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Social Sciences 7218

Handout #7: Contracts Continued

Review

1. **Remedies for Breaching Contract:** Damages awarded when contracts are breached may either be specified within contracts or issued by courts.

   (a) **Party-Designed Remedies:** Damages are specified in a contract for particular scenarios.
   - **Liquidated Damages:** Damages which reasonably approximate actual harm done by breach.
     - Typically upheld by courts on efficiency grounds.
   - **Penalty Damages:** Damages imposed are greater than the value of actual harm.
     - Often not upheld by courts.
     - Penalty damages *may* approximate subjective harm in such a way that the contract would not have been signed without it.
     - However, the dynamic incentives created by penalty damages can be matched by performance bonuses, which are upheld by courts.

   (b) **Court-Imposed Damages:** Damages are not specified in a contract, but are issued by a court.
   - **Expectation Damages ("Positive Damages"):** Makes the promisee indifferent between performance and breach.
   - **Reliance Damages ("Negative Damages"):** Restores the promisee to the same level of well-being they had before signing the contract.
   - **Opportunity Cost Damages:** Makes the promisee indifferent between breach and performance of the next-best alternative.
     - Rational agents should always choose the option which maximizes utility first.

   Note: Ranking Damages

   $$\text{Expectation Damages} > \text{Opportunity Cost Damages} > \text{Reliance Damages}$$

   (c) **Other Remedies:** Other court-mandated damages are less-common and situation-specific.
   - **Restitution:** A party must return money that was already received.
   - **Disgorgement:** A party must give up wrongfully-gained profits.
   - **Specific performance:** Forces the breaching party to live up to the terms specified in the contract.
     - Routinely used in Civil Law courts.
     - Often not upheld by Common Law courts, even when Specific Performance is explicitly written into the contract.

2. **The Paradox of Compensation:** Contracts between two parties generally cannot incentivize efficient reliance, efficient investment in performance, and efficient breach simultaneously.
   - If expected damages increase with reliance investments, this creates an incentive to over-rely.
   - If expected damages do not increase with reliance investments, this creates an incentive to under-invest in performance and an incentive to breach more than the efficient amount.

   Note: The fundamental problem in the Paradox of Compensation is the existence of a single price. "Anti-Insurance" can solve the Paradox of Compensation by driving a wedge between the amount paid by the promisor and the amount received by the promisee.

3. **Overview: The Purposes of Contract Law**

   (a) Encourage cooperation
   (b) Encourage efficient disclosure of information
   (c) Secure optimal commitment to performance
   (d) Secure efficient reliance
   (e) Provide efficient default rules and regulations
   (f) Foster enduring relationships

Math Review: Infinite Series

Note: Not all of the examples in this math review are strictly necessary for this class, but you should be familiar with the geometric series. For people who haven't taken Calculus II (or who took it a long time ago), it's often difficult to think about infinite sums. This is designed to help ease you into things!

Sometimes we want to add up an infinite number of terms. But not all infinite sums add up to a finite value. A few examples:

1. An obvious example:

$$\sum_{i=1}^{\infty} 1 = 1 + 1 + 1 + \ldots = \infty$$

2. A not-so-obvious example (The *Harmonic Series*):

$$\sum_{i=1}^{\infty} \frac{1}{n} = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \ldots = \infty$$

Proof.

$$\sum_{i=1}^{\infty} \frac{1}{n} = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \ldots > 1 + \frac{1}{2} + \left(\frac{1}{4} + \frac{1}{4}\right) + \left(\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8}\right) + \ldots = 1 + \frac{1}{2} + \frac{1}{2} + \ldots = \infty$$

□

But sometimes infinite sums are finite. Some examples:

1. The first(?) example (Zeno's Arrow Paradox): Suppose you shoot an arrow at a target. Before reaching the target, the arrow would first half to travel half the distance. But then it would have to travel half the remaining distance. But then...

   Zeno thought this meant motion was impossible, but he was dumb.[1] What it *does* mean is that the sum:

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \ldots$$

   is finite. In fact, it is exactly equal to one!

2. A more general example (The *Geometric Series*): Suppose $\delta < 1$. Then we have:

$$\sum_{n=0}^{\infty} \delta^n = \frac{1}{1-\delta}$$

Proof. (Sort of...)

$$\sum_{n=0}^{\infty} \delta^n = 1 + \sum_{n=1}^{\infty} \delta^n = 1 + \sum_{n=0}^{\infty} \delta^{n+1} = 1 + \delta \sum_{n=0}^{\infty} \delta^n \implies 1 = (1-\delta)\sum_{n=0}^{\infty} \delta^n \implies \sum_{n=0}^{\infty} \delta^n = \frac{1}{1-\delta}$$

□

   Zeno's paradox is just a special case of this.

3. An interesting case (The Basel Problem):[2]

$$\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$$

Note:

- A very useful fact (The *Hyperharmonic Series* or *p-Series*):

$$\sum_{n=1}^{\infty} \frac{1}{n^p} < \infty \quad \text{if } p > 1 \qquad \text{and} \qquad \sum_{n=1}^{\infty} \frac{1}{n^p} = \infty \quad \text{if } p \leq 1$$

  This gives us the convergence/divergence of both the Harmonic series and the Basel Problem.

[1] Alternatively, maybe he was just an ideologue. Some have speculated that Zeno was just trying to defend Parmenides (who believed that everything was fundamentally unchanging) against Heraclitus (who believed that everything was fundamentally in flux).

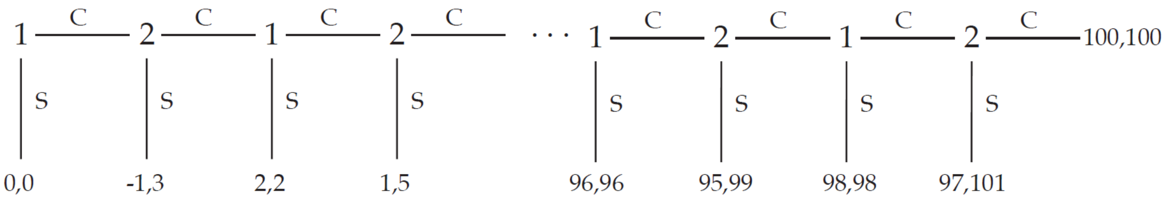
[2] If you're mathematically-inclined, you can show this with Fourier series.

Math Review: Repeated Games

We are often interested in analyzing relationships that involve more than one interaction between the same two parties. When these interactions only occur finitely many times, subgame perfection predicts that cooperative behavior breaks down due to the *endgame problem*, which says that misaligned incentives in the final (smallest) subgame lead to a cascading breakdown of trust in each larger subgame.

Example: The Centipede Game (Revisited)

Recall the centipede game we talked about a few discussions back:



Here, the fact that Player 2 has incentives in the smallest subgame which are misaligned with those of Player 1 in the second-smallest subgame leads us to predict that the game ends in the first period. That is, trust breaks down immediately!

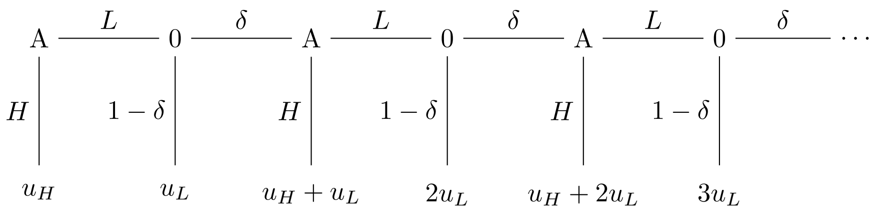
However, if we treat these interactions as occurring infinitely-many times, the endgame problem no longer applies since there is no deterministic final stage. To analyze infinitely-repeated interactions we use *repeated games*.

In the real world we know that interactions don't happen infinitely often. So to make our model more realistic we suppose that an interaction occurs once in each period of time, but that there is always a given chance $1-\delta$ that the relationship comes to an end. This is nice because it allows us to assign some (finite) value to a relationship which continues indefinitely.

An Instructive Example

Consider a repeated interaction between two players, A and B. At each decision node, Player A chooses between a high payoff u_H (which is unfavorable to Player B) and a low payoff u_L (which is favorable to Player B). If Player A chooses the high payoff, the relationship ends immediately (trust breaks down). If Player A chooses the low payoff, the relationship ends with probability $1-\delta$. That is, there is some probability δ that the interaction occurs again next period.

The game tree can be written as a series of alternating moves between Player A and "Player 0" (often called *Nature*) where Player 0's move represents the probability that the game ends at any given point. Payoffs are those of Player A.



Now we can write the (infinite discrete) expected value to Player A of choosing u_L in every period as:

$$\mathbb{E}[u] = \sum_{n=0}^{\infty} \delta^n u_L = \frac{u_L}{1-\delta}$$

As long as this expected value is greater than the one-time payoff of choosing u_H and ending the relationship, Player A will choose u_L and maintain the relationship.

Note:

- There are a number of equilibrium concepts for repeated games. We're not going to go into much depth with these equilibrium concepts, as they can be pretty complicated. For this class the key is to be able to calculate the expected value of a continuing relationship and weigh it against one-time benefits of breaking trust.

Problems

1. (From Handout 7) Anticipating a rent boom in Madison in the coming year, three housing developers, Adam, Bob and Chloe, attempt to acquire an old dilapidated townhouse to convert into a new student apartment. The developers have the following plans in mind.

	Adam	Bob	Chloe
Cost of converting to apartment	$60,000	$80,000	$120,000
Total anticipated rent	$150,000	$180,000	$160,000

The homeowner values his house at $30,000. To prepare the house for sale, the homeowner re-decorates the walls and cleans up the basement, at a cost of $10,000.

(a) Assuming free bargaining, which developer will the homeowner sign a contract with? Assuming equal bargaining power (i.e. equal split of surplus), what is his payoff?

(b) Now, suppose that rent level plummets, and the housing developer only anticipates a future rent revenue of $140,000. Therefore, he attempts to back out of the contract. The homeowner sues for damage payments.

(i) What is the amount of expectation damages?

(ii) What is the amount of reliance damages?

(iii) What is the amount of opportunity cost damages?

(iv) Does each of these damage rulings generate the efficient outcome?

(c) Suppose that instead of a damage rule, the court actually grants the homeowner a specific performance remedy. What do you expect to happen afterwards, if the homeowner and the developer could bargain freely?

(d) The housing developer makes an appeal and tries to invalidate the contract. What legal doctrines could he refer to? What doctrine could the homeowner use to argue for the enforcement of the contract?

2. Reliance and Breach (from sample exam questions)

Explain why...

(a) expectation damages lead to efficient breach.

(b) the efficient level of reliance is decreasing in the probability of breach – that is, the more likely a promisor is to breach, the lower is the efficient level of reliance.

(c) including the anticipated benefit from reliance investments in the calculation of expectation damages leads to overreliance.

3. As the activities coordinator of the Economics department graduate student association, you have been tasked with organizing the department's annual winter party. You contract with a professional DJ service to provide the music. The DJ service must choose which of its two employees to send to your event:

- Tom shows up with probability 1/2.
- Evan shows up with probability 2/3 but costs the service an additional $55.

The winter party will make the department $300 better off as currently planned. However, you have the opportunity to make reliance investments:

- You can purchase an additional keg of cheap beer for $175 or quality microbrew for $250.
- These investments will increase the value of the party to the department by $300 and $390 respectively.

If the DJ fails to show up, you will get nothing from these investments, because everyone will leave the party. The keg purchases available to you and the DJs available to the service are common knowledge.

(a) What is the efficient choice of DJ and reliance?

(b) What will you and the DJ service choose to do if reliance is included in expectation damages?

(c) What will you and the DJ service choose to do if reliance is not included in expectation damages?

(d) Is social surplus higher when reliance is included or not included?

Suppose that, before you sign the contract, the DJ service is unaware that you might purchase an additional keg.

(e) If reliance is included in expectation damages, are you likely to tell the DJ service about this contingency?

(f) What if it is not included? Assume that it is possible to specify who will DJ your event in the contract.