TE TAI ŌHANGA
THE TREASURY

Joint Treasury & Motu Presentation:

"The Treasury's social discount rate"

Prof. Arthur Grimes, Geoff Simmons,

Kirsten Jensen, Chris Parker

Motu
economic & public policy research

The session will begin at 11.00 am.

Please mute your microphones and turn your cameras off when you arrive in the meeting.

For Questions & Answers sessions, please use Q&A function.

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Treasury.AcademicLinkages@treasury.govt.nz

17 FEBRUARY 2025

Parliamentary Commissioner for the Environment
Te Kaitiaki Taiao a Te Whare Pāremata

NZ Public Sector Discounting

1. **New approaches to setting the social discount rate** – Prof Arthur Grimes, Motu, Expert paper
2. **Deriving SRTP values** – Chris Parker, The Treasury, Treasury Working Paper 25/01
3. **NZ rates and policy implications** – Kirsten Jensen, The Treasury, and Geoff Simmons, Parliamentary Commissioner for the Environment (PCE), PCE report

SECTION ONE

1. New approaches to setting the social discount rate

Prof Arthur Grimes, Motu

Expert paper

1. New approaches to setting rate
2. Deriving SRTP values
3. NZ rates and policy implications

Discounting :

New approaches to setting the Social Discount Rate

Motu PPS, Wellington, February 2025

Arthur Grimes

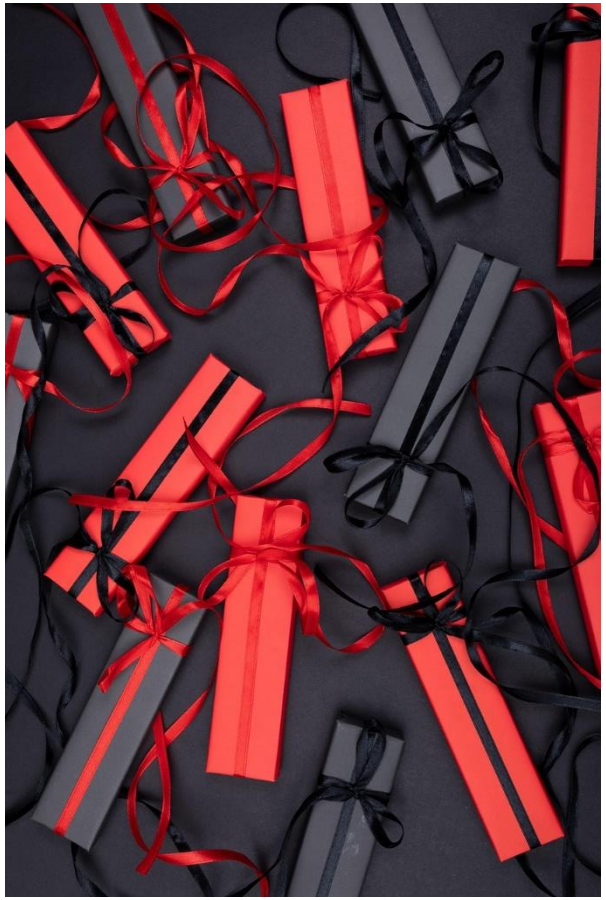
Motu Research & VUW

I thank Kirsten Jensen, Chris Parker, Andrew Coleman, Jonathan Boston, colleagues at Motu & NZAE participants for helpful comments. I also thank Treasury for funding the initial work on which this presentation is based, and the RSNZ Marsden Fund for funding continuation of the research

Why use a discount rate in public policy?

Hands up who would prefer a $104 cash (guaranteed) in 1 year's time vs $100 cash now?

- All those who prefer the $100 now have effectively discounted the future ($104 more than makes up for inflation over the next year)
  - Most people need to be compensated for delaying consumption
- It's the same when setting public policy



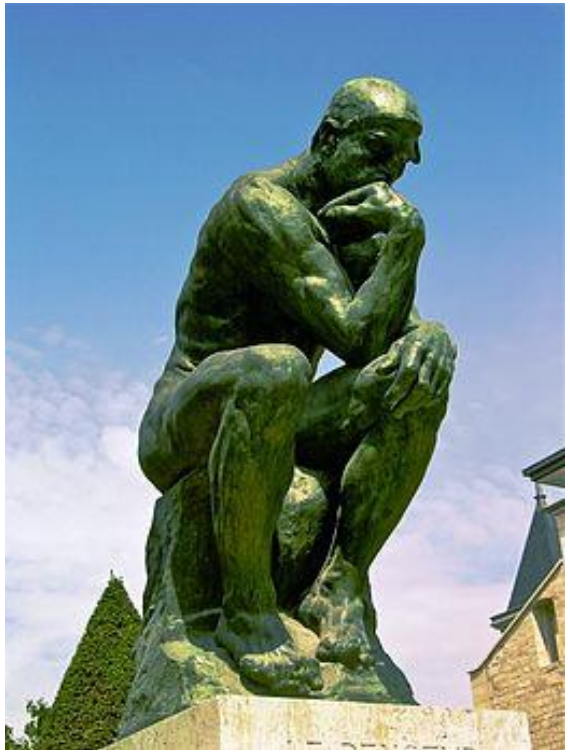
Theoretical motivation

Society now conducts a thought experiment … by asking how much additional consumption it would demand on behalf of tomorrow's people in payment for a reduction in today's consumption by one unit. (Dasgupta, 2008)

- The (risk-free) social discount rate (SDR) is that ratio minus one

- **How should we set the SDR?**

- Technical & ethical issues at stake



Key issues

- ‘SOC’ vs ‘SRTP’
- Exponential vs other forms of discounting
- Assumption of a single rate of ‘pure time preference’ across all goods
- Treatment of future generations

NB: All discussion here is of the risk-free real rate (% p.a.)

SOC vs SRTP

- Two common approaches to determining the discount rate:
  - ‘social opportunity cost of capital’ (SOC) approach, and
  - ‘social rate of time preference’ (SRTP) approach

- SOC bases the public sector discount rate on the observed return on the next best alternative investment with the same risk profile

- SRTP bases its choice to reflect maximisation of a social welfare function defined over present and future utilities

Previous Treasury practice – exponential discounting

- Until 2024, Treasury used a SOC approach with a default (real) discount rate of 5% using exponential discounting
  - with 6% for some sectors;
  - robustness checks could incorporate a rate of 2%

Standard pdv formula:

$$pdv(NetBen) = \sum_{t=0}^{T}(1+d)^{-t}\, NetBen_t$$

The exponential discount factor, $D(t)$, at time t is:

$$D(t) = (1+d)^{-t}$$

Hyperbolic discounting

- People often use a low discount factor (high discount rate) for near-term payoffs & a high discount factor for longer term payoffs (relative to exponential discounting)

- Hyperbolic discounting (Richard Herrnstein, 1967) leads to a declining discount rate (DDR) over future years

$$D(t) = \frac{1}{(1+td)}$$

- But hyperbolic discounting leads to time inconsistent decisions e.g.:
  - In 2023, we apply a low discount rate to 2025 relative to 2024
  - In 2024, we apply a high discount rate to 2025 relative to 2024

Quasi-hyperbolic discounting

- **Quasi-hyperbolic discounting** is an approximation (Phelps & Pollack, 1968) with a high discount rate in the first year, followed by low rates thereafter:

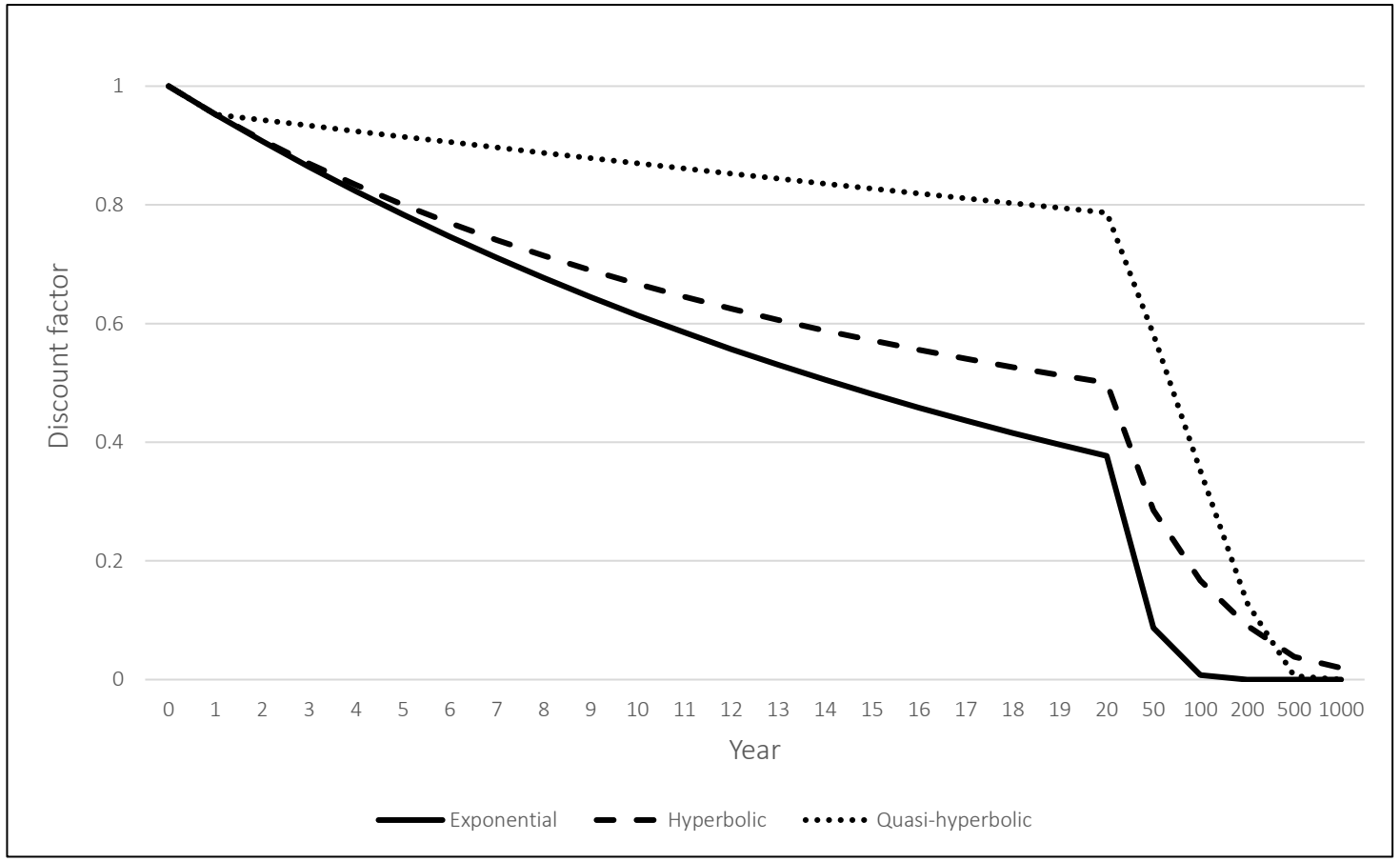
$$D(0) = 1,$$

$$D(t) = \beta\delta^t \text{ for } t>0$$

where $\beta < \delta < 1$

- But quasi-hyperbolic discounting also leads to time inconsistent decisions

Exponential, hyperbolic & quasi-hyperbolic discount factors



Note: The exponential discount factors are based on a discount rate of 0.05. The hyperbolic discount factors are calculated using a discount rate of 0.05 based on equation (3). Quasi-hyperbolic discount factors are calculated using values of β=0.962 and δ=0.99 based on equation (4). Each gives a discount factor = 0.952 in t=1.

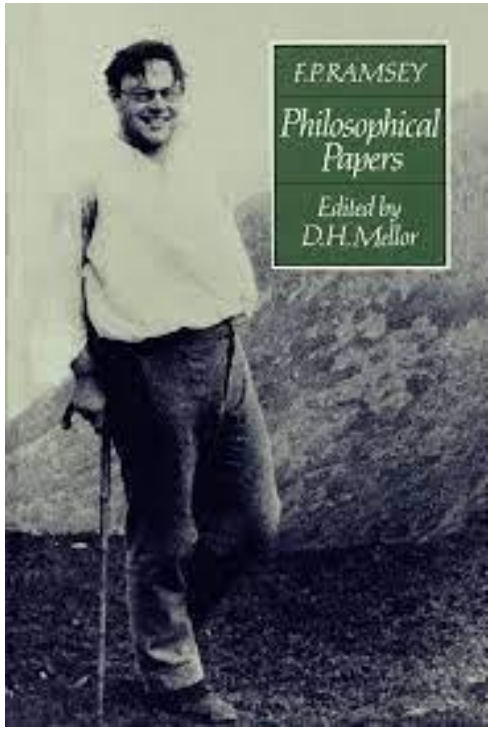
Frank Ramsey (1928)

Ramsey showed, with restrictive assumptions: SOC=SRTP

$$r \cong \rho + \gamma g$$

where: r is the **risk-free rate of return** (SOC)

$\rho + \gamma g$ is the social rate of time preference (SRTP)



SRTP will be higher if a person:

(i) strongly prefers consumption today relative to next year (ρ)

(ii) has a high growth rate of consumption (g)

(iii) likes to smooth consumption over time (γ)

Note: γ is (i) the elasticity of marginal utility with respect to consumption, (ii): an index of risk aversion, and (iii): an index of inequality aversion.

Some issues with the Ramsey specification

- **Uncertainty** about macro parameters leads to a Declining Discount Rate (DDR)

  (Weitzman, 1998 & 2001)

- Identical **inter-generational vs intra-generational** pure rate of time preference (ρ)
  - Chichilnisky, Dasgupta, Arrow, Helm, Pearce, Heal, Cowen, Li & Lofgren, …

- Why should we assume the **same** ρ for every item?

FOR INSTANCE …

- We may care more that democracy is preserved for a future generation than about preserving the Beehive, even if we value them both highly today

- We may care more that the quality of our local river is preserved than about the quality of a carpark being maintained for the future

- **Each of these examples implies different rates of pure time preference applying to different goods** **[**consistent with Debreu's (1959) *Theory of Value]*

PROPOSAL

- Adopt **different rates of pure time preference for different goods**

AND

- Adopt different rates of pure time preference for **inter-generational trade-offs** relative to **intra-generational trade-offs** (consistent with Barro, 1974)

EXAMPLE

- I place greater weight on my grandchildren's access to a clean river when they are young than to my access when I am old (even if they refer to the same year)

THESE CONCEPTS LEAD TO 3 PRACTICAL RECOMMENDATIONS:

1. Public investments in market activities should be discounted at the risk free rate plus an **appropriate risk premium** (as for the private sector)

2. Some public investments in **non-market activities** (e.g. river clean-up) be discounted at a lower rate which reflects a lower **intra-generational** rate of time preference

3. Some public investments in non-market activities be discounted at a **declining rate** over generations reflecting a lower **inter-generational** rate of time preference

These recommendations are (mostly) consistent with Treasury's 2024 approach of different discount rates for market and non-market activities, with a declining discount rate for the latter

SECTION TWO

2. Deriving SRTP values

Chris Parker, The Treasury

Treasury Working Paper 25/01

1. How to discount future payoffs
2. Deriving SRTP values
3. NZ rates and policy implications

Parameters for estimating SRTP rate

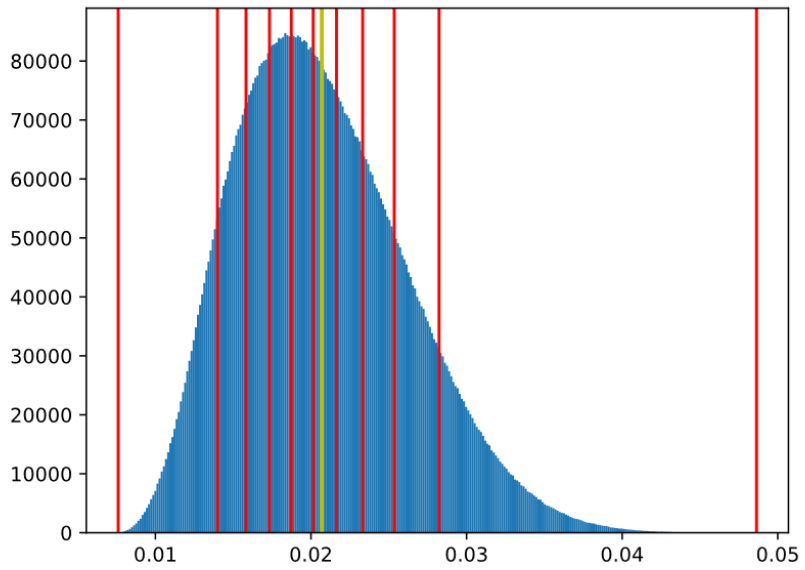
$r = \rho + \alpha + \mu g > g$ Parameters	Triangular distribution inputs			Comment
	Minimum	Mode	Max	
Pure rate time preference ρ	0.00%	0.25%	2.0%	Values used in major welfare economics studies
Annihilation risk α	0.00%	0.05%	0.20%	Extinction risk per century
Elasticity marginal social welfare with respect to consumption μ	0.25	0.75	1.5	Reasonably tolerable consumption loss from transfers
Growth rate of real consumption per capita g	0.75%	1.25%	2.0%	Historical per capita real consumption and projections
Resulting output				
SRTP r	0.8%	(Mean) 2.1% *	4.8%	Range of restricted values for SRTP. Rounded to one dp

* Between 1.2%–3.3%, with 95 percent confidence.

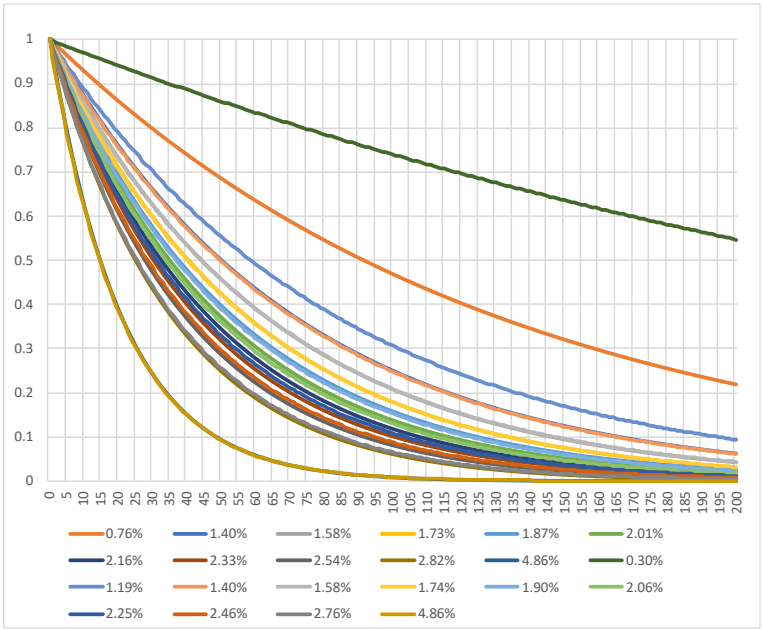
For comparison, the Treasury expects the real risk free interest rate in the long-term of 2.3%

Calibrating parameters and deriving SRTP rate using the Weitzman 1998 approach

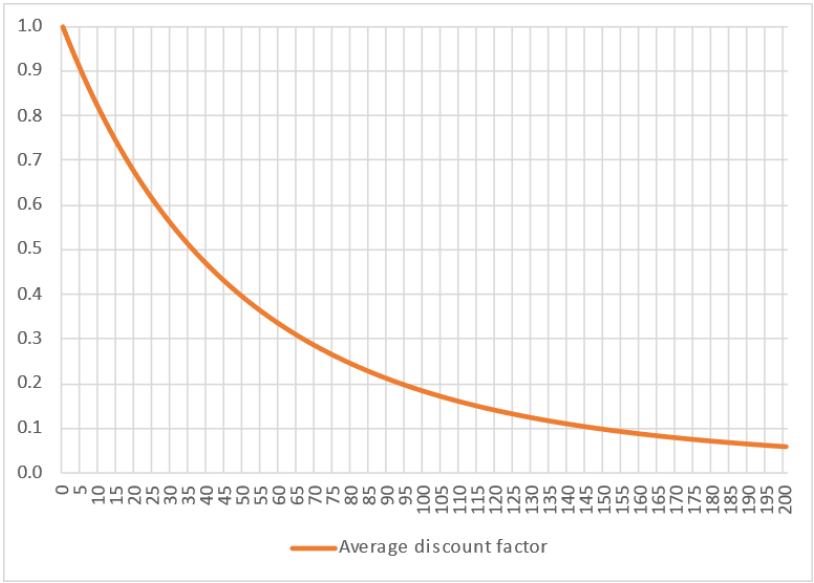
Results in this range of possible values of SRTP…



...this range of discount factors over 200 years...

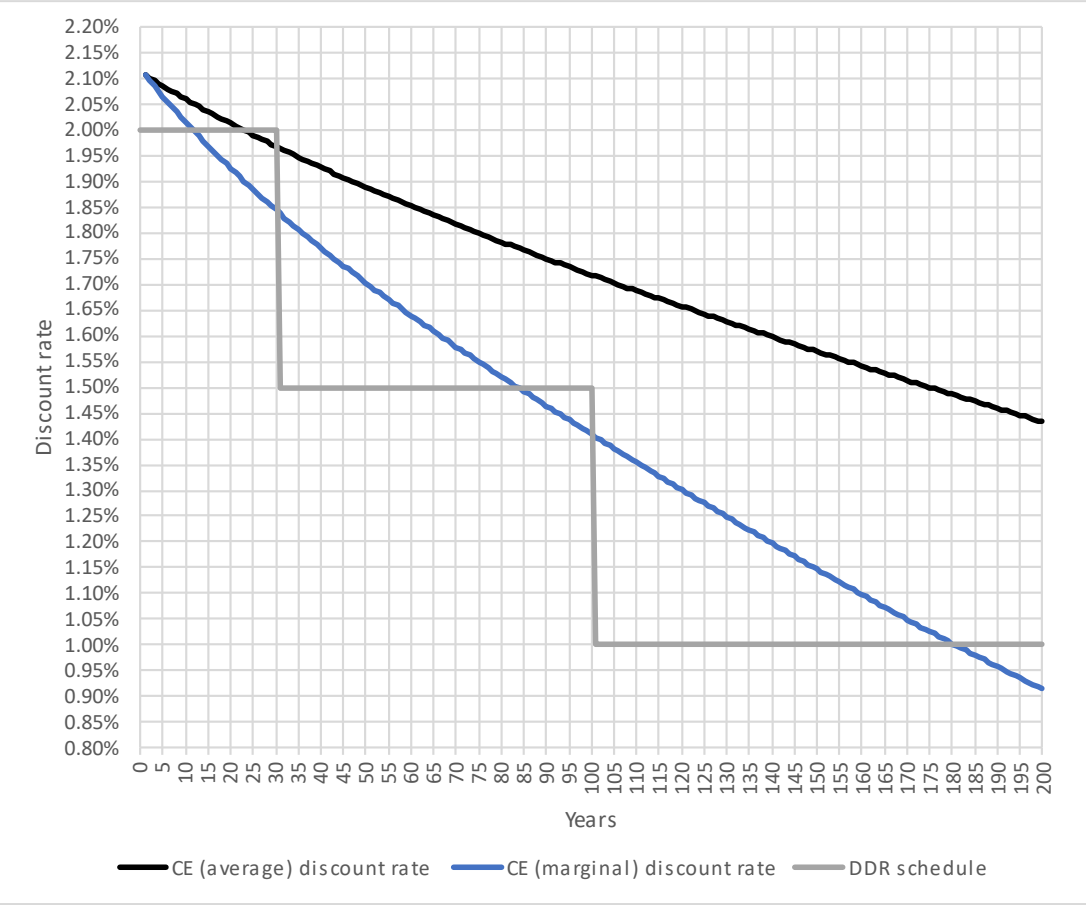


...and this average discount factor



Estimating declining SRTP rate schedule

Deriving a certainty equivalent declining discount rate



Schedule of SRTPs	Years
2%	1-30
1.5%	31-100
1%	101+

SECTION THREE

3. NZ rates and policy implications

Geoff Simmons, Parliamentary Commissioner for the Environment (PCE), PCE report and Kirsten Jensen, The Treasury

1. New approaches to setting rate
2. Deriving SRTP values
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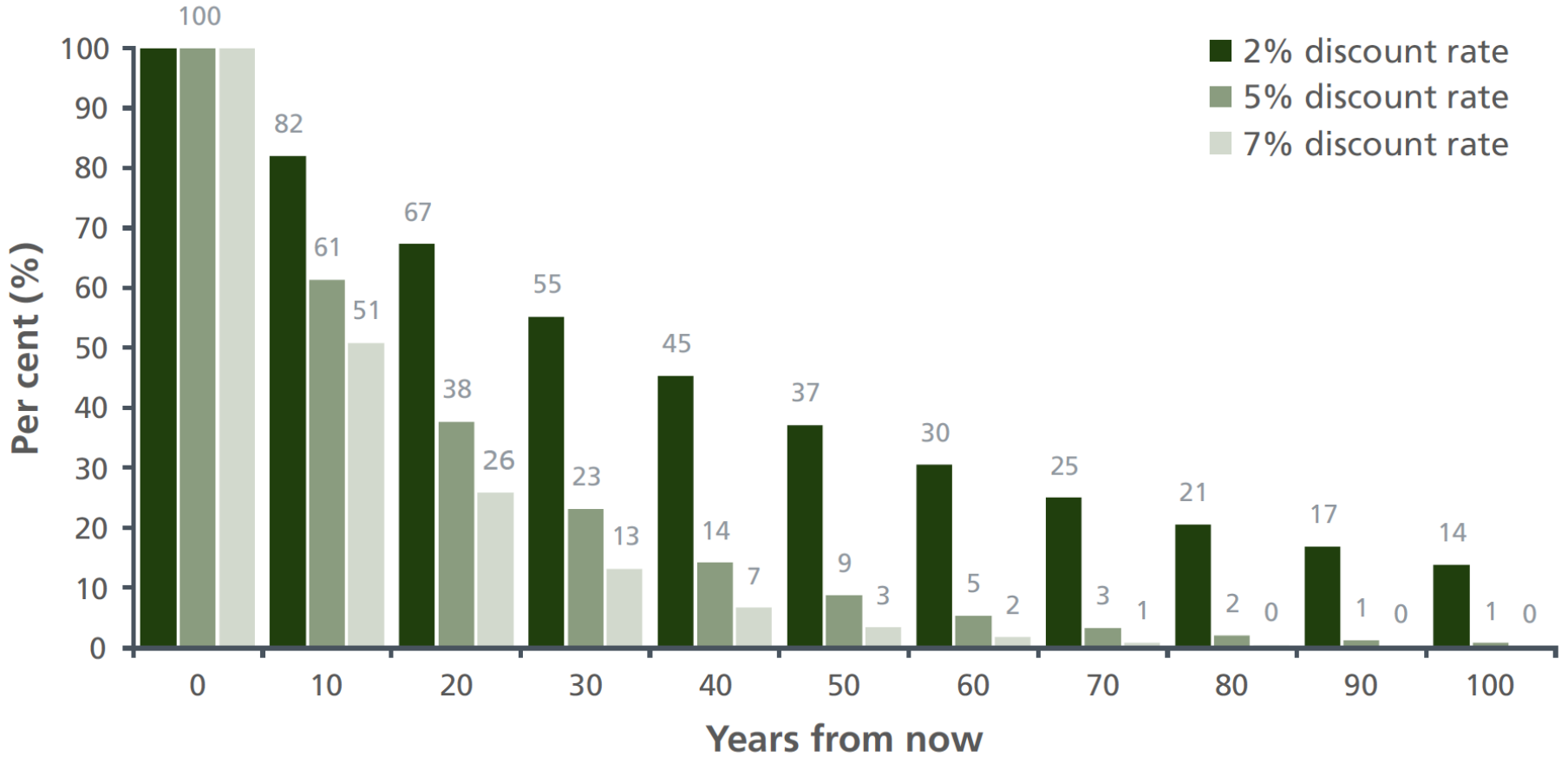
Wellbeing budgets and the environment: A promised land?

Recommendations

3. Ensuring that the long-term nature of environmental impacts is not ignored

   3.1 Modify the social discount rate so future costs and benefits to the environment matter

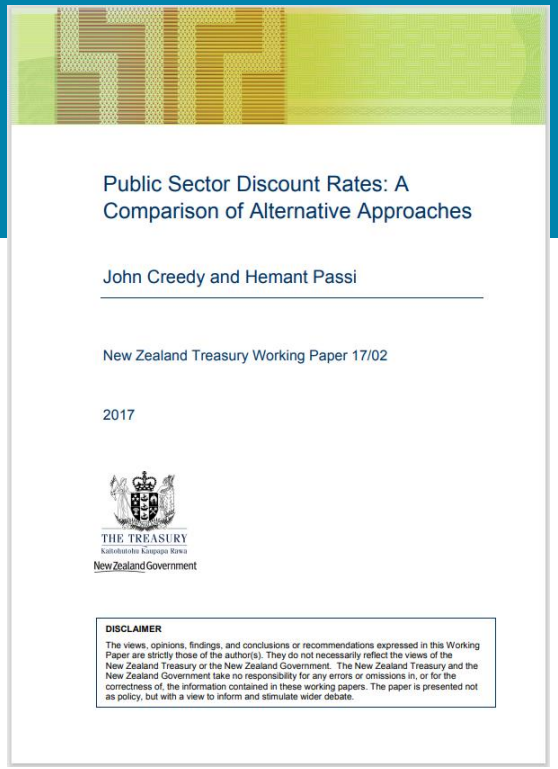
Impact of Discount Rates



Implications

1. This will be a gamechanger, especially for slow growing, long lived natural capital (eg native forest)
2. This will increase the importance of good quality environmental data at the right level of abstraction to inform decision making (eg value of ecosystem services)
3. How important is the discount rate (eg vs budget rules)?
4. Where is discounting inappropriate (eg offsets)?

Discounting is contentious



Public Sector Discount Rates: A Comparison of Alternative Approaches

John Creedy and Hemant Passi

New Zealand Treasury Working Paper 17/02

2017

THE TREASURY
Kaitohutohu Kaupapa Rawa
New Zealand Government

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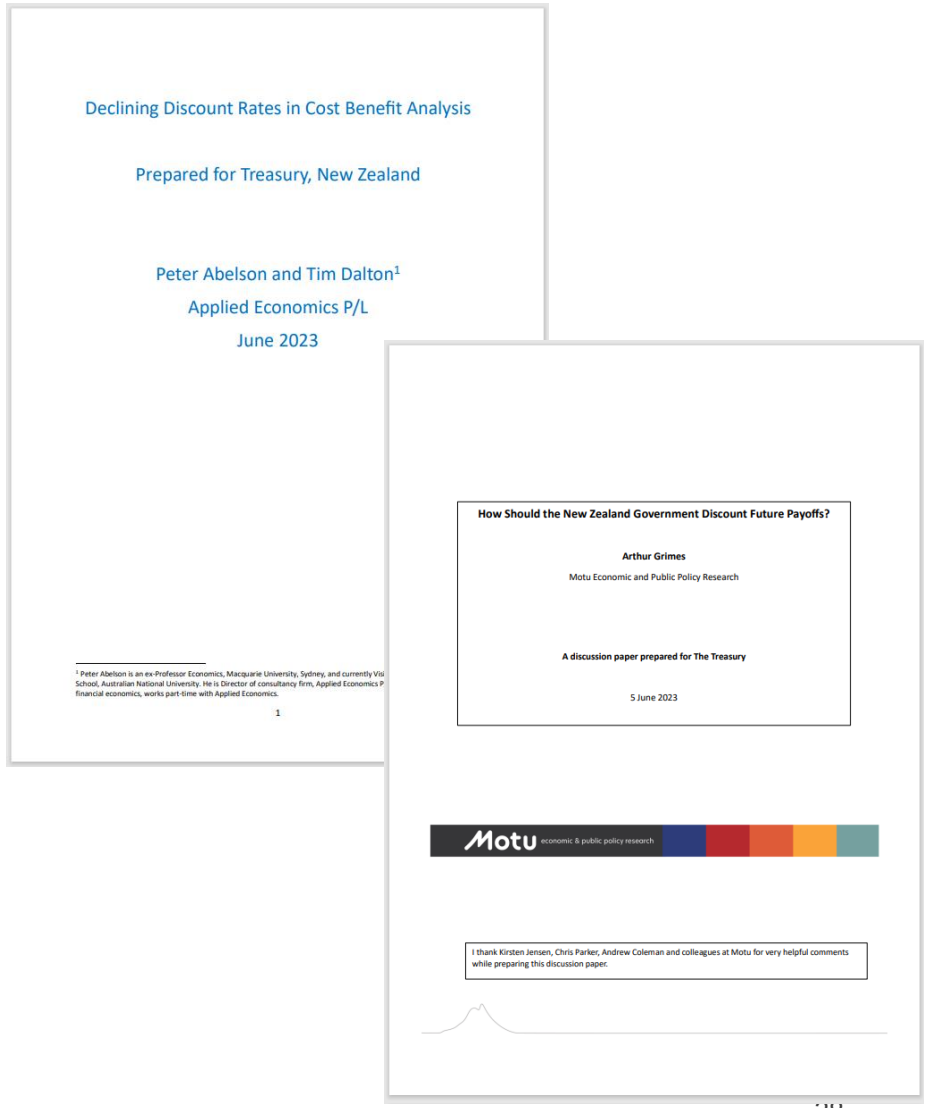
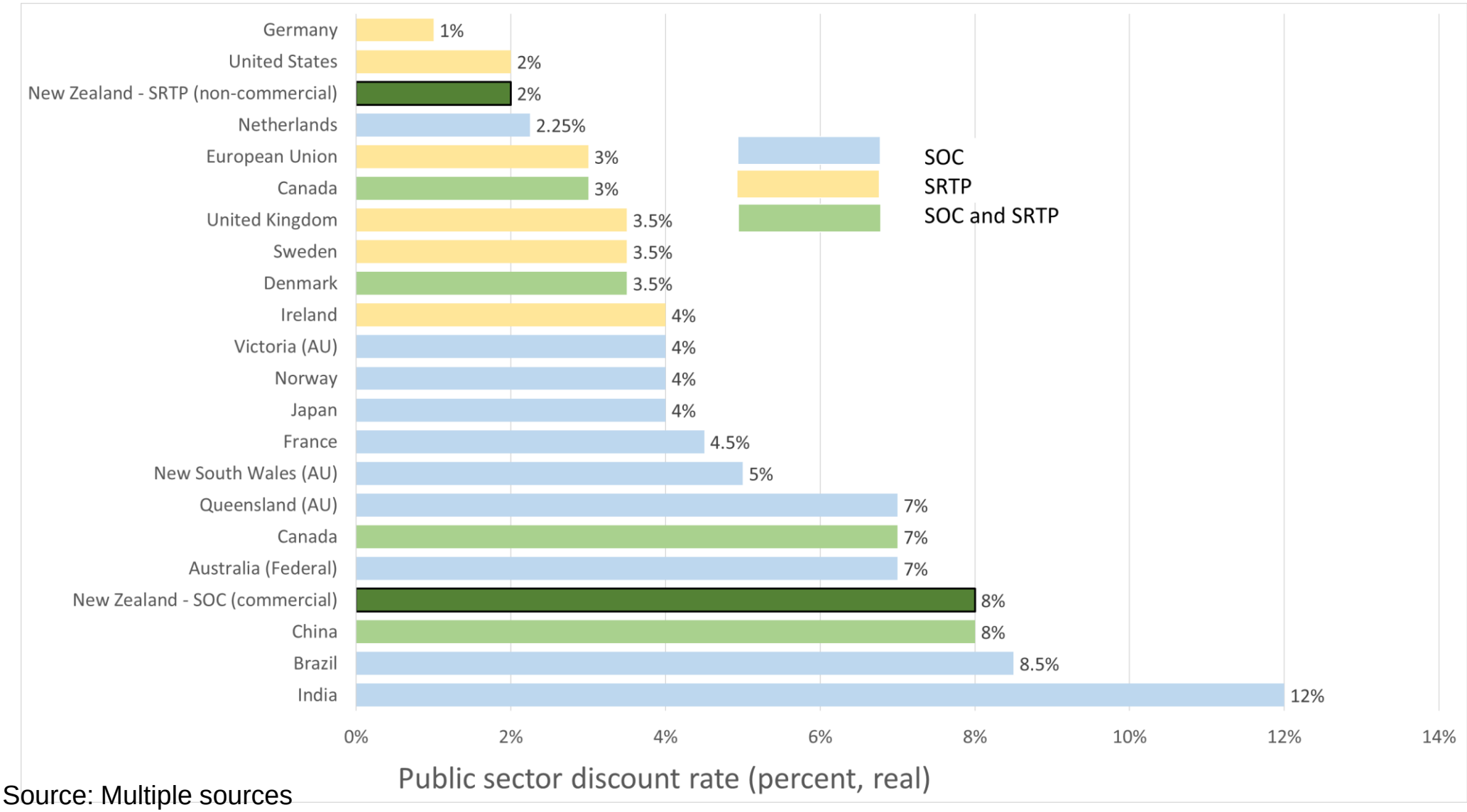
- Extensive academic and policy debate
- Long-term intergenerational impacts
- Find ways forward on a sound basis
  - Build on extensive literature, eg see Treasury working paper 17/02
  - Expert papers by:
    - Arthur Grimes How Should the New Zealand Government Discount Future Payoffs?
    - Peter Abelson & Tim Dalton Declining Discount Rates in Cost Benefit Analysis
  - Engagements and perspectives, including:
    - Public sector chief economist group
    - International and NZ experts eg Dr Ben Groom and Dr Andrew Coleman

Hyperbolic discounting – Expert insights

- Could consider declining rate with SRTP – not with SOC
- Retain SOC for commercial proposals
- Consider alternatives to SOC for non-commercial
  - SRTP rate
  - Declining discount rates, with SRTP
  - Multi-rates for different impacts



Discounting approaches vary



Source: Multiple sources

Explore policy options - SRTP

- Ramsey estimation - UK approach
  - 3.5 % real since 2003, declining
  - Multi-rates for health and environmental impacts
  - Inter-generational – Sensitivity “pure rate of time preference” 0% vs 0.5%

Green Book long term discount rates

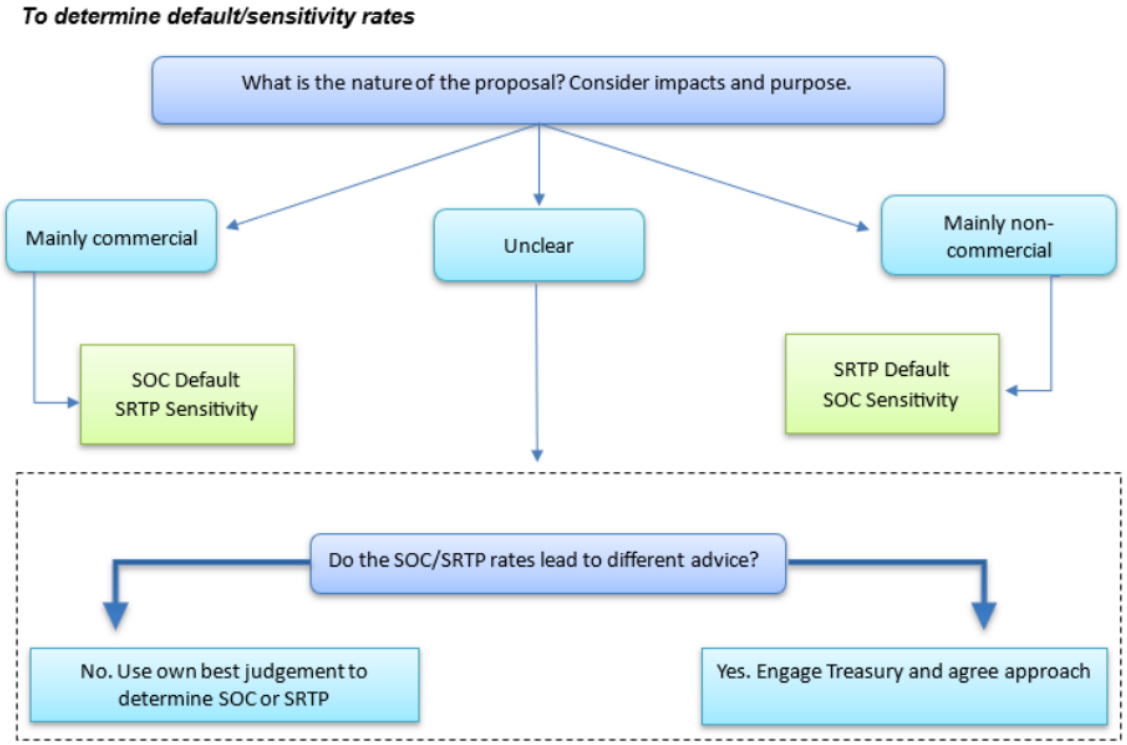
Period of years	0–30	31–75	76–125	126–200	201–300	301+
Standard rate as published in the Green Book	3.50%	3.00%	2.50%	2.00%	1.50%	1.00%
Reduced rate where “Pure STP” = 0[i]	3.00%	2.57%	2.14%	1.71%	1.29%	0.86%

- Risk free rate estimation - US approach
  - Significant policy engagement in 2023
  - Updated rate of 2% real November 2023, declining to 1% real

- Chief economist group played key role
  - What should the default SRTP rate be? Should the SRTP rate decline over time?
  - Mandatory SOC sensitivity analysis, alongside default SRTP?

Implications in practice

- Inform decision making
  - Fiscal constraints remain
  - Relative priorities might change – depends on profile for benefits and costs over time
- Shift focus of analysis
  - Do sensitivity analysis
  - Consider the nature of the proposal
  - Understand and quantify impacts over time
  - Use Treasury's CBAx model with in-built rates are
- NB - Unchanged settings
  - Capital charge remains 5%
  - Rates for accounting valuation purposes



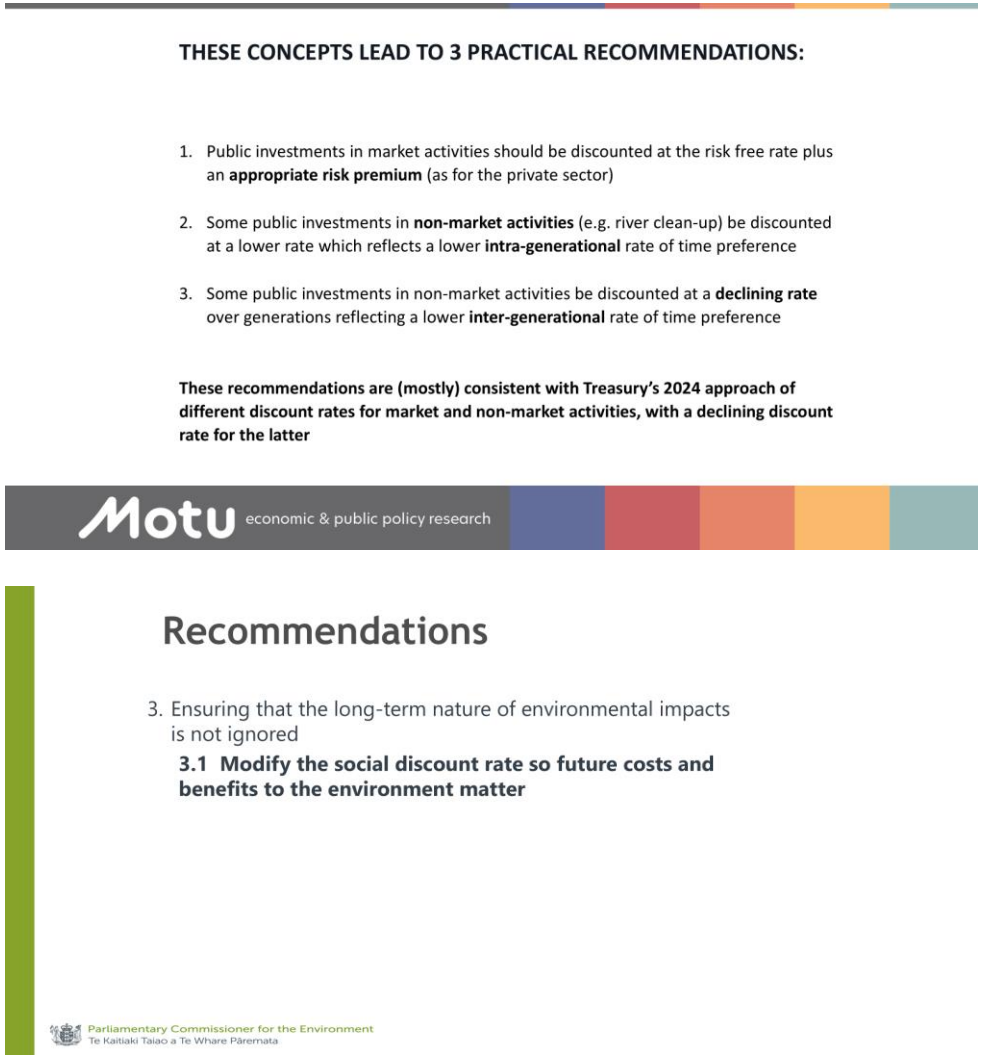
The updated NZ CBA discount rate settings

- Rates are based on
  - social rate of time preference (SRTP) and
  - social opportunity cost (SOC) methodologies

Discount Rates (Real)	Year 1-30	Year 31-100	Year 101+	Sensitivity test (mandatory)
Non-commercial proposals (SRTP)	2%	1.5%	1%	8%
Commercial proposals (SOC)	8%	8%	8%	2%

- Mandatory sensitivity analysis
- SRTP for the first time
- Declining rate for SRTP, not for SOC

See Discount Rates | The Treasury New Zealand



SECTION FOUR

Open for questions

1. New approaches to setting rate
2. Deriving SRTP values
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