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Public Policy Risk Management

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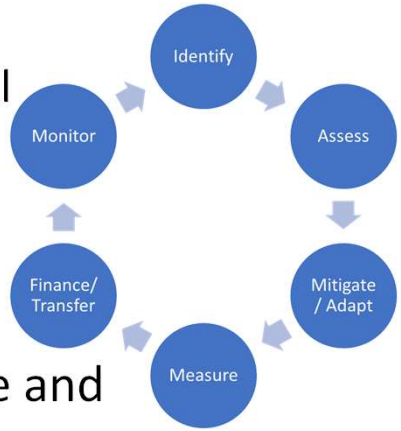
What I will discuss today

- Public Policy (social) Risk Management
- Social cost-benefit analysis
- Social discounting
- Application to climate risk analysis

Public policy (social) risk management

- This presentation is based on a research paper sponsored by the Society of Actuaries' Climate and Environmental Sustainability Research Committee
  - "Social Discounting", a work-in-progress
  - Doesn't necessarily relate to a particular countries' practice – more of a conceptual discussion
- An application of a risk management process applied to a social issue, parts of which may apply in other situations
  - Takes a broader perspective of all stakeholders, incorporating consequential risks, costs and opportunities, referred to as social externalities and co-benefits, as well as economic growth
  - Can include qualitative and intangible aspects



- An example illustrated in the paper and here is climate change and its risks
  - Stakeholders: society/government, your firm and you personally
  - Relevant due to the severity of its possible adverse effects and its ultra-long time horizon
- Actuaries have the tools and experience to play a role in the analysis of many such social policy issues

Social cost-benefit analysis

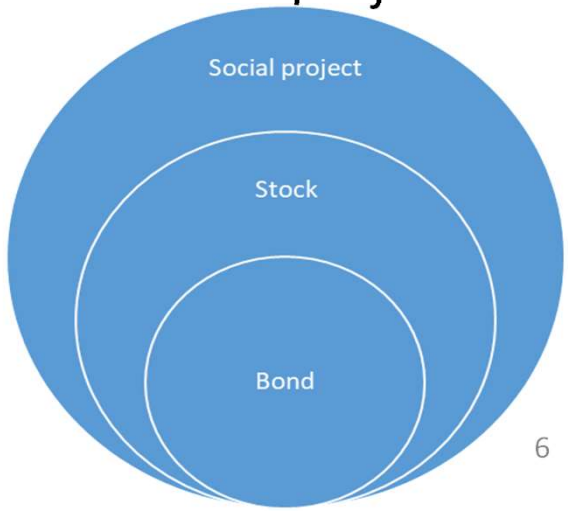
- It has been accepted that the analysis of public policy and public investments involves a cost-benefit analysis
  - An application of Enterprise Risk Management to a social issue
  - Depending on what is addressed, it can involve a back-of-the-envelope or multi-year research effort
- Differences from the usual cost-benefit analysis
  - Time horizon
  - Social externalities and co-benefits
  - Decision-making under uncertainty
  - Social discounting
- Includes:
  - Both quantitative and qualitative components
  - Possibly ethical or political considerations

Time horizon

- Assessment of costs and benefits over a given period
  - At least as long as the period of the public budget horizon
  - But for many issues/programs this is too short for an appropriate decision
- Possible considerations include
  - Expected life of capital investments required by or expected from the policy being assessed
  - Point at which benefits and costs reach a steady state
  - Extent to which benefits and costs are separated by a given number of generations
  - Statutory or other requirement applicable to policy or social cost-benefit analyses for long-term activities, such as for nuclear plants and retirement benefit systems

Social externalities

- An externality is something that is typically outside the scope of an analysis
- ‘An externality that may involve or affect a broad segment, if not all, of a population, usually viewed from the vantage point of society as a whole’
  - This inclusion creates a social discounting context
- The scope of analysis of a private sector investment is usually limited to the costs and benefits directly affecting the investor
  - In the public sector, costs and benefits of a rule or project can be included in the analysis
  - An example are resulting deaths
  - Broadest to narrowest scope:



Co-benefits

- ‘Favorable (or avoidance of unfavorable) side-effects not directly related to the scope of the project/strategy being assessed’
- Particularly relevant when the drivers/actions are identical
- For example, when attempting to mitigate climate change, a project may simultaneously reduce air pollution that can reduce premature deaths and ill-health

Social discounting

- The quantitative framework in which social risk management is quantitatively applied
- Social discounting is the process of reflecting the time value of expected cash flows and other elements in a social cost/benefit analysis
- Present value of future expected cash flows and a qualitative discussion

Key differences between 'regular' discounting and social discounting

Features	Discounting	Social Discounting
Context	Enterprise risk management process	Social risk management process
Focus	Private sector entities	Government entities
Treatment of externalities	Excluded	Incorporated
Preferences—values/risk preferences	Those of individuals or market participants	Those of society, across generations
Social premium	None	Difference between discount and social discount rates
Sustainability premium	Not included or implicit	Included as part of the social premium
Relative to market-basis	Usually market-based in some way	Usually lower than market-based rates

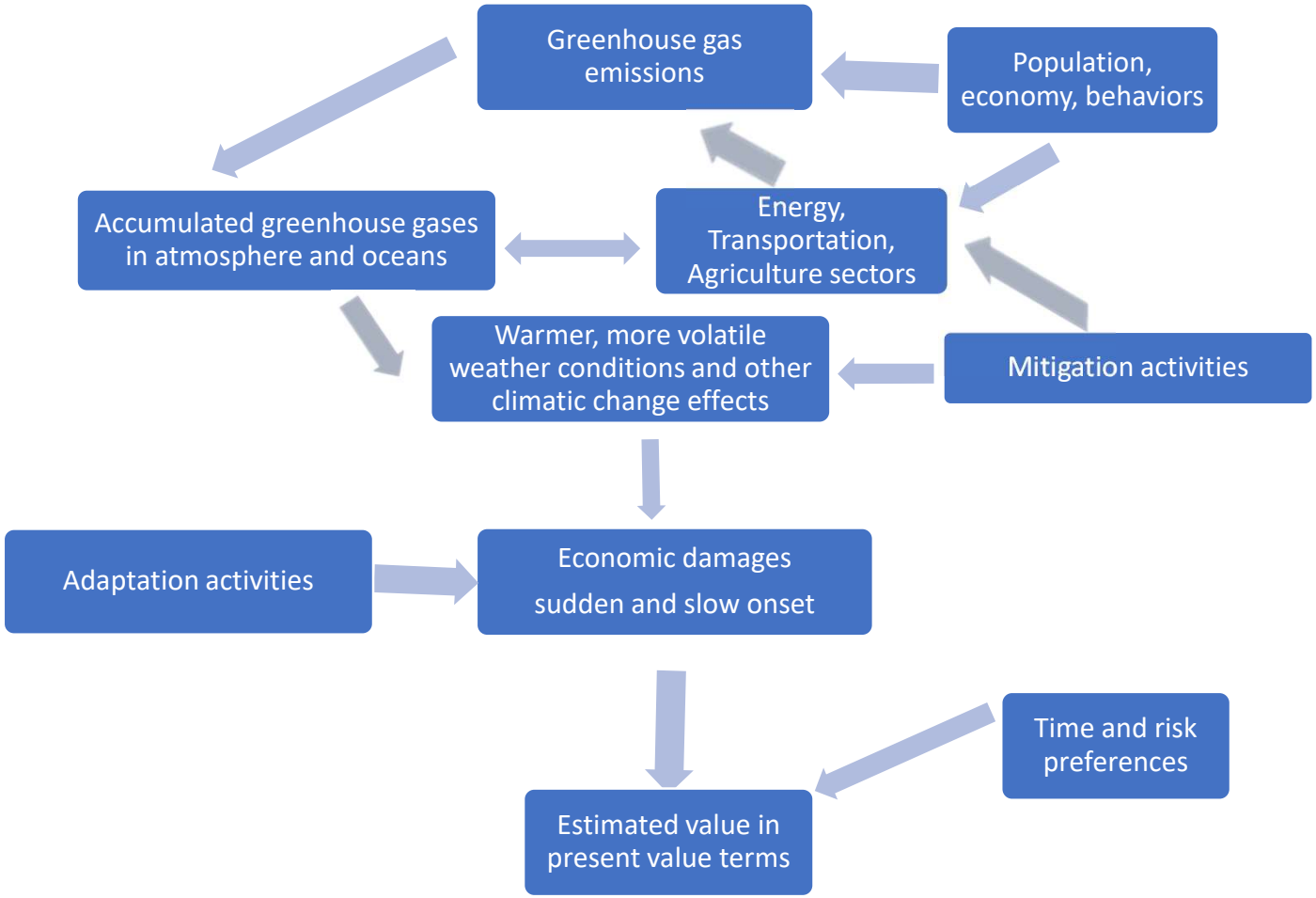
An example
Climate change risk analysis

- An issue most governments are involved with
  - But many private sector entities are also interested and might use elements of this type of analysis
- A relevant example because such analysis can be used to
  - strategically allocate resources at a macro-level to mitigation/adaptation of climate change risks
  - analyze a specific project or investment
- It is significant, affects more than just the costs/benefits of a particular government entity (as a result of externalities) and very long time horizon

Application to climate risk analysis

- Many view an analysis of a project/investment to manage climate change risk to be fundamentally different than other analyses
  - In part because of its nature, causes and consequences
- Mitigation and adaptation can be viewed differently, often defined in the climate change literature as
  - Mitigation – efforts to limit or eliminate fundamental drivers
  - Adaptation
    - Ex-ante – actions taken to reduce future damages
    - Ex-post – disaster recovery
  - Mitigation is global while adaptation is local/regional

Climate process



Relation to climate change

- Objective: to assess the current value of costs associated with a strategy or project whose aim is to mitigate or adapt to the effects of climate change
- CO_2 emissions remain in the atmosphere for centuries
  - Very long time frames and multiple generations are involved
  - Other greenhouse gas emissions are more intense but have much shorter half-life, e.g., methane
  - Almost irreversible in the absence of effective sequestration or geoengineering
- A primary reason why climate change costs are looked at differently from other long-term costs

Why not use market-based discount rates

- Imperfections in the market relative to the purpose of the application, as market prices don't usually incorporate
  - Costs (and benefits) to society external to the parties directly involved (externalities)
  - Related benefits (co-benefits, such as pollution reduction and health improvement)
- Markets have a shorter-term focus
  - Welfare of future generations at stake in climate change
- Global externalities and considerations are involved
- Market prices usually don't incorporate non-financial benefits/costs
  - Irreversible environmental damage
- Effective hedges are unavailable
- Usually lower than market-based discount rates are used that reflect externalities, related co-benefits and a sustainability/uncertainty premium
- Recent survey of 197 climate change economists*
  - Range 0% to 10%, with 92% between 1% and 4%
  - Mean 2.0%, median 2.25%

*Drupp et al.(2015) "Discounting Disentangled"

The Ramsey formula

An economics-based method of quantifying long-term discount rates is often used as a basis for social discount rates

- Formulated by economist Frank Ramsey* who described a social discount rate approach to analyze savings

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

where

r = social discount rate

ρ = pure rate of time preference

η = elasticity of marginal utility (in terms of a utility function)

g = per capita growth rate of consumption

ηg is a growth factor, representing the expected extent that the future will be "better off" than the present

*Ramsey, Frank (1928). "A Mathematical Theory of Saving". *Economic Journal*. 38(152)543-59

Ethical considerations

- Uncommon for actuaries to directly consider ethical aspects of a problem
  - Can be subjective and, if applicable, only a qualitative consideration
- Relevant to consider stakeholders
  - The global community, even when analyzed at the local level
  - Future generations (intergenerational effects), in additional to the usual intragenerational issues – key differences:

	Intergenerational	Intragenerational
Emphasis	Compares treatment across generation for the same population	Compares treatment within the same generation among different population segments
Primary focus	Mitigation	Ex-ante and ex-post adaptation
Social discount rate	Lower than rates applied to analysis within a single generation	Similar to other social discount rates

- Difficult to assign value to human life and health
- Capital budgeting: how to fairly weigh the value of current expenditures and irreversible future costs borne by future generations?
- Has led some economists to advocate a 0% pure discount rate

Structure of social discount rates

Practice to date varies by country

1. Level discount rates
   - Simple
   - U.S. EPA approach
     - Between 2003 and 2016 required alternative discount rates, e.g., 3.0%, 3.5% and 5.0%
       - Reflects consumption and investment views
     - Prior to 2003 and since 2017 requires 7.0%
2. Declining (hyperbolic) discount rates
   - More consistent with currently accepted theory (Weitzman, Gollier) and reflects uncertainty
   - U.K. – starts at 3.5% declining to 1.0% after 300 years
   - France – starts at 4.0% declining to 2.0% after 30 years

Application of social discount rates

- Of course, a primary factor is the estimates of future cash flows
- Important to recognize who is the user of a social cost-benefit analysis
- Ramsey formula is often applied to consumption, reflecting society's utility function
  - Some have concern regarding the ability to accurately quantify a population-wide utility function
  - Difficult to incorporate non-financial costs, such as human life, oceanside property and heritage assets
  - Should discount rates differ by application?
- Alternative approach is scenario analysis (e.g., a 2^{o}C future)
- In contrast, actuaries usually apply discount rates to cash flows or risk-adjusted cash flow equivalents

Central role for uncertainty

- Any long-term public project contains a great deal of risk and uncertainty
- Can either affect the choice of expected cash flow equivalents (increase) or the social discount rates (decrease), but not both
- Gollier appended the Ramsey formula with another term to be:

$$r = \rho + \eta\, g - \tfrac{1}{2}\, \eta^2\, \sigma^2(g)$$

- Common approaches used are similar to other analysis
  - Scenario analysis or stochastic modeling
- Key consideration is the importance of tail possibilities, including greenhouse gas atmospheric concentrations, effect on climatic factors and damages

Climate policy

- Climate policy is all about managing climate cycle uncertainties
- It can involve:
  - *Policy technique*, i.e., whether greenhouse gas emissions are best controlled through prices (e.g., an emissions tax) or quantity-based instruments (e.g., an emissions quota)
  - *Policy intensity*, e.g., the size of tax, the optimal level of mitigation, or flood insurance premium
  - *Timing of policy implementation*, i.e., whether it is best to put an emissions tax in place now, or wait several years (allowing a smoother implementation that results in somewhat larger increases in cumulative atmospheric greenhouse gases, offset by enhanced future technologies and a future reduction in uncertainty)
  - Resources devoted to the *mix of mitigation and ex-ante adaptation*, as well as the fall back ex-post adaptation (disaster recovery)

Why climate risk analysis is different

- Although none of these characteristics are unique to climate risks, when looked at together they
  - Are complex
  - Are irreversible
  - Have a global impact
  - Have related social externalities and co-benefits
  - Impact both multiple population segments and generations
  - Contain asymmetric risks and effects
  - Affect a long time horizon

Decision-making under uncertainty

- Through a real option approach
  - The right, but not the obligation, to undertake an initiative, such as deferring, abandoning, expanding, staging, or contracting a capital investment project
- Many options may be available to a public policy decision-maker
  - To act now, schedule or defer (kicking the can down the road) action
  - May consider expected costs and benefits of flexibility
    - Examples: new information, future resource availability or new technologies
- Discussions of climate change prior to 2007 (the Stern report)
  - Was common to assume future costs won't be that bad and future technologies will provide a cost-effective response
  - More recently, opinions range between either acting now or deferring as long as possible
- Difficult to quantitatively reflect these options

Some practical considerations

- Quantification of long-term and social risks can be quite complicated and take considerable resources/time
  - However, efforts to simplify them may affect the conclusions
  - For example, the Trump Administration is currently proposing to limit the time for environmental reviews to two years and to not require consideration of effects of climate on projects
- Effective communication of a social cost-benefit analysis, including its quantitative and qualitative components, has to keep in mind the expected users, focusing on known differences of opinion
- Rigorous documentation of the basis of findings
- The social aspects and implications of alternative program design are important to consider, including the weightings given affordability and motivations to mitigate and ex-ante adapt to climate change

Conclusions

- Often fraught with political constraints
  - Differences of opinion regarding relative importance of various needs and risks
  - Example
    - Determining social cost of carbon for use in analysis of a carbon tax
- Allocation of limited resources ("fairness") between
  - Developed and developing countries
  - Well-off and vulnerable (who are most affected)
  - Jobs and economic growth for current voters and their future well-being
  - Generations
- Unsurprisingly, advocates of immediate action justify a lower social discount rate, while those who advocate limited or deferred action justify a higher social discount rate
- Given the thousands of economic papers on this, you would expect a consensus to have been reached – but disagreements remain
- Role / opportunity for actuaries

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