CURRICULUM VITA

Vladimir I. Rotar

Education

1959-1967. Moscow Physical-Technical Institute, Diploma (equivalent to M.S.) in Applied Mathematics.
1967-1970. Moscow Physical-Technical Institute, Ph.D. in Mathematics, Probability Theory.
1978. St.Petersburg (Leningrad) State University, Doctor of Physical-Mathematical Sciences, Probability Theory.

Research Experience

1970-present. The Central Economics and Mathematics Institute of Russian Academy of Sciences:
Junior Scholar (since 1970), Senior Scholar (since 1975),
Leading Scholar (since 1985),
Director of the Unit for Risk Theory (1991-2008).
Principal Scholar (since 2008)

1994, 1996, 1997-present. Visiting professor, University of California at San Diego.
1998-present. A long-term contract, San Diego State University.

Teaching Experience

A) *1981-1995.* Professor, Department of Applied Mathematics, Moscow University MIEM.

1993, 1995-1997. Professor, The New Economic School, Moscow.
1996-1997. Professor, The High Economic School, Moscow.

B)

September 1992-March 1993.	University of California at Irvine, Visiting professor.
1995.	Penn State University, Visiting professor.
1994, 1996, 1997-present.	University of California at San Diego, Visiting professor.
1998-present.	San Diego State University, a long-term contract.

Awards, Grants

The official Professor title given by the USSR Ministry of Education, 1986.
A special stipend of the President of Russia for outstanding scientists, 1994-1997.
A grant of the International Science Foundation, 1994-1995.
Grants of the Russian Foundation for Basic Research, 1996-1997, 1998-1999.
Grants of the Russian Foundation for Humanitarian Research, 1996-1997, 1998-1999.
Grants of the National Science Foundation (NSF – USA) (co-holder), 1996-1998, 1998-2000.

Professional Affiliations

American Mathematical Society.
American Statistical Society, San Diego Chapter.
International Bernoulli Society.
Independent Union of Scientists, Russia, Organizing Committee, 1989; the Board of directors, 1989-1992.
Nomination Council for Ph.D. and Doctoral Dissertations on Mathematical Economics and Cybernetics, Moscow.

Theoretical Research *(See also the Publications List and the Research Summary).*

Four books and more than 100 papers, most in leading journals, concerning Probability Theory, Statistics, Stochastic Optimization, Decision Theory, Mathematical Economics, Operation Research, Mathematical Modeling in Economics (in particular, in Insurance, Finance, Random Economies).

Applied Research *(See also the Publications List and the Research Summary).*

	Where and When:
Net-Work Models.	The Central Economics and Mathematics Institute, Russian Academy of Sciences (CEMI), 1971-1975
Input-Output Models of Random Economies.	CEMI, 1975-1984
Insurance and Reinsurance Models, and a Software for Calculations of Premiums and Retention Coefficients.	CEMI, and a number of Russian Insurance companies, 1982-1996
Risk Evaluation Models.	CEMI, 1975-1998
Statistical Modeling in Biology: analysis and modeling in the search of a "good" chemical, the enlarging-of-the target approach.	The company IXSYS, 1997-1998
Financial Models: research, consulting, teaching.	CEMI, the Gasprom Bank, New Economic School; 1990-1997

Ph.D. Dissertations Supervision

The supervision of five Ph.D. dissertations and a great number of master theses in Probability Theory, Statistics, and their applications.

Courses taught

Various courses at different levels of Calculus and Linear Algebra.
Mathematical Analysis. Functional Analysis.
Probability Theory. Stochastic Processes.
Mathematical Statistics. Applied Statistics.
Statistical Decision Theory.
Probability models. Queuing Theory.
Game Theory.
Optimization Theory.
Mathematical Economics. Models of Economic and Social Behavior.
Financial Mathematics. Risk Management.
Actuarial Modeling. The Mathematical Theory of Insurance.
The General Theory of Risk. Risk Assessment.

Vladimir I. Rotar. **Publications**

* = *written in or translated into English.*

Theory Probabl. Appl. = "The Theory of Probability and its Applications"

Math.Notes = "Mathematical Notes"

Transac.Acad.Sci. = "Transactions of USSR Academy of Sciences"

Books.

1. The uncertainty factor and control of economic systems (with N.Y.Petrakov), 191pp, Moscow, Nauka, 1985.

2. *"Probability Theory",the first edition,Moscow, "Vischaya Shkola (High School)", 367pp, 1992.

3. *"Probability Theory", the second English edition essentially revamped, World Scientific Publishing, 412pp, 1998.

4. *"Actuarial Models: The Mathematics of Insurance", Chapman&Hall–CRC, 650pp, 2006.

Texts.

5. Probability in Discrete Schemes, University MIEM, Moscow, 1986.

6. Distributions of Random Variables and Vectors; University MIEM, Moscow, 1988.

7. Conditional Distributions. Limit theorems; University MIEM, Moscow, 1990.

Recent Papers.

8. * On Optimal Investment in the Long Run, in "Recent Advances in Infinite Horizon Optimal Control", Journal of Nonlinear and Convex Analysis , to appear in 2009.

9. * On asymptotic proximity of distributions (with Yu.Davydov), Journal of Theoretical Probability, Volume 22, Issue 1 (2009).

10. *On a non-classical invariance principle (with Yu.Davydov), Statistics and Probability Letters, v.78, #14, 2008.

11. * On Edgeworth Expansions for Dependency-Neighborhoods Chain Structures with strong mixing characteristics. Theory Probabl. Appl. , LII (2008), 1, 108-124.

12. * Stein's Method, Edgeworth's Expansions, and a Formula of Barbour, in: Stein's Method and applications, eds. A.D.Barbour, L.H.Y.Chen, World Scientific, 2005.

13. * On Optimality in Probability and Almost Surely for Processes with a Communication Property. I. The discrete time case. (with T.Belkina); Theory Probabl. Appl., 2005, #1.

14. * On Optimality in Probability and Almost Surely for Processes with a Communication Property. II. The continuous time case. (with T.Belkina); Theory Probabl. Appl., 2005, #2.

15. * Some remarks on lower bounds of Chebyshev's type for half-lines (with F.D.Lesley), Journal of Inequalities in Pure and Applied Mathematics, Volume 4, Issue 5, 2003

16. * On a dyadic parametrization of curves (with J.M. Anderson and F.D. Lesley); Computational Methods and Function Theory, 2003.

17. * On Edgeworth Expansions for Dependency-Neighborhoods-Chain Structures and Stein's Method (with Y.Rinott); Probab. Theory. Related Fields, (2003), 528-570.

Other Papers.

Probability Theory:

Random Walks:

18. * On moments of the value and the time of the first jump over a curvilinear bound; Theory Probabl. Appl., 1967,4.

19. * On moments of the value and the time of the first jump over curvilinear bound; Theory Probabl. Appl., 1968, v. XII,3.

20. On the time of the intersection of a curvilinear bound, I (with M.U. Gafurov); Transac. Uzbec. Acad. Sci., 1981, 1.

21. On the time of the intersection of a curvilinear bound, II (with M.U. Gafurov); Transac. Uzbec. Acad. Sci., 1981, 2.

22. * On intersections of a curvilinear bound by a random walk (with M.U. Gafurov); Theory Probabl. Appl., 1983, 4.

Nonclassical Limit Theorems:

23. * On a generalization of the Lyapunov estimate (with S.V.Nagaev); Transac. Acad.Sci., 1971, v.199, 2.

24. * A bound of the rate of the convergence in the CLT with pseudo moments (with S.V.Nagaev); Theory Probabl. Appl., 1972 v. XVII,2

25. * On an improvement of the Lyapunov estimate (the case of the proximity of summands distributions to normal ones) (with S.V.Nagaev); Theory Probabl. Appl., 1973, v.XVIII, 1.

26. * On a generalization of the Lindeberg-Feller theorem; Math.Notes, 1975, 1.

27. * Some remarks on summation of independent random variables in the nonclassical case; Theory Probabl. Appl., 1976, v. XXI, 1.

28. On non-uniform analogues of Esseen's inequality (with N.Gamkrelidze); Transac. Georgian Acad. Sci., 1978, v.90, 1.

29. * On nonclassical estimates of approximation in the central limit theorem; Math.Notes, 1978, 1.

30. * On summation of independent variables in the nonclassical situation; Russian Mathematical Surveys, 1982, 6.

31. * Conditions for proximity of two convolutions and a nonclassical limit theorem; Transac.Acad.Sci., 1983, 268.

32. * Necessary and sufficient conditions for proximity of convolutions (with A.Sholomitsky); Proceedings of the Sixth USSR-Japan Symposium on Probability Theory and Mathematical Statistics, World Scientific Publishing, 1992.

33. * On proximity of convolutions (with A.Sholomitsky); Theory Probabl. Appl., 1992, 2.

Multidimensional Limit Theorems:

34. * On the rate of convergence in the multidimensional central limit theorem; Theory Probabl. Appl., 1970, 2.

35. * A non-uniform bound for the rate of convergence in the multidimensional central limit theorem; Theory Probabl. Appl., 1970, 4.

36. On the rate of convergence in the multidimensional central limit theorem; Ph.D Dissertation, 1970

37. On the rate of convergence in the multidimensional central limit theorem; Thesis of Ph.D. Dissertation, 1970

38. * Nonclassical estimates of the rate of the convergence in the multidimensional central limit theorem - I; Theory Probab. Appl., 1977.

39. * Nonclassical estimates of the rate of the convergence in the multidimensional central limit theorem - II; Theory Probab. Appl., 1978, 1.

40. * On the infinity-dimensional central limit theorem (with L.V.Osipov); Theory Probabl. Appl., 1984, 2.

41. * An estimate of the rate of convergence in the infinite-dimensional central limit theorem for the probabilities of hitting parallelepipeds (with A.V.Asriev); Trans. Acad.Sci., 1984, 279.

42. * On the rate of convergence in the infinite-dimensional central limit theorem for the probabilities of parallelepipeds (with A.V.Asriev); Theory Probab. Appl , 1989, 4.

43. * A lemma on "corrected" distributions (with L.V.Kiryanova); Theory Probabl. Appl., 1986.

Limit Theorems for Nonlinear Functions:

44. * Some limit theorems for second degree polynomials; Theory Probabl. Appl., 1970, 3.

45. * Limit theorems for polylinear forms and quasi-polynomial functions; Theory Probabl. Appl., 1975, 3.

46. * On distributions of quadratic forms of many random variables; Theory Probabl. Appl., 1975, v.XX, 4.

47. * On the rate of the convergence in the limit theorem for quadratic forms (with N.G.Gamkrelidze); Theory Probabl. Appl., 1977, 2.

48. Limit Theorems for linear and polylinear forms; Doctor of Sciences Dissertation, 1978.

49. Limit Theorems for linear and polylinear forms; Thesis of the Doctor of Sciences Dissertation, 1978.

50. * Limit theorems for polylinear forms (in English); Journal of Multivariate analysis, 1979, 4.

51. Limit theorems for nonlinear functions of random variables; in the monograph "Mathematical methods and economic models", Moscow, Nauka, 1983.

52. * An estimate for the distributions of quadratic forms (with T.L. Shervashidze); Theory Probabl. Appl., 1985, 3.

53. * On the law of large numbers for non-linear functions (with E.Presman); Theory Probab.. Appl., 1996.

Limit Theorems for Dependent Summands:

54. * On the convergence in the CLT for martingales (with L.V.Kiryanova); Theory Probabl. Appl., 1991, 2.

55. * On the rate of the convergence in the CLT for martingales (with L.V. Kiryanova); Transac.Acad.Sci. 1990.

56. * Some remarks on summation of dependent variables (with L.V. Kiryanova); Math.Notes, 1987.

57. * A multivariate CLT for local dependence, and applications to multivariate graph related statistics (with Y.Rinott); Journal of Multivariate Analysis, 1996, 2.

58. * On coupling constructions and rates in the CLT for dependent summands with applications to the anti-voter model and weighted U-statistics (with Y.Rinott); Annals of Applied Probability, 1997.

59. * Some bounds on the rate of convergence in the CLT for martingales - I (with Y. Rinott); Theory Probabl. Appl., 1998, #4.

60. * Some bounds on the rate of convergence in the CLT for martingales - II (with Y. Rinott); Theory Probabl. Appl., 1999, #3.

61. * Normal Approximations by Stein's method (with Y.Rinott); Decisions in Economics and Finance, 23 (May), 2000, 15-29.

Distributions:

62. * A Remark on Quadrant Normal Probabilities in High Dimensions (with Y.Rinott); Letters on Probability and Statistics, Volume 51, Issue 1, 2000.

Stochastic Optimization:

63. * On sufficient controls in dynamic stochastic optimization schemes; Math.Notes, 1986.

64. Some remarks on asymptotic optimality; in "Investigation on probabilistic problems of control" Moscow, CEMI, 1986.

65. On asymptotic optimality in probability for a linear model with quadratic cost (with T.A.Konukhova); in "Probability problems in discrete mathematics", Moscow, MIEM, 1987.

66. On asymptotic optimality almost surely for controlled Markov chains; in "Probability and Mathematical Economics", Moscow, CEMI, 1988.

67. Optimal in probability control for linear systems with quadratic cost (with T.A.Konukhova); in "Probabilistic problems of the discrete mathematics", Moscow, MIEM, 1988.

68. * On asymptotic optimality in probability and almost surely in dynamic control (with A.V.Asriev); Stochastics and Stochastic Reports, 1990.

69. * Connectivity property and optimality almost surely and in probability; in "New Trends in Probability and Statistics" (Volume in honor of Yu.V.Prokhorov), VSP/Mokslas, 1991.

70. * Controls which are optimal almost surely and in probability for the linear regulator problem (with T.A.Belkina); Automatics and Remote Control, 1992, 6.

71. * Optimality in probability and almost surely: the general scheme and a linear regulator problem (with E.Presman and M.Taksar); Stochastics and Stochastic Report, 1993, v.43, pp. 127-137.

72. * On conditions for asymptotic optimality in probability and almost sure for controlled diffusion processes (with T.Belkina); Automatics and Remote Control (Automatika i telemekhanika), 1999, No 2, p. 46-56.

The Theory of Risk:

73. On existence and properties of utility functions; in "Stochastic Models and Control", Moscow, CEMI, 1981.

74. Some remarks on existence and properties of utility functions; Econ. Math. Methods, 1982, 3.

75. A model of mutual insurance (with P.K.Katushev); in "A Research in Stochastic Control Theory", Moscow, CEMI, 1982.

76. On a class of preference orderings on a space of probability distributions (with A.O.Kalashnikov); in "Methods and Models of Stochastic Optimization", Moscow, CEMI, 1983.

77. A model of mutual insurance (with P.K.Katushev); Econ. Math. Methods, 1983, 6.

78. * Some models of redistribution of risk; Theory Probabl. Appl., 1983, 4.

79. On a class of preferences in the space of distributions; in "Methods and Models of Stochastic Optimization", Moscow, CEMI, 1983..

80. A model of optimal behavior of an insurance company (with V. Bening), Economics and Mathematical Methods, 1993, 29, 4, pp.617-626.

81. * Research on risk and social choice, invited coeditor with R.D.Luce, Special Issue of Mathematical Social Sciences, 1994, July.

82. Introduction into Mathematical Theory of Insurance (a survey) (with V. Bening), Journal of Industrial Mathematics, November, 1994, pp. 698-779.

83. * On a statistical approach to choice under uncertainty, Journal of Risk and Uncertainty, 1994, July.

84. * On a generalization of the Pollatchek-Tversky theorem on risk (with A. Sholomitsky); Journal of Mathematical Psychology, 1994, September

85. Risk Evaluation in Insurance (with A.Sholomitsky); Economics and Mathematical Methods, 1996, 1.

The Theory of Functions:

86. * On an extremum problem (with T.Shervashidze); Mem. Differential Equations Math. Phys,, 24, 2001, 109-114.

Game Theory:

87. * On the Incentive Principle in Arbitrage Schemes; Econ. Math. Methods, 1981, 4, translated into English in MATEKON (Translations of Russian and East European Mathematical Economics), 1982, v.XIX, n.1.

88. The Maximum Incentive Principle and bargaining problems (with E.N. Smirnov); in " Investigation on Probability Control Theory", Moscow, CEMI, 1983

89. On a bargaining problem (with E.N. Smirnov); in "Methods and Models of Stochastic Optimization", Moscow, CEMI, 1983

90. Arbitrage schemes based on incentive and non-pressing principles (the case of three participants) (with A.O. Kalashnikov); in "Probability Problems of Control and Math. Economics", Moscow, CEMI, 1985.

91. The Maximum Incentive Solution in Arbitrage Schemes; Econ.Math. Methods, 1989, 5.

92. A Generalization of the Lefebvre Reflection Model (with A.Zhilinskii); The Psychological Journal, 1993, Jul.-Aug., v.4, 4.

93. Some remarks on probability interpretation of the Nash bargaining solution; (with D.A. Rodichev); in " Investigation on Stochastic Optimization", Moscow, CEMI, 1988.

94. * The maximum incentive solutions in bargaining problems (with E. Smirnov); Mathematical Social Sciences, 1992.

95. * Preferences and metric structures of spaces of alternatives; Mathematical Social Sciences, 1994, July.

Mathematical Economics:

96. Exchangeability and sample observations; Economics and Mathematical Methods, 1973, 6.

97. On control of a net of works; Economics and Mathematical Methods, 1975, 4.

98. Control network models in the case of uncertainty.; in "Probability problems of Control in Economics", Moscow, Nauka, 1977.

99. Macroeconomic models and nonlinear limit theorems of Probability Theory; in "Probability problems of control in Economics", Moscow, Nauka, 1977.

100. A model of economic control in the case of uncertainty (with N.Y Petrakov); Economics and Mathematical Methods, 1978, 3.

101. An approach to stabilization of economic growth (with N.Y Petrakov); Economics and Mathematical Methods, 1978, 3.

102. On criteria which take into account the possibility of product replacement (with M.A. Salnikova); in "Probability Models and Control of Economic Processes", Moscow, CEMI, 1978.

103. Economic control in the case of uncertainty (in Polish); in "Economic mathematical methods of control in the socialist economies", Warsaw, 1982.

104. A model of a union of economic agents; in "Investigation in Probabilistic Theory of Control", Moscow, CEMI, 1983.

105. Economic mechanisms in the case of uncertainty; in a monograph "Economic control models ", Moscow, Nauka, 1984.

106. On asymptotic optimality in growth models (with A.V.Asriev); in "Investigations on stochastic optimization and mathematical economics", Moscow, CEMI, 1988.

107. * Equilibrium prices in a random exchange economy with dependent summands (with M.Majumdar). Economic Theory, 15, 2000, 531-550.

108. * Some General Results on Equilibrium Prices in Large Random Exchange Economies (with M.Majumdar); Annals of Operation Research, 114, 2002, 245-261.

Theses, Reviews, Expository Papers:

109. A Guide for the World of Accuracy; in "Young Technician", 1968, 2.

110. Macro and Micro economic parameters and limit theorems of probability theory; Theses of the 1-st Conference on the optimal planning and control of the national economy, sec. 3, Moscow, 1972.

111. Control in network models in the case of uncertainty, and nonlinear limit theorems; Theses of the 1-st Conference on Application of Probability Theory in the National Economy, Kishinev, 1972.

112. *A limit theorem for one class of nonlinear functions; Theses of the 1-st International Conference on Probability Theory and Statistics, Vilnus, 1973.

113. On the work of the seminar on Probability Theory under direction of Yu.V. Prokhorov (with Yu.V. Prokhorov, E.L. Presman, V.V. Yurinsky); Theory Probabl. Appl., 1975,v.XX, 2.

114. On the distributions of polylinear forms; Theses of the Russian-Japanese Symposium on Probability Theory and Statistics, Tashkent, 1975.

115. Economic control in the case of uncertainty (with M.A. Salnikova); Theses of the Russian-Polish Seminar on Mathematical Methods in planning and economic control, Moscow, 1977.

116. *On approximations of the distributions of quadratic forms (with N.G. Gamkrelidze); Theses of the II-nd Vilnus International Conference on Probability Theory and Mathematical Statistics, Vilnus, 1977.

117. * Nonclassical estimates of the distribution of the sum of random vectors; Theses of the II-nd Vilnus International Conference on Probability Theory and Mathematical Statistics, Vilnus, 1977.

118. *On the rate of convergence in the multidimensional and infinity-dimensional CLT (with L.V. Osipov); Theses of the IIIrd Vilnus International Conference on Probability Theory and Mathematical Statistics, Vilnus, 1981.

119. A model of redistribution of risk; Theses of the USSR Conference on Multidimensional Statistical Analysis, Tartu, 1981.

120. R.Fisher: scientific activity (review); New foreign books, 1981, 9.

121. Probability inequalities for multidimensional distributions (review); New Foreign Books, 1981, 11.

122. *Conditions for proximity of two convolutions in the nonclassical situation; Theses of the Russian-Japanese Symposium on Probability Theory and Statistics, Tbilisi, 1982.

123. A Maximum Incentive solution to the income redistribution problem (with A.O. Kalashnikov); Theses of the USSR Symposium "Problems of Mathematical Economics", Vilnus, 1984.

124. Elements of Risk Redistribution Theory; Theses of the International Conference on Stochastic Optimization, Kiev, 1984.

125. A Maximum Incentive Income Redistribution (with A.O. Kalashnikov and E.N. Smirnov); Theses of the International Seminar on Methods of Probability Theory and Mathematical Statistics in Economics, Moscow, 1984.

126. A Method of Stochastic Optimization; Theses of the International Seminar on Methods of Probability Theory and Mathematical Statistic in Economics, Moscow, 1984.

127. *On asymptotic optimality; Theses of the IV Vilnus International Conference on Probability Theory and Mathematical Statistics, Vilnus, 1985.

128. *On the distributions of quadratic forms (with T Shervashidze); Theses of the IV Vilnus International Conference on Probability Theory and Mathematical Statistics, Vilnus, 1985.

129. On asymptotic optimality in probability; Theses of the IV USSR Conference on Multidimensional Statistical Analysis, Tartu, 1985.

130. *On the rate of the convergence in infinity-dimensional limit theorem; (with A.V. Asriev) Theses of the International Congress of Bernoulli Society, Tashkent, 1986.

131. *Risk Description and Economic Environment; Theses of the XXVI International Psychological Congress, 1996

Vladimir Rotar. Research Summary

Probability Theory

(1) *A text-book on probability theory.* The book [3] is intended for graduate students and advanced undergraduates. It includes various recent developments in Probability Theory, which concerns not only new results but some simplifications and unifying approaches to the exposition of known facts. The book discusses a number of modern applications, for example, Risk Theory and Stochastic Optimization.

(2) *Limit theorems.* A series of papers concerns the accuracy of the normal approximation in the multidimensional and infinite-dimensional central limit theorems. Papers [34-35] suggest a general method of the estimation of the proximity of distributions by means of characteristic functions in the multidimensional case. This method has allowed to obtain the multivariate analogue of the Berry-Esseen theorem as well as non-uniform bounds on the rate of convergence.

In [38-39] the method mentioned has been developed in order to cover two cases: large deviations, and the case when the summands are themselves close to normals (the so called non-classical case).

The methods provided in [34-39] were used in many papers of different authors dealing with convergence rates in various limit theorems.

The accuracy in the infinite-dimensional CLT was considered with L.Osipov in [40] and with A.Asriev in [41]. Both papers are based on original methods; the former deals with balls, and the latter is concerned with the non-traditional, in this context, class of parallelepipeds.

(3) *Non-linear limit theorems.* The goal of [44-50] is to provide some general theorems not for sums but for non-linear functions of many independent variables. The statement of the problem proceeds from the conjecture that, though the distribution of a non-linear function of random arguments may be rather complicated, for a large number of the arguments and under some mild conditions this distribution weakly depends on the distributions of separate arguments. The papers mentioned suggest a general framework, based on the notion of the so called invariance classes, and a general investigation method. Concrete results concern polylinear forms, polynomials and quasi-polynomial functions. Papers [44-50] also have many references.

(4) *Sums of dependent summands.* The goal of [54-56] is to establish some characteristics of dependence which are "responsible" for convergence to the normal law. These characteristics, being involved in estimates of the convergence rate, allow to cover simultaneously various situations: say, the Berry-Esseen bound for the independence case as well as the known estimates for martingales, etc.

This approach was essentially developed in papers [59-60], where in the general martingale framework the rate in the CLT was obtained in the terms of special characteristics of the dependency structure.

Papers [61, 58, 57] with Y.Rinott are concerned with some particular but important types of dependency (for instance, local dependency, some Markov chains structures, particles-evolution models), and use a certain modification of Stein's method.

In [17] (also with Y.Rinott) the Edgeworth expansion for a rather general dependency scheme has been obtained, including an essentially novel type of statistics. The results and technique were developed in

(5) *Random walk.* The boundary problem in [18-19] concerns the first time when the random walk crosses curvilinear bounds of a rather general nature. The solution in [18-19] deals with stable laws, the general case was considered later in [20-22] with M.Gafurov.

(6) *Proximity of convolutions.* The next series of papers considers limit theorems for the sums of independent summands in the non-classical case, that is, in the general case when one does not impose any condition of the negligibility of separate summands. In [26] general necessary and sufficient conditions for the convergence to the normal law were established for the case of finite variances. The result of [26] differs from preceding ones (P.Lévy, M.Loéve, V.Zolotarev, and others) by a choice of characteristics of proximity of distributions, as well as by an explicit specification of normalizing linear transformations needed. These characteristics proved to be more verifiable, and the conditions themselves are close to those for the classical situation.

The general case has been considered in [30-31]. The conditions in these papers are connected with the so called accompanying distributions which in this paper are introduced explicitly.

Though the mentioned conditions had been provided for the normal convergence, they work in the case of the convergence to some other laws too. Eventually in papers [32-33] with A.Sholomitsky it has been proved that the conditions under discussion were necessary and sufficient for proximity of

two arbitrary convolutions if one slightly strengthened the very definition of convergence making it closer to that in the functional theorem.

Later, this result allowed to provide necessary and sufficient conditions for the Donsker-Prokhorov principle in the general (non-classical) setup with Yu. Davydov in [10].

(7) Asymptotics of normal probabilities for high dimensions was considered in [62] with Y.Rinott.

(8) General results on proximity (or merging) of two measures were obtained with Yu. Davydov in [9]. The results proceeded from the analysis of the connection of weak convergence and that in the Lèvy-Prokhorov metric.

Stochastic Optimization

Much of optimal stochastic control theory deals with strategies maximizing the expectations of a reward function. Papers [72, 63-71, **??**, 106] are concerned with strategies with a much stronger property, namely those maximizing the reward for all realizations of the controlled process from a set, the probability of which is close, for large time horizons, to one (strategies optimal almost surely). For particular models, similar statements had been considered earlier by S.Lippman, P.Mandl, and others. In [64, 66, 68 (with A.Asriev), 69, 72, **??** (with Belkina)] a general model has been studied. Conditions established there concern either properties of the value function, or communication properties of the controlled process itself.

The general results are applied to economic growth models in [68, 106] with A.Asriev. Papers [65, 67] with T.Konyukhova and [71] with E.Presman and M.Taksar concern a detailed study of a linear model in continuous time.

The framework and the method of [72, 63-71 was used in a number of papers of other authors.

Statistics

The paper [57] with Y.Rinott considers, as an example of the general scheme, the nearest neighbor graphs criterion for testing equality of several multivariate distributions.

The paper [58] with Y.Rinott concerns, in particular, the Central Limit

Theorem for weighted and/or degenerated U-statistics.

The paper [96] deals with a general model of sample observations, which is based on the exchangeable variables scheme.

The applied research for the biological company IXSYS concerned analysis and modeling in the search of a "good"chemical, an enlarging-of-the target approach.

Asymptotics of normal probabilities for high dimensions was considered in [61].

Making Decision Theory, Game Theory, and Economics

(1) *A book on control of economic systems.* General questions of economic control under uncertainty were considered in the book [4], and also in papers [99-105]. The approach developed there is based on the fact that for a large stochastic system the influence of its separate elements on the global behavior of the system is relatively weak and is reflected through few essential parameters. The specification of these parameters proves to be the main stage in the search of the optimal control of the system, in particular, in specification of an optimal investment policy.

(2) *Preference orderings.* Paper [95] concerns the general preference ordering theory, and proceeds from the supposition that when rules of comparison of alternatives and characteristics of their proximity are considered in the same context, they should, in some way, be consistent or coordinated. The paper provides a general framework and establishes consistency conditions including the so called betweenness axiom and that of simple paths. It has been proved that the imposed axioms are, in a certain sense, necessary and sufficient for the consistency of the mentioned notions.

(3) *Bargaining.* The novelty of the approach to bargaining problems suggested in [94, and 87-91] consists of two issues. First, the class of games under consideration, which is rather arbitrary, is endowed by a partial ordering associated with the "contributions of participants" into the games. Second, the rule of choice of a unique solution requires the maximum incentive of the participant with the maximum contribution but within the framework of some axioms including that of monotonicity. The existence and uniqueness of a maximum incentive solution was proved in the general case. For the income allocation problem an explicit solution has been obtained.

Risk Theory

(1) *A textbook "Actuarial Models. The Mathematics of Insurance",* ,[**??**], 650 pages, is a rather comprehensive presentation of the models of insurance processes.

(2) *Evaluation of risk.* Two approaches are suggested. The first consists in the application of the general constructions of [95] (see above) to the comparison of probability distributions. Such an application allowed to establish a connection between criteria of choice under uncertainty and proximity structures in the spaces of probability distributions. In particular, this approach leads to some new comparison criteria, as well as implies a new justification for some well known criteria.

The second approach is connected with the notion of statistically stable criteria introduced in [83]. For such criteria, the act of "evaluation" of a random variable, which is based on a single experiment, does not disagree with that based on a long sequence of independent replicas of the same experiment. An explicit representation for such criteria is given.

A generalization of the Pollatchek-Tversky approach to risk evaluation was considered in [84] with A.Sholomitsky.

(3) *Various insurance models* are considered in [85, 75, 77, 80, 82]. Papers [85, 80, 82] concern optimal strategies (e.g., reserve funds, admissible premiums) for "classical" insurance processes. In papers [77, 80] with P.Katyshev a model of mutual insurance is constructed, and the main objective is "reasonable" rules of redistribution of the insurance fund. Papers [85, 82] represent also surveys of insurance models; especially it concerns [82] which is rather a book.

Models of Random Economic Systems.

Models of economic dynamics were considered in the above mentioned papers [68, 106]. Other models concern multi-sector economies [4, 100,101] (with N.Petrakov) and net-works [97, 98]. General questions of economic control under uncertainty were considered in [99, 103, 105] and in the book [4] (see above).

Papers [107, **??**, 108] with M.Majumdar contain a general description of the asymptotic behavior of the equilibrium prices in large random exchange economies.

Financial Dynamic Models.

Paper [8] concerns optimal investment in long run, for large time horizons. The main question under discussion concerns the long-known fact that the maximum-expected-utility (MEU) and the maximum- expected-log (MEL) criteria prove to be inconsistent even for large time horizons. The goal of the paper is to consider this phenomenon at the level of premises, and to suggest a generalized criterion, namely the rank dependent expected utility approach, which allows one to "bridge the gap" between the MEU and MEL criteria, and in a certain sense to "reconcile" the results based on the two approaches.

Recent research in finance concerns the asymptotic behavior of the probabilities of the perfect hedge in complete markets (as well as the expected value of possible losses) when the prices for the derivatives are close to the Black-Scholes prices.