

PRACTICUM of Sensitivity analysis for mathematical modelling

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Sensitivity Analysis



Question 1

The influence of the key variables should be investigated by a sensitivity analysis.

- Is something wrong about the statement above (p. 384 of EC guidelines)

Question 2



“Are the results from a particular model more sensitive to changes in the model and the methods used to estimate its parameters, or to changes in the data?” (Majone 1989)

Please comment

Question 3



What uses can you imagine for sensitivity analysis?

Question 4 (at home!)

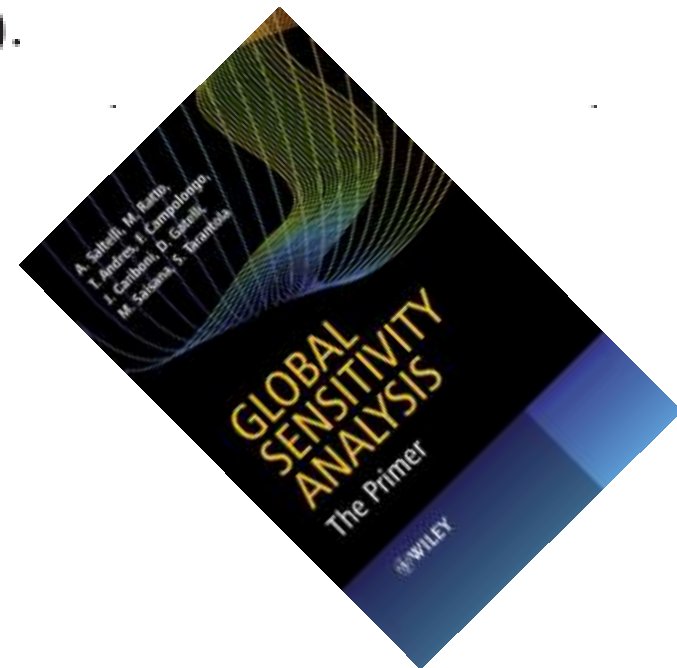
44

INTRODUCTION TO SENSITIVITY ANALYSIS

1.6 EXERCISES

1. Prove that

$$V(Y) = E(Y^2) - E^2(Y).$$





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Sensitivity Auditing

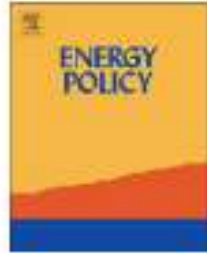
Exercise

One more fundamental rule should be inserted in the sensitivity auditing checklist, and this is ...

Discussion points



I am a modeller working on ... and I
haunted by a hidden assumptions,
or by elephants in the room nobody
else sees...



On the contribution of external cost calculations to energy system governance: The case of a potential large-scale nuclear accident

Erik Laes ^{a,*}, Gaston Meskens ^b, Jeroen P. van der Sluijs ^c

‘[...] calculation of the external costs of a potential large-scale nuclear accident [...] ‘An [analysis] resulted in a list of 30 calculation steps and assumptions’

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[...]30 calculation
steps and
assumptions' ...

What would you do if this happened to you
in the course of your PhD project?

What would you do if this happened to you
in the course of a paid consultancy work?



Discussion points



Can I recall an instance where uncertainties have been either amplified or deflated instrumentally?

Sensitivity auditing



Pathways Leading to a More Sustainable and Healthy Global Food System

Volume 7 | Issue 5 | Page 10-12 | September 2016

By Krishna Bahadur KC, Evan D.G. Fraser, Samantha Pascoal, Goretty Dias, Trudi Zundel

Purchase



“What follows is a hypothetical executive summary from an imagined Food and Agriculture Organization (FAO) report on the state of the world’s food systems, written from the perspective of the 2050s”

<https://www.thesolutionsjournal.com/article/pathways-leading-sustainable-healthy-global-food-system/>

Executive Summary: FAO State of World Agriculture in 2050 Draft Report

“[...]this FAO report presents evidence that the international food system of the second half of the 21st century is more sustainable than the food system of the late 20th or early 21st centuries.



[...] today more people are being fed on less land and agriculture is requiring fewer inputs”

Executive Summary: FAO State of World Agriculture in 2050 Draft Report

“[...] despite there being 10 billion people on the planet, today agriculture requires 438 million hectares* less land than it did in 2015, yet produces more adequate nutrition for all.”

*Authors' estimate

This [438 Mha] figure was arrived at by assuming that:

- Agriculture shifts away from over production of cereals, oils, and sugars, but increases fruit and vegetables;
- Agricultural yields increase $\sim 1\%/y$ between now and 2050.
- Protein consumption shifts from 86% animals and 14% plants to 50% animal and 50% plant.

“Please contact the authors for references etc. pertaining to these calculations”



END

Our study:

- Gain in number of hectares: three significant digits (438 millions)?
- Balancing hectares growth and population growth (our computation) results in no change in food per capita at planetary scale.

Our study:

- Neglect of diminishing returns and ecosystem stress (fertilizers, pesticides)
- More adults (higher caloric intake) in 2050 population
- Can one educate citizens globally? The case of tobacco

In conclusion the

“mismatch between what the world needed for everyone to enjoy a nutritious diet and what the world was actually producing”

is the substitution of a political problem with a technical one

Food ethics (2017) 1:173–179
DOI 10.1007/s41055-017-0020-6



DISCUSSION PAPER

Problematic Quantifications: a Critical Appraisal of Scenario Making for a Global ‘Sustainable’ Food Production

Andrea Saltelli^{1,2,3}  • Samuele Lo Piano¹

Accepted: 4 August 2017 / Published online: 15 August 2017
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