CHAPTER 9 OPTION MARKETS

Derivatives Securities

Junho Park

Chapter Outline

- Option positions. 옵션 포지션의 종류
- Terminology. 용어
- Adjustment in stock dividends. 주식 배당시 조정
- Option-like securities. 성질이 비슷한 증권들

Types of Options

옵션이란? 권리를 매매하는 것

- There are two basic types of options:
  - A **call option** gives the holder of the option the right to buy an asset by the expiration date for the exercise price.
  - A **put option** gives the holder of the option the right to sell an asset by the expiration date for the exercise price.
- Options can be categorized by the timing of exercise:
  - **American options** can be exercised at any time up to maturity. ↳ 옵션 만기일 전에 행사가능
  - **European options** can be exercised only on the maturity.

    ↳ 옵션 만기일에만 행사가능 (한국 옵션)

Option Positions

- There are four types of option positions:
  - A long position in a call option.
  - A long position in a put option.
  - A short position in a call option.
  - A short position in a put option.

주가변화에 따른 수익 패턴

	롱	숏
콜	상승시 수익	고정 프리미엄
풋	하락시 수익	고정 프리미엄

Long Call

* 옵션 프리미엄을 고려하지 않았음에 주의하자!

- The payoff from a long position in a European call option is

$$\max(S_T - K, 0)$$

만기일의 주가
- S_T is the final price of the underlying asset on maturity.

행사가격
- K is the strike price.

Example: Long Call

- Suppose that:
  - An investor buys a European call option.
  - The strike price of the option is $100.
  - The size of contract is 100 shares per contract.
  - The price of the option is $5 per share.
  - The expiration date of the option is in 4 months.
  - The stock price becomes $115 after 4 months.

콜옵션 구매
행사가격 K는 $100
1 계약당 100주
옵션의 가격: 주당 $5
만기: 4개월 후
만기시 주가: $115
S_T

Example: Long Call

- The initial investment is

$$5 \times 100 = \$500$$

- The investor exercises the option by paying

$$100 \times 100 = \$10{,}000$$

- The investor sells the shares and receives

$$115 \times 100 = \$11{,}500$$

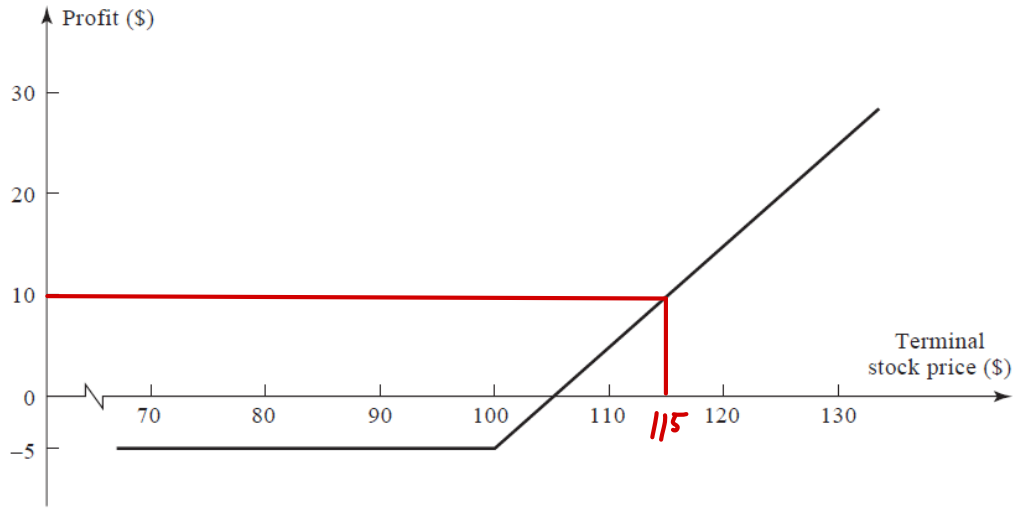
Example: Long Call

- The net gain of the investor is

$$11{,}500 - 10{,}000 - 500 = \$1{,}000$$

S_T K Premium

Figure 9.1 Profit from buying a European call option on one share of a stock. Option price = \$5; strike price = \$100.



Short Call

살 수 있는 권리를 파는 것

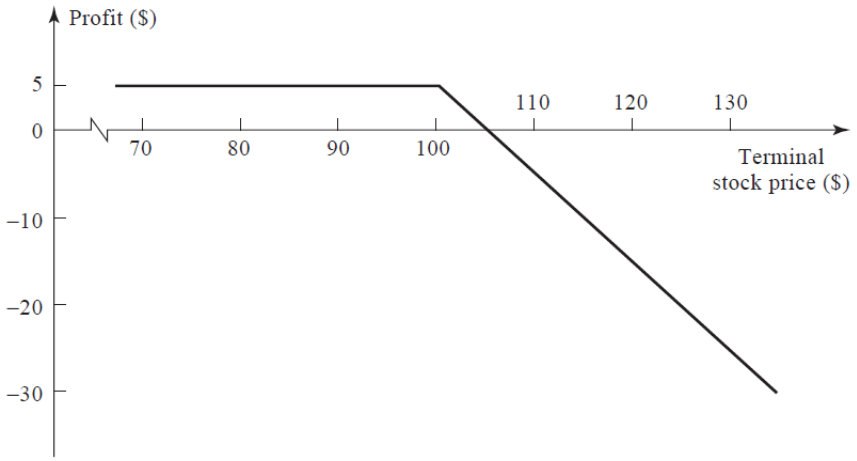
- The payoff from a short position in a European call option is

  * Max함수의 마이너스는 Min으로 변환 가능

$$-\max(S_T - K, 0) = \min(K - S_T, 0)$$

이 식은 프리미엄을 고려하지 않은 것에 주의하자

Figure 9.3 Profit from writing a European call option on one share of a stock. Option price = $5; strike price = $100.



그래프는 옵션 프리미엄만큼 y축으로 수평이동 했다

Long Put 팔 권리를 사는 것

- The payoff from a long position in a European put option is

$$\max(K - S_T, 0)$$

  - S_T is the final price of the underlying asset on maturity.
  - K is the strike price.

* 주가가 하락하면 이익을 보는 공매도의 패턴을 생각해보자!

Example: Long Put

- Suppose that:
  - An investor buys a European put option.
  - The strike price of the option is $70.
  - The size of contract is 100 shares per contract.
  - The price of the option is $7 per share.
  - The expiration date of the option is in 4 months.
  - The stock price becomes $55 after 4 months.

풋옵션 구매
행사가격 K는 $70
1 계약당 100주
옵션의 가격: 주당 $7
만기: 4개월 후
만기시 주가: $55

Example: Long Put

- The initial investment is

옵션 프리미엄 지불

$$7 \times 100 = \$700$$

- The investor buys the shares by paying

4개월뒤 가격이 떨어진 주식 100주 구매

$$55 \times 100 = \$5{,}500$$

- The investor exercises the option and receives

옵션 행사(행사 가격 K= 70으로 팖)

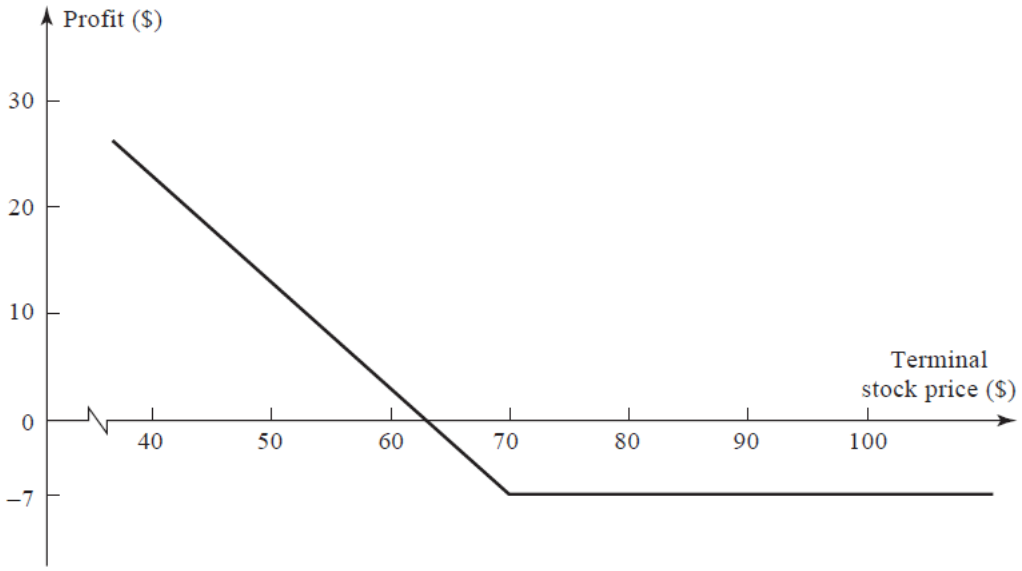
$$70 \times 100 = \$7{,}000$$

Example: Long Put

- The net gain of the investor is

$$7{,}000 - 5{,}500 - 700 = \$800$$

Figure 9.2 Profit from buying a European put option on one share of a stock. Option price = \$7; strike price = \$70.



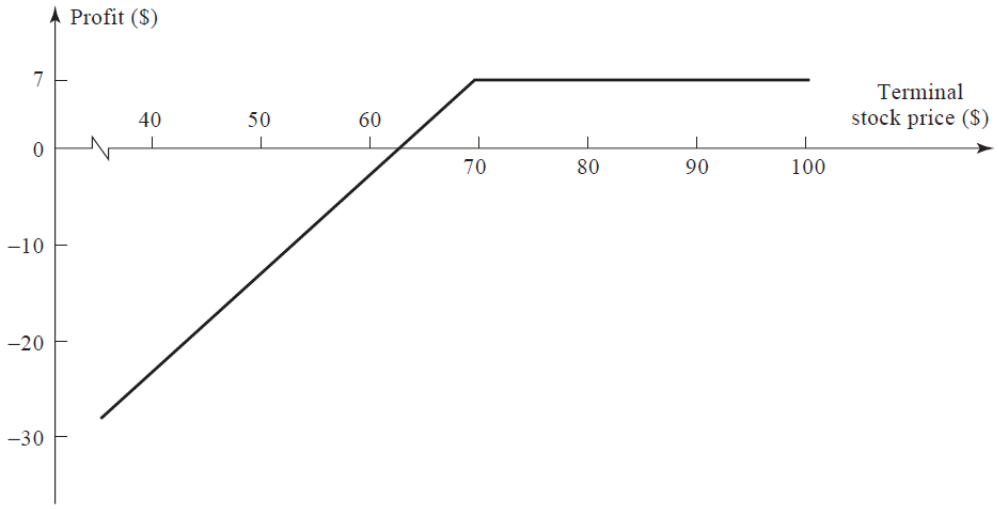
Short Put

일반투자자: 숏 잘 안함
기관: 헷징과 옵션프리미엄 -> 숏 유인 존재 -> 시장조성자 역할

- The payoff from a short position in a European put option is

$$-\max(K - S_T, 0) = \min(S_T - K, 0)$$

Figure 9.4 Profit from writing a European put option on one share of a stock. Option price = \$7; strike price = \$70.

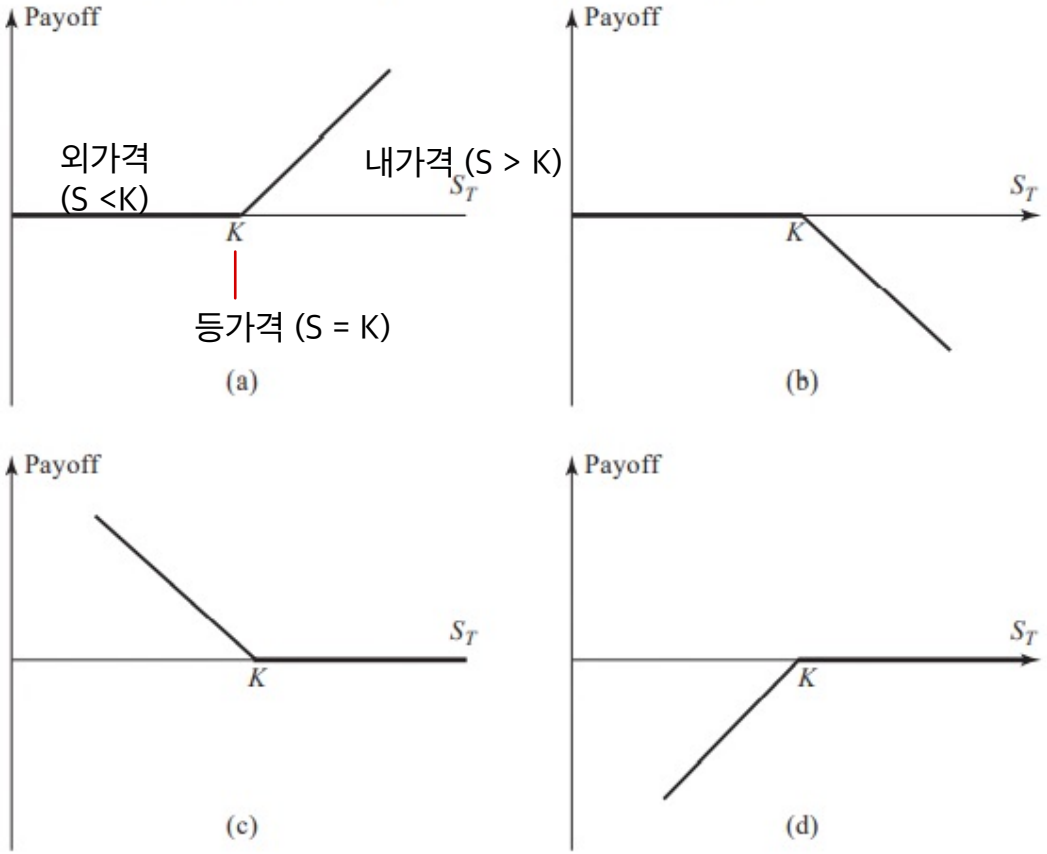


Terminology

S = 현재의 주가
K = 행사가격

- An option is **in the money** if its current payoff is positive.
  내가격
  - A call option is in the money if $S > K$.
  - A put option is in the money if $S < K$.
- An option is **at the money** if its current payoff is zero. That is, an option is at the money if $S = K$.
  등가격
- An option is **out of the money** if its current payoff is negative.
  외가격
  - A call option is out of money if $S < K$.
  - A put option is out of money if $S > K$.

Figure 10.5 Payoffs from positions in European options: (a) long call; (b) short call; (c) long put; (d) short put. Strike price = K; price of asset at maturity = S_T.



Intrinsic Value 옵션의 내재가치

- The **intrinsic value** of an option is the maximum of zero and the value the option would have if it were exercised immediately.
  - The intrinsic value of a call option is

$$\max(S - K, 0)$$

  - The intrinsic value of a put option is

$$\max(K - S, 0)$$

- The intrinsic value of an in-the-money option is positive.

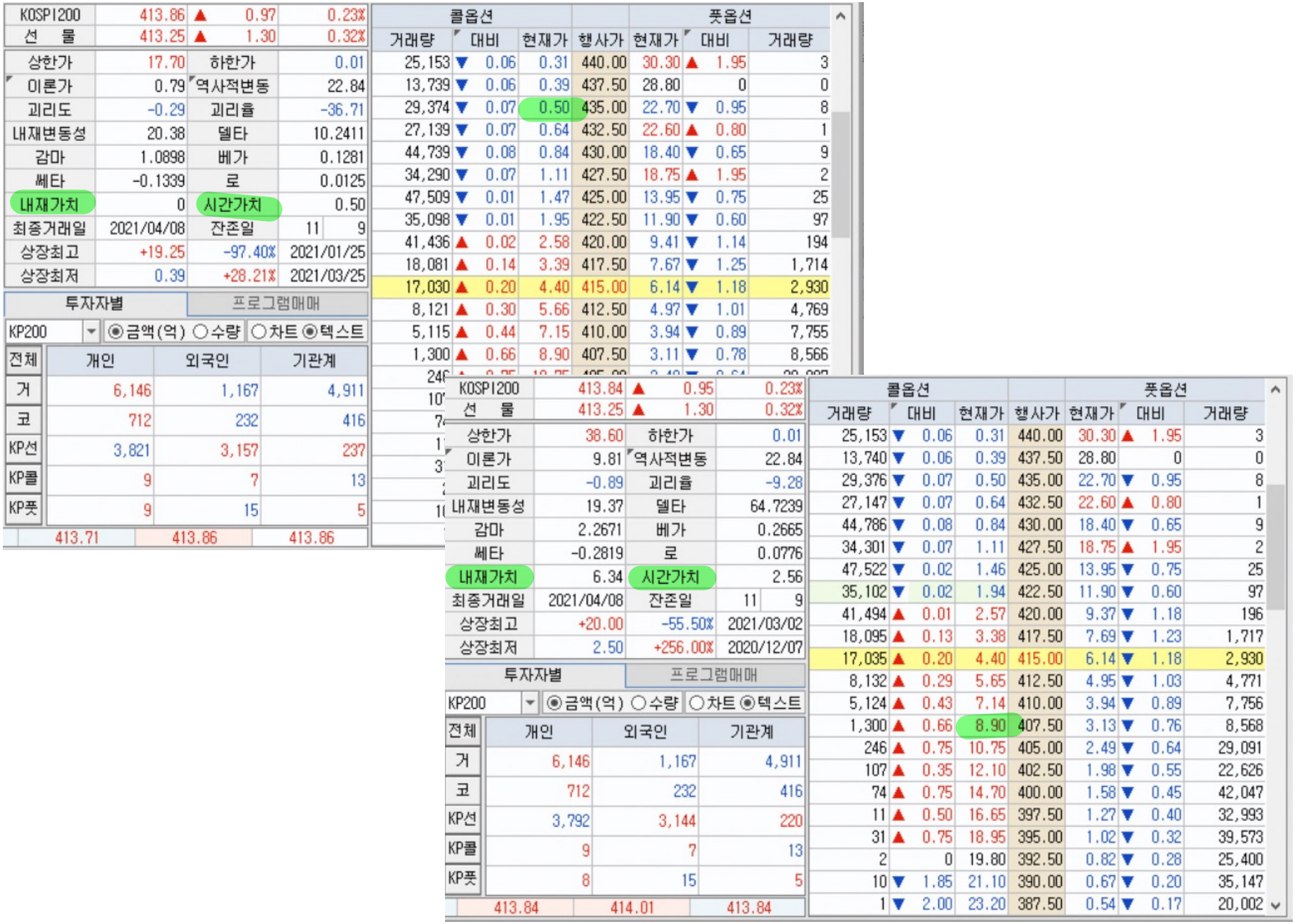
내재가치는 내가격에서만 존재
외가격에서 내재가치는 0

Time Value

아메리칸은 만기 전에 행사가능 = 시간가치

- An American option has **time value** when it is better for the holder of the option to wait rather than exercise it immediately.
  - There is time value when it is possible to have better payoffs in the future.
- The total value of an American option is the sum of its intrinsic value and its time value.

아메리칸 옵션 = 내재가치 + 시간가치



KOSPI200	413.86	▲ 0.97	0.23%
선 물	413.25	▲ 1.30	0.32%

상한가	17.70	하한가	0.01
이론가	0.79	역사적변동	22.84
괴리도	-0.29	괴리율	-36.71
내재변동성	20.38	델타	10.2411
감마	1.0898	베가	0.1281
쎄타	-0.1339	로	0.0125
내재가치	0	시간가치	0.50
최종거래일	2021/04/08	잔존일	11 9
상장최고	+19.25	-97.40%	2021/01/25
상장최저	0.39	+28.21%	2021/03/25

투자자별 | 프로그램매매

KP200 ◉금액(억) ○수량 ○차트 ◉텍스트

전체	개인	외국인	기관계
거	6,146	1,167	4,911
코	712	232	416
KP선	3,821	3,157	237
KP콜	9	7	13
KP풋	9	15	5

413.71 413.86 413.86

콜옵션				풋옵션		
거래량	대비	현재가	행사가	현재가	대비	거래량
25,153	▼ 0.06	0.31	440.00	30.30	▲ 1.95	3
13,739	▼ 0.06	0.39	437.50	28.80	0	0
29,374	▼ 0.07	0.50	435.00	22.70	▼ 0.95	8
27,139	▼ 0.07	0.64	432.50	22.60	▲ 0.80	1
44,739	▼ 0.08	0.84	430.00	18.40	▼ 0.65	9
34,290	▼ 0.07	1.11	427.50	18.75	▲ 1.95	2
47,509	▼ 0.01	1.47	425.00	13.95	▼ 0.75	25
35,098	▼ 0.01	1.95	422.50	11.90	▼ 0.60	97
41,436	▲ 0.02	2.58	420.00	9.41	▼ 1.14	194
18,081	▲ 0.14	3.39	417.50	7.67	▼ 1.25	1,714
17,030	▲ 0.20	4.40	415.00	6.14	▼ 1.18	2,930
8,121	▲ 0.30	5.66	412.50	4.97	▼ 1.01	4,769
5,115	▲ 0.44	7.15	410.00	3.94	▼ 0.89	7,755
1,300	▲ 0.66	8.90	407.50	3.11	▼ 0.78	8,566

KOSPI200	413.84	▲ 0.95	0.23%
선 물	413.25	▲ 1.30	0.32%

상한가	38.60	하한가	0.01
이론가	9.81	역사적변동	22.84
괴리도	-0.89	괴리율	-9.28
내재변동성	19.37	델타	64.7239
감마	2.2671	베가	0.2665
쎄타	-0.2819	로	0.0776
내재가치	6.34	시간가치	2.56
최종거래일	2021/04/08	잔존일	11 9
상장최고	+20.00	-55.50%	2021/03/02
상장최저	2.50	+256.00%	2020/12/07

투자자별 | 프로그램매매

KP200 ◉금액(억) ○수량 ○차트 ◉텍스트

전체	개인	외국인	기관계
거	6,146	1,167	4,911
코	712	232	416
KP선	3,792	3,144	220
KP콜	9	7	13
KP풋	8	15	5

413.84 414.01 413.84

콜옵션				풋옵션		
거래량	대비	현재가	행사가	현재가	대비	거래량
25,153	▼ 0.06	0.31	440.00	30.30	▲ 1.95	3
13,740	▼ 0.06	0.39	437.50	28.80	0	0
29,376	▼ 0.07	0.50	435.00	22.70	▼ 0.95	8
27,147	▼ 0.07	0.64	432.50	22.60	▲ 0.80	1
44,786	▼ 0.08	0.84	430.00	18.40	▼ 0.65	9
34,301	▼ 0.07	1.11	427.50	18.75	▲ 1.95	2
47,522	▼ 0.02	1.46	425.00	13.95	▼ 0.75	25
35,102	▼ 0.02	1.94	422.50	11.90	▼ 0.60	97
41,494	▲ 0.01	2.57	420.00	9.37	▼ 1.18	196
18,095	▲ 0.13	3.38	417.50	7.69	▼ 1.23	1,717
17,035	▲ 0.20	4.40	415.00	6.14	▼ 1.18	2,930
8,132	▲ 0.29	5.65	412.50	4.95	▼ 1.03	4,771
5,124	▲ 0.43	7.14	410.00	3.94	▼ 0.89	7,756
1,300	▲ 0.66	8.90	407.50	3.13	▼ 0.76	8,568
246	▲ 0.75	10.75	405.00	2.49	▼ 0.64	29,091
107	▲ 0.35	12.10	402.50	1.98	▼ 0.55	22,626
74	▲ 0.75	14.70	400.00	1.58	▼ 0.45	42,047
11	▲ 0.50	16.65	397.50	1.27	▼ 0.40	32,993
31	▲ 0.75	18.95	395.00	1.02	▼ 0.32	39,573
2	0	19.80	392.50	0.82	▼ 0.28	25,400
10	▼ 1.85	21.10	390.00	0.67	▼ 0.20	35,147
1	▼ 2.00	23.20	387.50	0.54	▼ 0.17	20,002

Underlying Assets

- The underlying assets of the options which are traded in exchanges are:
  - Stocks.
  - Foreign currency.
  - Stock indices.
  - Futures.

배당과 주식분할 pg 231

Dividends and Stock Splits

<-> 장외시장은 합의해서 보호 받을 수 있음

- Exchange-traded options are not adjusted for cash dividends.

현금배당 조정 X

- However, they are adjusted for stock dividends and stock splits.

주식분할 , 주식배당 조정

  - Strike price and the number of shares changes.

- Usually, if there is a n-for-m stock split,

n 대 m 액면분할
ex) 테슬라 5대1 액면분할

  - The changed strike price is mK/n.
  - The changed number of shares is nN/m.

Example: Stock Dividends

- Suppose that:
  - There is a call option already issued.
  - The strike price of the option is $30 per share.
  - The number of shares per option is 100 shares.
  - A company announces 2-for-1 stock split.

콜옵션 발행
행사가 K=30
옵션 한 계약당 100주
2대1 액면분할 발표

Example: Stock Dividends

- Note that stock split and stock dividends do not change the fundamental of the company.
- Suppose that the stock price before stock split was $40 per share.
- Then, the intrinsic value of the call option was

$$100 \times (40 - 30) = \$1{,}000$$

Example: Stock Dividends

- Now the changed stock price due to the stock split is

$$\frac{40}{2} = \$20$$

- If there were no change in strike price, the intrinsic value would be zero.
- Therefore, it is reasonable to adjust the terms of the call option.

Example: Stock Dividends

- To guarantee the same condition in which the option is at-the-money, the modified strike price is

$$\frac{30}{2} = \$15$$

- To guarantee the same intrinsic value, the modified number of shares covered by the option is

$$N = \frac{1{,}000}{20 - 15} = 200$$

Example: Stock Dividends

- Suppose that:
  - There is a put option.
  - The number of shares covered by the option is 100 shares.
  - The strike price of the option is $15 per share.
  - There is a 25% stock dividend.

풋옵션의 경우
옵션당 100주 커버
행사가 K= 15
25퍼 비율 주식배당을 한다고 가정하면?

Example: Stock Dividends

- This stock dividend is equivalent to a 5-for-4 stock split.
- Therefore, the changed strike price is

$$\frac{4}{5} \times 15 = \$12$$

- The changed number of shares is

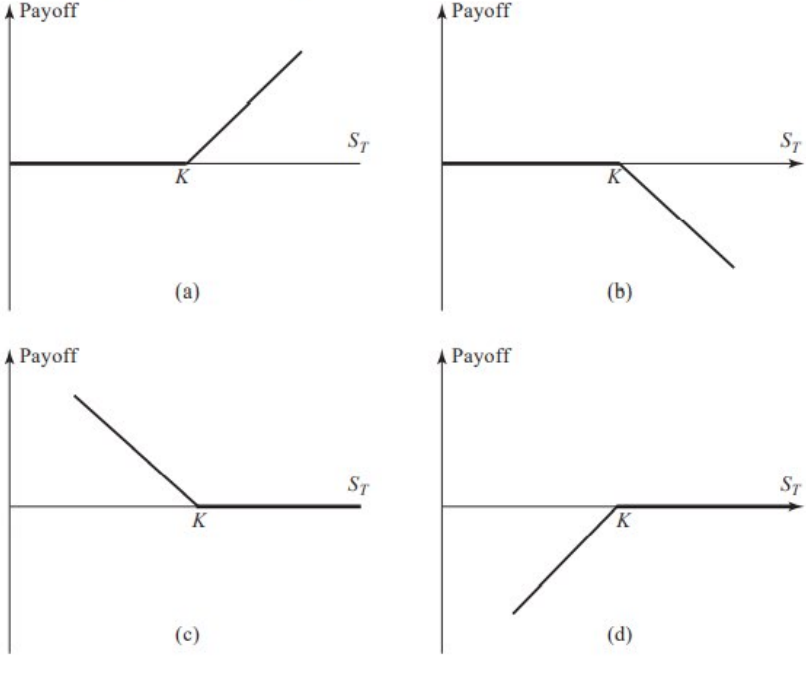
$$\frac{5}{4} \times 100 = 125$$

Margins

일반 주식, 옵션 롱 포지션 -> 현금으로 구매 -> 마진(증거금) 요구 x
공매도, 옵션 숏 포지션 -> 하방 열려있음 -> 증거금 요구

- A long position in a call option or a put option is made by paying the option price fully in cash.
  - Options already contain substantial leverage.
- A short position in an option is required to maintain sufficient amount of margin account.
  - The level of maintenance margin is determined by the volatility of the underlying asset.

Figure 10.5 Payoffs from positions in European options: (a) long call; (b) short call; (c) long put; (d) short put. Strike price = K; price of asset at maturity = S_T.



Option-like Securities

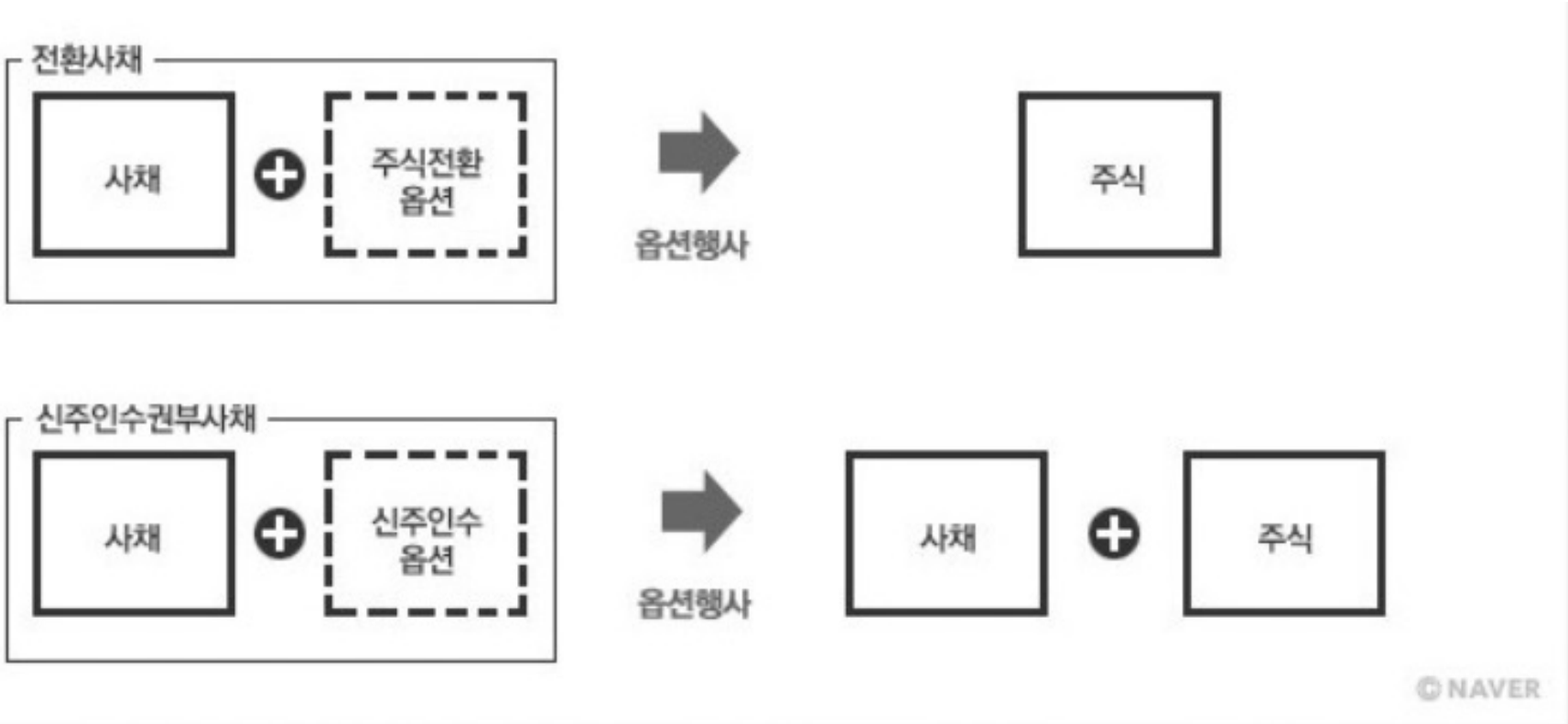
성질이 옵션과 비슷한 증권들

- There are some securities which are not exchange-traded options but have similar characteristics of options:
  - Convertible bonds. 전환사채
  - Warrants. Bond with warrants : 신주인수권부 사채
  - Employee stock options. 스탁옵션

Convertible Bonds & Warrants

- **Convertible bonds**, or **convertibles**, are bonds issued by a company which can be converted into equity in some specific conditions.

- **Warrants** are options issued by a company at the time of a bond issue.
  - The company issues call warrants on its own stock and then attaches them to the bond issued.
  - This kind of issued bonds are often referred as **bonds with warrants**, or BW.
- When convertibles or warrants are exercised, new shares are issued.



전환가액, 신주인수가액 사전에 설정

신주인수옵션은 따로 매매 가능

옵션행사 시 단기적으로는 주가에 부정적

Employee Stock Options

- **Employee stock options** are call options issued to employees by their company to motivate them to act in the best interest of the shareholders.
  - Usually issued to executives.
  - Generally, they are non-transferrable.
  - When ESOs are exercised, the company issue new shares.
  - They are now less attractive then used to be.

90년도까지는 활발히 쓰임
but...
1. 규제문제
2. 주식희석
3. 효과에 대한 의문 때문에
점점 줄어드는 추세