

## 1 Research Papers

Papers are classified to four categories, *Physics*, *Linguistics*, *Econophysics (including Network Science)*, and *Energy and Environment*. Note that all papers listed here are published in refereed academic journals, except for the very latest papers that are still in preprint stage or in print.

### 1.1 Physics

1. *Conserved Flux in Yang-Mills Theory: Elimination of Color Charge of Gauge Field*  
Hideaki Aoyama and Reijiro Fukuda, Prog. Theor. Phys. 59 (1978) 2064-2079.
2. *Pair Creation in Strong Electric Fields*  
Hideaki Aoyama and Makoto Kobayashi, Prog. Theor. Phys. 64 (1980) 1045-1057.
3. *Effective Geometry vs. Real Geometry*  
Hideaki Aoyama, Phys. Lett. 107B (1981) 39-43.
4. *Effects of Pair Creation on the Expansion of Vacuum Bubbles*  
Hideaki Aoyama, Nucl. Phys. B221 (1983) 473-494.
5. *Casimir Energy of Higgs Field Configurations in a Coleman-Weinberg Type Theory*  
Hideaki Aoyama, Phys. Rev. D29 (1984) 1763-1771.
6. *Casimir Energy of A Scalar Field with a Space-Dependent Mass Distribution*  
Hideaki Aoyama, Nucl. Phys. B244 (1984) 392-408.
7. *Goldstone Fermions in Supersymmetric Theories at Finite Temperature*  
Hideaki Aoyama and Daniel Boyanovsky, Phys. Rev. D30 (1984) 1356-1363.
8. *Nonperturbative Effects in Equilibrium Finite Temperature Scalar Field Theory*  
Hideaki Aoyama and Helen R. Quinn, Phys. Rev. D31 (1985) 885-899.
9. *Covariant Amplitudes in Polyakov's String Theory*  
Hideaki Aoyama, Avinash Dhar and M. Ali Namazie, Nucl. Phys. B267 (1986) 605-624.
10. *Goldstone Realization of Lorentz-Symmetry and Supersymmetry at Finite Temperature*  
Hideaki Aoyama, Phys. Lett. 171B (1986) 420-423.
11. *On the Most Effective Test for Models with Free Parameters*  
Ken-Ichi Aoki and Hideaki Aoyama, Nuclear Instruments and Methods A248 (1986) 483-487.
12. *Optimal Test for Electroweak Loop Effects*  
Ken-Ichi Aoki and Hideaki Aoyama, Zeitschrift Fur Physik C31 (1986) 557-559.
13. *Response to the Comment 'Role of Nonperturbative Field Configuration in Phase Transitions' By Aragao De Carvalho et. al*  
Hideaki Aoyama and Helen R. Quinn, Phys. Rev. D34 (1986) 662-663.
14. *On the Quantization of String Field Theory*  
Hideaki Aoyama, Nucl. Phys. B278 (1986) 276-288.
15. *BRST-Symmetries in Free String Field Theory*  
Hideaki Aoyama, Phys. Lett. 177B (1986) 30-34.
16. *Anomalous Baryon Number Nonconservation in PP Collisions at 40 TeV*  
Hideaki Aoyama and Haim Goldberg, Phys. Lett. 188B (1987) 506-510.

17. *Renormalization Group Analysis of the Ising Model on Two-Dimensional Quasi-Lattices*  
Hideaki Aoyama and Takashi Odagaki, Int. J. of Mod. Phys. B2 (1988) 13-35.
18. *Bond Percolation on Two-Dimensional Quasi-Lattices*  
Hideaki Aoyama and Takashi Odagaki, J. of Phys. A: Math. Gen. 20 (1987) 4985-4993.
19. *Eight-Parameter Renormalization Groups for Penrose Lattices*  
Hideaki Aoyama and Takashi Odagaki, J. of Stat. Phys. 48 (1987) 503-511.
20. *Osp(1,1|4) BRST-Symmetry of String Field with the World-Sheet Metric*  
Hideaki Aoyama, Nucl. Phys. B299 (1987) 379-388.
21. *Osp(2,2|4) for Open String Fields*  
Hideaki Aoyama, Phys. Rev. D37 (1988) 3616-3621.
22. *Sphalerons and Instantons at Finite Temperature*  
Hideaki Aoyama, Haim Goldberg and Zbyszek Ryzak, Phys. Rev. Lett. 60 (1988) 1902-1905.
23. *Hyper-Inflation in Periodic and Quasi-Periodic Chains*  
Takashi Odagaki and Hideaki Aoyama, Phys. Rev. Lett. 61 (1988) 775-778.
24. *Self-Similarities in One-Dimensional Periodic and Quasi-Periodic Systems*  
Takashi Odagaki and Hideaki Aoyama, Phys. Rev. B39 (1989) 475-487.
25. *Unitarity Restoration in Multi-Instanton Process*  
Hideaki Aoyama and Hisashi Kikuchi, Phys. Lett. B247 (1990) 75-80.
26. *Multi-Instanton Induced Baryon and Lepton Number Violation in the Electroweak Theory*  
Hideaki Aoyama and Hisashi Kikuchi, Phys. Rev. D43 (1991) 1999-2002.
27. *Interacting Instantons for TeV Physics*  
Hideaki Aoyama and Hisashi Kikuchi, Int. J. of Mod. Phys. A7 (1992) 2741-2773.
28. *A New Valley Method for Instanton Deformations*  
Hideaki Aoyama (SLAC) and Hisashi Kikuchi, Nucl. Phys. B369 (1992) 219-234.
29. *Borel-Summable Perturbation Series for Theories with Degenerate Minima*  
Hideaki Aoyama, Mod. Phys. Lett. A7 (1992) 1337-1344.
30. *Path-Integral for Quantum Tunneling*  
Hideaki Aoyama and Arihiro M. Tamra, Nucl.Phys. B384 (1992) 229-250.
31. *Instantons in Large Order of the Perturbative Series*  
Hideaki Aoyama, Phys. Lett. B329 (1994) 285-288.
32. *Bounce in Valley; Study of Extended Structures from Thick-Wall To Thin-Wall Vacuum Bubbles*  
Hideaki Aoyama and Shinya Wada, Phys. Lett. B349 (1995) 279-283.
33. *Complex-time Approach for Semi-classical Quantum Tunneling*  
Hideaki Aoyama and Toshiyuki Harano, Mod. Phys. Lett. A10 (1995) 1135-1142.
34. *Complex-time Path-integral Formalism for Quantum Tunneling*  
Hideaki Aoyama and Toshiyuki Harano, Nucl. Phys. B446 (1995) 315-333.
35. *Valley Instanton in the Gauge-Higgs System*  
Hideaki Aoyama, Toshiyuki Harano, Masatoshi Sato, and Shinya Wada, Mod. Phys. Lett. A11 (1996) 43-54.
36. *Valley Instanton versus Constrained Instanton*  
Hideaki Aoyama, Toshiyuki Harano, Masatoshi Sato, and Shinya Wada, Nucl. Phys. B466 (1996) 127-158.

37. *Fake Instability in the Euclidean formalism*  
Hideaki Aoyama, Toshiyuki Harano, Hisashi Kikuchi, Masatoshi Sato, and Shinya Wada, Phys. Rev. Lett. 79 (1997) 4052-4055.
38. *Multi-instanton Calculus in  $N = 2$  Supersymmetric QCD*  
Hideaki Aoyama, Toshiyuki Harano, Masatoshi Sato, and Shinya Wada, Phys. Lett. B388 (1996) 331-337.
39. *Recent developments of the Theory of Tunneling*  
Hideaki Aoyama, Toshiyuki Harano, Hisashi Kikuchi, Ikuo Okouchi, Masatoshi Sato, and Shinya Wada, Prog. Theor. Phys. Supplement 127 (1997) 1-92.
40. *Valleys in Quantum Mechanics*  
Hideaki Aoyama, Hisashi Kikuchi, Ikuo Okouchi, Masatoshi Sato, and Shinya Wada, Phys. Lett. B424 (1998) 93-100.
41. *Valley Views: Instantons, Large order behaviors, and Supersymmetry*  
Hideaki Aoyama, Hisashi Kikuchi, Ikuo Okouchi, Masatoshi Sato, and Shinya Wada, Nucl. Phys. B553 (1999) 644-710
42.  *$\mathcal{N}$ -fold Supersymmetry for a Periodic Potential*  
Hideaki Aoyama, Masatoshi Sato, Toshiaki Tanaka, and Mariko Yamamoto, Physics Letters B 498 (2001) 117-122
43. *General Forms of a  $\mathcal{N}$ -fold Supersymmetric Family*  
Hideaki Aoyama, Masatoshi Sato, and Toshiaki Tanaka, Physics Letters B 503 (2001) 423-429
44.  *$\mathcal{N}$ -fold Supersymmetry in Quantum mechanics: General Formalism*  
Hideaki Aoyama, Masatoshi Sato, and Toshiaki Tanaka, Nuclear Physics B 619 (2001) 105-127
45.  *$sl(2)$  Construction of Type A  $\mathcal{N}$ -fold Supersymmetry*  
Hideaki Aoyama, Noriko Nakayama, Masatoshi Sato and Toshiaki Tanaka, Physics Letters B 519 (2001) 260-268
46. *Classification of Type A  $\mathcal{N}$ -fold Supersymmetry*  
Hideaki Aoyama, Noriko Nakayama, Masatoshi Sato and Toshiaki Tanaka, Physics Letters B 521 (2001) 400-408

## 1.2 Linguistics

1. *Word Length Frequency and Distribution in English: Part I. Prose*  
Hideaki Aoyama and John Constable, Literary and Linguistic Computing 14 (1999) 339-358
2. *Word Length Frequency and Distribution in English: Part II. An Empirical and Mathematical Examination of the character and Consequences of Isometric Lineation*  
John Constable and Hideaki Aoyama, Literary and Linguistic Computing 14 (1999) 507-536
3. *Testing for Mathematical Lineation in Jim Crace's **Quarantine** and T.S. Elliot's **Four Quartets***  
John Constable and Hideaki Aoyama, Linguistic Approaches to Poetry (Belgian journal of linguistics) 15 (2001) 35-52

## 1.3 Econophysics

1. *Pareto's Law for Income of Individuals and Debt of Bankrupt Companies*  
Hideaki Aoyama, Y. Nagahara, M. P. Okazaki, W. Souma, H. Takayasu, and M. Takayasu, Fractals 8 (2000) 293-300
2. *Growth and Fluctuations of Personal Income*  
Yoshi Fujiwara, Wataru Souma, Hideaki Aoyama, Taisei Kaizoji, and Masanao Aoki, Physica A: Statistical Mechanics and its Applications 321 (2003) 598-604

3. *Growth and Fluctuations of Personal and Company's Income*  
Hideaki Aoyama, Wataru Souma, and Yoshi Fujiwara, *Physica A: Statistical Mechanics and its Applications* 324 (2003) 352-358
4. *Complex Networks and Economics*  
Wataru Souma, Yoshi Fujiwara, and Hideaki Aoyama, *Physica A: Statistical Mechanics and its Applications* 324 (2003) 396-401
5. *Do Pareto–Zipf and Gibrat Laws Hold True? –An analysis with European Firms*  
Yoshi Fujiwara, C. Di Guilmi, Hideaki Aoyama, Mauro Gallegati, and Wataru Souma, *Physica A: Statistical Mechanics and its Applications* 335 (2004) 197-216
6. *Gibrat and Pareto–Zipf Revisited with European Firms*  
Yoshi Fujiwara, Hideaki Aoyama, C. Di Guilmi, Wataru Souma, and Mauro Gallegati, *Physica A: Statistical Mechanics and its Applications* 344 (2004) 112-116
7. *Random Matrix Approach to Shareholding Networks*  
Wataru Souma, Yoshi Fujiwara, and Hideaki Aoyama, *Physica A: Statistical Mechanics and its Applications* 344 (2004) 73-76
8. *Kinematics and dynamics of Pareto–Zipf's law and Gibrat's law*  
Hideaki Aoyama, Yoshi Fujiwara, and Wataru Souma, *Physica A: Statistical Mechanics and its Applications* 344 (2004) 117-121
9. *Correlation in Business Networks*  
Wataru Souma, Hideaki Aoyama, Yoshi Fujiwara, Yuichi Ikeda, Hiroshi Iyetomi, and Taisei Kaizoji, *Physica A* 370 (2006) 151-155
10. *Heterogeneous Economic Networks*  
Wataru Souma, Yoshi Fujiwara, and Hideaki Aoyama, in *The Complex Networks of Economic Interactions* (Springer Berlin Heidelberg, 2006) 79-92
11. *Response of Firm Agent Network to Exogenous Shock*  
Yuichi Ikeda, Hideaki Aoyama, Hiroshi Iyetomi, Yoshi Fujiwara, Wataru Souma, and Taisei Kaizoji, *Physica A: Statistical Mechanics and its Applications*, 382 (2007) 138-148
12. *Quantitative Agent-based Firm Dynamics Simulation with Parameters Estimated by Financial and Transaction Data Analysis*  
Yuichi Ikeda, Wataru Souma, Hideaki Aoyama, Hiroshi Iyetomi, Yoshi Fujiwara, and Taisei Kaizoji, *Physica A: Statistical Mechanics and its Applications* 375 (2007) 651-667
13. *Correlated Performance of Firms in a Transaction Network*  
Yuichi Ikeda, Hideaki Aoyama, Hiroshi Iyetomi, Yoshi Fujiwara, and Wataru Souma, *Journal of Economic Interaction and Coordination* 3 (2008) 73-80.
14. *Productivity Dispersion: Facts, Theory, and Implications*  
Hideaki Aoyama, Hiroshi Yoshikawa, Hiroshi Iyetomi and Yoshi Fujiwara, RIETI Discussion Paper Series 08-E-035 (2008), *Economic Interaction and Coordination* 5 (2010) 27-54
15. *Agent-Based Model Approach to Complex Phenomena in Real Economy*  
Hiroshi Iyetomi, Hideaki Aoyama, Yoshi Fujiwara, Yuichi Ikeda and Wataru Souma, *Progress of Theoretical Physics Supplement* 179 (2008) 123-133
16. *Labour Productivity Superstatistics*  
Hideaki Aoyama, Hiroshi Yoshikawa, Hiroshi Iyetomi and Yoshi Fujiwara, *Progress of Theoretical Physics Supplement* 179 (2008) 80-92
17. *Structure and Temporal Change of Credit Network between Banks and Large Firms in Japan*  
Yoshi Fujiwara, Hideaki Aoyama, Yuichi Ikeda, Hiroshi Iyetomi, and Wataru Souma, *Economics: The Open-Access, Open-Assessment E-Journal* 3, 2009-7 (2009).
18. *Superstatistics of Labour Productivity in Manufacturing and Nonmanufacturing Sectors*  
Hideaki Aoyama and Yoshi Fujiwara and Yuichi Ikeda and Hiroshi Iyetomi and Wataru Souma, *Economics: The Open-Access, Open-Assessment E-Journal* 3, 2009-22 (2009)

19. *A Paradigm Shift from Production Function to Production Copula –Statistical Description of Production Activity of Firms*  
Hiroshi Iyetomi, Hideaki Aoyama, Yoshi Fujiwara, Yuichi Ikeda and Wataru Souma, Quantitative Finance vol.12 pp.1453–1466 (2012)
20. *Analysis of Labor Productivity using Large-scale Data of Firm’s Financial Statements*  
Yuichi Ikeda, Wataru Souma, Hideaki Aoyama, Yoshi Fujiwara, and Hiroshi Iyetomi, The European Physical Journal B76 (2010) 491-499, DOI:10.1140/epjb/e2009-00421-y
21. *A Stochastic Model of Labor Productivity and Employment*  
Yoshi Fujiwara and Hideaki Aoyama, RIETI Discussion Paper Series 10-E-00 (2010)
22. *Large-scale Structure of a Nation-wide Production Network*  
Yoshi Fujiwara and Hideaki Aoyama, European Physics Journal B77 (2010) 565-580, DOI:10.1140/epjb/e2010-00275-2
23. *Econophysics and Real Economy -The First Decade of the Kyoto Econophysics Group*  
Hideaki Aoyama, Yoshi Fujiwara, Yuichi Ikeda, Hiroshi Iyetomi, and Wataru Souma, Science and Culture 76 (2010) 368-373.
24. *What Causes Business Cycles? –Analysis of the Japanese Industrial Production Data*  
Hiroshi Iyetomi, Yasuhiro Nakayama, Hiroshi Yoshikawa, Hideaki Aoyama, Yoshi Fujiwara, Yuichi Ikeda, and Wataru Souma, doi:10.1016/j.jjie.2011.06.002 (2011), Journal of Japanese and International Economics 25 (2011) 246-272.
25. *Fluctuation-Dissipation Theory of Input-Output Interindustrial Correlations*  
Hiroshi Iyetomi, Yasuhiro Nakayama, Hideaki Aoyama, Yoshi Fujiwara, Yuichi Ikeda, and Wataru Souma, Physical Review E83 (2011) 016103(–1-12)
26. *Stochastic origin of scaling-laws in productivity and employment dispersion*  
Yoshi Fujiwara and Hideaki Aoyama, RIETI Discussion Paper Series 11-E-044, (2011) 1–16.
27. *Debt-rank analysis of the Japanese credit network*  
Hideaki Aoyama, Stefano Battiston and Yoshi Fujiwara, RIETI Discussion Paper, 13-E-087 (Oct. 2013)
28. *Synchronization and the Coupled Oscillator Model in International Business Cycles*  
Hideaki Aoyama, Yuichi Ikeda, and Hiroshi Yoshikawa, RIETI Discussion Paper, 13-E-089 (Oct. 2013)
29. *Equilibrium distribution of labor productivity: a theoretical model*  
Hideaki Aoyama, Hiroshi Iyetomi and Hiroshi Yoshikawa, Journal of Economic Interaction and Coordination, vol.10 pp.57–66 (2013).
30. *Direct evidence for synchronization in Japanese business cycles*  
Yuichi Ikeda, Hideaki Aoyama, Hiroshi Iyetomi and Hiroshi Yoshikawa, Evolutionary and Institutional Economics Review, Vol.2, pp.315–327 (2013).
31. *Micro-Macro Relation of Production – The Double Scaling Law for Statistical Physics of Economy*  
Hideaki Aoyama, Yoshi Fujiwara and Mauro Gallegati, Journal of Economic Interaction and Coordination, vol.10 pp.67–78, (2014).
32. *Application of the Concept of Entropy to Equilibrium in Macroeconomics*  
Hideaki Aoyama, Hiroshi Iyetomi, Wataru Souma and Hiroshi Yoshikawa, RIETI Discussion Paper 15-E-070 (June 2015).
33. *Bank-firm credit network in Japan: an analysis of a bipartite network*  
Luca Marotta, Salvatore Micchiché, Yoshi Fujiwara, Hiroshi Iyetomi, Hideaki Aoyama, Muro Gallegati and Rosario N. Mantegna, PloS one, vol.10 e0123079 (2015).
34. *Econophysics Point of View of Trade Liberalization: Community dynamics, synchronization, and controllability as example of collective motions*  
Yuichi Ikeda, Hideaki Aoyama, Hiroshi Iyetomi, Takayuki Mizuno, Takaaki Ohnishi, Yohei Sakamoto, and Tsutomu Watanabe, RIETI Discussion Paper 16-E-26 (March 2016)

35. *Backbone of credit relationships in the Japanese credit market*  
Luca Marotta, Salvatore Miccichè, Yoshi Fujiwara, Hiroshi Iyetomi, Hideaki Aoyama, Mauro Gallegati, and Rosario N. Mantegna, EPJ Data Science, vol.5 p.10 (2016).
36. *Interdependencies and causalities in coupled financial networks*  
Irena Vodenska, Hideaki Aoyama, Yoshi Fujiwara, Hiroshi Iyetomi, and Yuta Arai, PloS one, vol.11, e0150994 (2016).
37. *Systemic Risk and Vulnerabilities of Bank Networks*  
Irena Vodenska, Hideaki Aoyama, Alexander P. Becker, Yoshi Fujiwara, Hiroshi Iyetomi and Eliza Lungu, Available at SSRN: <https://ssrn.com/abstract=3049976> (Oct. 2017)
38. *Complex Correlation Approach for High Frequency Financial Data*  
Mateusz Wilinski, Yuichi Ikeda, and Hideaki Aoyama, The Journal of Statistical Mechanics: Theory and Experiment, 023405 (2018). <http://dx.doi.org/10.1088/1742-5468/aaa8eb>
39. *Empirical Evidence for Collective Motion of Prices with Macroeconomic Indicators in Japan*  
Yuichi Kichikawa, Hiroshi Iyetomi, Hideaki Aoyama, and Hiroshi Yoshikawa, Available at SSRN: <https://ssrn.com/abstract=3127339>, RIETI Discussion Paper 18-E-007 (2018).
40. *Interindustry Linkages of Prices: Analysis of Japan's Deflation*  
Yuichi Kichikawa, Hiroshi Iyetomi, Hideaki Aoyama, Yoshi Fujiwara, and Hiroshi Yoshikawa, Available at SSRN: <https://ssrn.com/abstract=3118735> to appear as a RIETI Discussion Paper (2018)
41. *Hierarchical Communities in Walnut Structure of Japanese Production Network*  
Abhijit Chakraborty, Yuichi Kichikawa, Takashi Iino, Hiroshi Iyetomi, Hiroyasu Inoue, Yoshi Fujiwara, and Hideaki Aoyama, RIETI Discussion Paper Series 18-E-026. Also Available at SSRN: <https://ssrn.com/abstract=3129974>, to appear as a RIETI Discussion Paper (2018)

## 1.4 Energy and Environment

1. *Wind Power*  
John Constable and Hideaki Aoyama, Oxford Energy Forum 78 (2009) 17-20

## 2 Books

### 2.1 Books in English

1. *Econophysics and Companies –Statistical Life and Death in Complex Network*  
Hideaki Aoyama, Yoshi Fujiwara, Yuichi Ikeda, Hiroshi Iyetomi, and Wataru Souma, Cambridge University Press (Cambridge, UK, 2010)
2. *Macro-Econophysics –New Studies on Economic Networks and Synchronization*  
Hideaki Aoyama, Yoshi Fujiwara, Yuichi Ikeda, Hiroshi Iyetomi, Wataru Souma and Hiroshi Yoshikawa, Cambridge University Press, (Cambridge, UK , 2017)

### 2.2 Books in Japanese

1. *Classical Mechanics*  
Hideaki Aoyama, Gakujutsu Tosho Shuppan (Tokyo, Japan, 2005 (First Edition))
2. *Pareto Firms –Rise and Fall of Firms and Science of Connection*  
Hideaki Aoyama, Hiroshi Iyetomi, Yuichi Ikeda, Wataru Souma, and Yoshi Fujiwara, Nihon Keizai Hyoronsha, Inc. (Tokyo, Japan, 2007)
3. *Invitation to Network Science –Thought and Science of Connection of the World*  
Hideaki Aoyama, Wataru Souma, and Yoshi Fujiwara (eds.), Science Sha (Tokyo, Japan, 2008)
4. *Econophysics*  
Hideaki Aoyama, Hiroshi Iyetomi, Yuichi Ikeda, Wataru Souma, and Yoshi Fujiwara, Kyoritsu Shuppan, Inc. (Tokyo, Japan, 2009)

## 2.3 English-Japanese Translation of Books

1. *Forest in Moscow: Physics Exercises from MPTI* (eds. Kozel, et.al.)  
Kaoru Aoki and Hideaki Aoyama, Yoshioka Shoten (Kyoto, Japan, 1989)
2. *Statistical Field Theory* (by Giorgio Parisi)  
Kaoru Aoki and Hideaki Aoyama, Yoshioka Shoten (Kyoto, Japan, 1993)
3. *Path Integrals and Quantum Processes* (by Mark Swanson)  
Hideaki Aoyama, Hiroyuki Kawamura and Shinya Wada, Yoshioka Shoten (Kyoto, Japan, 1996)
- 4-10. *The Quantum Theory of Fields I-III* (by Steven Weinberg)  
Japanese volume 1-4 (original volume I and II); Hideaki Aoyama and Hiroaki Arisue, Japanese volume 5-6 (original volume III); also with Katsuyuki Sugiyama, Yoshioka Shoten (Kyoto, Japan, 1993-2003)
11. *Modeling Aggregate Behavior and Fluctuations in Economics: Stochastic Views of Interacting Agents* (by Masanao Aoki)  
Hideaki Aoyama and Yoshi Fujiwara (eds.), Kyoritsu Shuppan (Tokyo, Japan 2003)