

Curriculum Vitae

Kaoru TONE

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1 Current Affiliation and Address

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2 Academic Background

1. Graduated from the University of Tokyo, Department of Mathematics in 1953.
2. Ph.D. in Operations Research from Keio University in 1976.

3 Academic Career

1. Chair Professor at National Chiao Tung University, Taiwan: 2018-2019.
2. Honorary Professor at Heriot-Watt University, United Kingdom: 2014-present.
3. Professor Emeritus at National Graduate Institute for Policy Studies: 2008-present.
4. Academic Fellow at National Graduate Institute for Policy Studies: 2006-2013.
5. Research Fellow at National Graduate Institute for Policy Studies: 2005-2006.
6. Professor at National Graduate Institute for Policy Studies: 1998-2005.
7. Honorary Professor at Saitama University: 1999-present.
8. Professor at Saitama University, Graduate School of Policy Science: 1977-1998.
9. Associate Professor at Keio University, Faculty of Engineering: 1966-1977.

10. Associate Professor at Tokyo University of Agriculture and Engineering, Faculty of Engineering: 1963-1966.
11. Associate Professor at Tsuda-juku University, Faculty of Science: 1962-1963.

4 Academic Services

1. President of the Operations Research Society of Japan: 1996-1998.
2. Editorial Board of *Omega*.
3. Editorial Board of *The Journal of Data Envelopment Analysis*.
4. Editorial Board of *Socio-Economic Planning Sciences*.
5. Editorial Board of *Journal of Optimization Theory and Applications*.
6. Editorial Board of *Encyclopedia of OR/MS* (Kluwer Academic Publishers).
7. Editorial Board of *Metamorphosis* (Indian Institute of Management).
8. Editor-in-Chief, *Journal of the Operations Research Society of Japan*: 1976-1978.

5 Main Publications

1. “Nested Dynamic Network Data Envelopment Analysis Models with Infinitely Many Decision Making Units for Portfolio Evaluation,” T.S Chang, K. Tone, C.H. Wu, *European Journal of Operational Research*, October 2020, DOI: [10.1016/j.ejor.2020.09.044](https://doi.org/10.1016/j.ejor.2020.09.044)
2. “A Modified Slacks-Based Measure of Efficiency in Data Envelopment Analysis,”
Tone, M. Toloo, M. Izadikhah, *European Journal of Operational Research*, May 2020. DOI:10.1016/j.ejor.2020.04.019.
3. “Handling negative data in slacks-based measure data envelopment analysis models,” K. Tone , T.S Chang , C.H. Wu, *European Journal of Operational Research*, 282(2020)926-935.
4. “A Comparative Analysis of Two-Stage Distress Prediction Models,”
M. M. Mousavi , J. Ouenniche , K. Tone
Expert Systems With Applications,
DOI: <https://doi.org/10.1016/j.eswa.2018.10.053>
5. “Modeling investments in the dynamic network performance of insurance companies,” K.Tone, Q.L.Kweh,W.M.Lu, I. W. K.Ting,
Omega, <https://doi.org/10.1016/j.omega.2018.09.005>
6. *Advances in DEA Theory and Applications: with Extensions to Forecasting Models*, K. Tone (Ed.), John Wiley & Sons, 2017.
7. “Impact of the Local Public Hospital Reform on the efficiency of medium sized hospitals in Japan: an improved slacks-based measure DEA approach,” X. Zhang, K. Tone, Y. Lu, *Health Services Research*, DOI: 10.1111/1475-6773.12676, 2017.

8. "On the Consistency of Slacks-based Measure-Max Model and Super-Slacks-based Measure Model," K. Tone, *Universal Journal of Management*, 5(3), 160-165, 2017.
9. "An Out-of-Sample Evaluation Framework for DEA with Application in Bankruptcy Prediction," J. Ouenniche and K. Tone, *Annals of Operations Research*, 2017.
10. "The efficiency of higher education institutions in England revised: comparing alternative measures," G. Johnes and K. Tone, *Tertiary Education and Management*, DOI:10.1080/13583883.2016.1203457, 2016
11. "Data Envelopment Analysis as a Kaizen Tool: SBM Variations revisited," Tone, *Bulletin of Mathematical Sciences and Applications*, 16, 49-61, 2016.
12. "Setting handicaps to industrial sectors in DEA illustrated by Ethiopian industry," K. Hailu, K. Tone, *Annals of Operations Research*, DOI: 10.1007/s10479-016-2225-1, 2016.
13. "DEA models involving future performance," T.S. Chang, K. Tone, C.H. Wu, *European Journal of Operational Research*, DOI: 10.1016/j.ejor.2016.04.005. 2016.
14. "Finding a maximal element of a convex set through its characteristic cone: An application to finding a strictly complementary solution," M. Mehdiloozad, K. Tone, R. Askarpour, M. Ahmadi, *Computational and Applied Mathematics*, DOI: 10.1007/s40314-016-0324-x, 2016.
15. "DEA Scores 'Confidence Intervals with Past-Present and Past-Present-Future based Resampling," K. Tone, J. Ouenniche, *American Journal of Operations Research*, 6, 121-135, 2016.
16. "How to deal with Non-convex Frontiers in Data Envelopment Analysis," K. Tone, M. Tsutsui, *Journal of Optimization Theory and Applications*, DOI:10.1007/s10957-014-0626-3, 166(3), 1002-1028, 2015.
17. "Cost, revenue and profit efficiency measurement in DEA: A directional distance function approach," M. Mehdiloozad, B.K. Sahoo, K. Tone *European Journal of Operational Research*, forthcoming, 2014.
18. "Decomposing technical efficiency and scale elasticity in two-stage network DEA," B.K. Sahoo, J. Zhu, K. Tone, B.M. Klemen, *European Journal of Operational Research*, forthcoming, 2014
19. "Past-present-future intertemporal DEA models," T.S. Chang, K. Tone, C.H. Wu, *Journal of Operational Research Society*, doi: 10.1057/jors.2013.139.
20. "Dynamic DEA with network structure: A Slacks-based Measure Approach," K. Tone, M. Tsutsui, *Omega*, 42, 124-1131, 2014.
21. "Estimation of the efficiency of Japanese hospitals using a dynamic and network data envelopment analysis model," H. Kawaguchi, K. Tone, M. Tsutsui, *Health Care Management Science*, doi: 10.1007/s10729-013-9248-9, 2013.
22. "Non-parametric measurement of economies of scale and scope in noncompetitive environment with price uncertainty," B.K. Sahoo, K. Tone, *Omega*, 41, 97-111, 2013.

23. "Returns to growth in a nonparametric DEA approach , " B.K. Sahoo, K. Kerstens , K. Tone, *International Transactions in Operational Research*, 19, 463-486, 2012.
24. "Ownership-specified network DEA models," T.S. Chang, K. Tone, Q.L.Wei, *Annals of Operations Research*, doi: 10.1007/s10479-011-0949-5, 2011.
25. "An efficiency measure of desirable and undesirable outputs in DEA and its application to US electric utilities," K. Tone, M. Tsutsui, *Journal of Centrum Cathedra*, 4, 2, 236-249, 2011.
26. "Dynamic DEA: A Slacks-based Measure Approach," K. Tone, M. Tsutsui, *Omega*, 38, 145-156, 2010.
27. "Variations on the theme of slacks-based measure of efficiency in DEA," K. Tone, *European Journal of Operational Research*, 200, 901-907, 2010.
28. "An epsilon-based measure of efficiency in DEA: A third pole of technical efficiency," K. Tone, M. Tsutsui, *European Journal of Operational Research*, 207, 1554-1563, 2010.
29. "Network DEA: A Slacks-based Measure Approach," K. Tone, M. Tsutsui, *European Journal of Operational Research*, 197, 243-252, 2009.
30. "Decomposing Capacity Utilization in Data Envelopment Analysis: An Application to Banks in India, B. K. Sahoo, K. Tone, *European Journal of Operational Research*, 195(2), 575-594, 2009.
31. "Radial and Non-radial Decompositions of Profit Change: With an Application to Indian Banking, B. K. Sahoo, K. Tone, *European Journal of Operational Research*, 196(3), 1130-1146, 2009.
32. "Bridging Radial and Non-radial Measures of Efficiency in DEA," K. Tone, N.K. Avkiran, M. Tsutsui, *Annals of Operations Research*, 164, 127-138, 2008.
33. "A Multi-stage Method to Measure Efficiency and its Application to Japanese Banking Industry," K. Tone, J. Liu, *Socio-Economic Planning Sciences* 42, 75-91, 2008.
34. "Some Models and Measures for Evaluating Performances with DEA: Past Accomplishments and Future Prospects," W. W. Cooper, L.M. Seiford, K. Tone , J. Zhu, *Journal of Productivity Analysis* 28, 151-163, 2007.
35. "Decomposition of Cost Efficiency and its Application to Japanese-US Electric Utility Companies," K. Tone, M. Tsutsui, *Socio-Economic Planning Sciences* 41, 91-106, 2007.
36. *Data Envelopment Analysis: A Comprehensive Text with Models, Applications, References and DEA-Solver Software*, Second Edition, W.W. Cooper, L.M. Seiford, K. Tone, Springer-Verlag, 490 pages, 2006.
37. "Re-examining Scale Elasticity in DEA," K. Tone, B.K. Sahoo, *Annals of Operations Research*, 145, 69-87, 2006.

38. *Introduction to Data Envelopment Analysis and Its Uses: with DEA-Solver Software and References*, W.W. Cooper, L.M. Seiford, K. Tone, Springer-Verlag, 354 pages, 2005.
39. "Evaluating Cost Efficiency and Returns to Scale in the Life Insurance Corporation of India Using Data Envelopment Analysis," K. Tone, B.K. Sahoo, *Socio-Economic Planning Sciences* 39, 261-285, 2005.
40. "Degree of Scale Economies and Congestion: A Unified DEA Approach," K. Tone, B. K. Sahoo, *European Journal of Operational Research*, 158, 755-772, 2004.
41. "Malmquist Productivity Index," Chapter 8 of *Handbook on Data Envelopment Analysis*, Cooper, W.W., Seiford, L.M. and Zhu, J., (eds.) Kluwer Academic Publishers, 2004.
42. "A Comparative Site Evaluation Study for Relocating Japanese Government Agencies out of Tokyo," K. Tone, Y. Takamura, *Socio-Economic Planning Sciences*, 37, pp.85-102, 2003.
43. "Scale, Indivisibilities and Production Function in Data Envelopment Analysis," K. Tone, B.K. Sahoo, *International Journal of Production Economics*, 84, pp.165-192, 2003.
44. "A Slacks-based Measure of Super-efficiency in Data Envelopment Analysis," K. Tone, *European Journal of Operational Research*, 143, pp.32-41, 2002.
45. "A Strange Case of the Cost and Allocative Efficiencies in DEA," K. Tone, *Journal of the Operational Research Society*, 53, pp.1225-1231, 2002.
46. "Sensitivity and Stability Analysis in DEA: Some Recent Developments," K. Tone, W.W. Cooper, S. Li, L.M. Seiford, R.M. Thrall, J. Zhu) *Journal of Productivity Analysis*, 15, pp.217-246, 2001.
47. "On Returns to Scale under Weight Restrictions in DEA," K. Tone, *Journal of Productivity Analysis*, 16, pp.31-47, 2001.
48. "A Slacks-based Measure of Efficiency in Data Envelopment Analysis," K. Tone, *European Journal of Operational Research*, 130, pp.498-509, 2001.
49. *Data Envelopment Analysis: A Comprehensive Text with Models, Applications, References and DEA-Solver Software* (with W.W. Cooper and L.M. Seiford), Kluwer Academic Publishers, 1999.
50. "A Search Model with Subjective Judgements: Auditing of Incorrect Declarations," K. Tone, S. Iwasaki, *Omega*, 26, pp.249-261, 1998.
51. "Measures of Inefficiency in Data Envelopment Analysis and Stochastic Frontier Estimation," K. Tone, W.W. Cooper, *European Journal of Operational Research*, 99, pp.72-88, 1997.
52. "Several Algorithms to Determine Multipliers in Use in Cone-Ratio Envelopment Approaches to Efficiency Evaluations in DEA," K. Tone, in

53. *Computational Approaches to Economic Problems* edited by H. Amman, B. Rustem and A. Whinston, Kluwer Academic Publishers, pp.91-109, 1997.
54. "A Simple Characterization of Returns to Scale in Data Envelopment Analysis," K. Tone, *Journal of the Operations Research Society of Japan*, 39, pp.604-613, 1996.
55. "An ε -free DEA and a New Measure of Efficiency," K. Tone, *Journal of the Operations Research Society of Japan*, 36, pp.167-174, 1993.
56. "An Active-Set Strategy in an Interior Point Method for Linear Programming," K. Tone, *Mathematical Programming*, 59, pp.345-360, 1993.
57. "On DEA Models," K. Tone, *Communications of the Operations Research Society of Japan*, 38, pp.34-40, 1993.
58. "Remarks on Potential versus Barrier Function Methods for Linear Programming," K. Tone, *Journal of the Operations Research Society of Japan*, 34, pp.391-403, 1991.
59. "An Efficiency Analysis of Public vs. Private Bus Transportation Enterprises," K. Tone, *Operations Research '90*, edited by H.E. Bradley, Pergamon Press, pp.357-366, 1991.
60. "Site Selection for a Large Scale Integrated Circuit Factory," K. Tone, S. Yanagisawa, *The Analytic Hierarchy Process*, edited by B.L. Golden, E.A. Wasil and P.T. Harker, Springer-Verlag, 242-250, 1989.
61. "A Comparative Study on AHP and DEA," K. Tone, *Policy and Information*, 13, pp.57-63, 1989.
62. "A Cost Information System for R&D and Production Management Program as Applied to a Solar Cell Development Project," K. Tone, *Operational Research '84*, edited by J.P. Brans, North-Holland, pp.531-545, 1985.
63. "Revisions of Constraint Approximations in the Successive QP Method for Nonlinear Programming Problems," K. Tone, *Mathematical Programming*, 26, pp.144-152, 1983.

6 Main Research Interests

- a. Efficiency Analysis of Public and Private Enterprises
- b. Mathematical Foundation of Efficiency Analysis
- c. Group Decision Making
- d. Application of OR/MS Methods to Public Sector Problems

7 Main Contributions

Professor Kaoru Tone is a Professor Emeritus at the National Graduate Institute for Policy Studies (GRIPS), Japan. He holds B.S. in Mathematics from the University of Tokyo and Ph.D. in Operations Research from the Keio University, Japan. He has served as professor at GRIPS, Saitama University and Keio University over 40 years. He was the *President of the Operations Research Society of Japan*, from 1996 to 1998. Professor Tone has achieved a high level of distinction both in Japan and internationally, and is known for being a world leading expert in Data Envelopment Analysis (DEA) and performance evaluation. His contribution to DEA has a variety of attainments. He authored a classical book “*Data Envelopment Analysis: A Comprehensive Text with Models, Applications, References and DEA-Solver Software*,” under the co-authorship with Professor Cooper (University of Texas) and Professor Seiford (University of Michigan), published by Springer. He also published many papers on DEA in prestigious international journals, such as *European Journal of Operational Research*, *Omega*, *Journal of the Operational Research Society*, *Journal of Productivity Analysis*, *Socio-Economic Planning Sciences*, *Annals of Operations Research*, and *International Transactions of Operational Research*. He opened a new avenue for performance evaluation, called Slacks-based Measure (SBM). This model is widely utilized over the world. Recently, *European Journal of Operational Research* announced that the SBM model by Tone is among the 20 most cited papers among 14,617 papers during 1977-2017 (40 year Anniversary). His recent innovations include Network SBM, Dynamic SBM, Dynamic DEA with Network Structure, Congestion, Returns to growth in DEA, Ownership-specified Network DEA, Non-convex Frontier DEA, Past-Present-Future Inter-temporal DEA and Resampling DEA. He had served as Editorial Board member of *Omega*, *The Journal of Data Envelopment Analysis*, *Socio-Economic Planning Sciences*, *Journal of Optimization Theory and Applications*, and *Metamorphosis*.

Furthermore, Professor Tone’s research activity has made significant impact in the public sectors. For example, the National Land Agency Japan Committee has adopted his proposed consensus-marking methodology to solve the site selection for relocating Japanese government agencies out of Tokyo. The committee has reported his conclusion to the Prime Minister of Japan at the end of December 1999. More recently, he acted as a specialist in designing the

decision methodology for a government project on the site selection for the Next Generation Supercomputing Centre in Japan (cost about US\$1.3 billion). Professor Tone proposed the use of Analytic Hierarchy Process and Assurance Region DEA models to devise the conclusion. The selection committee reported his recommendation to the RIKEN (an Independent Administrative Institute funded by the Japanese Government). On March 29, 2007, RIKEN announced to the public “The Winner is Kobe.” The “Supercomputer-K” is now in operation and takes consecutive top rank in world ranking.