Dissolution dynamics and durations

- Building intuition

Relational durations

- Imagine a world in which all relationships have a constant daily hazard of dissolution, 1%. (The formation process might be quite complex, but the dissolution process is simple).

- Q1: What would be the mean duration that a relationship lasts in this world?

Relational durations

- Now imagine that you enter this world one day, and are able to interview all couples who are in on-going relationships at that point. You ask them how long their relationship has lasted up until that point (relational “age”)

- Q2: What would the mean answer be?

Relational durations

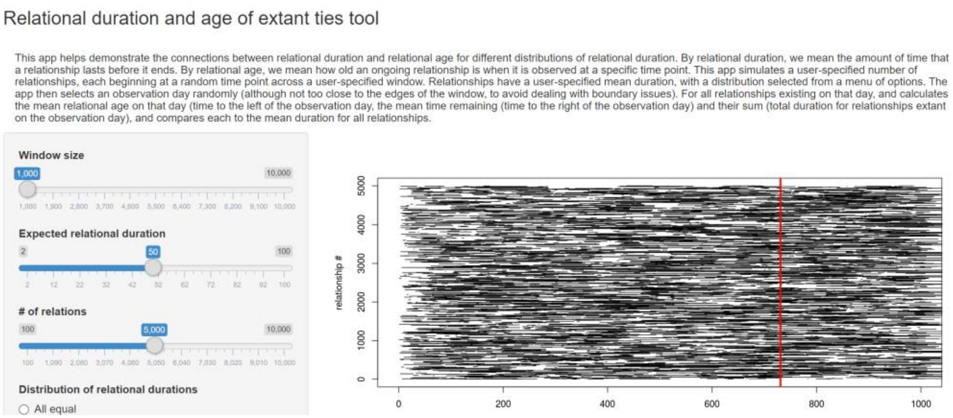
- Now imagine a world in which all relationships last exactly 100 days before ending.
- Once again, you are able to show up one day and interview all couples who are in on-going relationships at that point. You ask them how long their relationship has lasted up until that point (relational “age”)

- Q3: What would the mean response be?

Relational durations

- We’ve built a little Rshiny app to let you play with this process

[RShiny app]



- Try modifying the parameters
  - For the observation window size
  - The expected duration
  - The sample size (number of relations)
  - The distribution of duration

One cross-section + duration info

- Exponential/geometric durations suggests a memoryless processes – one in which the future does not depend on the past
- Imagine a fair, 6-sided die:

1/6
- What is the probability I will get a 1 on my next toss?

1/6
- What is the probability I will get a 1 on my next toss given that my previous 1 was five tosses ago?

6
- On average, how many tosses will I need before I get my first 1?

6
- On average, how many more tosses will I need before I get my next 1, given that my previous 1 was 8 tosses ago?

Geometric	
Parameters	$0 < p \leq 1$ success probability (real)
Support	$k \in \{1, 2, 3, \dots\}$
Probability mass function (pmf)	$(1-p)^{k-1}p$
Cumulative distribution function (CDF)	$1-(1-p)^k$
Mean	$\frac{1}{p}$

One cross-section + duration info

- Now, let’s imagine this fairly bizarre scenario:
  - You arrive in a room where there are 100 people who have each been rolling one die; they pause when you arrive.
  - You don’t know how many sides those dice have, but you know they all have the same number.
  - You are not allowed to ask any information about what they’ve flipped in the past.
  - The only information people will give you is: how many flips after your arrival does it take until they get their first 1?
  - You are allowed to stay until all of the 100 people get their first 1, and they can inform you of the result.
- Given the information provided you, how will you estimate the number of sides on the die?

One cross-section + duration info

- Simple: when everyone tells you how many flips it takes from your arrival until their first 1, just take the mean of those numbers. Call it m.
- Your best guess for the probability of getting a 1 per flip is $1/m$.
- And your best guess for the number of sides is the reciprocal of the probability of any one outcome per flip, which is 1/1/m, which just equals m again.
- Voila!

One cross-section + duration info

Retrospective relationship surveys are like this, but in reverse:

Dice:

Relationships: