

# **MGST 451**

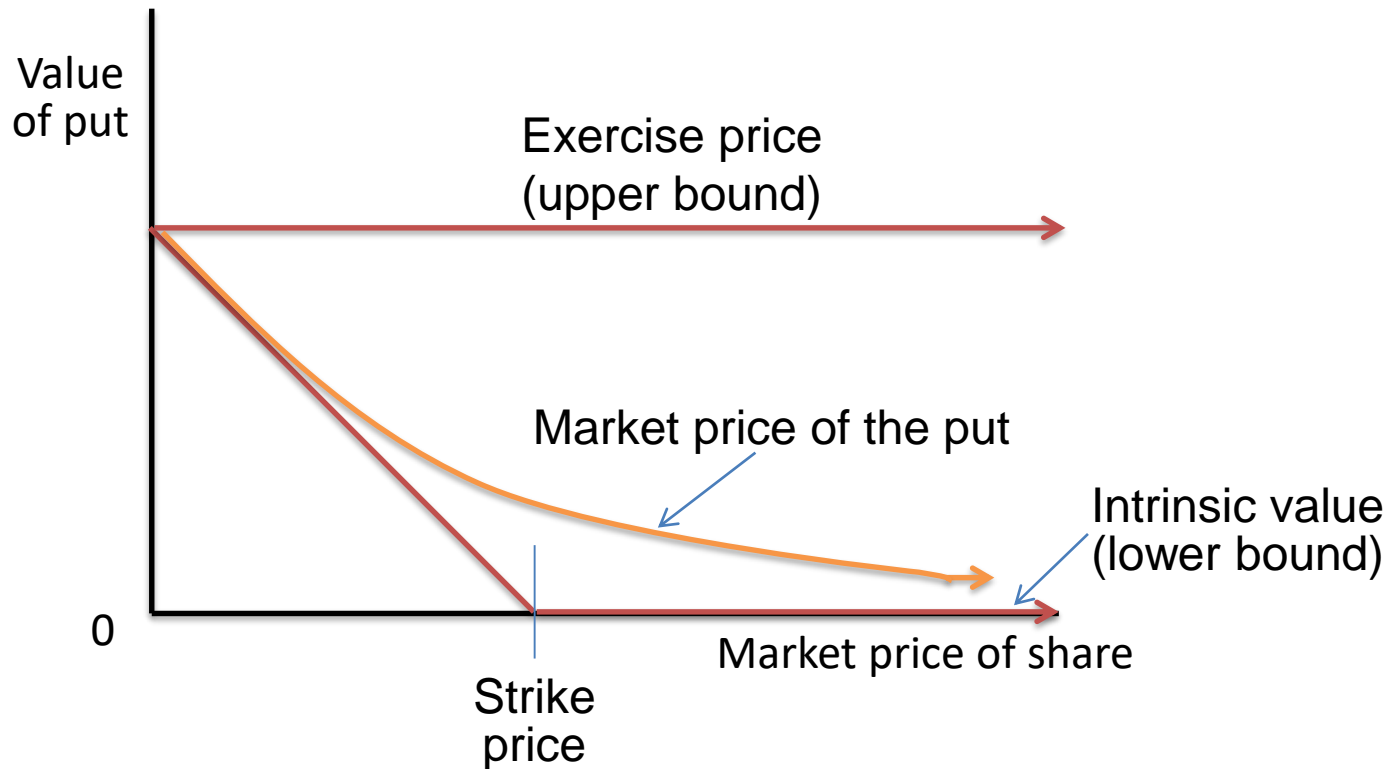
## **Corporate Governance and Ethical Decision-Making**

**Lecture 9 – Winter 2019 L01-L03**

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1. Price of Exchange-Traded Stock Put Options
2. Leverage
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  - Profit and losses of covered call options
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# Price of American Stock Put Options



- The value of a put cannot be higher than the exercise price.
- The value of an American put cannot be lower than its intrinsic value.
- The time value is the price of the call minus its intrinsic value
- See <http://www.investopedia.com/terms/o/option-premium.asp>

# Summary of Naked Stock Options

| Buyers                                                                                                                                               | Sellers                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bulls buy calls                                                                                                                                      | Bears (or Crabs) write calls                                                                                                                         |
| Pays a 'call premium' (price) to the writer.                                                                                                         | Receives a 'call premium' (price) from the buyer.                                                                                                    |
| Has the right, but not the obligation, to buy a stated number of shares at a predetermined price, for a defined period of time.                      | Has the obligation, if required to do so by the holder, to sell a stated number of shares at a predetermined price, for a defined period of time.    |
| Share price > (Strike price + Premium) → Gain<br>Share price = (Strike price + Premium) → Breakeven<br>Share price < (Strike price + Premium) → Loss | Share price > (Strike price + Premium) → Loss<br>Share price = (Strike price + Premium) → Breakeven<br>Share price < (Strike price + Premium) → Gain |
| Potential of unlimited gain but potential maximum loss limited to 100% of premium paid.                                                              | Potential of gain up to 100% of premium received but potential of unlimited loss.                                                                    |
| Bears buy puts                                                                                                                                       | Bulls (or Crabs) write puts                                                                                                                          |
| Pays a 'put premium' (price) to the writer.                                                                                                          | Receives a 'put premium' (price) from the buyer.                                                                                                     |
| Has the right, but not the obligation, to sell a stated number of shares at a predetermined price, for a defined period of time.                     | Has the obligation, if required to do so by the holder, to buy a stated number of shares at a predetermined price, for a defined period of time.     |
| Share price < (Strike price - Premium) → Gain<br>Share price = (Strike price - Premium) → Breakeven<br>Share price > (Strike price - Premium) → Loss | Share price < (Strike price - Premium) → Loss<br>Share price = (Strike price - Premium) → Breakeven<br>Share price > (Strike price - Premium) → Gain |
| Potential of gain up to strike price less premium paid and potential of loss of 100% of premium paid.                                                | Potential of gain up to 100% of premium received and loss potential up to strike price less premium received.                                        |

- A “levered position” refers to investing using a mix of investor own funds and borrowed money. It magnifies the potential investment profit and losses. It could be described as using leverage for the purpose of investing.
- In a similar manner, buying options offers potential returns which will likely be more ‘extreme’ than an outright unlevered position in the underlying asset.

# Example of a Levered Long Position

|                                                    | Stock price | Unlevered Long                |                       | Levered long                        |                        |
|----------------------------------------------------|-------------|-------------------------------|-----------------------|-------------------------------------|------------------------|
|                                                    |             | Cash in account               | Position              | Cash in account                     | Position               |
| Start of day #1                                    | \$50        | \$5,000                       | -                     | \$5,000                             | -                      |
| Buy 100 shares <b>or</b><br>Buy 200 shares levered | \$50        | \$5,000<br>- \$5,000<br>= \$0 | 100 shares<br>\$5,000 | \$5,000<br>- \$10,000<br>= -\$5,000 | 200 shares<br>\$10,000 |
| Start of day #2                                    | \$40        | \$0                           |                       | -\$5,000                            |                        |
| Loss of \$1,000 <b>or</b><br>Loss of \$2,000       | \$40        | \$0                           | 100 shares<br>\$4,000 | -\$5,000                            | 200 shares<br>\$8,000  |
| Start of day #3                                    | \$70        | \$0                           |                       | -\$5,000                            |                        |
| Gain of \$2,000 <b>or</b><br>Gain of \$4,000       | \$70        | \$0                           | 100 shares<br>\$7,000 | -\$5,000                            | 200 shares<br>\$14,000 |
| Sell all shares                                    | \$70        | \$7,000                       | -                     | \$9,000                             | -                      |
| Gain                                               |             | \$2,000                       |                       | \$4,000                             |                        |
| Holding period return                              |             | +40%                          |                       | +80%                                |                        |

# Example of an Option Position

|                                                                        | Stock price | Unlevered Long                |                       | Long Call                     |                       |
|------------------------------------------------------------------------|-------------|-------------------------------|-----------------------|-------------------------------|-----------------------|
|                                                                        |             | Cash in account               | Position              | Cash in account               | Position              |
| Start of day #1                                                        | \$50        | \$5,000                       | -                     | \$5,000                       | -                     |
| Buy 100 shares <b>or</b><br>Buy 5 options<br>@ \$10/share; Strike \$55 | \$50        | \$5,000<br>- \$5,000<br>= \$0 | 100 shares<br>\$5,000 | \$5,000<br>- \$5,000<br>= \$0 | +5 options<br>\$5,000 |
| Start of day #2                                                        | \$40        | \$0                           |                       | \$0                           |                       |
| Loss of \$1,000 <b>or</b><br>Loss of \$2,500; \$5/share                | \$40        | \$0                           | 100 shares<br>\$4,000 | \$0                           | +5 options<br>\$2,500 |
| Start of day #3                                                        | \$70        | \$0                           |                       | \$0                           |                       |
| Sell→ gain of \$2,000 <b>or</b><br>Exercise→ gain of \$2,500           | \$70        | \$0                           | 100 shares<br>\$7,000 | \$0                           | +5 options<br>\$7,500 |
| Close positions                                                        | \$70        | \$7,000                       | -                     | \$7,500                       | -                     |
| Gain                                                                   |             | \$2,000                       |                       | \$2,500                       |                       |
| Holding period return                                                  |             | +40%                          |                       | +50%                          |                       |

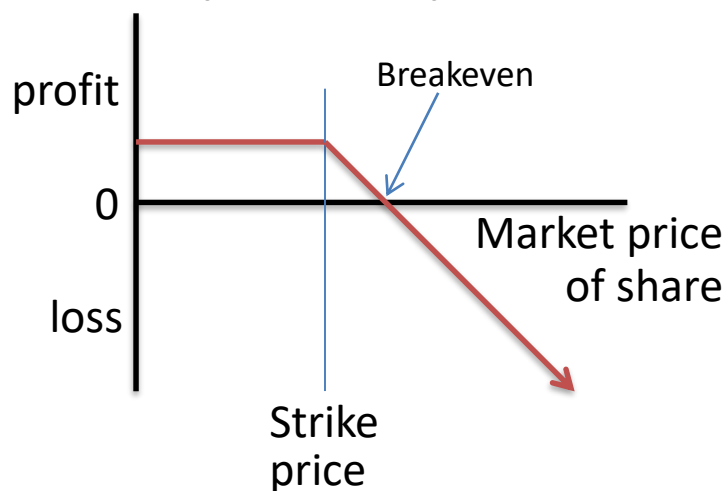
- American options sell at more than their intrinsic value, since they also have 'time value' until expiry.
- Therefore, if an option has increased in price, rather than exercising it makes more sense for the holder to sell it.
- Typically, American options are not exercised until maturity.
- However, there are special circumstances under which it makes sense to exercise American options immediately.
  - e.g. unusual and unexpected large dividend.
- European options cannot be exercised prior to maturity, so the holder choice is either sell the option or wait until expiry.
- Writers cannot 'sell' to get out of their obligations, they must take an offsetting option or long/short position (and wait...).



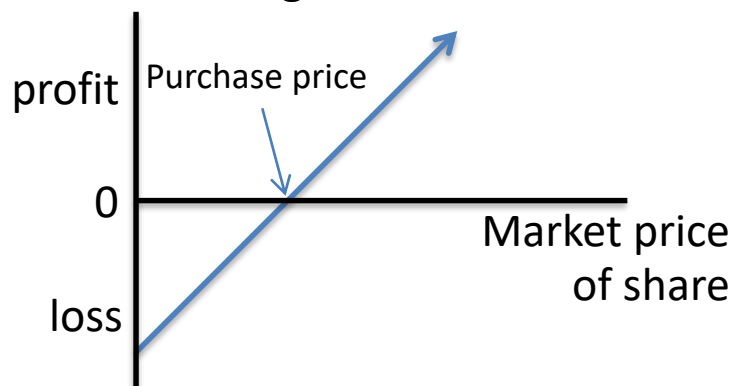
- A 'covered call' results from being short a call and long in the underlying stock in matching quantities.
- These are two positions which have independent lives from one another through time, for example:
  - An initial long position gives rise to a covered call as soon as the investor writes a call (e.g. to enhance current return while the investor expects stock price to go sideways);
  - A naked call gives rise to a covered call as soon as the investor establishes a corresponding long position (e.g. to lock-in gains to date or to cap losses to date).
- If quantities between the option and the outright stock positions do not match it is called a 'partially covered call'.

# Profits and Losses of Covered Call Options

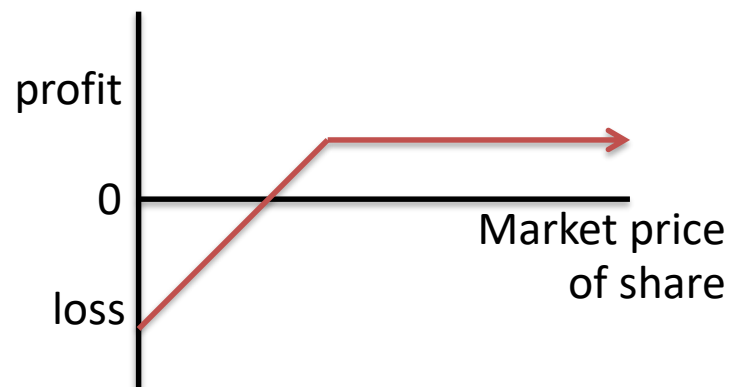
**Call Writer  
(short a call)**



**Long Position**



**Covered Call  
(~ short a put)**



# One Example of a Covered Call Option

|                                                                              | Stock price | Cash in account                                | Positions                 |                           |             |
|------------------------------------------------------------------------------|-------------|------------------------------------------------|---------------------------|---------------------------|-------------|
|                                                                              |             |                                                | Short Call                | Long Stock                | Combined    |
| Start of day #1                                                              | \$50        | \$5,000                                        | -                         | -                         | -           |
| Buy 100 shares <b>and</b><br>Sell 1 option<br>@ \$10/share; Strike \$55      | \$50        | \$5,000<br>- \$5,000<br>+ \$1,000<br>= \$1,000 | -1 option<br>V = -\$1,000 | 100 shares<br>V = \$5,000 | V = \$4,000 |
| Start of day #2                                                              | \$40        | \$1,000                                        |                           |                           |             |
| Market \$40 < Strike \$55<br>Option price = \$5/share                        | \$40        | \$1,000                                        | -1 option<br>V = -\$500   | 100 shares<br>V = \$4,000 | V = \$3,500 |
| Start of day #3                                                              | \$70        | \$1,000                                        |                           |                           |             |
| Market \$70 > Strike \$55<br>Holder exercise option<br>Buy 100 shares @ \$55 | \$70        | \$1,000<br>+ \$5,500<br>= \$6,500              | -                         | -                         | -           |
| Gain                                                                         |             | \$1,500                                        |                           |                           |             |

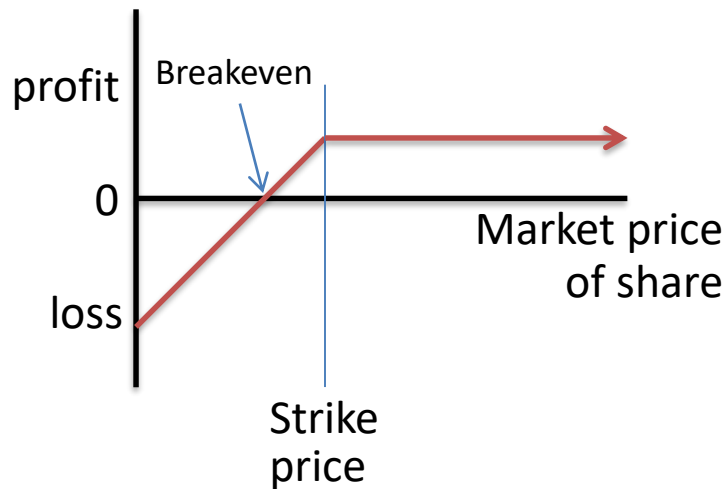
## Second Example of a Covered Call Option

|                                                                                | Stock price | Cash in account                   | Positions                 |                           |              |
|--------------------------------------------------------------------------------|-------------|-----------------------------------|---------------------------|---------------------------|--------------|
|                                                                                |             |                                   | Short Call                | Long Stock                | Combined     |
| Start of day #1                                                                | \$50        | \$5,000                           | -                         | -                         | -            |
| Sell 1 option<br>@ \$10/share; Strike \$55                                     | \$50        | \$5,000<br>+ \$1,000<br>= \$6,000 | -1 option<br>V = -\$1,000 |                           | V = -\$1,000 |
| Start of day #2                                                                | \$40        | \$6,000                           |                           |                           |              |
| Market \$40 < Strike \$55<br>Option price = \$5/share<br>Buy 100 shares @ \$40 | \$40        | \$6,000<br>- \$4,000<br>= \$2,000 | -1 option<br>V = -\$500   | 100 shares<br>V = \$4,000 | V = \$3,500  |
| Start of day #3                                                                | \$70        | \$2,000                           |                           |                           |              |
| Market \$70 > Strike \$55<br>Holder exercise option<br>→ buy 100 shares @ \$55 | \$70        | \$2,000<br>+ \$5,500<br>= \$7,500 | -                         | -                         | -            |
| Gain                                                                           |             | \$2,500                           |                           |                           |              |

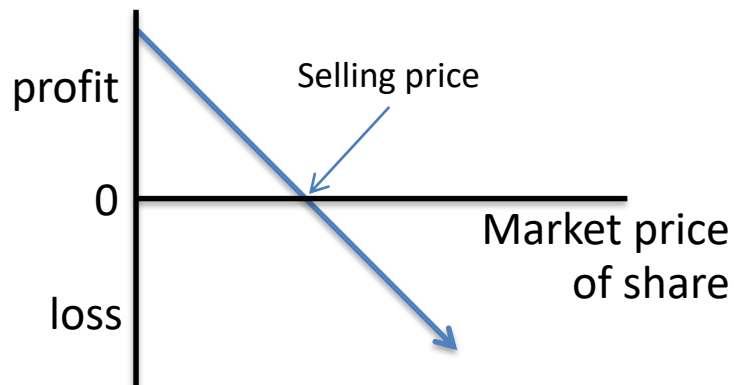
- A 'covered put' results from being short a put and short in the underlying stock in matching quantities.
- These are two positions which have independent lives from one another through time, for example:
  - An initial short position gives rise to a covered put as soon as the investor writes a put (e.g. to enhance current return while the investor expects stock price to go sideways);
  - A naked put gives rise to a covered put as soon as the investor establishes a corresponding short position (e.g. to lock-in gains to date or to cap losses to date).
- If quantities between the option and the outright stock positions do not match it is called a 'partially covered put'.

# Profits and Losses of Covered put Options

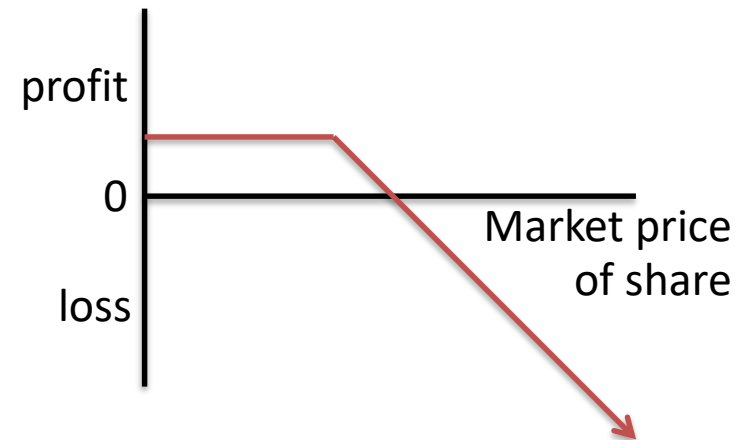
**Put Writer  
(short a put)**



**Short Position**



**Covered Put  
(~ short a call)**



# One Example of a Covered Put Option

|                                                                           | Stock price | Cash in account                                | Positions                 |                             |              |
|---------------------------------------------------------------------------|-------------|------------------------------------------------|---------------------------|-----------------------------|--------------|
|                                                                           |             |                                                | Short Put                 | Short Stock                 | Combined     |
| Start of day #1                                                           | \$50        | \$5,000                                        | -                         | -                           | -            |
| Short 100 shares <b>and</b><br>Sell 1 option<br>@ \$10/share; Strike \$45 | \$50        | \$5,000<br>+ \$5,000<br>+ \$1,000<br>=\$11,000 | -1 option<br>V = -\$1,000 | -100 shares<br>V = -\$5,000 | V = -\$6,000 |
| Start of day #2                                                           | \$40        | \$11,000                                       |                           |                             |              |
| Market \$40 < Strike \$45<br>Option price = \$15/share                    | \$40        | \$11,000                                       | -1 option<br>V = -\$1,500 | -100 shares<br>V = -\$4,000 | V = -\$5,500 |
| Start of day #3                                                           | \$70        | \$11,000                                       |                           |                             |              |
| Market \$70 > Strike \$45<br>Option expires worthless                     | \$70        | \$11,000                                       | -                         | -100 shares<br>V = -\$7,000 | V = -\$7,000 |
| Short position is closed<br>(buy 100 shares @ \$70)                       | \$70        | \$11,000<br>- \$7,000<br>= \$4,000             | -                         | -                           | -            |
| Loss                                                                      |             | \$1,000                                        |                           |                             |              |

## Second Example of a Covered Put Option

|                                                                           | Stock price | Cash in account                                | Positions                 |                             |              |
|---------------------------------------------------------------------------|-------------|------------------------------------------------|---------------------------|-----------------------------|--------------|
|                                                                           |             |                                                | Short Put                 | Short Stock                 | Combined     |
| Start of day #1                                                           | \$50        | \$5,000                                        | -                         | -                           | -            |
| Short 100 shares <b>and</b><br>Sell 1 option<br>@ \$10/share; Strike \$45 | \$50        | \$5,000<br>+ \$5,000<br>+ \$1,000<br>=\$11,000 | -1 option<br>V = -\$1,000 | -100 shares<br>V = -\$5,000 | V = -\$6,000 |
| Start of day #2                                                           | \$40        | \$11,000                                       |                           |                             |              |
| Market \$40 < Strike \$45<br>Option price = \$15/share                    | \$40        | \$11,000                                       | -1 option<br>V = -\$1,500 | -100 shares<br>V = -\$4,000 | V = -\$5,500 |
| Short position is closed<br>(buy 100 shares @ \$40)                       | \$40        | \$11,000<br>- \$4,000<br>= \$7,000             | -1 option<br>V = -\$1,500 | -                           | V = -\$1,500 |
| Start of day #3                                                           | \$70        | \$7,000                                        |                           |                             |              |
| Market \$70 > Strike \$45<br>Option expires worthless                     | \$70        | \$7,000                                        | -                         | -                           | -            |
| Gain                                                                      |             | \$2,000                                        |                           |                             |              |



## On-line videos explaining options

- Kahn Academy has a series of well-made short videos.
- Each video is typically between 3 and 4 minutes.
- Go to [www.khanacademy.org/economics-finance-domain/core-finance/derivative-securities](http://www.khanacademy.org/economics-finance-domain/core-finance/derivative-securities)
- I suggested that you watch videos 4-5-18 carefully.

| Video                         | Lecture | Video                             | Lecture |
|-------------------------------|---------|-----------------------------------|---------|
| 1. American call options      | 8       | 8. Put as insurance               | 11      |
| 2. Basic shorting             | 7       | 9. Put-call parity                | 11      |
| 3. American put options       | 8       | 10. Long straddle                 | 11      |
| 4. Call options as leverage   | 9       | 11. Put writer payoff diagram     | 8       |
| 5. Put vs. short and leverage | 9       | 12. Call writer payoff diagram    | 8       |
| 6. Call payoff diagram        | 8       | 16. Put-call parity clarification | 11      |
| 7. Put payoff diagram         | 8       | 18. Option expiration & price     | 9       |

## Example 1a (maximum profit)

You **short** a call option on 100 shares for \$3 per share with a strike price of \$40 and you simultaneously cover your short call by buying 100 shares at \$38.

- You hold both positions until maturity when the stock trades at \$40, what is your profit? (at-the-money at maturity)

$$\text{Cost} = -\text{price of option} + \text{cost of stock} = (-\$3 + \$38) \times 100 = \$3,500$$

$$\begin{aligned}\text{Payoff} &= -\text{value of option} + \text{value of stock} \\ &= [-(\text{market price} - \text{strike price})^+ + \text{market price}] \times 100 \\ &= [-(\$40 - \$40)^+ + \$40] \times 100 = \$4,000\end{aligned}$$

$$\text{Profit} = -\text{cost} + \text{payoff} = -\$3,500 + \$4,000 = \$500$$

$$\text{Return} = \frac{\text{payoff} - \text{cost}}{\text{cost}} = \frac{\$4,000 - \$3,500}{\$3,500} = 14.3\%$$

## Example 1b (maximum profit)

You **short** a call option on 100 shares for \$3 per share with a strike price of \$40 and you simultaneously cover your short call by buying 100 shares at \$38.

- You hold both positions until maturity when the stock trades at \$45, what is your profit? (in-the-money at maturity)

$$\text{Cost} = -\text{price of option} + \text{cost of stock} = (-\$3 + \$38) \times 100 = \$3,500$$

$$\begin{aligned}\text{Payoff} &= -\text{value of option} + \text{value of stock} \\ &= [-(\text{market price} - \text{strike price})^+ + \text{market price}] \times 100 \\ &= [-(\$45 - \$40)^+ + \$45] \times 100 = \$4,000\end{aligned}$$

$$\text{Profit} = -\text{cost} + \text{payoff} = -\$3,500 + \$4,000 = \$500$$

$$\text{Return} = \frac{\text{payoff} - \text{cost}}{\text{cost}} = \frac{\$4,000 - \$3,500}{\$3,500} = 14.3\%$$

You **short** a call option on 100 shares for \$3 per share with a strike price of \$40 and you simultaneously cover your short call by buying 100 shares at \$38.

- You hold both positions until maturity when the stock trades at \$35, what is your profit? (out-of-the-money at maturity)

$$\text{Cost} = -\text{price of option} + \text{cost of stock} = (-\$3 + \$38) \times 100 = \$3,500$$

$$\begin{aligned}\text{Payoff} &= -\text{value of option} + \text{value of stock} \\ &= [-(\text{market price} - \text{strike price})^+ + \text{market price}] \times 100 \\ &= [-(\$35 - \$40)^+ + \$35] \times 100 = \$3,500\end{aligned}$$

$$\text{Profit} = -\text{cost} + \text{payoff} = -\$3,500 + \$3,500 = \$0$$

$$\text{Return} = \frac{\text{payoff} - \text{cost}}{\text{cost}} = \frac{\$3,500 - \$3,500}{\$3,500} = 0\%$$

## Example 1d (maximum loss is limited)

You **short** a call option on 100 shares for \$3 per share with a strike price of \$40 and you simultaneously cover your short call by buying 100 shares at \$38.

- You hold both positions until maturity when the stock trades at \$0, what is your profit? (out-of-the-money at maturity)

$$\text{Cost} = -\text{price of option} + \text{cost of stock} = (-\$3 + \$38) \times 100 = \$3,500$$

$$\begin{aligned}\text{Payoff} &= -\text{value of option} + \text{value of stock} \\ &= [-(\text{market price} - \text{strike price})^+ + \text{market price}] \times 100 \\ &= [-(\$0 - \$40)^+ + \$0] \times 100 = \$0\end{aligned}$$

$$\text{Profit} = -\text{cost} + \text{payoff} = -\$3,500 + \$0 = -\$3,500$$

$$\text{Return} = \frac{\text{payoff} - \text{cost}}{\text{cost}} = \frac{\$0 - \$3,500}{\$3,500} = -100\%$$

## Example 2a (maximum profit)

You **short** a put option on 100 shares for \$3 per share with a strike price of \$40 and you simultaneously cover your short put by shorting 100 shares at \$42.

- You hold both positions until maturity when the stock trades at \$40, what is your profit? (at-the-money at maturity)

$$\text{Cost} = -\text{price of option} - \text{value of stock} = (-\$3 - \$42) \times 100 = -\$4,500$$

$$\begin{aligned}\text{Payoff} &= -\text{value of option} - \text{value of stock} \\ &= [-(\text{strike price} - \text{market price})^+ - \text{market price}] \times 100 \\ &= [-(\$40 - \$40)^+ - \$40] \times 100 = -\$4,000\end{aligned}$$

$$\text{Profit} = -\text{cost} + \text{payoff} = \$4,500 - \$4,000 = \$500$$

Return does not really exist since negative investment...

## Example 2b (maximum profit)

You **short** a put option on 100 shares for \$3 per share with a strike price of \$40 and you simultaneously cover your short put by shorting 100 shares at \$42.

- You hold both positions until maturity when the stock trades at \$0, what is your profit? (at-the-money at maturity)

$$\text{Cost} = -\text{price of option} - \text{value of stock} = (-\$3 - \$42) \times 100 = -\$4,500$$

$$\begin{aligned}\text{Payoff} &= -\text{value of option} - \text{value of stock} \\ &= [-(\text{strike price} - \text{market price})^+ - \text{market price}] \times 100 \\ &= [-(\$40 - \$0)^+ - \$0] \times 100 = -\$4,000\end{aligned}$$

$$\text{Profit} = -\text{cost} + \text{payoff} = \$4,500 - \$4,000 = \$500$$

Return does not really exist since negative investment...

You **short** a put option on 100 shares for \$3 per share with a strike price of \$40 and you simultaneously cover your short put by shorting 100 shares at \$42.

- You hold both positions until maturity when the stock trades at \$45, what is your profit? (at-the-money at maturity)

$$\text{Cost} = -\text{price of option} - \text{value of stock} = (-\$3 - \$42) \times 100 = -\$4,500$$

$$\begin{aligned}\text{Payoff} &= -\text{value of option} - \text{value of stock} \\ &= [-(\text{strike price} - \text{market price})^+ - \text{market price}] \times 100 \\ &= [-(\$40 - \$45)^+ - \$45] \times 100 = -\$4,500\end{aligned}$$

$$\text{Profit} = -\text{cost} + \text{payoff} = \$4,500 - \$4,500 = \$0$$

Return does not really exist since negative investment...



## Example 2d (maximum loss is 'infinite')

You **short** a put option on 100 shares for \$3 per share with a strike price of \$40 and you simultaneously cover your short put by shorting 100 shares at \$42.

- You hold both positions until maturity when the stock trades at \$90, what is your profit? (at-the-money at maturity)

$$\text{Cost} = -\text{price of option} - \text{value of stock} = (-\$3 - \$42) \times 100 = -\$4,500$$

$$\begin{aligned}\text{Payoff} &= -\text{value of option} - \text{value of stock} \\ &= [-(\text{strike price} - \text{market price})^+ - \text{market price}] \times 100 \\ &= [-(\$40 - \$90)^+ - \$90] \times 100 = -\$9,000\end{aligned}$$

$$\text{Profit} = -\text{cost} + \text{payoff} = \$4,500 - \$9,000 = -\$4,500$$

Return does not really exist since negative investment...