

SHORT COMMUNICATIONS

ABSOLUTE CONTINUITY OF MEASURES CORRESPONDING TO MARKOV
PROCESSES WITH DISCRETE TIME

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(Translated by K. Durr)

We shall consider probability measures on a space $X = X_1 \times X_2 \times \dots$ (the space of trajectories of a random process), where $X_i = (Y, \mathfrak{A})$ is a measurable space (the space of states) on the σ -algebra generated by the cylindrical sets

$$A_1 \times A_2 \times \dots \times A_n \times X_{n+1} \times \dots, \quad A_i \subset X_i, \quad A_i \in \mathfrak{A}, \quad i = 1, \dots, n.$$

In the case when two measures μ and $\tilde{\mu}$ are products of measures

$$\mu = \prod_{i=1}^{\infty} \mu_i, \quad \tilde{\mu} = \prod_{i=1}^{\infty} \tilde{\mu}_i,$$

and the μ_i and $\tilde{\mu}_i$ are mutually absolutely continuous ($\mu_i \sim \tilde{\mu}_i$), the question of the equivalence of μ and $\tilde{\mu}$ is completely resolved by a theorem of Kakutani [1]. This theorem gives a criterion from which it results that two such measures are either equivalent or singular. A. M. Vershik proposed that one consider the wider class of Markov measures in which such a dichotomy exists.

1. Let us note several general facts on absolute continuity. Let μ and $\tilde{\mu}$ be measures on X . If $\tilde{\mu}$ is absolutely continuous with respect to μ ($\tilde{\mu} < \mu$), then their projections $\tilde{\mu}_n$ and μ_n onto $X_1 \times \dots \times X_n$ stand in the same relationship. Below we shall always assume that $\tilde{\mu}_n < \mu_n$.

Let

$$\rho_n(x) = \frac{d\tilde{\mu}_n}{d\mu_n}(x_1, \dots, x_n), \quad x = (x_1, x_2, \dots) \in X.$$

The sequence $\{\rho_n\}$ is a martingale and thus converges to some function ρ_∞ μ -a.e. (by a theorem of Doob, [2], p. 319).

Theorem 1. The absolute continuity of $\tilde{\mu}$ with respect to μ is equivalent to each of the following conditions:

- the functions ρ_n are uniformly integrable with respect to μ ;
- $\rho_n \rightarrow \rho_\infty$ in $L^1(X, \mu)$;
- $\int_X \rho_\infty d\mu = 1$;
- $\rho_n \rightarrow \rho_\infty$ weakly in $L^1(X, \mu)$;
- $\rho_n^{1/q} \rightarrow \rho_\infty^{1/q}$ in $L^q(X, \mu)$, $q > 1$;
- $\lim_{q \rightarrow 1+0} \lim_n \int_X \rho_n^{1/q} d\mu = 1$.¹

PROOF. Assertions a–d follow from the cited theorem of Doob. Note that the sequence

$$f_n = |\rho_n^{1/q} - \rho_\infty^{1/q}|^q$$

¹ This condition is due to A. M. Vershik. Its proof was given in one of a series of lectures on the theory of measure on linear spaces given at Leningrad State University during the academic year 1967–68.

Absolute Continuity Of Measures In The Class Of Markov And

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Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability Lucien Marie Le Cam, Jerzy Neyman, 1967 **From Stochastic Calculus to Mathematical Finance** Yu. Kabanov, R. Liptser, J. Stoyanov, 2007-04-03 Dedicated to the Russian mathematician Albert Shiryaev on his 70th birthday this is a collection of papers written by his former students co authors and colleagues The book represents the modern state of art of a quickly maturing theory and will be an essential source and reading for researchers in this area Diversity of topics and comprehensive style of the papers make the book attractive for PhD students and young researchers Point Process Theory and Applications Martin Jacobsen, 2006-07-27 The book aims at presenting a detailed and mathematically rigorous exposition of the theory and applications of a class of point processes and piecewise deterministic processes The framework is sufficiently general to unify the treatment of several classes of stochastic phenomena point processes Markov chains and other Markov processes in continuous time semi Markov processes queueing and storage models and likelihood processes There are applications to finance insurance and risk population models survival analysis and congestion models A major aim has been to show the versatility of piecewise deterministic Markov processes for applications and to show how they may also become useful in areas where thus far they have not been much in evidence Originally the plan was to develop a graduate text on marked point processes indexed by time which would focus on probabilistic structure and be essentially self contained However it soon became apparent that the discussion should naturally include a traditional class of continuous time stochastic processes constructed from certain marked point processes This class consists of piecewise deterministic processes that is processes with finitely many jumps on finite time intervals which roughly speaking develop deterministically between the random jump times The position starts with the point process theory and then uses this to treat the piecewise deterministic processes **Mathematical Reviews** , 2005-06 *Mathematical and Statistical Models and Methods in Reliability* V.V. Rykov, N. Balakrishnan, M.S. Nikulin, 2010-11-02 The book is a selection of invited chapters all of which deal with various aspects of mathematical and statistical models and methods in reliability Written by renowned experts in the field of reliability the contributions cover a wide range of applications reflecting recent developments in areas such as survival analysis aging lifetime data analysis artificial intelligence medicine carcinogenesis studies nuclear power financial modeling aircraft engineering quality control and transportation Mathematical and Statistical Models and Methods in Reliability is an excellent reference text for researchers and practitioners in applied probability and statistics industrial statistics engineering medicine finance transportation the oil and gas industry and artificial intelligence Dirichlet Forms and Related Topics Zhen-Qing Chen, Masayoshi Takeda, Toshihiro Uemura, 2022-09-04 This conference proceeding contains 27 peer reviewed invited papers from leading experts as well as young researchers all over the world in the related fields that Professor Fukushima has made important contributions to These 27 papers cover a wide range of topics in probability theory ranging

from Dirichlet form theory Markov processes heat kernel estimates entropy on Wiener spaces analysis on fractal spaces random spanning tree and Poissonian loop ensemble random Riemannian geometry SLE space time partial differential equations of higher order infinite particle systems Dyson model functional inequalities branching process to machine learning and Hermitizable problems for complex matrices Researchers and graduate students interested in these areas will find this book appealing

Proceedings of the Berkeley Symposium on Mathematical Statistics and Probability Jerzy Neyman,1967

Proceedings of the American Mathematical Society American Mathematical Society,1975
Contains the material formerly published in even numbered issues of the Bulletin of the American Mathematical Society

Stochastic Analysis and Related Topics J.E. Lindstrom,1993-12-08 First published in 1993 Routledge is an imprint of Taylor Francis an informa company

Continuous Measures and Strange Attractors in One Dimension Stewart Dorin Johnson,1985

Probability Theory Subject Indexes from Mathematical Reviews American Mathematical Society,1987

Invariant and Quasiinvariant Measures in Infinite-dimensional Topological Vector Spaces Gogi Pantsulaia,2007 This monograph deals with certain aspects of the general theory of systems The author develops the ergodic theory which is the theory of quaslinvariant and invariant measures in such infinite dimensional vector spaces which appear as models of various physical economic genetic linguistic social etc processes The methods of ergodic theory are successful as applied to study properties of such systems A foundation for ergodic theory was stimulated by the necessity of a consideration of statistic mechanic problems and was directly connected with the works of G Birkhoff Kryloff and Bogoliuboff E Hoph and other famous mathematicians

The Annals of Mathematical Statistics ,1971

Mathematics of the USSR. ,1967

Cumulative Index to IMS Scientific Journals, 1960-1989 Bruce E. Trumbo,Richard K. Burdick,1990

Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability: pts. 1-2. Contributions to probability theory Lucien Marie Le Cam,Jerzy Neyman,1967

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Current Index to Statistics, Applications, Methods and Theory ,1987 The Current Index to Statistics CIS is a bibliographic index of publications in statistics probability and related fields

Israel Journal of Mathematics Mo'atsah ha-le'umit le-mehkar ule-fituah (Israel),2005

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Table of Contents Absolute Continuity Of Measures In The Class Of Markov And

1. Understanding the eBook Absolute Continuity Of Measures In The Class Of Markov And
 - The Rise of Digital Reading Absolute Continuity Of Measures In The Class Of Markov And
 - Advantages of eBooks Over Traditional Books
2. Identifying Absolute Continuity Of Measures In The Class Of Markov And
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Absolute Continuity Of Measures In The Class Of Markov And
 - User-Friendly Interface
4. Exploring eBook Recommendations from Absolute Continuity Of Measures In The Class Of Markov And
 - Personalized Recommendations
 - Absolute Continuity Of Measures In The Class Of Markov And User Reviews and Ratings
 - Absolute Continuity Of Measures In The Class Of Markov And and Bestseller Lists
5. Accessing Absolute Continuity Of Measures In The Class Of Markov And Free and Paid eBooks
 - Absolute Continuity Of Measures In The Class Of Markov And Public Domain eBooks
 - Absolute Continuity Of Measures In The Class Of Markov And eBook Subscription Services

- Absolute Continuity Of Measures In The Class Of Markov And Budget-Friendly Options
- 6. Navigating Absolute Continuity Of Measures In The Class Of Markov And eBook Formats
 - ePub, PDF, MOBI, and More
 - Absolute Continuity Of Measures In The Class Of Markov And Compatibility with Devices
 - Absolute Continuity Of Measures In The Class Of Markov And Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Absolute Continuity Of Measures In The Class Of Markov And
 - Highlighting and Note-Taking Absolute Continuity Of Measures In The Class Of Markov And
 - Interactive Elements Absolute Continuity Of Measures In The Class Of Markov And
- 8. Staying Engaged with Absolute Continuity Of Measures In The Class Of Markov And
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Absolute Continuity Of Measures In The Class Of Markov And
- 9. Balancing eBooks and Physical Books Absolute Continuity Of Measures In The Class Of Markov And
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Absolute Continuity Of Measures In The Class Of Markov And
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Absolute Continuity Of Measures In The Class Of Markov And
 - Setting Reading Goals Absolute Continuity Of Measures In The Class Of Markov And
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Absolute Continuity Of Measures In The Class Of Markov And
 - Fact-Checking eBook Content of Absolute Continuity Of Measures In The Class Of Markov And
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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