Uncertainty and Discounting
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• Assume the real rate of interest/productivity is uncertain (Few risk-free investments beyond say 30 years exist)

• Find the certainty equivalent discount rate to evaluate costs and benefits of climate policy

Example:

• Current rate of 4% can rise to 7% or decline to 1% over the next 100 years

Source:
Uncertainty and Discounting

In 100 years
- $100$ is worth $20.28$ (lower path) or $0.20$ (higher path)
- Assume they are equally likely: Expected value: $10.24$

In 101 years
- $100$ is worth $20.28/1.01=20.08$ (low path) or $0.20/1.07=0.19$ (high path)
- Expected value: $10.13=0.5 \times 20.08 + 0.5 \times 0.19$

Effective certainty equivalent discount rate
- $10.24 / 10.13 = 1.01 = 1+r$ [equivalent to $10.13 = 10.24/(1+r)$]
- Effective Discount rate $r=1\%$ is determined by smaller discount rate
- Reason: large discount rate heavily discounts future benefits such that it adds little to the expected value
Uncertainty and Discounting

• British Green Book prescribes for evaluation of long term cost and benefits declining (‘hyperbolic’) discount rates:

<table>
<thead>
<tr>
<th>Period of years</th>
<th>0–30</th>
<th>31–75</th>
<th>76–125</th>
<th>126–200</th>
<th>201–300</th>
<th>301+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount rate</td>
<td>3.5%</td>
<td>3.0%</td>
<td>2.5%</td>
<td>2.0%</td>
<td>1.5%</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

stating that “The main rationale for declining long-term discount rates results from uncertainty about the future. “


• However, this reasoning on discounting and uncertainty does not take into consideration learning
  -> More complicated! (current research)