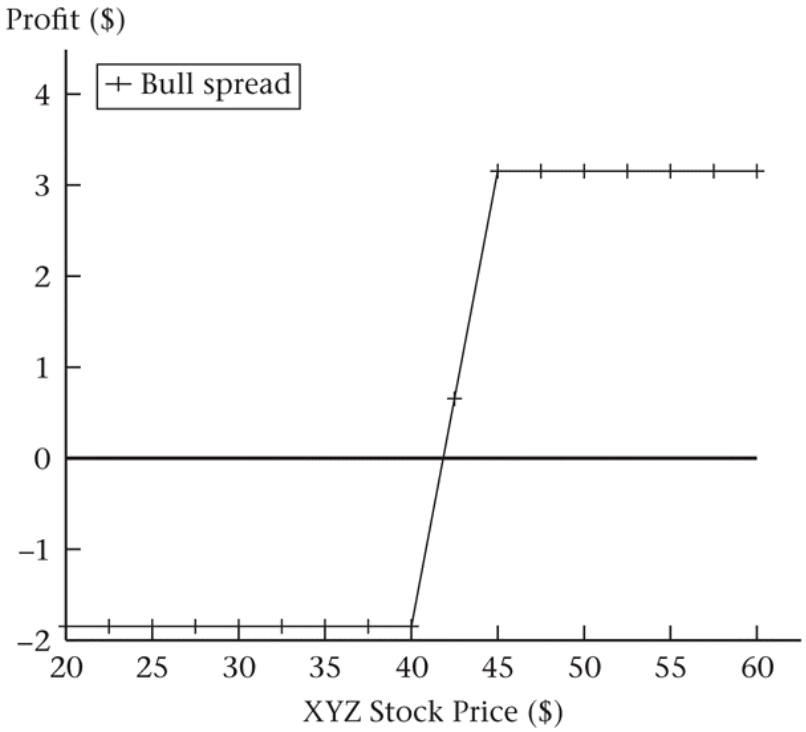
- The net cost of buying the index using options must equal the net cost of buying the index using a forward contract
- Call (K, t) – Put (K, t) = PV ($F_{0,t}$ – K)
  - Call (K, t) and Put (K, t) denote the premiums of options with strike price K and time t until expiration, and PV ($F_{0,t}$) is the present value of the forward price
- *This is one of the most important relationships in derivatives!*

Spreads and Collars

- An option **spread** is a position consisting of only calls or only puts, in which some options are purchased and some written
  - Examples: bull spread, bear spread, box spread
- A **collar** is the purchase of a put option and the sale of a call option with a higher strike price, with both options having the same underlying asset and having the same expiration date
  - Example: zero-cost collar

Spreads

- A **bull spread** is a position, in which you buy a call and sell an otherwise identical call with a higher strike price
  - It is a bet that the price of the underlying asset will increase
  - Bull spreads can also be constructed using puts

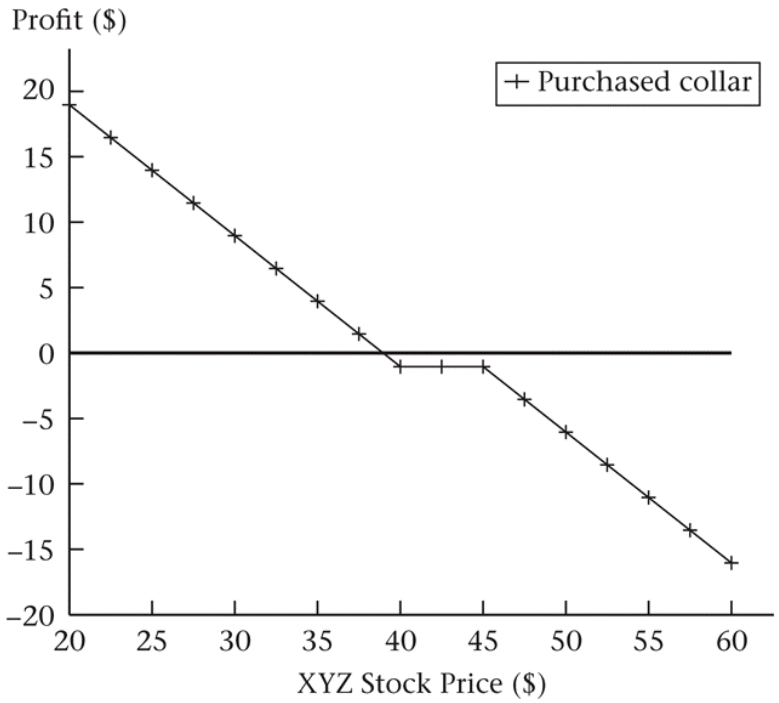


Spreads (cont'd)

- A **bear spread** is a position in which one sells a call and buys an otherwise identical call with a higher strike price
- A **box spread** is accomplished by using options to create a synthetic long forward at one price and a synthetic short forward at a different price
  - A box spread is a means of borrowing or lending money: It has no stock price risk
- A **ratio spread** is constructed by buying *m* calls at one strike and selling *n* calls at a different strike, with all options having the same time to maturity and same underlying asset
  - Ratio spreads can also be constructed using puts

Collars

- A collar represents a bet that the price of the underlying asset will decrease and resembles a short forward
- A **zero-cost collar** can be created when the premiums of the call and put exactly offset one another

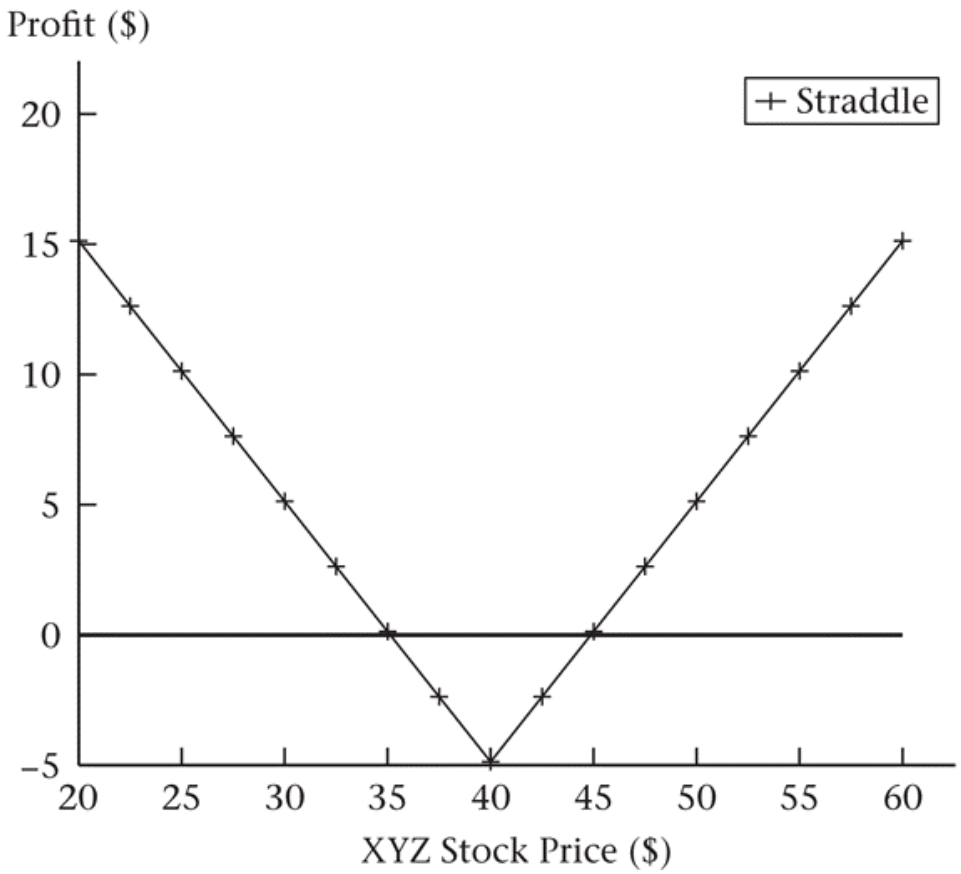


Speculating on Volatility

- Options can be used to create positions that are nondirectional with respect to the underlying asset
- Examples
  - Straddles
  - Strangles
  - Butterfly spreads
- Who would use nondirectional positions?
  - Investors who do not care whether the stock goes up or down, but only how much it moves, i.e., who speculate on volatility

Straddles

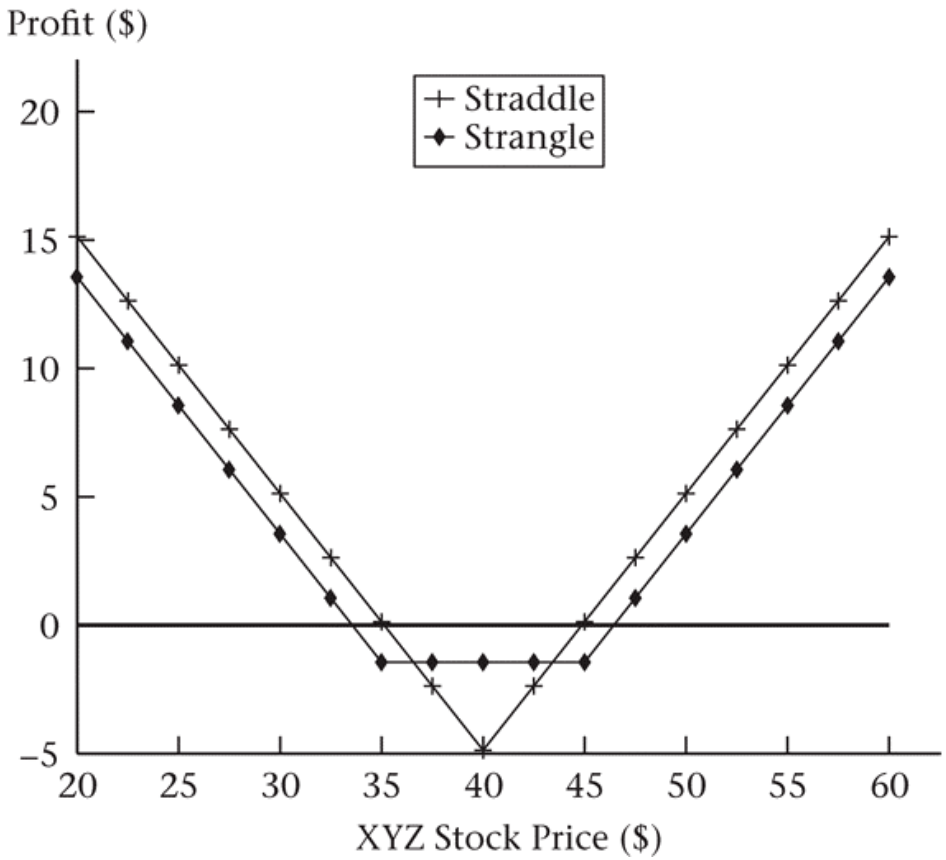
- Buying a call and a put with the same strike price and time to expiration



- A straddle is a bet that volatility will be high relative to the market's assessment

Strangles

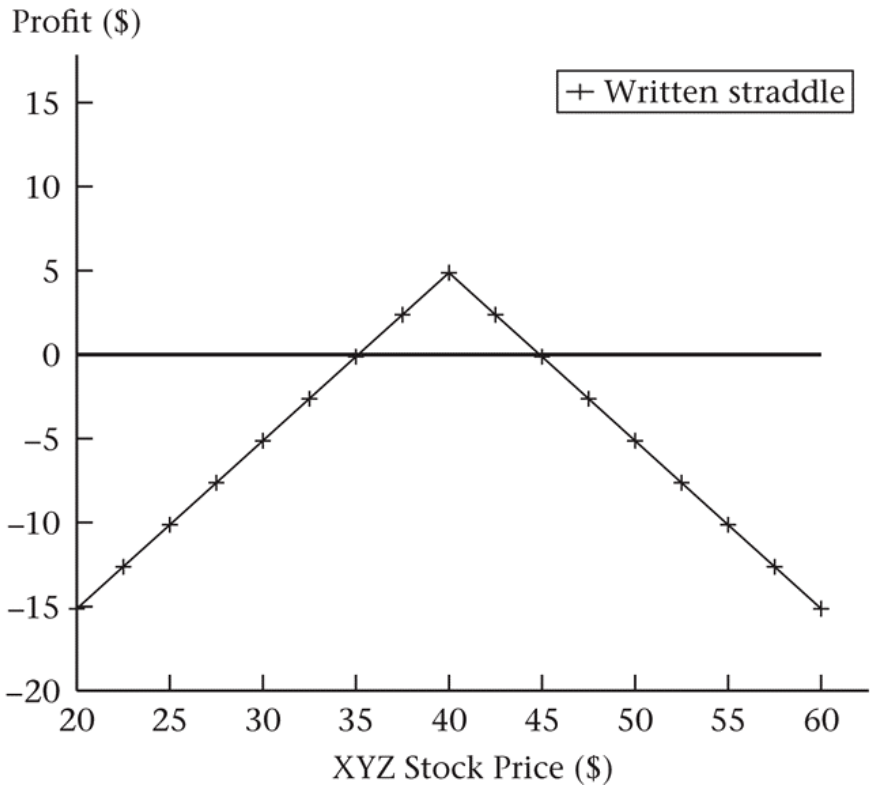
- Buying an out-of-the-money call and put with the same time to expiration



- A strangle can be used to reduce the high premium cost, associated with a straddle

Written Straddles

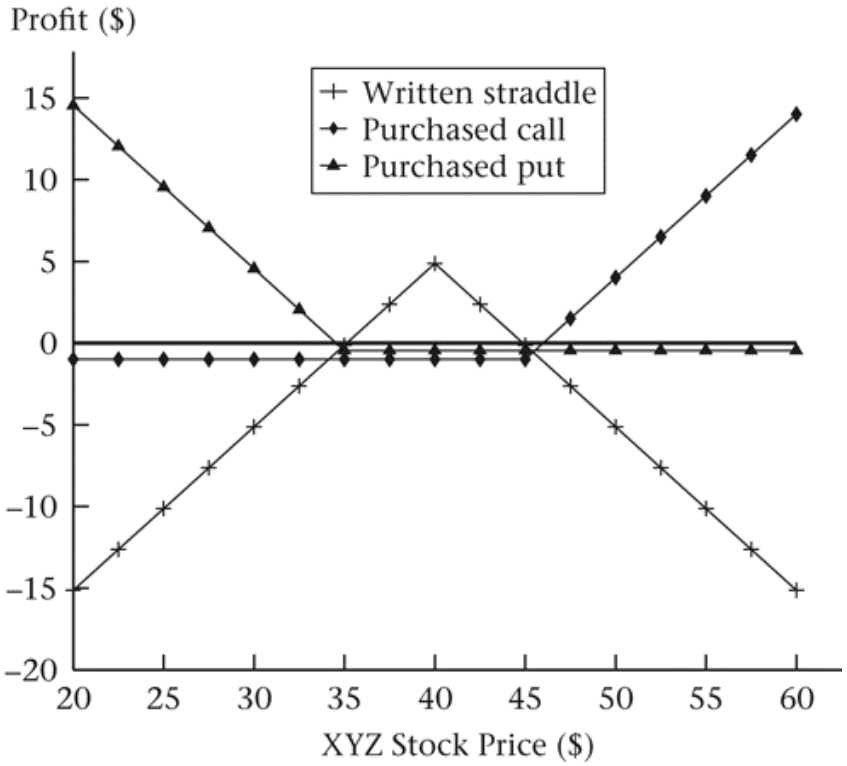
- Selling a call and put with the same strike price and time to maturity



- Unlike a purchased straddle, a written straddle is a bet that volatility will be low relative to the market's assessment

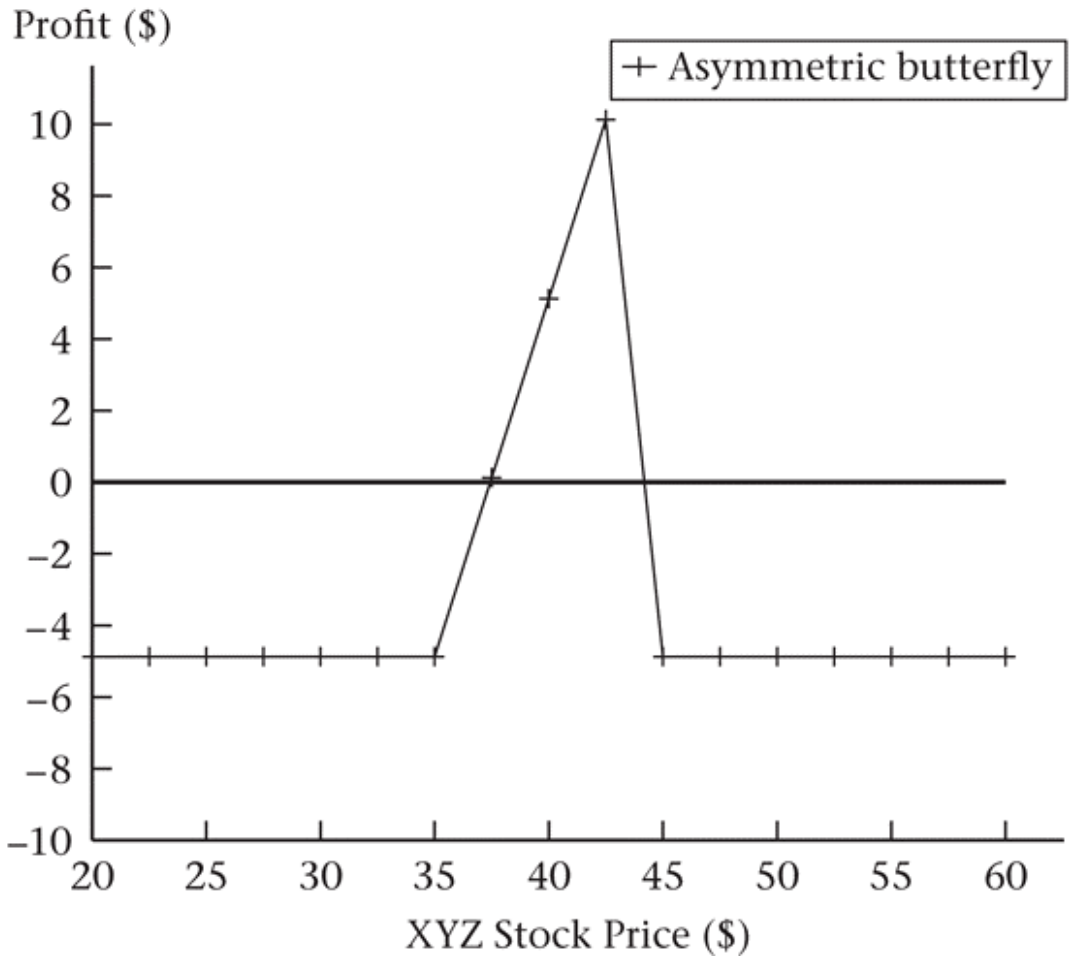
Butterfly Spreads

- Write a straddle + add a strangle = insured written straddle



- A butterfly spread insures against large losses on a straddle

Asymmetric Butterfly Spreads



Summary of Various Strategies

- Different positions, same outcome

TABLE 3.7 Summary of equivalent positions from Section 3.1.

Position	Is Equivalent To	And Is Called
Index + Put	Zero-Coupon Bond + Call	Insured Asset (floor)
Index − Call	Zero-Coupon Bond − Put	Covered Written Call
−Index + Call	−Zero-Coupon Bond + Put	Insured Short (cap)
−Index − Put	−Zero-Coupon Bond − Call	Covered Written Put

- Strategies driven by the view of the market's direction

TABLE 3.8 Positions consistent with different views on the stock price and volatility direction.

	Volatility Will Increase	No Volatility View	Volatility Will Fall
Price will fall	Buy puts	Sell underlying	Sell calls
No price view	Buy straddle	Do nothing	Sell straddle
Price will increase	Buy calls	Buy underlying	Sell puts

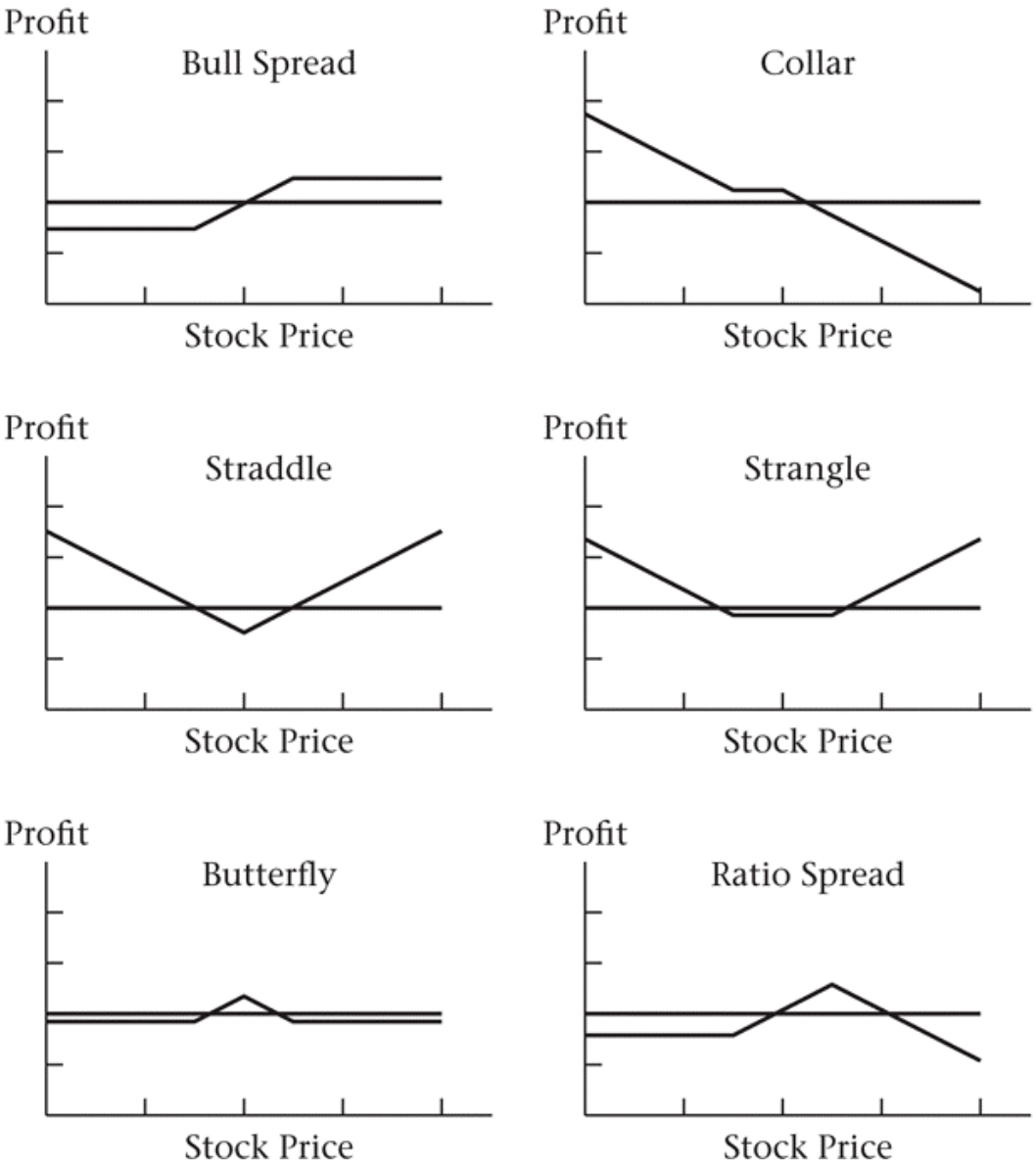


FIGURE 3.2

Payoff to owning a house and owning insurance. We assume a $25,000 deductible and a $200,000 house, with the policy costing $15,000.

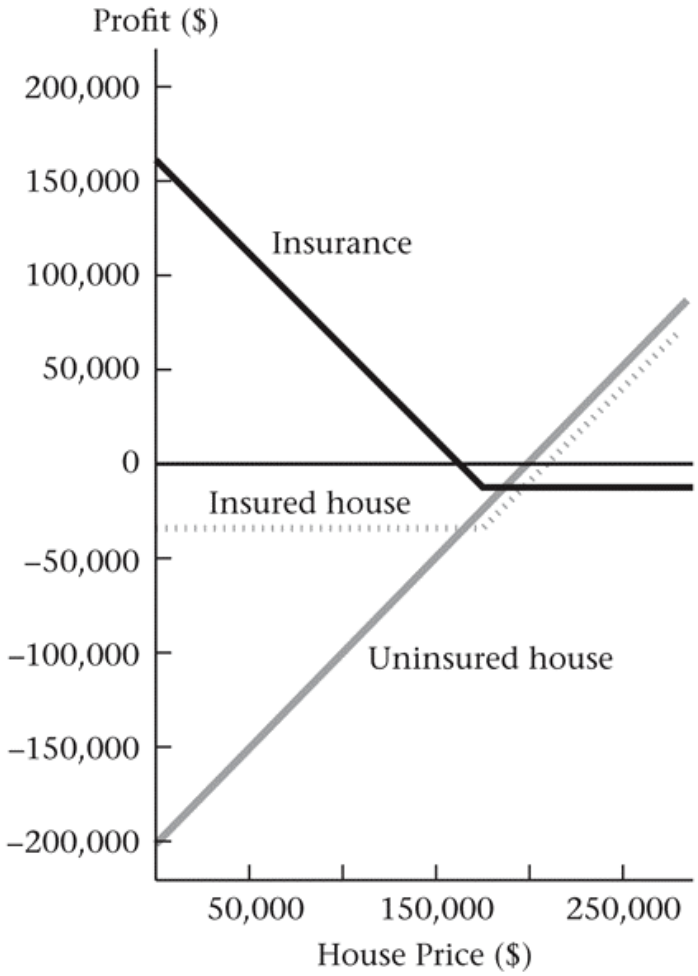


TABLE 3.1

Payoff and profit at expiration from purchasing the S&R index and a 1000-strike put option. Payoff is the sum of the first two columns. Cost plus interest for the position is ($1000 + $74.201) × 1.02 = $1095.68. Profit is payoff less $1095.68.

Payoff at Expiration				
S&R Index	**S&R Put**	**Payoff**	**−(Cost + Interest)**	**Profit**
$900	$100	$1000	−$1095.68	−$95.68
950	50	1000	−1095.68	−95.68
1000	0	1000	−1095.68	−95.68
1050	0	1050	−1095.68	−45.68
1100	0	1100	−1095.68	4.32
1150	0	1150	−1095.68	54.32
1200	0	1200	−1095.68	104.32

TABLE 3.2

Payoff and profit at expiration from short-selling the S&R index and buying a 1000-strike call option at a premium of $93.809. The payoff is the sum of the first two columns. Cost plus interest for the position is (−$1000 + $93.809) × 1.02 = −$924.32. Profit is payoff plus $924.32.

Payoff at Expiration				
Short S&R Index	S&R Call	Payoff	−(Cost + Interest)	Profit
−$900	$0	−$900	$924.32	$24.32
−950	0	−950	924.32	−25.68
−1000	0	−1000	924.32	−75.68
−1050	50	−1000	924.32	−75.68
−1100	100	−1000	924.32	−75.68
−1150	150	−1000	924.32	−75.68
−1200	200	−1000	924.32	−75.68

TABLE 3.3

Payoff and profit at expiration from purchasing the S&R index and selling a 1000-strike call option. The payoff column is the sum of the first two columns. Cost plus interest for the position is ($1000 − $93.809) × 1.02 = $924.32. Profit is payoff less $924.32.

Payoff at Expiration				
S&R Index	Short S&R Call	Payoff	−(Cost + Interest)	Profit
$900	$0	$900	−$924.32	−$24.32
950	0	950	−924.32	25.68
1000	0	1000	−924.32	75.68
1050	−50	1000	−924.32	75.68
1100	−100	1000	−924.32	75.68
1150	−150	1000	−924.32	75.68
1200	−200	1000	−924.32	75.68

TABLE 3.4

Black-Scholes option prices assuming stock price = $40, volatility = 30%, effective annual risk-free rate = 8.33% (8%, continuously compounded), dividend yield = $0, and 91 days to expiration.

Strike	Call	Put
35	6.13	0.44
40	2.78	1.99
45	0.97	5.08

TABLE 3.5 Profit at expiration from purchase of 40-strike call and sale of 45-strike call.

Stock Price at Expiration	Purchased 40-Call	Written 45-Call	Premium Plus Interest	Total
$35.0	$0.0	$0.0	−$1.85	−$1.85
37.5	0.0	0.0	−1.85	−1.85
40.0	0.0	0.0	−1.85	−1.85
42.5	2.5	0.0	−1.85	0.65
45.0	5.0	0.0	−1.85	3.15
47.5	7.5	−2.5	−1.85	3.15
50.0	10.0	−5.0	−1.85	3.15

TABLE 3.6 Profit at expiration from purchase of 40-strike put and sale of 45-strike call.

Stock Price at Expiration	Purchased 40-Put	Written 45-Call	Premium Plus Interest	Profit on Stock	Total
$35.00	$5.00	$0.00	−$1.04	−$5.81	−$1.85
37.50	2.50	0.00	−1.04	−3.31	−1.85
40.00	0.00	0.00	−1.04	−0.81	−1.85
42.50	0.00	0.00	−1.04	1.69	0.65
45.00	0.00	0.00	−1.04	4.19	3.15
47.50	0.00	−2.50	−1.04	6.69	3.15
50.00	0.00	−5.00	−1.04	9.19	3.15

FIGURE 3.9

Zero-cost collar on XYZ, created by buying XYZ at $40, buying a 40-strike put with a premium of $1.99, and selling a 41.72-strike call with a premium of $1.99.

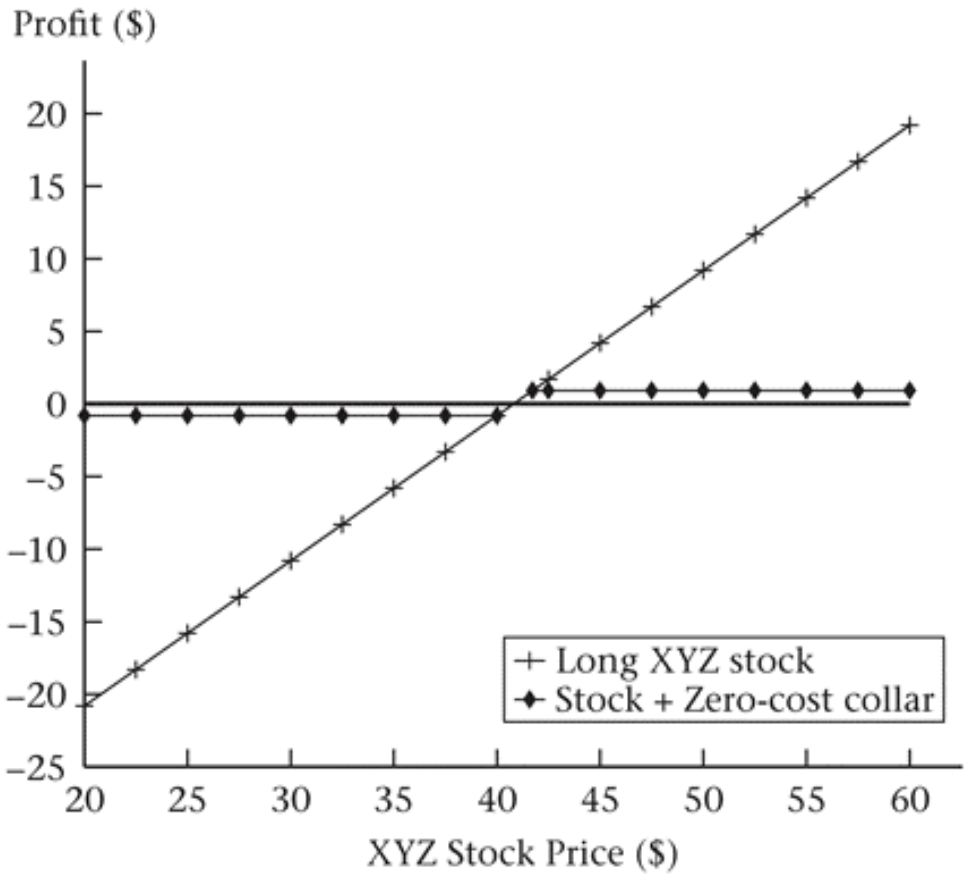


FIGURE 3.14

Comparison of the 35–40–45 butterfly spread, obtained by adding the profit diagrams in Figure 3.13, with the written 40-strike straddle.