Is the future discounted too much?

Investment projects can be appraised by calculating the present discounted value of the future cash flows generated by the project relative to the costs of the investment. The internal rate of return is the discount factor that equalises the two. If this exceeds the domestic interest rate, then the investment project yields a higher return than bonds (the opportunity cost of investment) and so is profitable to undertake.

Therefore, in calculating present discounted values the discount rate is an important factor. This approach seems reasonable when evaluating projects of relatively short duration, say up to 30 years. The problem however is that very long term investments become practically worthless. Compound discounting means that the present value of large sums in the future is practically worthless in today's terms.

For example, in 2005 the value of total global GDP is \$44,433 billion (US dollars). Assuming that the global economy grows at 3% per year then in 200 year's time global GDP will grow to \$16,411,587 billion. But, if a long-term discount rate of 7% is applied then in present discounted value terms global GDP in 2205 is only \$22 billion (see figure 1). This implies that it would be uneconomic to spend \$22 billion (0.05% of current GDP) to safeguard the entire level of GDP 200 years in the future.





Figure 1

This outcome arises because the discount factor is applied in a compound way, so over long periods of time it becomes increasingly significant. In the above example, if a discount factor of 5% is applied (which is unrealistically low for a long-term project) then the present discounted value of 2205 global GDP is \$949 billion. However, this is still only 2.1% of current GDP.

There are few businesses that make 200 year investments- but the principal is of undoubted importance in the setting of environmental policy. Any policy costing more than \$22 billion, but will prevent environmental catastrophe 200 years in the future, will not be undertaken. Much public policy is considered in cost-benefit analysis. If costs are present, but benefits accrue a long way in the future such as preventing climate change, then discounting might have a strong effect on the outcome.

The problem is potentially much worse, in that higher discount rates might be applied to longer-term investments. This would reduce the present discounted value of future benefits even further and reduce further the incentives to undertake these types of investments. A 200 year investment will undoubtedly mean an intergenerational transfer of wealth, so unless we value the utility of our descendants by at least as much as we value our own society will exert a higher discount rate on 200 year investments over those of 20-30 years. Uncertainty is also an issue that raises long-term discount factors. Nobody for sure can predict the true effects of climate change, and it cannot be ruled out that future improvements in technology might mitigate much of the problem.