Stern, Climate Policy and Saving Rates

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Thanks and Disclaimer

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- Presentation represents my professional opinions and views expressed should not be attributed to the Department of Climate Change or the Australian Government
Outline

1. Stern’s parameters

2. Saving rates associated with Stern’s parameters in theory

3. Comparing Stern’s and key critic Nordhaus’s saving rates in a calibrated model (DICE)
The Stern Review

• Policy prescription: strong and early action
• Methodology: mixed
  – Includes aggregated economic modelling
• Forming policy requires judgements about importance of future welfare
• Judgements embodied in model parameters
Two Ways to Disagree with Stern’s Parameter Values

1. The choice of parameter values
Two Ways to Disagree with Stern’s Parameter Values

1. The choice of parameter values
2. The method for choosing the parameter values
Disagreement #1

\[
SDR = \rho + \eta g
\]

- Social discount rate
- Rate of ‘pure time preference’
- Elasticity of the marginal utility of consumption
- Growth rate of consumption
Disagreement #1

\[ SDR = \rho + \eta g \]

- social discount rate
- rate of ‘pure time preference’
- growth rate of consumption
- elasticity of the marginal utility of consumption

Stern: \( \sim 0 \)
Disagreement #1

\[ SDR = \rho + \eta g \]

- social discount rate
- rate of 'pure time preference'
- growth rate of consumption
- elasticity of the marginal utility of consumption

Stern: ~ 0

Stern: 1, then 2
Dasgupta: 2
Disagreement #2

\[ SDR = \rho + \eta g \]

\[ r = \rho + \eta g \]

- Observed real interest rate: Nordhaus: 5-6%
- Rate of ‘pure time preference’: Nordhaus: 3, then 1.5
- Elasticity of the marginal utility of consumption: Nordhaus: 1, then 2
- Growth rate of consumption
“Patently Absurd” Saving Rates?
“Patently Absurd” Saving Rates?

The resulting saving rates are patently absurd!

Dasgupta
“Patently Absurd” Saving Rates?

The resulting saving rates are patently absurd!

Dasgupta

Yep.
But I think Stern is right for the wrong reasons.

Weitzman
“Patently Absurd” Saving Rates?

The resulting saving rates are patently absurd!

Dasgupta

Yep.
But I think Stern is right for the wrong reasons.

Weitzman

I think Stern is just wrong.

Nordhaus
“Patently Absurd” Saving Rates?

Of course I thought of that!

Yeah, everyone. Stern is right.

Stern

DeLong
Outline

1. Stern’s parameters

2. Saving rates associated with Stern’s parameters in theory

3. Comparing Stern’s and key critic Nordhaus’s saving rates in a calibrated model (DICE)
Saving in the Ramsey Model

• Basis of micro-founded climate policy models
• Specific case: iso-elastic utility and Cobb-Douglas production:

\[ Y(t) = A(t)K(t)^\alpha L(t)^{1-\alpha} \]
Saving in the Ramsey Model

• Basis of micro-founded climate policy models

• Specific case: iso-elastic utility and Cobb-Douglas production:

\[ Y(t) = A(t)K(t)^\alpha L(t)^{1-\alpha} \]

• Question: what can we say about saving rates?

[Image 0x0 to 720x66]
Saving in the Ramsey Model

• Fact 1: steady-state saving is bounded above by the capital share of output regardless of pure time preference
• Fact 2: transitional saving rate is monotonic
Saving in the Ramsey Model

- Fact 1: steady-state saving is bounded above by the capital share of output \textit{regardless of pure time preference}
- Fact 2: transitional saving rate is monotonic

\[ \alpha = 0.3 \]
Saving in the Ramsey Model

• So: for Stern’s parameter choices:
  – saving rates will approach a steady-state level of less than 30% from above.
What’s Absurd About That?

• How to reconcile with Dasgupta’s 97.5%?
  – comes from swapping C-D with AK production and removing TFP growth

• In this case

  \[ s^* = \frac{r - \rho}{\eta r} \]

• For \( r = 4\% \), Stern’s parameters yield
  \[ s^* = 97.5\% \]

• Plausibility of underlying assumptions?
Outline

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Ramsey and the Climate: DICE

• Sophisticated micro-founded IAM
• Links Ramsey growth model with General Climate Model
• Key differences from standard Ramsey:
  – Finite horizon: complete dissaving
  – Production externality
Are Stern’s Rates ‘Reasonable’?

• Run DICE with Stern’s parameter choices
• Examine saving rates
• Compare with those resulting from Nordhaus’s parameters
Saving Rates in DICE07
Different rates of pure time preference and eta

Notes: s1: saving rate from DICE07 base run; s2: saving rate in base run with Stern 'hindsight' utility function parameters; s3: saving rate in base run with utility function parameters as in the Stern Review.
Source: author’s results from DICE07
Another Way to Show Reasonableness

• Look at effect of Stern’s saving rates on capital accumulation and optimal rate of emissions control
  – exploits ability to switch off optimal savings in DICE
Comparison

• Compare emissions control rate under:
  1. Nordhaus default parameters and optimal saving rate
  2. Nordhaus default parameters and fixed saving rate
  3. Stern ‘hindsight’ parameters same fixed saving rate
  4. Stern ‘hindsight’ parameters and optimal saving rate
### Comparison (cont.)

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Rationale</th>
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<tbody>
<tr>
<td>1. Nordhaus default parameters and optimal</td>
<td>• Choice of fixed saving rate in (2) to match optimal rate in (1) means</td>
</tr>
<tr>
<td>saving rate</td>
<td>that</td>
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<tr>
<td>2. Nordhaus default parameters and fixed</td>
<td>– shift from Nordhaus to Stern (1 to 4) can be approx. decomposed into</td>
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<tr>
<td>saving rate</td>
<td>shift from (1 or 2) to (3) (the ‘welfare effect’) and (3) to (4) (the</td>
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<td>3. Stern ‘hindsight’ parameters same fixed</td>
<td>‘capital effect’)</td>
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<tr>
<td>saving rate</td>
<td>• Hypothesis: capital effect is small as saving rate differences shown to</td>
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<tr>
<td>4. Stern ‘hindsight’ parameters and optimal</td>
<td>be small</td>
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<tr>
<td>saving rate</td>
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Optimal Emissions Control Rates in DICE07

Different utility function parameters and saving rates

Source: author's results from DICE07
Are Stern’s Rates ‘Reasonable’?

• Broadly yes
• Certainly not 97.5 per cent
• Maximum difference with Nordhaus is 4.5 percentage points.
In Conclusion

• Clarified the conditions under which ‘high saving rates’ can be used as a criticism of Stern’s utility function parameters
• Future work: many ways of ‘extending’ or altering DICE; key is prioritising areas of most value
Thank you!