Maximum Likelihood Estimation

Theorem 1

$$L(\theta; X) = \prod_{i=1}^{n} f(x_i; \theta), \theta \in \Omega \text{ i.}$$

$$l(\theta) = \log L(\theta) = \sum_{i=1}^{n} \log f(x_i; \theta) \theta \in \Omega$$

Example: Bernoulli

Let $X_1, X_2, X_3, \ldots X_n$ denote a randoms ample from the distribution with pmf

$$p(x) = \begin{cases} \theta^x (1-\theta)^{1-x} & x = 0, 1 \\ 0 & elsewhere \end{cases}$$

where $0 \le \theta \le 1$. The probability that $X_1 = x_1, X_2 = x_2, \ldots X_n = x_n$ is the joint pmf

$$\theta^{x_1}(1-\theta)^{1-x_1} \theta^{x_2}(1-\theta)^{1-x_2} \ldots \theta^{x_n}(1-\theta)^{1-x_n} = \theta^{\sum x_i}(1-\theta)^{n-\sum x_i}$$

Where $x_i = 0 \vee 1 i = , 1, 2, \ldots n$. This probability, which is the joint pmf of

$X_1, X_2, \ldots X_n$ as a function of θ is the likelihood function $L(\theta)$ of obtaining this particular observed sample.

$x_1, x_2, \ldots x_n$. Certainly this maximizing value of θ would seemingly be a good estimate of θ because it would provide the largest probability of this particular sample. Since, the likelihood function of $L(\theta)$ and its logarithm

$$l(\theta) = \log L(\theta) = \left(\sum_{1}^{n} x_i \right) \log \theta + \left(n - \sum_{1}^{n} x_i \right) \log(1-\theta)$$

so, we have

$$\frac{dl(\theta)}{d\theta} = \frac{\sum x_i}{\theta} - \frac{n - \sum x_i}{1-\theta} = 0$$

Provided that θ is not equal to zero or 1. This is equivalent to the equation:

$$(1-\theta) \sum_{1}^{n} x_i = \theta \left(n - \sum_{1}^{n} x_i \right)$$

Chapter 6 Maximum Likelihood Analysis Of Dynamic

Dabao Zhang

Chapter 6 Maximum Likelihood Analysis Of Dynamic:

Dynamic System Identification: Experiment Design and Data Analysis Goodwin,1977-11-10 Dynamic System Identification Experiment Design and Data Analysis   **Handbook of Research Methods and Applications in Empirical Macroeconomics** Nigar Hashimzade,Michael A. Thornton,2013-01-01 This comprehensive Handbook presents the current state of art in the theory and methodology of macroeconomic data analysis It is intended as a reference for graduate students and researchers interested in exploring new methodologies but can also be employed as a graduate text The Handbook concentrates on the most important issues models and techniques for research in macroeconomics and highlights the core methodologies and their empirical application in an accessible manner Each chapter is largely self contained whilst the comprehensive introduction provides an overview of the key statistical concepts and methods All of the chapters include the essential references for each topic and provide a sound guide for further reading Topics covered include unit roots non linearities and structural breaks time aggregation forecasting the Kalman filter generalised method of moments maximum likelihood and Bayesian estimation vector autoregressive dynamic stochastic general equilibrium and dynamic panel models Presenting the most important models and techniques for empirical research this Handbook will appeal to students researchers and academics working in empirical macro and econometrics   **The Roots of Backpropagation** Paul John Werbos,1994-03-31 Now for the first time publication of the landmark work inbackpropagation Scientists engineers statisticians operationsresearchers and other investigators involved in neural networkshave long sought direct access to Paul Werbos s groundbreaking much cited 1974 Harvard doctoral thesis The Roots ofBackpropagation which laid the foundation of backpropagation Now with the publication of its full text these practitioners can gostraight to the original material and gain a deeper practicalunderstanding of this unique mathematical approach to socialstudies and related fields In addition Werbos has provided threemore recent research papers which were inspired by his originalwork and a new guide to the field Originally written for readerswho lacked any knowledge of neural nets The Roots ofBackpropagation firmly establishhed both its historical andcontinuing significance as it Demonstrates the ongoing value and new potential ofbackpropagation Creates a wealth of sound mathematical tools useful acrossdisciplines Sets the stage for the emerging area of fast automaticdifferentiation Describes new designs for forecasting and control which exploitbackpropagation Unifies concepts from Freud Jung biologists and others into anew mathematical picture of the human mind and how it works Certifies the viability of Deutsch s model of nationalism as apredictive tool as well as the utility of extensions of thiscentral paradigm What a delight it was to see Paul Werbos rediscover Freud sversion of back propagation Freud was adamant in The Projectfor a Scientific Psychology that selective learning could onlytake place if the presynaptic neuron was as influenced as is thepostsynaptic neuron during excitation Such activation of bothsides of the contact barrier Freud s name for the synapse wasaccomplished by reducing synaptic resistance by the absorption of energy at the synaptic membranes Not bad for 1895

But Werbos1993 is even better Karl H Pribram Professor Emeritus Stanford University **Economic Modeling and Inference** Bent Jesper Christensen,Nicholas M. Kiefer,2021-07-13 Economic Modeling and Inference takes econometrics to a new level by demonstrating how to combine modern economic theory with the latest statistical inference methods to get the most out of economic data This graduate level textbook draws applications from both microeconomics and macroeconomics paying special attention to financial and labor economics with an emphasis throughout on what observations can tell us about stochastic dynamic models of rational optimizing behavior and equilibrium Bent Jesper Christensen and Nicholas Kiefer show how parameters often thought estimable in applications are not identified even in simple dynamic programming models and they investigate the roles of extensions including measurement error imperfect control and random utility shocks for inference When all implications of optimization and equilibrium are imposed in the empirical procedures the resulting estimation problems are often nonstandard with the estimators exhibiting nonregular asymptotic behavior such as short ranked covariance superconsistency and non Gaussianity Christensen and Kiefer explore these properties in detail covering areas including job search models of the labor market asset pricing option pricing marketing and retirement planning Ideal for researchers and practitioners as well as students Economic Modeling and Inference uses real world data to illustrate how to derive the best results using a combination of theory and cutting edge econometric techniques Covers identification and estimation of dynamic programming models Treats sources of error measurement error random utility and imperfect control Features financial applications including asset pricing option pricing and optimal hedging Describes labor applications including job search equilibrium search and retirement Illustrates the wide applicability of the approach using micro macro and marketing examples *Digital Control of Dynamic Systems* Gene F. Franklin,J. David Powell,1980 This well respected work discusses the use of digital computers in the real time control of dynamic systems The emphasis is on the design of digital controls that achieve good dynamic response and small errors while using signals that are sampled in time and quantized in amplitude Both classical and modern control methods are described and applied to illustrative examples The strengths and limitations of each method are explored to help the reader develop satisfactory designs with the least effort Two new chapters have been added to the third edition offering a review of feedback control systems and an overview of digital control systems MATLAB statements and problems have been more thoroughly and carefully integrated throughout the book to offer readers a more complete design picture The new edition contains up to date material on state space design and twice as many end of chapter problems Copyright Libri GmbH All rights reserved Econometrics: Alchemy Or Science? David F. Hendry,2000-10-26 Econometrics Alchemy or Science analyses the effectiveness and validity of applying econometric methods to economic time series The methodological dispute is long standing and no claim can be made for a single valid method but recent results on the theory and practice of model selection bid fair to resolve many of the contentious issues The book presents criticisms and evaluations of competing approaches based on theoretical economic and

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