



Irish Government Economic & Evaluation Service

Research on Central Technical Parameters

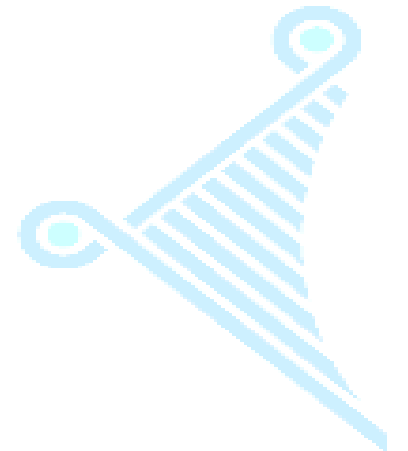
Social Discount Rate

IGEES Annual Conference

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Department of Public Expenditure & Reform



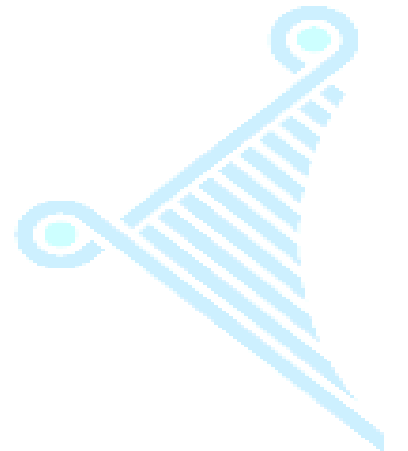
Structure

Part One: Project and methodological approach

Part Two: Overview of discounting

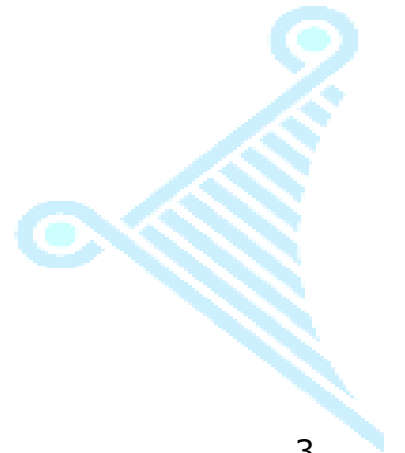
Part Three: Social Discount Rate in Ireland

Part Four: Term Structure of the Discount Rate



Part 1

PROJECT & METHODOLOGICAL APPROACH



Project & Methodological Approach

Project

Analysis on four central technical appraisal parameters:

- Discount Rate
- Time Horizon
- Shadow Price of Labour
- Shadow Price of Public Funds.

Parameter X

Irish Academic
Literature

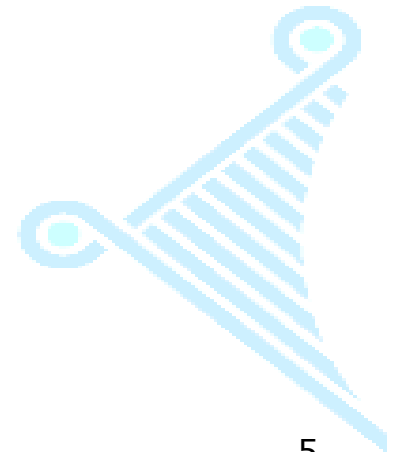
International Academic
Literature

International
Practice

Consideration and
application of relevant
quantitative data

Part 2

OVERVIEW OF DISCOUNTING

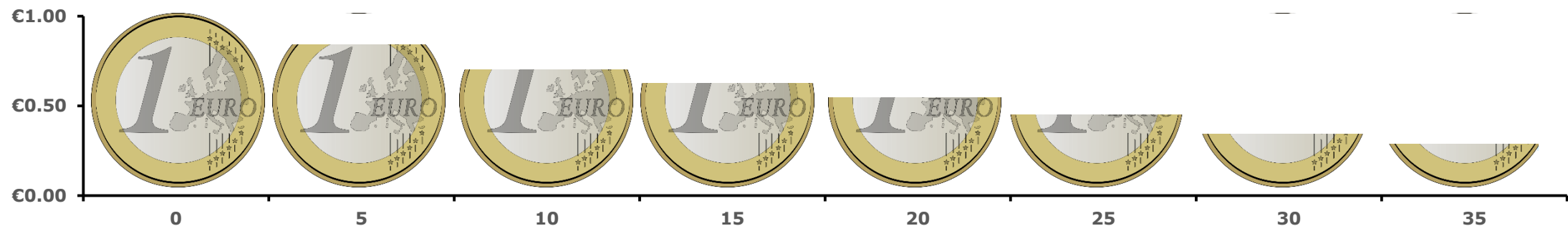


What is discounting?

[...] an economic test discount rate should be used to convert future costs, benefits and income streams into their value today (present value) to allow them to be meaningfully measured and compared for appraisal purposes.

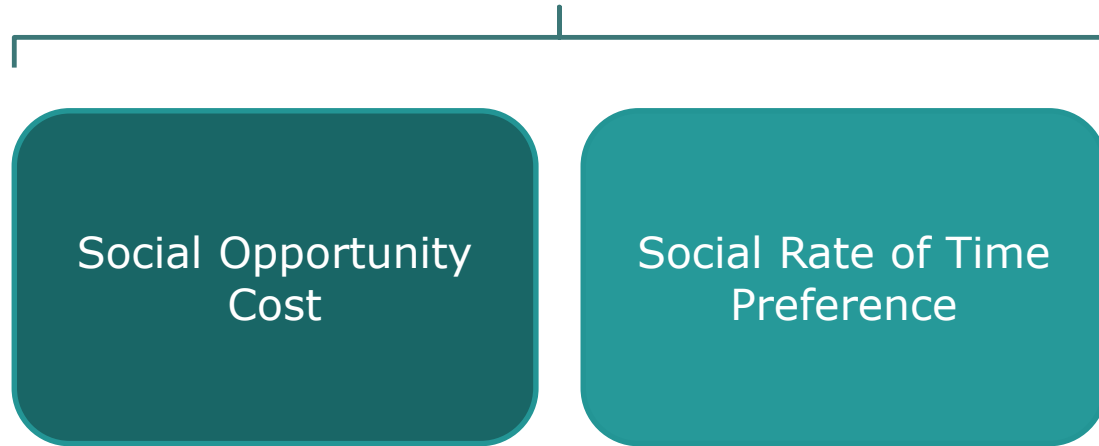
DPER - Public Spending Code 2015

$$\text{Net Present Value} = \sum_0^N \left(\text{future costs} - \text{future benefits} \right) * \frac{1}{(1 + \text{discount rate})^n}$$



Why discount?

theoretical justifications



Legacy of financial appraisal

Balancing intertemporal welfare

practical reasons

Why discount?

Social Opportunity Cost

- Based on the idea that public investments displace private investments. Therefore, according to this approach, the return from the public investment should be at least as big as the one that could be obtained from a private investment. As a result, the SDR is considered equal to the marginal social opportunity cost of funds in the private sector.

Netherlands

New Zealand

Norway

Australia

Canada

Social Rate of Time Preference

- Rate at which society is willing to postpone a unit of current consumption in exchange for more future consumption. The logic of this approach is that the government should consider the welfare of both the current and future generations and solve an optimal planning programme based on individual preferences for consumption.

Ireland

France

UK

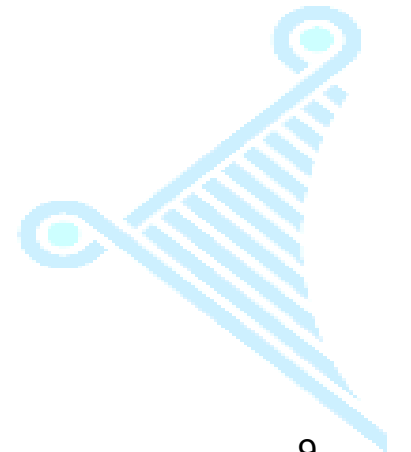
Germany

Italy

Spain

Part 3

IRELAND'S DISCOUNT RATE



Social Rate of Time Preference (SRTTP)

Ramsey formulation for the Social Rate of Time Preference:

$$r = \rho + \mu g$$

r = the rate of social time preference

ρ = rate of pure time preference

μ = the marginal utility of consumption

g = the future rate of consumption growth

International and Academic Comparison

Wide range of values proposed/in use: between 1.6% and 8%

Country	Rate Used
Ireland	5%
Australia	~7%
Canada	8%
European Commission	3% - 5%
France	4.5%
Netherlands	3%
New Zealand	6%
Norway	4%
UK	3.5%
US	3% - 7%

Study	Proposed Rate
Metastudy: Weitzman (2001)	3.96%
Metastudy: Drupp, Freeman, Groom, Nesje (2015)	2.27%
Stern (2006)	1.6%
Nordhaus (2008)	5%
Weitzman (2007)	6% (in near term)
Gollier (2012)	3.6% (in near term)

Part 4

TERM STRUCTURE OF THE SDR



Critiques of Exponential Discounting



Evidence on human's innate intertemporal decision making structure.



Concern about future rates of consumption and environmental spending, given externalities.



Morally questionable distribution of intra and intergenerational cost-benefits.



Does not allow for the incorporation of uncertainty into models.



Theoretical basis for Declining Discount Rates (DDRs)

Three DDR methodologies identified:

1. Exponential & Hyperbolic combination

- Discount exponentially up to $t=30$, generic hyperbolic function thereafter
- Based on psychological evidence of human discounting behaviour
- Pragmatic solution proposed by Morgenroth (2011)

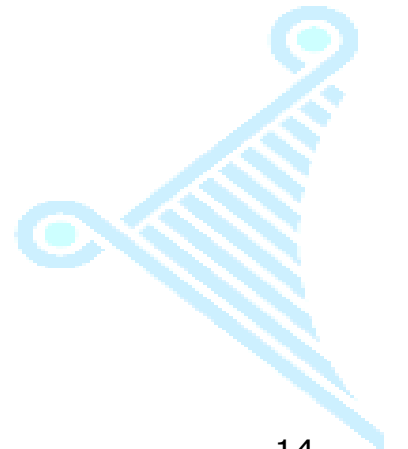
2. Uncertainty – Interest Rates Newell and Pizer (2001)

- Use of historic bond yield data as proxy for time preference
- Econometric estimation of uncertainty from volatility
- Simulation of future DRs with uncertainty

3. Uncertainty – Ramsey SRTP Parameters

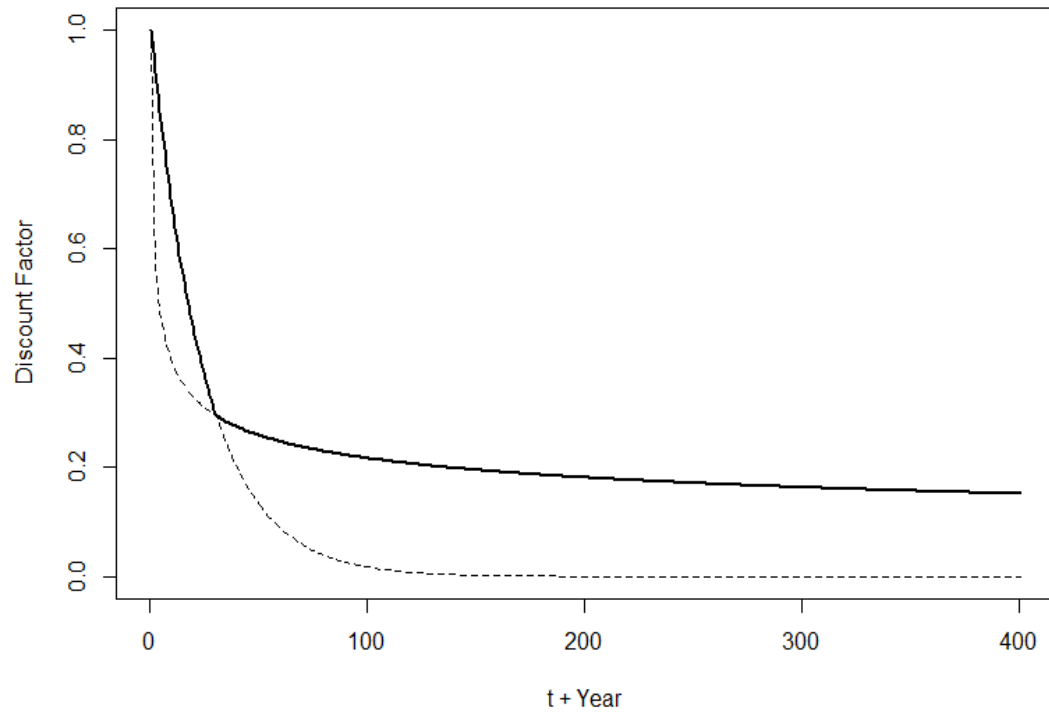
- Based on observation of Weitzman (1999)
- Estimate SDR under various assumptions
- Take the average of the discount factors and calculate the effective discount rate, which will be declining

$$r = \rho + \mu g$$

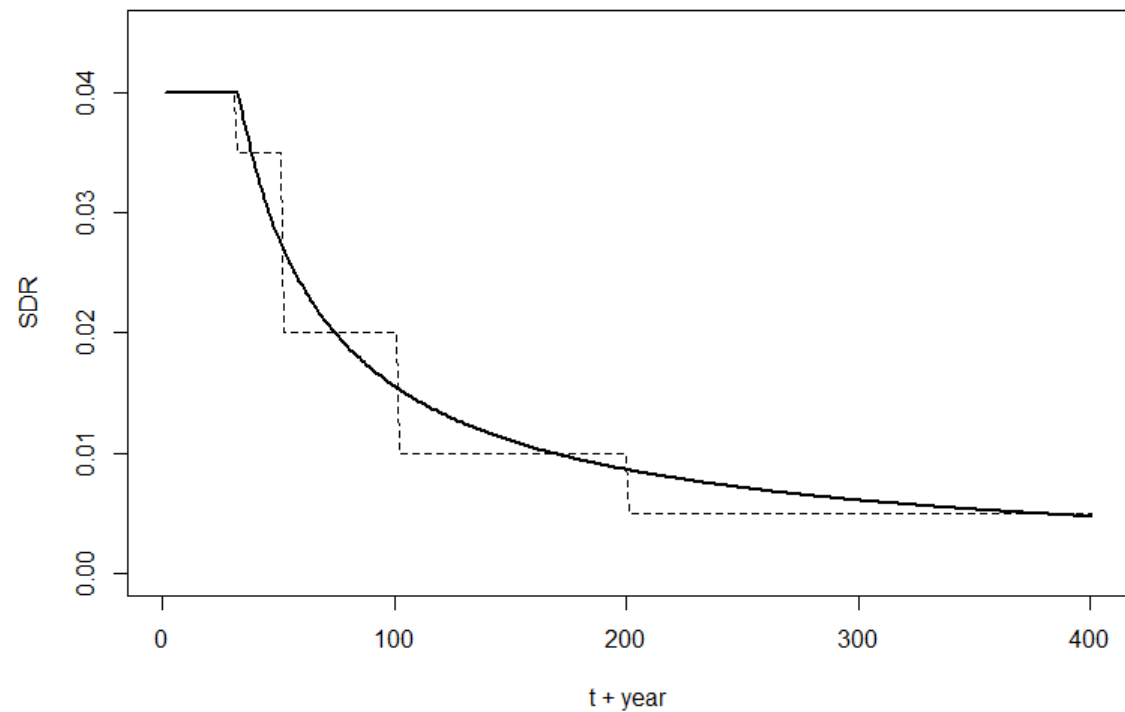


Exponential/Hyperbolic Discount Rate

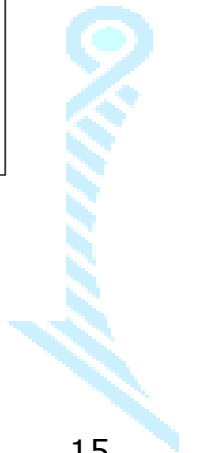
Exponential/Hyperbolic Discount Factor



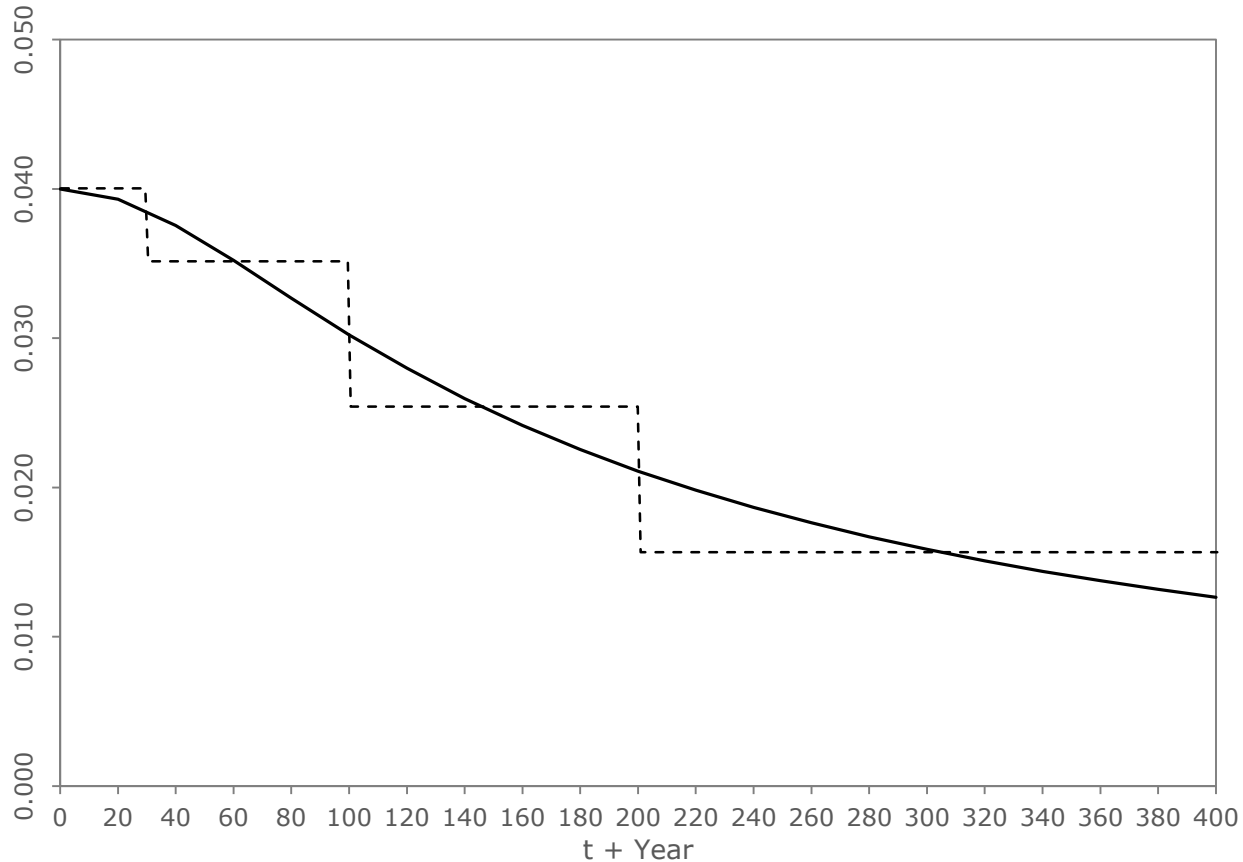
Exponential/Hyperbolic DDR



Exponential: $(1 - r^t)$ & Hyperbolic $(1 + \alpha t^{-\frac{\gamma}{\alpha}})$
 $r = 0.04$, $\gamma = 1$, $\alpha = 3.89$



Newell and Pizer



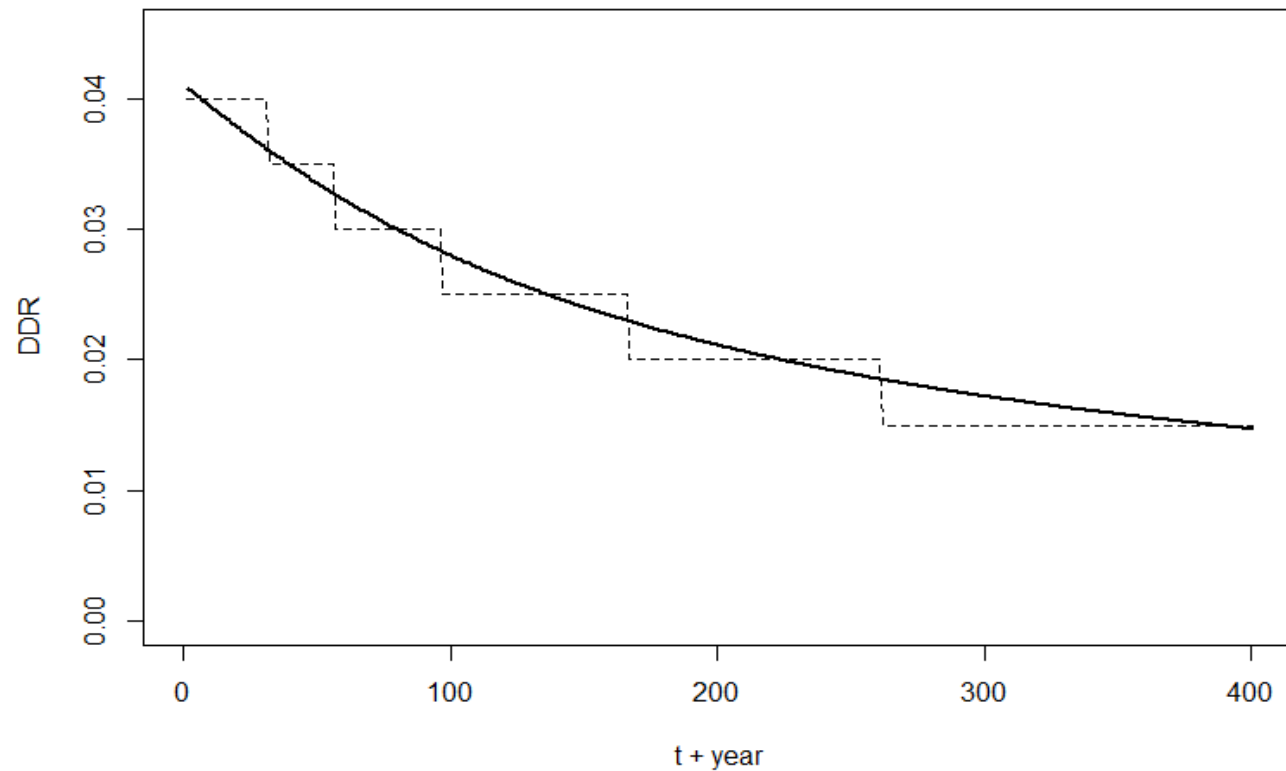
Approach

- Application of discount factor data derived from N&P random walk analysis of historic long-term US bond rates
- Methodologically robust, but subject to critique
- DDR schedule decreasing from 4% to 1.5% after $t = 200$

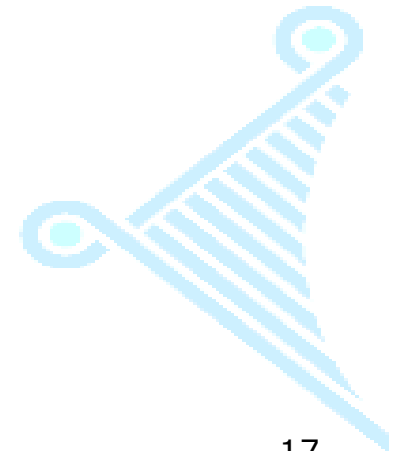


Parameter Uncertainty DDR

Parameter Uncertainty DDR



- Based on identified ranges of parameter values
- Similar approach to Weitzman (1999)



Conclusions

Appropriate Rate of
Discount

Appropriate Term
Structure

Finalisation of analysis

Any Questions?

