Options Part 1

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Context

- *Options* are simple financial contracts that show up everywhere in finance.
- They can be viewed as the building blocks of many other financial instruments.
- The theory of option pricing is the starting point for much of quantitative finance.
- Most of the data that we are going to analyze in this class will be options related.
- **Bottom Line:** You need to understand options.

Options are Insurance Contracts

- **Options** are simple **insurance** contracts wrapped around other financial assets.
- The financial asset that is being insured is called the *underlying*.
- The type of underlyings that we are going to discuss in this class will mostly be stocks and ETFs.
- The essential concepts are the same for other underlyings like interest rates, futures, or barrels of oil.
- Let's build some intuition using a type of insurance that you are all familiar with: car insurance.

Wolve Auto Insurance

- Wolverine Trading wants to get into the car insurance business. They would like our help on formulatin a pricing policy.
- The type of underlying they want to insure: a specific driver coupled with a specifc vehicle.
- The driver being insured is going to pay Wolve *premium*.
- In exchange for premium, Wolve will reimburse the driver whenever damage to the car exceeds a certain dollar amount, called the *strike* (deductible).
- Do you think Wolverine should charge the same premium irrespective of the underlying?

Price of Underlying

- Sandra has two different vehicles that she wants to switch over to Wolve Auto insurance.
- One is an old busted Mazda 3 that she bought several years ago when she was a struggling MFM instructor.
- The other is a fancy new self-driving Tesla that she bought last week after starting her lucrative options trading career.
- Which one should be more expensive to insure? Why?

Strike Price of Contract

- Wolve Auto has three different strikes that they can offer Sandra for the insurance on her self-driving Tesla:
  - *at-the-money* := \$0
  - \$1,000
  - \$5,000
- Let's order the premium for the three strike prices from cheapest to most expensive. Explain.

Time to Expiration (Tenor) of Contract

- Wolve has three different contract lengths that they can offer Sandra for her Tesla insurance:
  - 0.25 years
  - 0.50 years
  - 1.00 years
- Let's order the premium for these tenors from most expensive to least expensive. Explain.

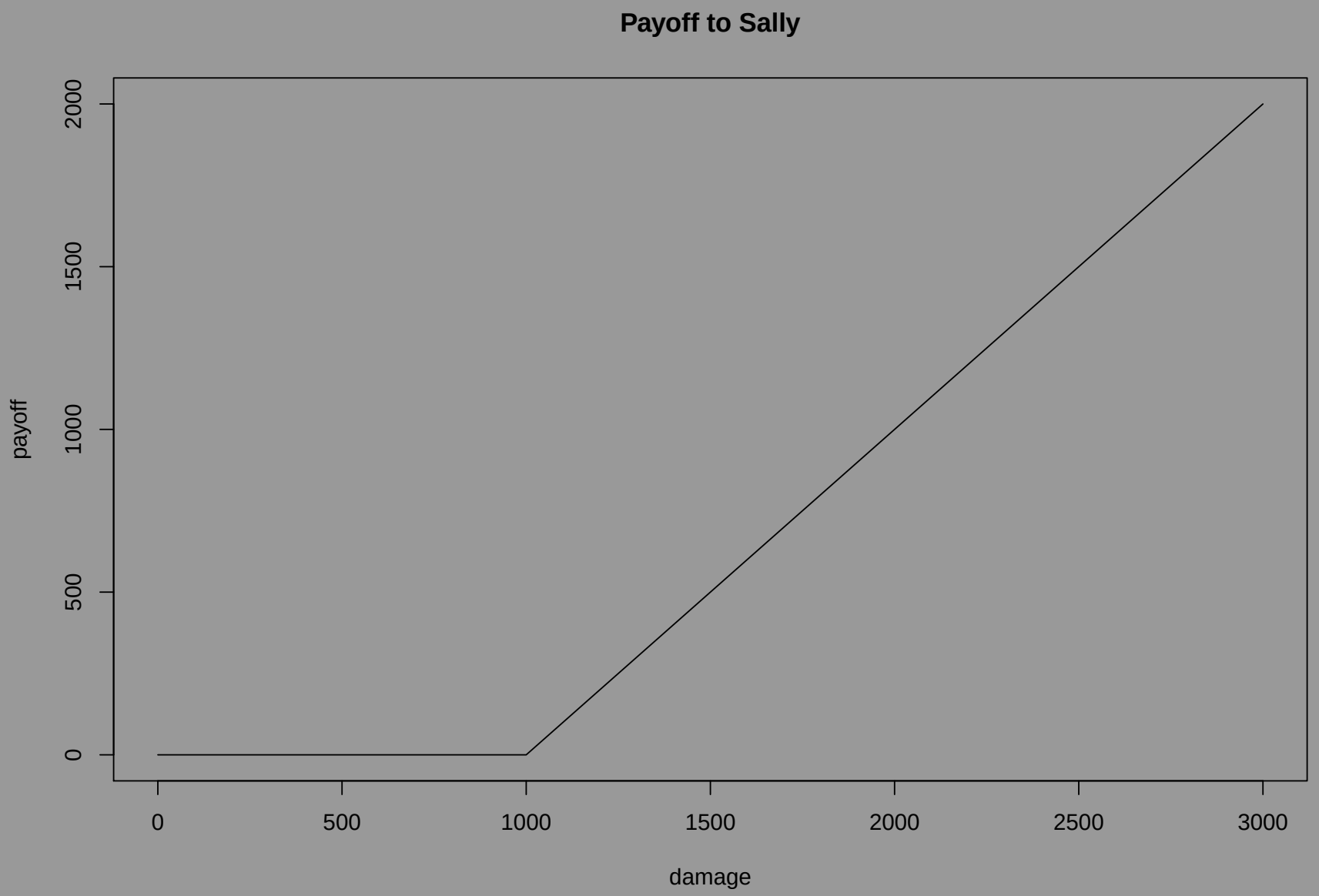
Volatility of Underlying

- Wolve is pricing insurance for two different customers, Sally and Patty.
- Both Sally and Patty are looking to purchase insurance a fancy new self-driving Tesla. They both want a 1 year contract with with a $1,000 strike price.
- Here is how Sally's friends describe her: calm, chill, responsible, quiet, serene.
- Here is how Patty's friends describe her: wild, hyper, flakey, loud, volatile.
- Who should Wolverine charge more for insurance? Why?

Insurance Payoff Graph (1 of 3)

- It's Saturday morning and Sally is driving on the freeway, hands at 10-2, eyes on the road, listening to classical music.
- Patty is on her way home from an all night rave. As she is driving, she is blasting Bassnectar and posting to her IG story.
- Suddenly, Patty loses control and swerves in front Sally. . . (freeze tape)
- Patty is riding dirty with no insurance, but Sally purchased a $1000-strike contract before she left the dealership.
- **Excercise:** Graph the value of Sally's insurance payoff as a function of the damage to her vehicle from the accident.

Insurance Payoff Graph (2 of 3)



Insurance Payoff Graph (3 of 3)

- The payoff graph we created was from Sally's perspective.
- What does the graph look like from Wolverine's perspective?
- **Jargon:** We say that Sally is long (bought) the insurance contract and that Wolverine is short (sold) the insurance contract.