Discounting and time preferences

Cost–benefit analysis (CBA), social CBA and Social Return on Investment (SROI) do not simply involve listing the costs and benefits of a project over time and adding them up. They also involve considering how much the future impacts of a project are worth to us now – which is often a very different matter.

What is discounting?

Broadly speaking, welfare economics works on the rule that individuals have a higher 'time preference' for the present than for the future. That is, people prefer to increase their "utility" (their welfare) sooner rather than later. Ask yourself, for instance, if you'd rather have £100 now or in a year's time?

Most people's answer to this question would be 'now' – unless there was some extra benefit gained by waiting. For instance, would you consider accepting the money in one years' time if it meant you would be given more? How much more would make it worth the wait?

All this points to the idea that the 'present value' (PV) of things (i.e. the value you put on them now) increases or decreases depending on how soon they will happen.

In order to take this into account, CBA involves the practice of discounting – which means devaluing future benefits and costs so as to represent their present value (PV). It is this *present value* of costs and benefits that CBA weighs up and presents so that decision-makers can determine whether a project or intervention should go ahead. Only when the present value (PV) of benefit outweighs the present value (PV) of costs should an action be taken.

The extent to which future cash flows are devalued is determined through the discount rate. To illustrate how this works, imagine a hypothetical investment which involves a cost of £50 today (input) and generates a benefit of £100 in three years from now (output).

Table 1 (on the next page) shows how manipulating the discount rate affects the PV of that future £100 return.

	Year 0	Year 1	Year 2	Year 3	NPV 0% discount rate (£)	NPV 5% discount rate (£)	NPV 15% discount rate (£)
Costs	£50	0	0	0	£50 (£100-£50)	£32.7 (£82.2-£50)	£7.1 (£57.18-£50)
Benefits	0	0	0	£100			

Table 1: A discount rate application example

Net Present Value (NPV) represents the net benefits of the project, after weighing up the PV of its costs and benefits – i.e. its discounted benefits minus its discounted costs.

Given that, in this example, the £50 costs of the project are borne today (in year zero); they are not influenced by the future discount rate. The £100 worth of benefits, however, *are* influenced by the discount rate – since they arise after three years. So the overall NPV of the transaction depends on the level at which this discount rate is set.

As Table 1 shows, *setting a 0% discount rate is the same as stating no time preference for the present.* The costs incurred today would be weighted the same as benefits accruing three years from now. So the present value of the future £100 cash flow would not be discounted, and the NPV of making the original £50 transaction would be £50 (£100−£50).

By discounting future values by 5% per year, however, then the present value of gaining £100 cash 3 years in the future would work out at £82.28. This, in turn, would place the net present value of paying £50 today at roughly £32.7

Finally, if applying a 15% discount rate to the transaction, the present value of future benefits would almost halve to £57.18. So the net present value (net benefit) will, in this case, be only £7.18 (£57.18 - £50).

As you can see from the examples above, the choice of discount rate can critically influence the results of a cost-benefit analysis. The higher the discount rate, the higher the presumed time preference for immediate costs and benefits, and the lower the value placed on future benefits and costs.

In the example above we went from a net present value (NPV) of £50 to ~£7 simply by raising the discount rate to 15%. So you can see that, if the discount rate went above 20% (stating a very high time preference for the present) the net benefits (NPV) of the project would come out as zero or even a negative number. Such a result would imply that the initial investment is a bad, inefficient idea that should be abandoned.

Should we use discounting for social and public interventions?

There is wide consensus that discounting makes sense at a personal / household level, because people do tend to have a higher preference for well-being in the present rather than in the future. This is partly caused by fear of not being alive in the future to collect those well-being benefits. As such, we should expect discount rates at this micro level to be virtually always higher than zero. (Although the fact that people usually care about their children's future wellbeing can lower such discount rates, and partly explain why individuals tend to save money and assets).

Likewise if conducting a CBA for a private investment, discounting is sensible and can

be set relatively high, depending on a variety of factors and the time preferences of the entrepreneurs in question.

But when it comes to public investment the matter is not so clear. Should we discount the future when carrying out CBA's of public interventions, when doing so would clearly favour short-term gains rather than public interest in the long-run? Or, is there a rate at which a society as a whole is willing to sacrifice current consumption or well-being in exchange for future consumption and well-being? Finally, are individuals capable of making this collective choice (i.e. capable of accurately foreseeing future public needs) or should the State impose time preferences?

Two contrasting views on these issues are salient:

1. On the one hand, a variety of mainstream economists consider that what is valid for individuals (i.e. relatively strong preference for the present) is also valid for society as a whole.

   According to this view, so-called "social" discount rates (i.e. discounting used for appraising public investment) should definitely be used, and should be based upon individual preferences (i.e. collective preferences are perceived as the aggregation of individual / private preferences).

   This view takes an empirical, rather than normative stance. That is, instead of asking whether we should discount, it asserts (in a "consequentialist" rationale) that *because private individuals discount the future, we should also discount for public investment*.

2. Other scholars think that the question of discounting public investment is an essentially philosophical one, relating to how much a given society should value the future (including the well-being of future generations) relative to the present. According to this stream of thought, social discount rates cannot be based on the evidently high time preferences of individuals, and should be set sensibly lower. There is also evidence that individuals are very bad at computing time for example, which makes the focus on 'time preferences' paradoxical.

In practice, discount rates for social projects and public interventions are set differently in different countries. Despite the debate outlined above, many countries opt to set their public discount rates lower than private discount rates (as illustrated below).As you can see below, there is a trend towards using lower discount rates for public interventions.

Country/ agency	Discount rate
Australia	1991: 8%; current: SOC rate annually reviewed
Canada	10%
People's Republic of China	8% for short and medium term projects; lower than 8% rate for long-term projects
France	Real discount rate set since 1960; set at 8% in 1985 and 4% in 2005
Germany	1999: 4% 2004: 3%
India	12%
Italy	5%
New Zealand (Treasury)	10% as a standard rate whenever there is no other agreed sector discount rate
Norway	1978: 7% 1998: 3.5%
Pakistan	12%
Philippines	15%
Spain	6% for transport; 4% for water
United Kingdom	1967: 8% 1969: 10% 1978: 5% 1989: 6% 2003: 3.5% Different rates lower than 3.5% for long-term projects over 30 years

The UK requires all social projects' costs and benefits to be discounted at a rate of 3.5% per year – except for projects happening 30 years or more into the future, for which lower

discount rates are chosen (see section below for an explanation).

Of course, a government's decisions to impose specific discount rates are not without criticism. Aside from the general lack of consensus on the matter, discounting the future has numerous implications – particularly for environmental sustainability.

What are the implications of discounting the future?

The debate about discounting the future in public investment has been accentuated by environmental problems like biodiversity loss, ecosystem disruption and climate change. All of these problems are bound to have long-term impacts which will affect us, as well as future generations.

By and large, public investment for mitigating these impacts and preventing further environmental destruction is considered necessary for the well-being of future generations. But how much should our current generation invest? Should we sacrifice part of our well-being for the benefit of future generations? This is dependent, among other things, on the inter-temporal preferences (and thus discounting of public investment) of the current generation.

If we choose to discount investments in biodiversity conservation and climate change mitigation, the benefits that our investments deliver for future generations will automatically appear smaller in present value terms. This would foster a state of "low inter-generational equity", where the wellbeing of different generations – including those yet to be born – would be unequally valued.

> *Imagine a situation whereby action could be taken to restore a particular fish stock. A £200 million investment is required today in order to stop the stock being fished to extinction over the next fifty years. (This investment might include compensation for fishermen in return for not fishing the endangered species, or, funding to allow the fisherman to re-train and take up other professions).*
>
> *After fifty years of protection, the replenished fish population is predicted to be worth £1 billion in actual market value – 5 times the value of our original £200 million investment.*
>
> *But, if the UK's prevailing social discount rate of 3.5% was applied, that £1 billion benefit, due 50 years down the line, would generate a present value of just £179 million[1] And – given this amount is less than the £200 million cost of the project – the investment would not be made.*

As you can see, a high discount rate can be a major impediment when it comes to making our economic system more environmentally sustainable. It can also devalue the well-being of future generations, which is ethically questionable. Can we really suggest, for example, that a coral reef is "worth" less to a person fifty years into the future than to a person living today?

What are the alternatives to future discounting?

One way of tackling this problem of inter-generational bias is to reject future discounting. This would mean that costs and benefits accruing to present generations would be considered equal to those accruing to future generations.

Beyond ethical discussions, a 0% discount rate could have the perverse effect of favouring over-investment in the present (to mitigate higher costs in the future) and thus

1 i.e. ***1billion / (1 + 0.035) ^ 50*** *(1 billion, divided by 3.5% to the power of 50 years) = 179,053,337.*

spur further environmental and natural resource degradation. The perversity is that this would enhance what “0%” discount rate proponents aim to avoid: the reduction of the stock of natural capital available to future generations.

TEEB (The Economics of Ecosystems and Biodiversity) has proposed a solution to this problem by suggesting that different social discount rates should be used for different purposes. A 0% discount rate could be used for investment in environmental sustainability only, while higher discount rates would be used for other forms of public investment. This proposal avoids the problems associated with using a zero discount rate (see the first point above).

Finally, other research has suggested a so-called “hyperbolic” discount rate. The discount rate would be high for short term impacts, in order to represent the time preferences of the current generation (for their own income stream), but would gradually decrease over time to enhance inter-generational equity. Put simply, medium to long-term impacts would be discounted less than short-term impacts.

Further reading and useful resources

- TEEB: Discounting, ethics, and options for maintaining biodiversity and ecosystem integrity

  http://evolution.binghamton.edu/evos/wp-content/uploads/2010/01/Gowdy-2009.aspx.pdf

- Climate Change and Discounting the Future: A Guide for the Perplexed

  http://www.hks.harvard.edu/m-rcbg/cepr/Online%20Library/Papers/Weisbach_Sunstein_Climate_Future.pdf

- Asian Development Bank: Review of theory and practice of discounting

  http://www2.adb.org/Documents/ERD/Working_Papers/WP094.pdf

- Valuing future life and future lives: A framework for understanding discounting http://faculty.som.yale.edu/ShaneFrederick/Future%20Life%20and%20Future%20Lives.pdf

The **Marine Socio–Economics Project** (MSEP) is a project funded by The Tubney Charitable Trust and coordinated by **nef** in partnership with the WWF, MCS, RSPB and The Wildlife Trusts.

The project aims to build socio-economic capacity and cooperation between NGOs and aid their engagement with all sectors using the marine environment.