"Answers" to Charge Questions

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Question 1: Ramsey

- Descriptive: Problematic
  - Puzzles
  - Restrictive preferences: 'siblings not triplets'
  - Externalities and other imperfections
  - Ethics of market rates
- Prescriptive
  - A particular SWF
  - Optimal?

General Issues

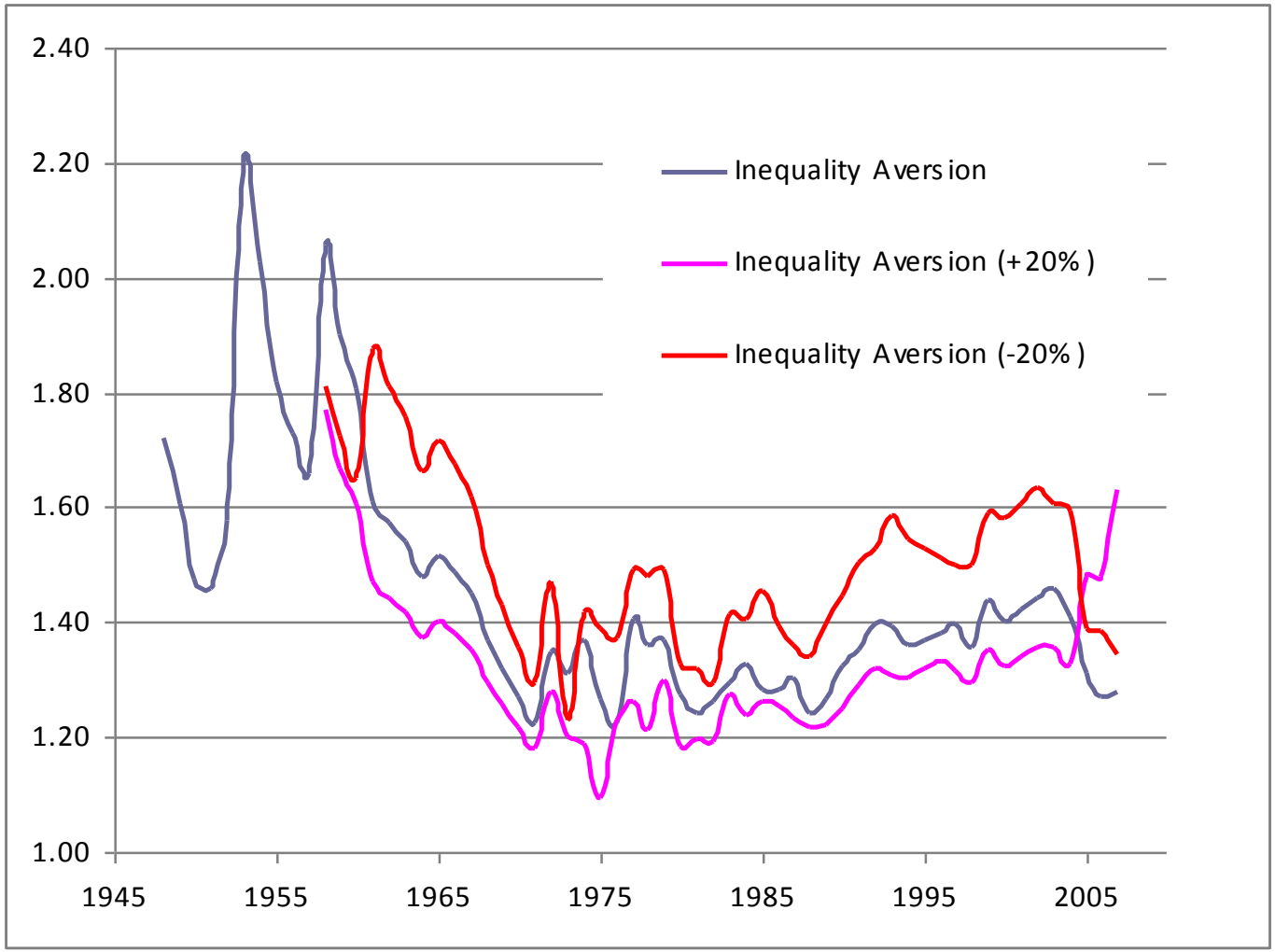
- Non-marginal impacts
- Aggregation
- Representative agent and population
- Compensation Criterion

- Descriptive vs prescriptive
  - Neither measures changes in welfare precisely
  - Show profiles and distributions of benefits and costs

Question 1b: parameters

- η:Social siblings
- ρ: Social
  - Stern approach seems fair
  - Agent relative ethics?
- Point estimates in time or space?
  - Aggregation
- Applied Social Ethics
  - Reflective
  - 'Mock referendum' (Kopp and Portney 1999, Sen 1967?)

Socially revealed inequality aversion



Question 1c: Uncertainty

- In growth: Extend Ramsey, welfare analysis
- In parameters? Monte Carlo
- Uncertainty or heterogeneity?
  - Jouini, Marin and Napp (2010), Weitzman (2001)
  - Beliefs differ about ρ and g: $r_i = \rho_i + \eta g_i$

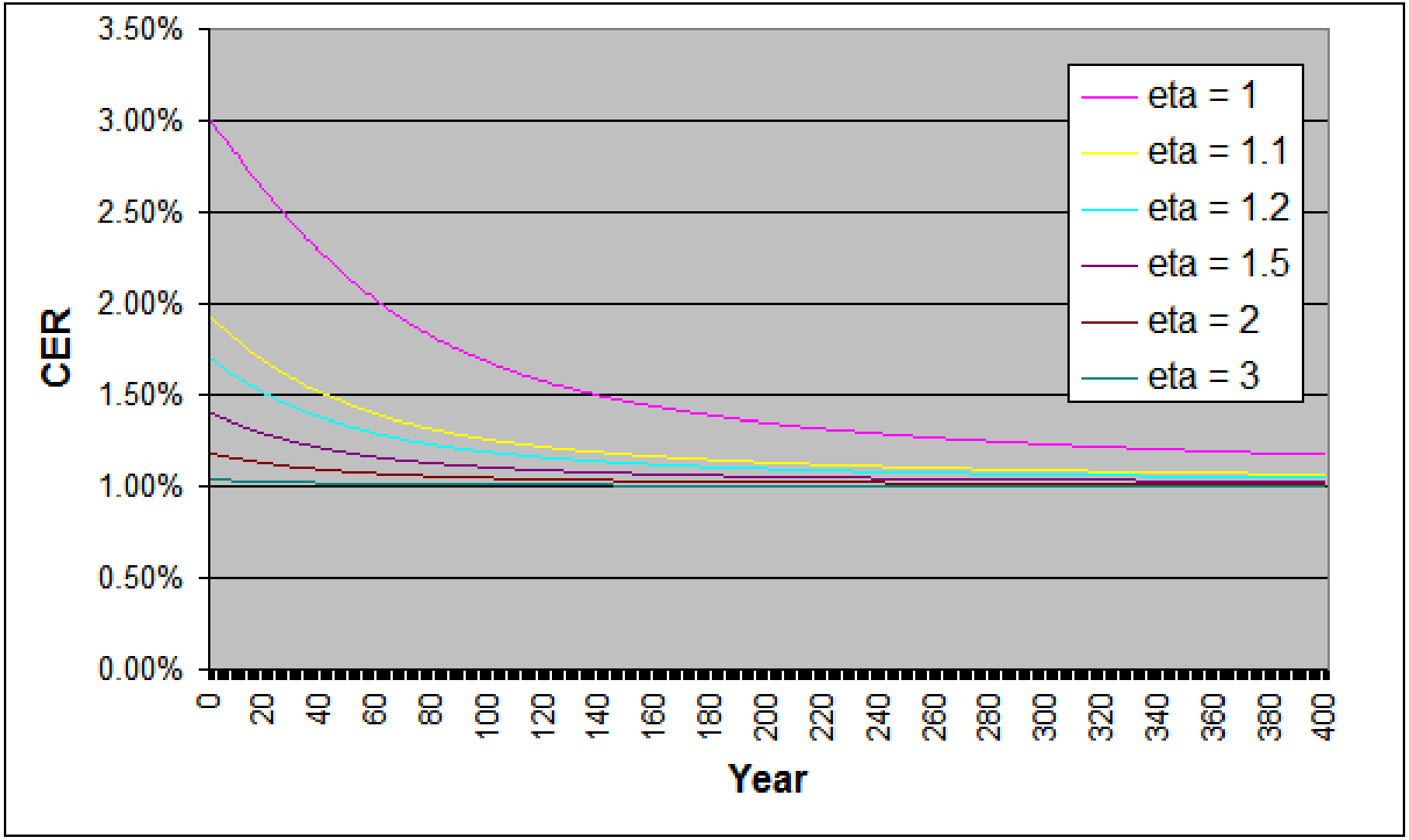
$$\Rightarrow R^{JMN}(H) = -\frac{1}{H}\ln\left[\sum_i \frac{\omega_i \rho_i}{\sum \omega_i \rho_i}\exp(-r_i H)\right]$$

$$\Rightarrow R^{Weitz}(H) = -\frac{1}{H}\ln\left[\frac{1}{n}\sum_i \exp(-r_i H)\right]$$

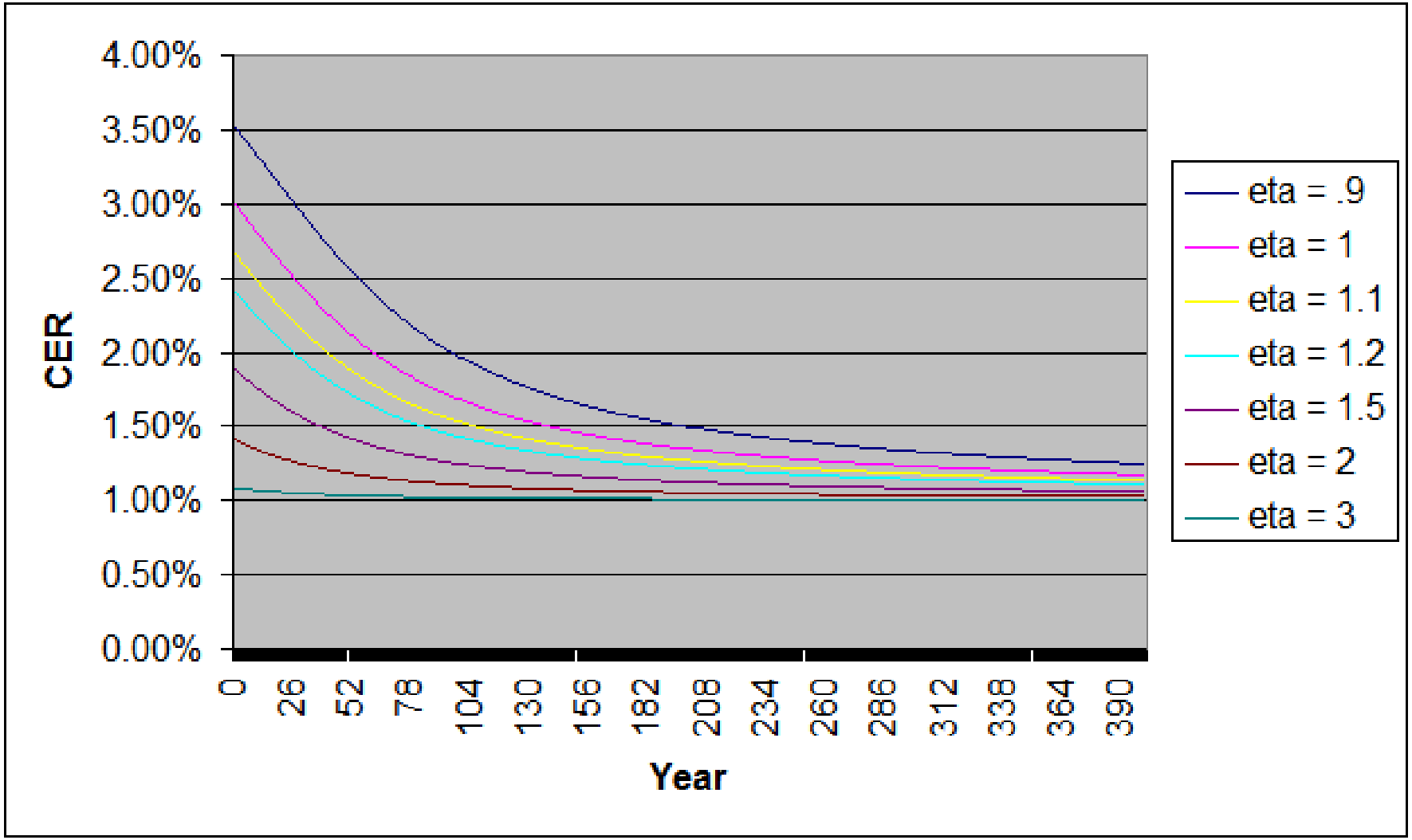
Question 2: DDRs

- Gollier and Weitzman (2010):
  - General preferences, production economy
  - Perfectly elastic supply of the risk free asset
  - ENPV valid with log preferences
  - Otherwise risk adjustment/'term premium'
- Freeman (2010)
  - Time inseparable prefs, risk neutral, exchange economy
  - C(0) fixed: perfectly inelastic
  - ENPV valid more generally
  - See Traeger (2011)

G&W (2010) r = 1% or 5%, ρ = .1%



G&W (2010) r = 1% or 5%, ρ = 1%



Question 2a: Empirics of Persistence

- Historical Data
  - Model selection: Econometric methods plus intuition
  - Data: inflation, smoothing, negative values, etc.

- Expert Opinion
  - Persistence due to 'irreducible disagreement'
  - Normative: no true value, irreducible
  - Positive: forecast error about true value

Groom, Koundouri, Panopolou and Pantelidis (2007), Newell and Pizer (2003)

Historical Data	
Model	**SCC**
State Space	**14.4**
Random Walk	**10.4**
Mean Reverting	**6.4**
Constant 4%	**5.74**

A Descriptive Approach

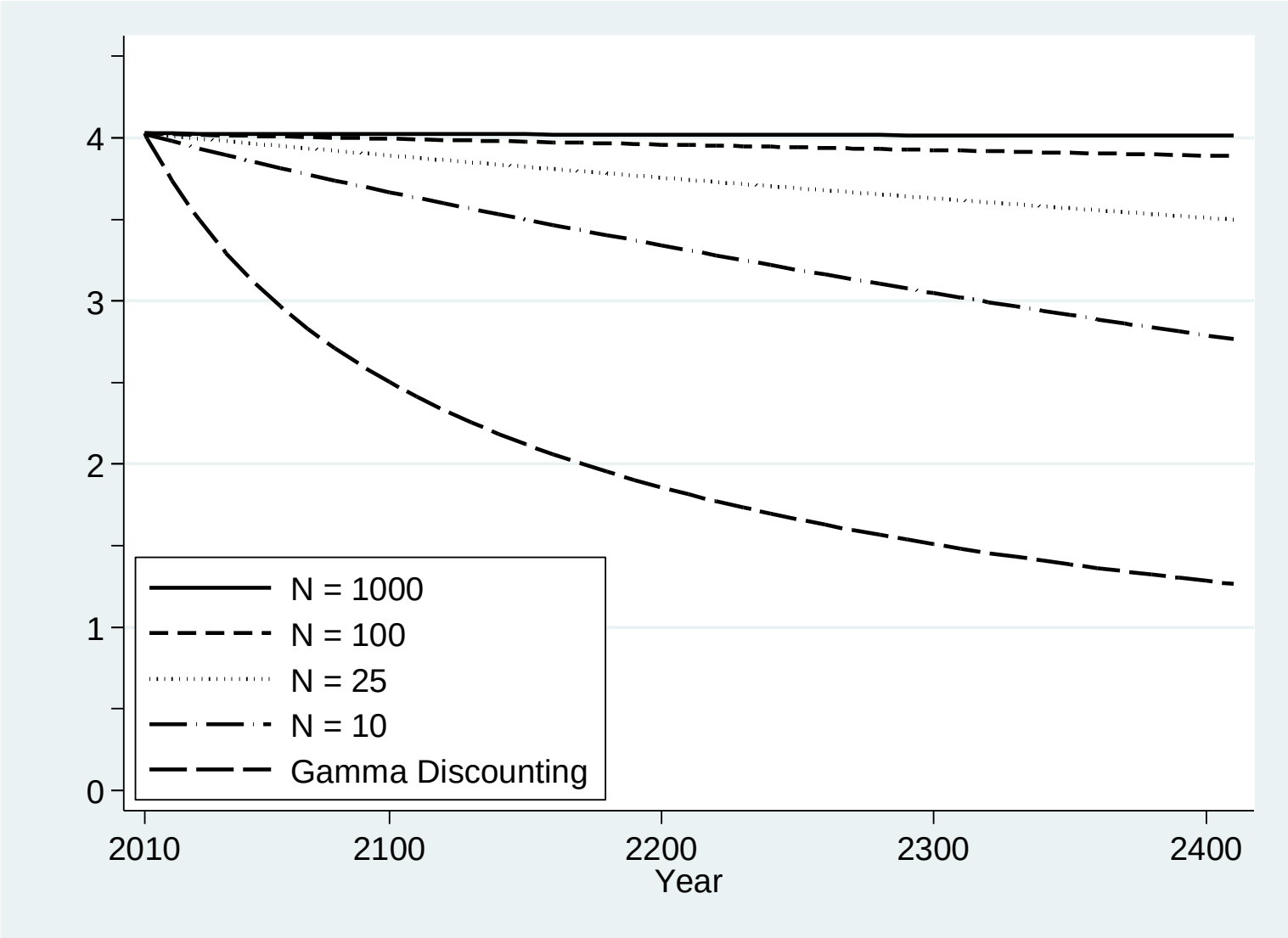
- Unbiased $r_i = \bar{r}_H + \varepsilon_i, \quad E(\varepsilon_i) = 0 \quad \forall \mathrm{i}$
- $\sum$ is diagonal
- Where the CLT holds:

$$\phi(\bar{r}_H) \approx N(\bar{r}_H^n, \sigma^2 / n)$$

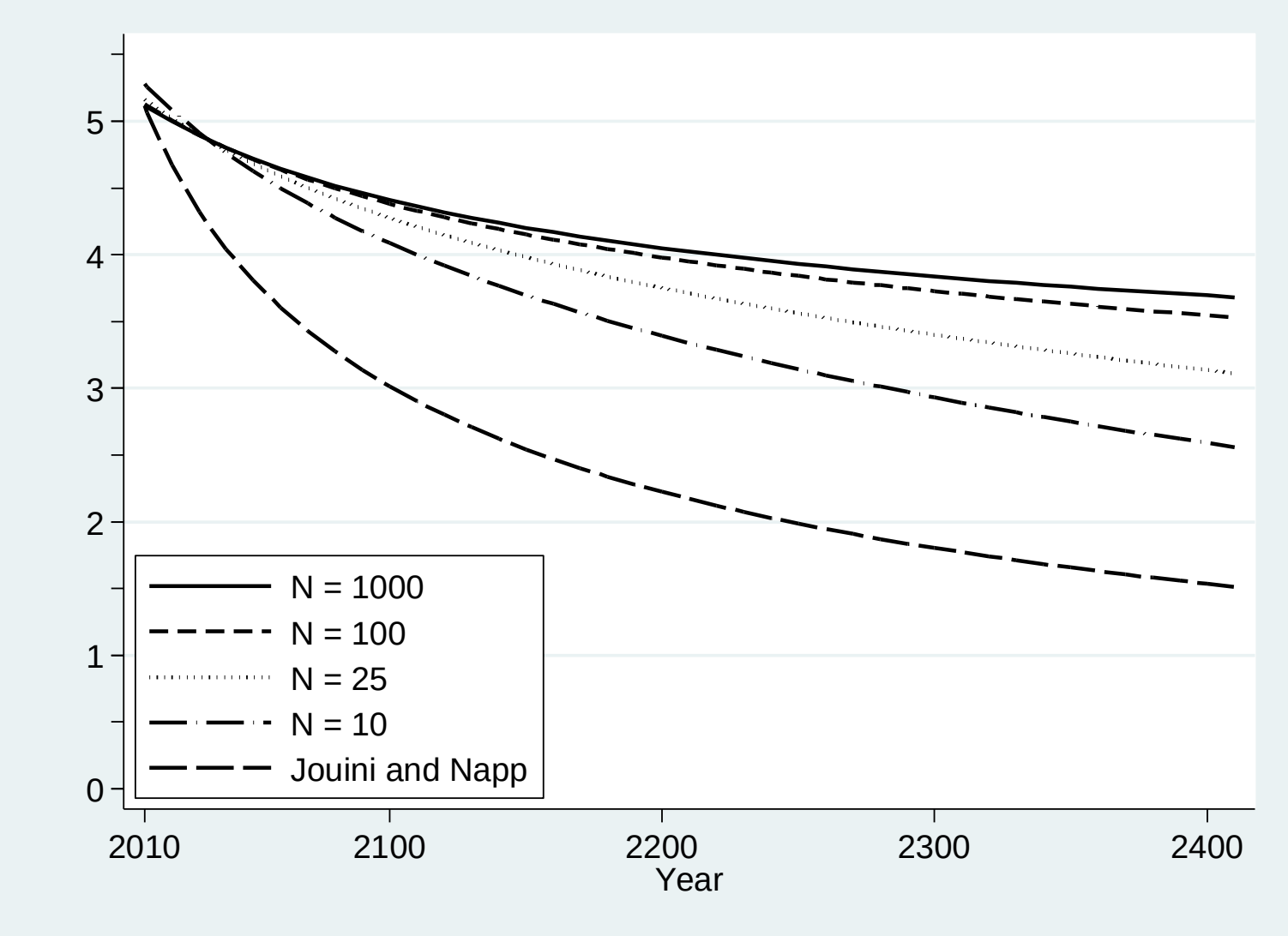
$$E\left[\exp(-rH)\right] = \int_0^\infty \exp(-r_i H)\phi(\bar{r}_H)\, dr_i$$

$$\Rightarrow R^{FG}(H) = \bar{r}_H^n - 0.5\frac{\sigma^2 H}{n}$$

Descriptive vs Prescriptive



Mixed Descriptive-Prescriptive



Social Cost of Carbon

Expert opinion			
(Weitzman 2001)		(Jouni and Napp, 2010)	
Method	**SCC**	**Method**	**SCC**
Prescriptive	**15.02**	Prescriptive	**10.01**
Descriptive (N=10)	**6.10**	Mixed (N = 10)	**4.65**
Descriptive (N=1000)	**5.38**	Mixed (N =1000)	**4.01**
Constant 4%	**5.34**	Constant 5%	**4.00**

Effective independent experts

- Non-independent experts
  - 'Schools of thought' vs idiosyncratic

$$r_i = x\left(\Sigma_k^K w_{ik} r_k\right) + \left(1 - x\right)\varepsilon_i$$

$$N = \left[\frac{x^2}{K}\sigma^* + \frac{1}{n}\left[1 - \frac{\alpha x}{\sqrt{K}}\right]^2\right]^{-1}$$

$x = 0.5$

$K = 10$

$n = 2160 \Rightarrow N = 34$

$x = 0.75$

$K = 10$

$n = 2160 \Rightarrow N = 18$