

Theory of Probability and Mathematical Statistics

Number 99 2019

A Translation of

ТЕОРІЯ
ЙМОВІРНОСТЕЙ ТА
МАТЕМАТИЧНА
СТАТИСТИКА

ВИПУСК 99 2018



AMERICAN
MATHEMATICAL
SOCIETY

Providence, Rhode Island USA

THEORY OF PROBABILITY AND MATHEMATICAL STATISTICS

A translation of

ТЕОРІЯ ЙМОВІРНОСТЕЙ ТА МАТЕМАТИЧНА СТАТИСТИКА

Originally published in Ukrainian by Taras Shevchenko National University of Kyiv.

© Taras Shevchenko National University of Kyiv, 2018

Editorial Board

V. S. Korolyuk (Editor-in-Chief)

Yu. V. Kozachenko (Deputy Editor-in-Chief)

Yu. S. Mishura (Deputy Editor-in-Chief)

L. M. Sakhno (Executive Secretary)

V. V. Anisimov

T. Bodnar

M. Dozzi

A. A. Gushchin

A. V. Ivanov

M. V. Kartashov

A. G. Kukush

M. M. Leonenko

I. K. Matsak

M. P. Moklyachuk

I. Molchanov

A. A. Novikov

A. Ya. Olenko

E. Orsingher

M. I. Portenko

G. M. Shevchenko

D. S. Sil'vestrov

A. Y. Veretennikov

O. K. Zakusylo

SUBMISSION INFORMATION. All submissions to the journal should be sent to journal.tims@gmail.com. For more information see <http://probability.univ.kiev.ua/tims/>.

SUBSCRIPTION INFORMATION. The 2019 subscription is for Numbers 98 and 99. Beginning in 2004, *Theory of Probability and Mathematical Statistics* is accessible from www.ams.org/journals/.

Subscription prices for 2019 are as follows:

Paper format with free electronic access: List: US\$1017.00; Institutional member: US\$813.60;

Electronic only: List: US\$966; Institutional member: US\$772.80. Upon request, subscribers to paper delivery of this journal are also entitled to receive electronic delivery. Subscription renewals are subject to late fees. See www.ams.org/journal-faq for more journal subscription information.

BACK NUMBER INFORMATION. For back issues see www.ams.org/backvols.

Subscriptions and orders should be addressed to American Mathematical Society, P.O. Box 845904, Boston, MA 02284-5904, USA. *All orders must be accompanied by payment.* Other correspondence should be addressed to 201 Charles Street, Providence, RI 02904-2213, USA.

COPYING AND REPRINTING. Individual readers of this publication, and nonprofit libraries acting for them, are permitted to make fair use of the material, such as to copy an article for use in teaching or research. Permission is granted to quote brief passages from this publication in reviews, provided the customary acknowledgment of the source is given.

Republication, systematic copying, or multiple reproduction of any material in this publication is permitted only under license from the American Mathematical Society. Requests for permission to reuse portions of AMS publication content are handled by the Copyright Clearance Center. For more information, please visit www.ams.org/publications/pubpermissions.

Excluded from these provisions is material in articles for which the author holds copyright. In such cases, requests for permission to use or reprint should be addressed directly to the author(s). (Copyright ownership is indicated in the notice in the lower right-hand corner of the first page of each article.)

Theory of Probability and Mathematical Statistics (ISSN 0094-9000) is published by the American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213, USA and is mailed from Providence, Rhode Island. Postmaster: Send address changes to Theory of Probability and Mathematical Statistics, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213, USA.

© 2019, American Mathematical Society. All rights reserved.

This journal is abstracted/indexed in SCOPUS[®], Web of Science Core Collection (original version), *Zentralblatt Math*, *Mathematical Reviews*, Statistical Methods and Applications, and Google Scholar.

This journal is archived in *Portico* and in *CLOCKSS*.

Printed in the United States of America.

⊗ The paper used in this journal is acid-free and falls within the guidelines established to ensure permanence and durability.

10 9 8 7 6 5 4 3 2 1 24 23 22 21 20 19

Theory of Probability and Mathematical Statistics

Number 99 2019

A Translation of

ТЕОРІЯ
ЙМОВІРНОСТЕЙ ТА
МАТЕМАТИЧНА
СТАТИСТИКА

ВИПУСК 99 2018



AMERICAN
MATHEMATICAL
SOCIETY

Providence, Rhode Island USA

THEORY OF PROBABILITY AND MATHEMATICAL STATISTICS

A translation of

ТЕОРІЯ ЙМОВІРНОСТЕЙ ТА МАТЕМАТИЧНА СТАТИСТИКА

Originally published in Ukrainian by Taras Shevchenko National University of Kyiv.

© Taras Shevchenko National University of Kyiv, 2018

Editorial Board

V. S. Korolyuk (Editor-in-Chief)

Yu. V. Kozachenko (Deputy Editor-in-Chief)

Yu. S. Mishura (Deputy Editor-in-Chief)

L. M. Sakhno (Executive Secretary)

V. V. Anisimov

T. Bodnar

M. Dozzi

A. A. Gushchin

A. V. Ivanov

M. V. Kartashov

A. G. Kukush

M. M. Leonenko

I. K. Matsak

M. P. Moklyachuk

I. Molchanov

A. A. Novikov

A. Ya. Olenko

E. Orsingher

M. I. Portenko

G. M. Shevchenko

D. S. Sil'vestrov

A. Y. Veretennikov

O. K. Zakusylo

SUBMISSION INFORMATION. All submissions to the journal should be sent to journal.tims@gmail.com. For more information see <http://probability.univ.kiev.ua/tims/>.

SUBSCRIPTION INFORMATION. The 2019 subscription is for Numbers 98 and 99. Beginning in 2004, *Theory of Probability and Mathematical Statistics* is accessible from www.ams.org/journals/.

Subscription prices for 2019 are as follows:

Paper format with free electronic access: List: US\$1017.00; Institutional member: US\$813.60;

Electronic only: List: US\$966; Institutional member: US\$772.80. Upon request, subscribers to paper delivery of this journal are also entitled to receive electronic delivery. Subscription renewals are subject to late fees. See www.ams.org/journal-faq for more journal subscription information.

BACK NUMBER INFORMATION. For back issues see www.ams.org/backvols.

Subscriptions and orders should be addressed to American Mathematical Society, P.O. Box 845904, Boston, MA 02284-5904, USA. *All orders must be accompanied by payment.* Other correspondence should be addressed to 201 Charles Street, Providence, RI 02904-2213, USA.

COPYING AND REPRINTING. Individual readers of this publication, and nonprofit libraries acting for them, are permitted to make fair use of the material, such as to copy an article for use in teaching or research. Permission is granted to quote brief passages from this publication in reviews, provided the customary acknowledgment of the source is given.

Republication, systematic copying, or multiple reproduction of any material in this publication is permitted only under license from the American Mathematical Society. Requests for permission to reuse portions of AMS publication content are handled by the Copyright Clearance Center. For more information, please visit www.ams.org/publications/pubpermissions.

Excluded from these provisions is material in articles for which the author holds copyright. In such cases, requests for permission to use or reprint should be addressed directly to the author(s). (Copyright ownership is indicated in the notice in the lower right-hand corner of the first page of each article.)

Theory of Probability and Mathematical Statistics (ISSN 0094-9000) is published by the American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213, USA and is mailed from Providence, Rhode Island. Postmaster: Send address changes to Theory of Probability and Mathematical Statistics, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2213, USA.

© 2019, American Mathematical Society. All rights reserved.

This journal is abstracted/indexed in SCOPUS[®], Web of Science Core Collection (original version), *Zentralblatt Math*, *Mathematical Reviews*, Statistical Methods and Applications, and Google Scholar.

This journal is archived in *Portico* and in *CLOCKSS*.

Printed in the United States of America.

⊗ The paper used in this journal is acid-free and falls within the guidelines established to ensure permanence and durability.

10 9 8 7 6 5 4 3 2 1 24 23 22 21 20 19

CONTENTS

Editorial	1
G. Alfelt, Stein–Haff identity for the exponential family	5
I. Arab and P. E. Oliveira, Asymptotic results for certain weak dependent variables	19
T. Bodnar, S. Mazur, S. Muhinyuza, and N. Parolya, On the product of a singular Wishart matrix and a singular Gaussian vector in high dimension .	39
S. V. Bodnarchuk and O. M. Kulyk, Modified Euler scheme for the weak approximation of stochastic differential equations driven by the Wiener process	53
O. D. Borysenko and D. O. Borysenko, Persistence and extinction in a stochastic nonautonomous logistic model of population dynamics	67
D. V. Gusak and E. V. Karnaukh, On the lack of memory for distributions of overshoot functionals in the case of upper almost semicontinuous processes defined on a Markov chain	77
A. V. Ivanov and I. K. Matsak, Minimax estimators of parameters of a regression model	91
M. M. Kapustei and P. V. Slyusarchuk, Estimation of the rate of convergence in the central limit theorem for a sequence of series in terms of averaged pseudomoments	101
Yu. V. Kozachenko and I. V. Rozora, Construction of the Karhunen–Loève model for an input Gaussian process in a linear system by using the output process	113
A. G. Kukush and O. O. Chernova, Goodness-of-fit test in the Cox proportional hazards model with measurement errors	125
N. N. Leonenko, I. Papić, A. Sikorskii, and N. Šuvak, Ehrenfest–Brillouin-type correlated continuous time random walk and fractional Jacobi diffusion	137
S. S. Lohvinenko and K. V. Ralchenko, Asymptotic distribution of the maximum likelihood estimator in the fractional Vašíček model	149
R. E. Maiboroda, G. V. Navara, and O. V. Sugakova, Orthogonal regression method for observations from a mixture	169
N. O. Malykh and I. S. Postevoy, Calculation of the convexity adjustment to the forward rate in the Vasicek model for the forward in-arrears contracts on LIBOR rate	189
Yu. S. Mishura and H. S. Zhelezniak, Evaluation of extreme values of entropy functionals	199
M. V. Pratsiovytyi and S. P. Ratushniak, Properties and distributions of values of fractal functions related to Q_2 -representations of real numbers ...	211
V. M. Radchenko and N. O. Stefans’ka, Approximation of solutions of the wave equation driven by a stochastic measure	229

UKRAINIAN CONTENTS*

Від редколегії	5
<i>Г. Алфелт</i> Тотожність Стейна – Гаффа для експоненційної сім’ї	7
<i>І. Араб, П. Е. Олівейра</i> Асимптотичні результати для деяких слабо залежних величин	19
<i>Т. Боднар, С. Мазур, С. Мухітоза, Н. Пароля</i> Добуток сингулярної випадкової матриці Вішарта та сингулярного нормального випадкового вектора у великих розмірностях	37
<i>С. В. Боднарчук, О. М. Кулик</i> Модифікований метод Ейлера для слабкої апроксимації стохастичних диференціальних рівнянь, керованих процесом Вінера	51
<i>О. Д. Борисенко, Д. О. Борисенко</i> Вживання і вимірювання у стохастичній неавтономній логістичній моделі популяційної динаміки	63
<i>Д. В. Гусак, Є. В. Карнаух</i> Про особливість розподілів перестрибкових функціоналів майже напівнеперервних зверху процесів на ланцюгу Маркова	71
<i>О. В. Іванов, І. К. Мацак</i> Про мінімаксні оцінки параметрів моделі регресії	83
<i>М. М. Капустей, П. В. Смосарчук</i> Оцінка швидкості збіжності в центральній граничній теоремі для послідовності серій у термінах середніх псевдомоментів	91
<i>Ю. В. Козаченко, І. В. Розора</i> Побудова моделі Карунена – Лоева для вхідного гауссового процесу, що подається на лінійну систему, з урахуванням виходу	101
<i>О. Г. Кукуш, О. О. Чернова</i> Критерій згоди в моделі Кокса із пропорційними ризиками та похибками вимірювання	113
<i>М. М. Леоненко, І. Папіч, А. Сікорська, Н. Шувак</i> Корельоване випадкове блукання з неперервним часом типу Ернфеста – Бріллюена та дробова дифузія Якобі	123
<i>С. С. Логвіненко, К. В. Ральченко</i> Асимптотичний розподіл оцінок максимальної вірогідності у дробовій моделі Васічека	134

*The American Mathematical Society scheme for transliteration of Cyrillic may be found at the end of index issues of *Mathematical Reviews*.

<i>Р. Є. Майборода, Г. В. Навара, О. В. Сугакова</i>	
Метод ортогональної регресії для спостережень із суміші	152
<i>М. О. Малих, І. С. Постевой</i>	
Розрахунок поправки до форвардної ставки в моделі Васічека для форвардних in-arrears контрактів на відсоткову ставку LIBOR	168
<i>Ю. С. Мішура, Г. С. Железняк</i>	
Відшукування екстремумів ентропійних функціоналів	177
<i>М. В. Працьовитий, С. П. Ратушняк</i>	
Властивості та розподіли значень фрактальних функцій, пов'язаних із Q_2 -зображенням дійсних чисел	187
<i>В. М. Радченко, Н. О. Стефанська</i>	
Наближення розв'язків хвильового рівняння, керованого стохастичною мірою	203



0094-9000(2019)99;1-7