



Introductory Remarks

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- Why are stochastic dependencies important?
 - Examples
- Reasons for non-determinism
 - Multiple determination of psychological and social phenomena
 - Measurement errors
 - Situational effects



Contents of Chapter 1

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- Kinds of stochastic dependencies
- Where do regressive dependencies occur?
- Main tasks of regression models
- Remarks on theory of science issues
- Historical remarks
- Regression as a term of theory language
- Contents of “Probability and Regression”
- Prerequisites for understanding the lecture



Kinds of Stochastic Dependencies

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- Dependence of events
- Dependence of random variables
 - Stochastic dependence
 - Regressive dependence
 - Correlative dependence
 - Others
- Goal: Learn to differentiate between these dependencies, and to learn to formulate substantive (psychological and social science hypotheses) in these terms. This is important, because these dependencies mean different things in psychological and social phenomena.



Regressive Dependencies and Where They Occur

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- A *regression* $E(Y | X)$ of a numerical random variable Y on a random variable X is itself a random variable, the values of which are the conditional expected values $E(Y | X = x)$. Note that the regressor X may consist of several random variables, that is $X = (X_1, \dots, X_m)$
- Regressions occur in analyzing group means (t -tests, ANOVA), simple and multiple regression, factor analysis, structural equation models, for instance.



Regressive Dependencies and How They are Presented 5

- Regressions may be presented as
 - regression lines, curves or planes (in multiple regression)
 - bar charts
 - tables with expected values
 - path diagrams
 - equations
- All these presentations say how the expected values $E(Y | X = x)$ of the variable Y depend on the values of X



Main Tasks of Regression Models 6

- They make explicit the relationship between empirical and theoretical concepts, i.e. the *measurement model*
- They formulate the relationship between the empirical and also between the theoretical concepts
- Examples



Remarks on Theory of Science Issues

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- Theories should not contain logical contradictions
- Theories should allow to derive propositions about empirical observations
- The advantages of a formal language
- Regression as a term of theory language



Historical Remarks

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- Galton and others in the 19th century
- Kolmogorov 1933



Contents of This Lecture

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Probability and Regression

- Part I: Elements of Probability Theory
- Part II: Regression Theory
- Part III: Causal Regression

Theories of Psychological Tests

- Classical Test Theory
- Latent State-Trait Theory
- Item Response Theory
- Latent Class Theory



Prerequisites for Understanding the Lecture

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- Basic concepts of logic
- Set theory
- Relations and mappings
- Elementary descriptive and inferential statistics (useful)



Summary

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- Dependencies in the social and behavioral sciences of usually nondeterministic, because of “multiple determination“, “measurement error” and situational specificity
- The concepts of dependencies to be treated in this lecture are not “just methods”. Instead they are abstract contents. They contain different ideas of dependencies that are substantively relevant
- Many of the dependencies of interest the Social and Behavioral Sciences describe in different ways how one variable depends of the values of one or more other variables
- Regression models are used to formulate *measurement models* and *dependency models*
- Regression theory as treated in this lecture is part of the theory language of the Social and Behavioral Sciences