Appendix 4: Social discount rates

Discounting is essential in cost-benefit analysis (CBA) because it provides a way to express all costs and benefits in terms of their present value. It does so by assigning smaller weights to values that occur further into the future than the present. Unless the values of costs and benefits are made commensurable by being expressed as present values, they cannot be aggregated.

Social discount rates reflect society's preference or valuation on current well-being versus future well-being. Despite a voluminous literature, however, there is no consensus on the methodology for determining social discount rates, or their value.

It is not the intention here to review the literature, or to recommend specific values for discount rates. An outline of the main conceptual approaches is provided below, but the focus is rather to record the range of rates that are used in Australia, New Zealand and other countries. This diversity of rates is problematic because the discount rate is a key factor, albeit not necessarily the most important factor, in determining the net present value of a project.

A4.1 Conceptual approaches to establishing social discount rates

The so-called consumption and investment rates are the two major approaches to conceptualising social discount rates. Other perspectives tend to be some form of combination or extension of these approaches. Zhuang et al. (2007), Pearce et al. (2006) and Boardman et al. (2011) provide readable introductions to the topic.

The social rate of time preference (SRTP) reflects the rate at which society is willing to forgo current consumption in return for more consumption in the future. It therefore assumes that all costs and benefits are consumption goods and services. Benefits are consumed rather than being reinvested.

One method of estimating the SRTP empirically is by estimating the after-tax return on government or other low-risk bonds or securities. Individuals may, however, have preferences that go beyond those expressed in their participation in financial markets. Moreover, individuals' preferences are unlikely to be the same as those of society's collective attitude to trading off current consumption for more consumption in the future. An alternative method of estimating the SRTP is to use the Ramsey (1928) formula, but this approach is contentious because it requires the specification of a 'pure' rate of social time preference, as well as other variables.

The other major alternative method for estimating the social discount rate takes an investment or producer perspective. Society's resources are scarce. Their use by government will thus deny or reduce their availability to private investors. If private investors can obtain a higher rate of return than that achieved by the public sector project, society's welfare could be improved by allowing the private sector to use the resources (or funds) instead of the government. Put another way, government projects should only proceed if they are feasible when discounted at the marginal social opportunity cost (SOC) of capital, which is the rate of return on private sector investment.

Most countries, including the Australian and New Zealand jurisdictions, tend to use either the SRTP or the SOC approach (tables A4.1 and A4.2). It is also possible to calculate an average of the SRTP and SOC, weighted by the respective shares of tax funding (assumed to reduce consumption) and domestic borrowing (assumed to crowd out private investment). Some formulations of the weighted average approach include borrowing from other countries. The SRTP and SOC can also be combined into a shadow price of capital, defined by Boardman et al. (2011, p. 256) as the ratio of SOC to SRTP, and multiplying relevant costs and benefits to convert them to 'consumption equivalents' that can then be discounted using the SRTP.

Other approaches, such as the use of intergenerational discount rates, are based primarily on subjective equity justifications. An approach that seeks to incorporate uncertainty about the future (interest rates or the state of the economy) by extending the Ramsay equation is 'time-declining discount rates' (Pearce et al., 2006, ch. 13; Freeman et al., 2013). Time-declining rates, however suffer from the problem of time-inconsistency, which is the incongruence in behaviour between successive time periods.

A4.2 Diversity in discount rates

Table A4.1 demonstrates clearly the diversity of discount rates that have been adopted for use in transport projects by selected Organisation for Economic Cooperation and Development (OECD) countries. Table A4.2 reveals that considerable diversity exists within and between Australian and New Zealand jurisdictions, but discount rates are generally higher than those used in other countries.

Table A4.1: Discount rate used by transport agencies in selected OECD countries

Jurisdiction	Method	Discount rate (real)
France	Risk-adjusted social rate of time preference	4.5% (or project specific rate)
Germany	Social rate of time preference	3% (for short-term effects) and 1% (for long-term effects)
Japan	Social cost of capital	4%
The Netherlands	Risk-adjusted social rate of time preference	4% to 5.5%
Norway	Risk-adjusted social rate of time preference	4% reducing to 2% over 75 years
Sweden	Social rate of time preference	3.5%
United States	Certainty equivalent	2.5%, 3% and 5% (for estimation of social cost of carbon)
United Kingdom	Social rate of time preference	3.5% reducing to 1% over 300 years

Source: OECD (2015)

Table A4.2: Discount rates advocated by selected Australian and NZ government agencies

Jurisdiction[1]	Rate (% p.a, real terms)	Basis	Source
Commonwealth of Australia	3% (SRTP) and SOC (not specified)	3% used for consumption-only stream (SRTP), with no opportunity cost of resources. SOC is not specified, but investment examples used for illustration utilise 8 % p.a. real.	Department of Finance and Administration (2006, ch. 5)
	4%, 7%, 10%	For infrastructure project proposals by the states. 7% (central value, SOC) with 4% and 10% for sensitivity testing. The 7% central estimate 'is in accordance with the majority of national, state and territory guidelines on cost benefit analysis …'	Infrastructure Australia (2013, p. 9)
	Government bond rate	The Australian Transport Council (ATC) states that the Bureau of Transport Economics (Luskin & Dobes, 1999, p. 78) 'concludes that the most appropriate discount rate to use for BCA is the government bond rate'. But this is not the case: the citation refers to the allocation of program funding and the need to avoid adding a risk premium.	ATC (2006, vol. 5, p. 84)
	7% p.a. real for public transport infrastructure projects	Recommendation of 7% is followed by the statement that 'Discount rates are determined by state Treasuries'.	Austroads (Rockliffe et al., 2012, p. 7)
	3%, 7%, 10%	7% is 'central', with 3% and 10% for sensitivity testing. Office of Best Practice Regulation (OBPR) notes that 7% is consistent with the US Office of Management and Budget, as well as the NSW Treasury.	OBPR (2014, pp. 7–8)
	3%, 8%, 10%	3%, 8%, 10% represent 'the weighted average riskless rate of return, the weighted average rate of return and a rate of return for a riskier asset or that reflects the marginal productivity of capital during the 2000s' (Harrison, 2010, p. 61).	(Harrison, 2010, pp. 59–61). No other separate official Productivity Commission guidance on discount rates appears to have been published.

Jurisdiction[1]	Rate (% p.a, real terms)	Basis	Source
New South Wales	Central rate 7% (SOC), with 4% (SRTP) and 10% for sensitivity testing	'While there may be no universally accepted "correct" discount rate, interpretation of appraisal results will be impossible if different agencies use different discount rates. The solution is the application of a standard set of real discount rates of 4%, 7% and 10% to see if the outcome is sensitive to such variations and, if it is, to make the critical "break-even" rate clear in the analysis results.'	New South Wales Treasury (2007, p. 52)
	7%	Capital asset pricing model (CAPM) and other calculations suggest SRTP rate is about 5% and SOC 9.3%, but use 7% p.a. real for consistency across the NSW transport portfolio.	Transport for NSW (2013, p. 210)
Victoria	Category 1 (4%) Category 2 (7%) Category 3 (Department of Treasury and Finance (DTF) provides)	Category 1: core areas like public health, justice, education where benefits are not easily quantified; rate based on long-term government bond rate Category 2: services like public transport, roads, public housing; rate based on long-term government bond rate plus 'modest risk premium'. Category 3: commercial investments with risk similar to private sector. DTF to be consulted on appropriate rate.	DTF (2013, Table 7, p. 25)
	4%	Regulatory proposals should use 4%, like Category 1 in DTF guidelines. Other rates can be used if warranted.	Government of Victoria (2014, p. 11)

Jurisdiction[1]	Rate (% p.a, real terms)	Basis	Source
New Zealand	8% default rate for projects that are difficult to categorise, including regulatory proposals; 5% general purpose office and accommodation buildings; 7% infrastructure and special purpose (single-use) buildings (e.g. prison, hospital); 9% R&D, media, IT, telecoms, technology.	SOC: 'Treasury's policy is to use a pre-tax discount rate equal to the long-run return on investments made by share-market companies … [the Government could, and does, invest in the share market] this guide recommends the use of a discount rate that is based on the rate of return of the next best alternative investment. The most convenient "alternative investment" is the share market.' Assumptions: statutory tax rate: 28%; effective marginal tax rate: 24%; equity risk premium: 7%; risk-free rate: 3.82% at 5 December 2014; inflation 2% p.a.; equity beta: 1.0; gearing: 33% default, 30% buildings, 23% infrastructure, 24% technology.	New Zealand Treasury (2015, pp. 34–36) www.treasury.govt.nz/publications/guidance/planning/costbenefitanalysis/currentdiscountrates [published 17 March 2015.;
Queensland	6% with sensitivity analysis at 4%, 7%, 10%	'Traditionally, infrastructure projects in Queensland have used 6% as the standard discount rate including sensitivity analysis at the 4%, 7% and 10% discount rates. Before any discount rate is applied in a CBA, it is advisable to seek confirmation of the appropriate discount rate from the relevant authority.'	Department of Transport and Main Roads (2011, p. 2.9)
	Not specified — subject to discussion with Queensland Treasury	'The discount rate(s) to be used in a cost-benefit analysis should be agreed between the agency and Queensland Treasury.'	Queensland Treasury (2015, p. 14)
Western Australia	4%, 7%, 10% but other rates sometimes used.	Aligns with Infrastructure Australia, but may use a weighted average cost of capital for commercially oriented projects. The Western Australian Program Evaluation Unit (2015) does not specify a discount rate.	Personal communication, 2014

Jurisdiction[1]	Rate (% p.a, real terms)	Basis	Source
South Australia	Examples of CAPM-based real discount rates range from 2.7% (very low) to 6.7% (high). Section 3.3.3 of DTF (2014) suggests ± 2% sensitivity.	Department of Treasury and Finance (DTF) recommends CAPM-based rates with sectoral or project risk premium included. One line agency claimed that DTF specifies 6% as default rate.	DTF (2014) part B, Table 3 of *Guidelines*.
Tasmania	Agencies generally use 7%	No guidelines issued by Treasury	Personal communication, December 2014
Australian Capital Territory	4%, 7%, 10%	CBA to be applied to projects greater than $10 million (i.e. Tier 2 and Tier 3). 'The stream of costs and benefits should … be discounted by a real discount rate of 7% with sensitivity testing using discount rates of 4% and 10%. ACT Guide for preparing RIS (2003 version) proposes discounting, but does not specify discount rate.	ACT Government (undated, p. 27)

Notes: 1. Jurisdictions listed in order of size of population; 2. Selection of rates was limited approximately to the period 2000 to 2015, with most recent information available used for each agency.

Source: compiled by Leo Dobes from the sources cited

A4.3 The issue of harmonisation

The choice of approach to determine the public sector discount rate as well as the discount rate value has been, and is subject to continuing debate. It is unlikely that the matter will be resolved in the near future.

Given the unsettled theory and practice about appropriate social discount rates, agreement on harmonised values is unlikely, particularly between different jurisdictions. A degree of de facto harmonisation is occurring, however, in a number of Australian states, which have adopted the NSW 4 per cent, 7 per cent (central rate) and 10 per cent per annum approach. Infrastructure Australia also uses these rates, so that jurisdictions applying for federal funding are of necessity required to use them.

Over time, the 4 per cent, 7 per cent and 10 per cent rates may become standard practice, but a considered review would nevertheless be worthwhile to ensure that the central rate at least is an appropriate and justifiable one.

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