

Midterm Grade Contracts

Official Offering

A

An insurance that pays you 20 J-points in the event that your midterm exam score is < 70 .

- **Price:** 3 J-points
- **Payoff:** $\begin{cases} 17 \text{ J-points} & \text{if } M < 70 \\ -3 \text{ J-points} & \text{if } M \geq 70 \end{cases}$, where M denotes your midterm exam score.

B

An option that gives you the *right* to buy product A on or before expiration time.

- **Price:** 1 J-point
- **Expiration time:** end of the exam day
- **How it works:** After you purchase this option, you have the right to buy product A any time before the expiration time.
 - ▷ If you exercise your right to buy product A, your final payoff will be $\begin{cases} 16 \text{ J-points} & \text{if } M < 70 \\ -4 \text{ J-points} & \text{if } M \geq 70 \end{cases}$
 - ▷ If you do not buy product A, your payoff will be -1 J-point.

C

A betting contract on whether the class average midterm exam score is ≥ 82.5 .

- **Your position:** either (C.a) the class average is ≥ 82.5 ; or (C.b) the class average is < 82.5 .
- **Amount bet:** x J-points ($2.5 \leq x \leq 20$)
- **Payoff for (C.a) :** $\begin{cases} -x \text{ J-points} & \text{if } \bar{M} < 82.5 \\ x \text{ J-points} & \text{if } \bar{M} \geq 82.5 \end{cases}$, where \bar{M} denotes the class average of midterm scores
- **Payoff for (C.b) :** $\begin{cases} x \text{ J-points} & \text{if } \bar{M} < 82.5 \\ -x \text{ J-points} & \text{if } \bar{M} \geq 82.5 \end{cases}$

D

An option to buy C on or before expiration time.

- **Price:** $y = (x - 2.5) / 2.5$ J-points¹, where x denotes the amount bet in contract C
- **Expiration time:** end of the exam day
- **Payoff:**
 - ▷ (C'payoff $-y$) J-points if you exercise the option (i.e. buy C).
 - ▷ $-y$ J-points if you don't.

¹ e.g., if $x = 10$, then $y = 3$. If $x = 20$, then $y = 7$.

Private Contracting

You can form contracts with each other using midterm exam scores as the reference entity and J-points as the currency. There is no limit on how many contracts you can enter into. Here's an example:

Example. You want to protect yourself against the risk of scoring below 70, but are concerned that the exam may turn out to be too easy, in which case you waste your money purchasing an insurance. One way to deal with this problem is to purchase an option that allows you to buy an insurance if the exam turns out to be hard. Another way is to enter into two contracts: 1. an insurance contract that protects you against the risk of scoring below 70; 2. a betting contract in which your position is that the class average will be above, say, 82.5. In this way, if the exam is hard and you fall below 70, you may lose money on your bet but receive compensation from your insurance. If the exam is easy and the class average is high, you may lose money on your insurance but receive compensation from your bet.

Here is another example of how a combination of different contracts can benefit you:

Example. A forms betting contracts respectively with B and C. A's contract with B: A pays B 10 J-points if the class average midterm score is ≥ 70 . Otherwise, B pays A 10 J-points; A's contract with C: C pays A 10 J-points if the class average midterm score is ≥ 60 . Otherwise, A pays C 10 J-points. Then,

$$\text{A's payoff} = \begin{cases} 0 \text{ J-points} & \text{if class average} \geq 70 \\ 20 \text{ J-points} & \text{if class average} \in (60, 70) \\ 0 \text{ J-points} & \text{if class average} < 60 \end{cases}$$