Chapter 7
Risk and Uncertainty on Technology and Science Under Bayes and Popper's Statements View

Vicente Gonzalez-Prida

iD https://orcid.org/0000-0001-5257-8224

University of Seville, Spain & Universidad Nacional de Educación a Distancia, Spain

Jesus Zamora Bonilla

Universidad Nacional de Educación a Distancia, Spain

Christopher Nikulin Chandia

University Federico Santa María, Chile

Antonio Guillén

University of Seville, Spain

ABSTRACT

The overall perspective of this study is related to the concept of risk and uncertainty in the world today. In this sense, it considers Popper's contributions together with the deductive method, contrasted Bayes' contributions with the inductive method. On one hand, induction allows to generate results considered probabilistically true. This is basically the method used by supervised predictive methods of machine learning, where a general rule is inferred from particular examples in which solutions are known, inducing consequently to possible results for new inputs. On the other hand, deduction is a process in which general hypotheses are proposed, and from them, particular statements are obtained. These particular statements can obviously generate the rejection of those initial hypotheses. Under these considerations, Bayes' and Popper's postulates should not be understood as opposed methods. With this, the specific objectives of this chapter states on an overview about technology and its relationship with science, being analyzed from the Popperian and Bayesian perspective.

INTRODUCTION

The scientific method applies a set of methodological rules. These rules or principles can be summarized as the fact of proposing assumptions in order to tests them by experience. The logic allows deducing from the hypothesis a series of results or predictions that shall be confronted with facts or evidences (Rojas et al., 2014). That means, in the scientific method, hypotheses are proposed as plausible solutions to a problem, by confronting the results deduced from the hypothesis with the true experience, the hypothesis may be rejected or not by the facts (Banegas et al., 2000). In this line, the proposed theory will remain true if it resists the attempt to reject it. The concept of contrasting raised by Popper lays therefore in the criticism or attempts of falsification, which is in other words, the review of errors within a theory, in order to reject it in case of being false. Those theories that pass the process of falsification, can be regarded as true (Renovell, 2015).

In few words, from general statements to particular facts, refers to a scientific method that uses deductive arguments (Rosales. 2002). On the contrary, induction goes in the other direction, from particular facts to general statements. . That refers when particular data are used to state hypotheses, reaching a series of overall conclusions. Hence, induction is applied to evaluate if a deductive hypothesis is false or may be true. To be fals can be demonstrated with just one case. On the other hand, the complete verification of general hypotheses or theories would require to explore all the possible situations.

In order to consider if a theory is maintained as true, casualty criteria appear as rules of the method designed to eliminate or reduce the error (random biases) to contrast a specific hypothesis (Popper, 1959). Causal inference, which is the step from particular evidence to a general theory, can be considered therefore as a process of decision-making based on the hypothesis assessment performed by logic rules (causality criteria).

With all these aspects taken into account, the objective of this chapter relies in the logical sequence of considerations addressed towards the description of those aspects provided by Popperian and Bayesian statements, in order to introduce the link between risk and technology and its connection to deductive or inductive analyses, combining when possible philosophical aspects with others much more practical. It is important to reiterate that this chapter provides a conceptual view on the topic related to risk and technology, and does not lead to tools with immediate applications in an industrial environment. In other words, this document discusses different theories associated with diagnostic or prognostic techniques and the basis of the concepts that they convey. In fact, theorists will refresh thoughout the following sections already known concepts which are connected to the concerns of many technology end-users.

BACKGROUND

On Deductive and Inductive Scientific Methods

In accordance to inductive thought, natural science is characterized by a method that starts from long series of observations and experiments, in order to set general behaviors or theories (Popper, 1972). That means inductive method can provide a criterion of demarcation between science and speculation, stablishing or verifying those theories as almost sure or very likely to be sure. In other words, induction is a method of trial and error from a hypothesis raised by scientists in order to explain a problem to resolve (Howson & Urbach, 1991), (Popper, 1972). If evidences obtained are in favor of the hypothesis,

Related Content

Comparative Analysis of Value at Risk(VaR) of MSCI-EMI With Traditional Time Series Methods and ANN

Emre Çevik, Suzan Kantarc Savaand Esin Cumhur Yalçn (2021). *Financial Management and Risk Analysis Strategies for Business Sustainability (pp. 34-57).*

www.irma-international.org/chapter/comparative-analysis-of-value-at-riskvar-of-msci-emi-with-traditional-time-series-methods-and-ann/274720

Event Management and Terrorism in a Global Order: A Preliminary Insight

Maximiliano Emanuel Korstanje (2020). *Legal, Safety, and Environmental Challenges for Event Management: Emerging Research and Opportunities (pp. 103-118).*

www.irma-international.org/chapter/event-management-and-terrorism-in-a-global-order/252722

Behavioral Strategies to Achieve Financial Stability in Uncertain Times

Ashlesha Khedekar-Swaminathan (2019). *Maintaining Financial Stability in Times of Risk and Uncertainty (pp. 177-198).*

www.irma-international.org/chapter/behavioral-strategies-to-achieve-financial-stability-in-uncertain-times/218681

The Rise of Credit Default Swaps and Its Implications on Financial Stability

Fatma Sezer Dural (2018). *Risk and Contingency Management: Breakthroughs in Research and Practice (pp. 336-350).*

www.irma-international.org/chapter/the-rise-of-credit-default-swaps-and-its-implications-on-financial-stability/192383

Estimation of Securities Positioning Efficiency in Commercial Banks

Natalia Frolovaand Evgeniy Frolov (2021). *Recent Applications of Financial Risk Modelling and Portfolio Management (pp. 235-256).*

www.irma-international.org/chapter/estimation-of-securities-positioning-efficiency-in-commercial-banks/260904