JAN 21 2021 MATH 134B

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1. Some risks of being an option-seller

Remark (Some risks you should have known before being an option seller)**.**

Fat tail risk: *Tail risk is a form of portfolio risk that arises when the possibility that an investment will move more than three standard deviations from the mean is greater than what is shown by a normal distribution. Tail risks include events that have a small probability of occurring, and occur at both ends of a normal distribution curve. See also,* [2]*.*

Increasement of buying power: *Buying power (sometimes referred to as "excess equity") as it relates to trading stocks and options, is the maximum amount of capital (money) available to make trades with. When stock price goes deeper in the money, the buying power requirement will also increase. For example, when you are selling a put, if the stock price drops below your strike price, then you need more margin to keep the position.*

Margin call: *A margin call occurs when the value of an investor's margin account falls below the broker's required amount. An investor's margin account contains securities bought with borrowed money (typically a combination of the investor's own money and money borrowed from the investor's broker). A margin call refers specifically to a broker's demand that an investor deposit additional money or securities into the account so that it is brought up to the minimum value, known as the maintenance margin.*


FIGURE 1. Fat tail risk
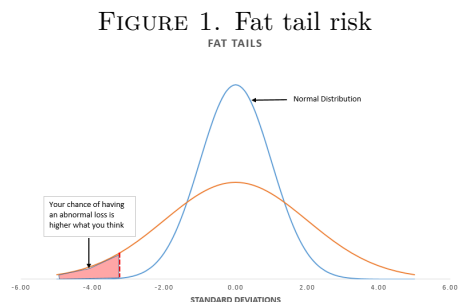
Remark (Misconception: Options Expire Worthless)**.** *So you might have heard of: "Over 75% of all options held until expiration expire worthlessly...that's why you should do what the professionals do and sell options to other people. After all, if most of them will expire worthlessly, why not collect some money for them today while they still have value?"*

2. Question solving

Question (2.6)**.** *A default-free zero-coupon bond costs* $91 *and will pay* $100 *at maturity in 1 year. What is the effective annual interest rate? What is the payoff diagram for the bond? The profit diagram?*

Solution. Since it is a default-free zero-coupon bond and you spend $91 to buy this bond. After 1-year, they will pay you $100 back. So the payoff will be $100 − $91 = $9, this implies that the effective annual interest rate is $9/$91 ∼ 9.89%.

The payoff for default-free zero-coupon bond will be the following

Payoff ($)

$100

S&R Index price ($)
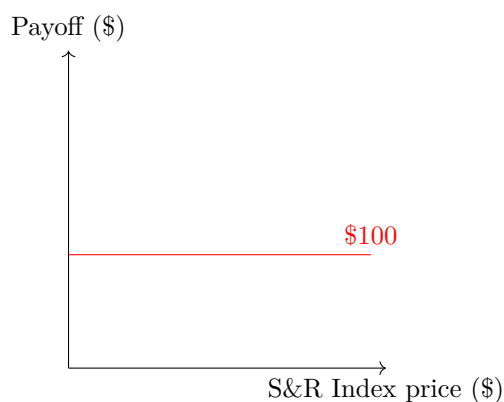
Note that there are various definitions of profit. For example, in the textbook, we take into account the risk-free annual return, which is regarding the future value of your investment. Also, we list the normal definition of profit as well
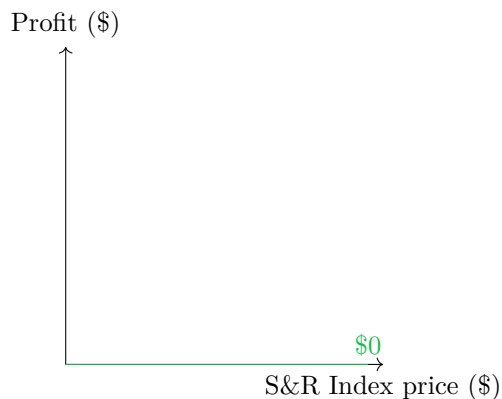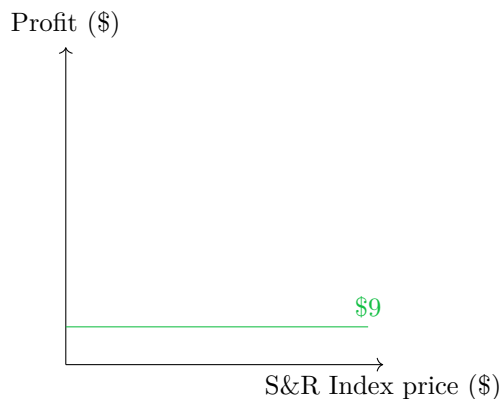
FIGURE 2. Textbook's definition

Profit ($)

$0

S&R Index price ($)

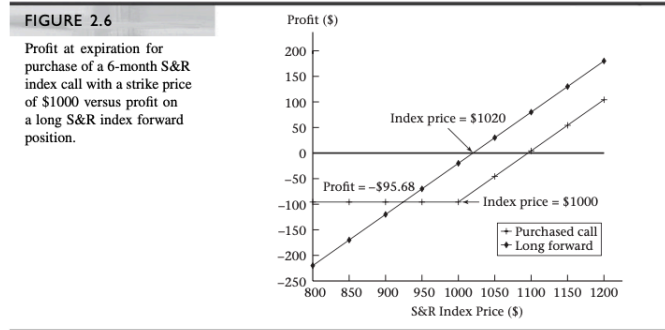FIGURE 3. Normal definition

Profit ($)

$9

S&R Index price ($)

□

Remark. *Juylance mentioned the current federal interest rate in class. The U.S. 10 year treasury rate is at 1.12% on January 21, yes it is "risk-free", but by taking into account the inflation rate*

and the U.S. dollar's weakening, is it really risk-free? Or are you just quietly losing your own money?

Question (2.10). *For Figure 2.6 (see page below), verify the following:*

  a. *The S&R index price at which the call option diagram intersects the x-axis is $1095.68.*
  b. *The S&R index price at which the call option and forward contract have the same profit is $924.32.*

FIGURE 4. Figure 2.6

FIGURE 2.6

Profit at expiration for purchase of a 6-month S&R index call with a strike price of $1000 versus profit on a long S&R index forward position.

Solution.

a. The premium of the call option will be $95.68, assume the S&R index price and the profit intersect at p, so we are solving

$$\max[0, p - \$1000] - \$95.68 = \$0,$$

hence $p = \$1095.68$.

b. For the long S&R index forward position, when the index price equals $1020, the profit equals $0. Assume when the S&R index price at x, the call option and forward contract have the same profit, then

$$\max[0, x - \$1000] - \$95.68 = x - \$1020.$$

Solving this we see that x must be less than $1000 and $x = \$924.32$. $\qquad\square$

REFERENCES

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