Hurdle rates, declining discount rates, and uncertain opportunity cost

Daniel Wilmoth
daniel.wilmoth@gmail.com
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Outline

- Uncertain opportunity cost
- Taking an average
- Declining discount rate
- Effect of an outlier
- Hurdle rates
- Implications for expected value
- In practice
Uncertain opportunity cost

• Policy changes redirect resources from...?
  a) consumption
  b) investment

• In the future, people will be investing in...?
  a) comic books
  b) fusion reactors
A probability distribution

Discount rate
The expected value

Discount rate

expected value
Which expected value?

• The discount factor \( D(t,r) = 1/(1+r)^t \) is a convex function of the discount rate \( r \)

• By Jensen’s Inequality, the expected value of the discount factor, \( E(D(t,r)) \), will be greater than the discount factor that corresponds to the expected discount rate, \( D(t,E(r)) \)
The declining discount rate

![Graph showing the declining discount rate over time. The x-axis represents time, and the y-axis represents the discount factor. Two curves are shown: D(t,E(r)) and E(D(t,r)).]
In the long run

• The declining discount rate converges to the lowest rate in the distribution
• Summarizing a distribution using an expected value can be problematic when the expected value is dominated by a single scenario
Proportion of the expected discount factor attributable to one scenario
Hurdle rates

• What if we want a minimum probability of positive net benefits?
• When costs precede benefits, positive net benefits at a given discount rate imply positive net benefits at every lower discount rate
A hurdle rate

Discount rate

hurdle rate
If costs follow benefits
A reverse hurdle rate

Discount rate

reverse hurdle
The ratio of $E(D(t,r))$ to $D(t,\text{hurdle})$
In practice

• Declining discount rate in the UK
• A low rate combined with a high rate in the US
• Risk of strategic choices