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What Discount Rate Should Be Applied To Long Run Environmental Policies? Why?

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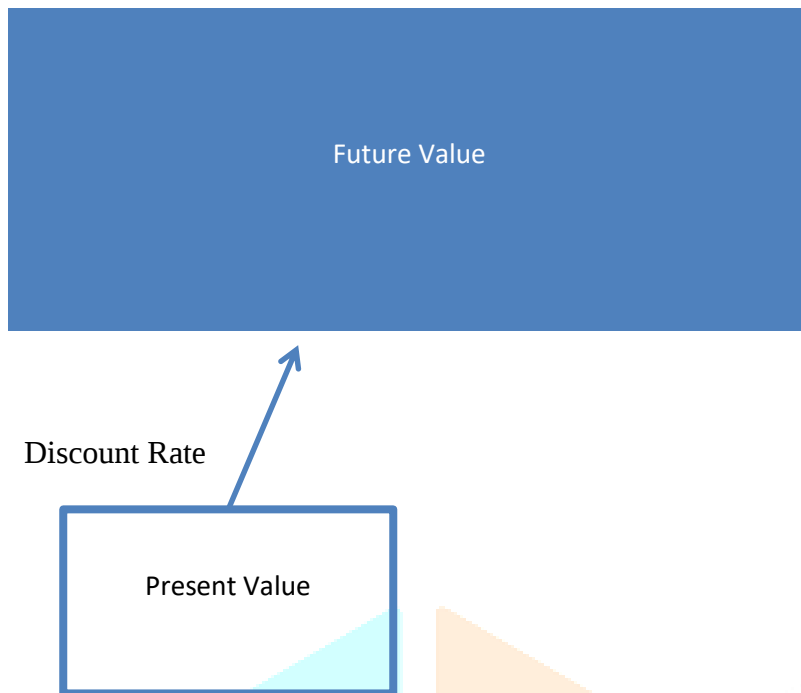
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The above question brings into focus a number of issues. Among the most important is the emphasis that is placed on “environment”, today. The term discount rate is usually applied for financial capital, but given the disaster that climate change has impacted the world, it has become necessary to place a percentage that economies need to impose to save the surroundings. This term has also been proposed for the value of degradation of the environment and it is labeled as “social discount rate”. The fact that the event is happening in the future, which is the reason the term “discount”, is used.

The “discount rate”, in financial terminology is the value of future streams of income **today** and has been and is used most extensively in terms of financial decision making. It indicates the value of future financial streams of earnings, and is used to assess portfolio management and suggestions by bankers, stock brokers and other financial analysts for themselves and their investors, taking the risk involved of various assets. The rate that is decided takes into account the following

- Time period that the investment should be in existence
- Extent of riskiness of the various assets under consideration
- Opportunity cost for the firm
- Exact rate that can be earned minus the risk factor- often called the ‘hurdle rate’
- Allows different investment decisions to be compared.



In the case of long term environment policy there cannot be and is not a single universally correct discount rate. The choice of the rate depends on the country imposing it: is it a developed or a developing one, what are the difference between marginal cost and marginal social cost, difference between marginal benefit and marginal social benefit, and also the time horizon involved where this has to be applied. Besides the application of a low discount rate there are economists and researchers that advocate a higher discount rate for reasons that give greater emphasis on the present generation rather than the future, as it is possible with greater advancement of technology the ability to mitigate various disasters in the future maybe be easier.

An answer to evaluating a “single”, discount rate for environment is difficult to pinpoint as there is **no single universally “correct” discount rate** for long-term environmental policy. Instead, the choice depends on *ethics, economics, uncertainty, and the time horizon involved*.

If an high discount rate is applied it means the valuation of the present is more than the future, but if a low discount rate is applied it means the opposite.

In the case of environmental issues the impact is felt in the future maybe after decades or centuries. As environment impact are measured in biodiversity loss, sea-level rise, and climate change, it becomes difficult to indicate a definitive numerical value.

Arguments for applying a low Discount rate

The proponents that advise to apply low discount rates(1-2%) are Economists like Sir Nicholas Stern, Martin Weitzman and Partha Dasgupta among others. They feel that as most environment impacts are felt after a long time, future generation should not be penalised if they are born later. Use of a low discount rate is linked to equality among generations. The damages imposed are extremely long term in nature. If a discount rate is imposed then it would act as a deterrent and save the world for future generations. A high rate emphasizes on present consumption and investment while a low rate gives emphasis on future consumption.

The additional reasons for applying a low discount rate are that even if impact on the future is uncertain, policymakers should take preventive steps, as environmental damages are irreversible. Damages that occur are difficult to quantify, applying a high discount rate is likely to undervalue the non market benefits.

A common equation that depicts environmental degradation is known as the “Ramsey Formula” which is used for social discount rate.

$$r = \rho + \eta g$$

It is the rate for society’s collective action against environmental degradation. Where ‘rho- ρ ’, is the pure rate of time preference, plus ‘eta- η ’ which is the elasticity of marginal utility of consumption and ‘g’, is the expected rate of consumption growth. This provides an ‘ethical’ equation to measure considerations with future economic gains.

There are **three** more popular measures that establish the adoption of a ‘Social Discount Rate’, these are “Social Time Preference”, “Special Opportunity Cost” and “Shadow Price Capital”.

Social Time Preference Theory

It is necessary to use a discount rate as “fair practices”, require “fairness among generations”. It is important for the present generation to look positively about the future generations. Taking into account the “exogenous productivity growth”, the optimal social discount rate according to this theory is “equal to the sum of the instantaneous rates of productivity and population growth”. The main focus is **Not to discriminate against future generations**. The aim is for an equitable distribution of resources among the present and the future generations.

Special Social Opportunity Cost

Opportunity is the “cost of the next best alternative”, in the case of “social opportunity cost”, the calculations take into account the value of externalities as well as the direct costs that have been forgone.

Shadow Price Capital

This theory applies a “shadow price”, on externalities; both positive and negative. These commodities are not normally bought and sold in the market and have thus to be given an imputed price. The basis for the “shadow price”, is based on economic value, market price and external market conditions. Extremely important for understanding sustainability projects, government decisions, and infrastructure.

Theories and reasons behind Higher discount rates

But opposed to this are arguments for a higher discount rate which do not take into account detrimental factors of the future. They expect the future generation to be more equipped to manage future costs in terms of them being wealthier. Opportunity cost of capital, in this case, being a trade of between private versus public returns. Public funds used for future could be invested in the private sector for immediate high rate of return, leading to an all around increase in wealth of its citizens. There is this inherent impatience in terms of enjoying fruits in the present rather than waiting for the unknown future that exists among the present generation. Lastly the unpredictable future in terms of risk and uncertainty.

Economists who advocate higher discount rates state that resources should be spent on areas that increase economic growth today so that the high yields earned will lead to wealthier future generations, adapting

positively to environmental challenges, while applying a lower interest rate would result in reduction of present economic welfare.

Economists like William Nordhaus support somewhat higher rates (around 3–5%), based on his DICE (Dynamic Integrated Climate-Economy) model. This model looks into the economic costs involved in reducing green house gasses as opposed to the long term damages caused due to climate change. It integrates macroeconomics, climate science, and public policy. A “damage function” calculates the extent to which high temperature impact lower agricultural yields, damage due to rising sea levels and lower productivity. The society then decides how much needs to be sacrificed today to protect future consumption.

Christian Gollier who researched on risk -based discount rates. These are based on inter temporal choices which looks for the exact point at which an individual switches from preferring a smaller immediate payoff to a larger delayed one.

Arnold Harberger who delved into the Social Opportunity Cost (SOC) approach, looks into the total value of the benefits foregone by the society. The government has to consider it's importance on environment, public health and well being of its citizens. A high rate emphasises on present consumption and investment as opposed to the future.

The $PV = FV / (1 + r)^t$

- PV is the Present Value
- FV is the Future Value
- r is the rate of the interest
- t is time

The above formula illustrates how the value of future benefits declines over time. The longer the time frame and the higher the discount rate, the smaller the present value becomes. This creates major implications for environmental policy because environmental damages often occur far in the future. If adverse climate change conditions causes major damages running into trillion of dollars, the value of the damage will differ depending on the discount rate used. At 1% the present value will be very high, while at 5% the value decreases substantially. The discount rate used depends on how countries view *disasters* caused by adverse climate change conditions

Researchers have argued that two different rates applied by the private sector and the government would lead to distortion of “decision making”. These economists feel it is incorrect to apply a low discount rate because given the speed at which innovations are taking place in the “green sector”, it is very likely that future costs on addressing these areas would drastically reduce compared to the present. Governments especially of Developing Countries have to weigh “trade offs”, between reduction of poverty levels, reduction in unemployment and increasing literacy among the costs involved in addressing environmental protection of the future.

The third aspect of deciding what to choose is the “**Ethical Way**”. These involve a number of factors. One is the manner in which the valuation of present and future generations take place. This states that future individuals are as important as present. The counter argument is that the present generation face enormous challenges that have to be immediately addressed, more so for developing nations as they have additional macro economic indicators to address, and Governments are elected representatives of the present generation.

Other areas of concern is the fact that developed nations used fossil fuels and walked the path of development in the past, and now that it is the turn of developing nations, they who contributed minimum

to the global disaster are in fact being made to bear the brunt, of the cost of climatic disasters which is incorrect. This is one of the foremost reasons why during most COP(Conference of Parties in climate and environmental policy) meetings, suggestions are made that the larger payment should be borne by developed economies both in terms of “corpus”, as well as lower discount rates.

Conclusion and the possible use of Declining Discount Rates as a Compromise

There are several arguments that support declining rates. Mainly the uncertainty about future economic growth and impact of high interest rates increases over long periods. If future growth is uncertain, relying on a constant discount rate may produce misleading results.

Given the limitations of both high and low fixed discount rates, many economists and policymakers increasingly support *declining discount rates* for long-term environmental policy. This type of rate means that future costs and benefits are discounted at progressively lower rates over time attempting at the same time to balance economic efficiency in the short term with ethical concern for distant future generations. Increasing impact of present climate change disasters strengthen the case for lower discount rates.

Declining rates better reflect long-run uncertainty. These rates recognise that environmental risks become more significant over longer timescales. Catastrophic climate outcomes may appear unlikely in the near term but increasingly plausible over centuries. Lower rates for distant periods ensure that these long-term risks are not ignored. Reduced rates provide a practical compromise between competing ethical and economic perspectives. They acknowledge the opportunity costs of current investments while still assigning meaningful value to future welfare.

Governments in countries such as the United Kingdom and France have incorporated declining discount schedules into public policy appraisal for long-term projects. A large number of economies developed or developing have realised the adverse impact of ‘climate change’, and have started imposing ‘green tax’, on various projects. The present US - Iran- Israel war has further brought in to the forefront in adopting viable alternatives to energy being derived from fossil fuels, thus aiding the progress towards imposing a lower discount rate, reflecting a growing recognition that traditional constant discounting may be inappropriate for environmental problems spanning multiple generations.

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