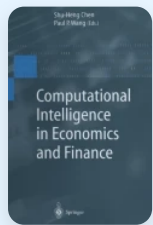


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# Computational Intelligence in Economics and Finance

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## Computational Intelligence in Economics and Finance

[Shu-Heng Chen](#) & [Paul P. Wang](#)


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## Abstract

Computational intelligence is a consortium of data-driven methodologies which includes fuzzy logic, artificial neural networks, genetic algorithms, probabilistic belief networks and machine learning as its components. We have witnessed a phenomenal impact of this data-driven consortium of methodologies in many areas of studies, the economic and financial fields being no exception. In particular, this volume of collected works will give examples of its impact on various kinds of economic and financial modeling, prediction and forecasting, and the analysis of various phenomena which sheds new light on a fundamental understanding of the

research issues. This volume is the result of the selection of high-quality papers presented at the **Second International Workshop on Computational Intelligence in Economics and Finance (CIEF'2002)**, held at the Research Triangle Park, North Carolina, United State of America, March 8-14, 2002. To complete a better picture of the landscape of this subject, some invited contributions from leading scholars were also solicited.

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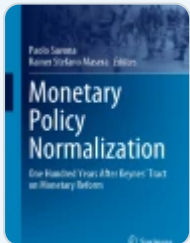
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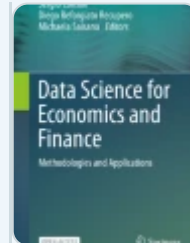
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## References

1.1 Aha, D. (1997): Lazy Learning. Kluwer

[Google Scholar](#)

1.2 Aoki, M. (1987): State Space Modeling of Time Series. Springer-Verlag

[Google Scholar](#)

1.3 Armano, G., Minnt A., Marchesi, M. (2002): NXCS-A Hybrid Approach to Stock Indexes Forecasting. In: Chen, S.-H. (Ed.), Genetic Algorithms and Genetic Programming in Computational Finance, Kluwer

[Google Scholar](#)

1.4 Aussem, A., Campbell, J., Murtagh F. (1998): Wavelet-Based Feature Extraction and Decomposition Strategies for Financial Forecasting. Computational Intelligence in Economics and Finance, Vol. 6, No. 2, 5-12

[Google Scholar](#)

1.5 Azoff, M. (1994): Neural Network Time Series: Forecasting of Financial Markets. Wiley

[Google Scholar](#)

1.6 Baestaens, 1).-E., Van Den Bergh, W., Wood D. (1991): Neural Network Solutions for Trading in Financial Markets, Pitman

[Google Scholar](#)

1.7 Baglioni, S., Sorbello, D., Pereira, C., Tettarnanzi, A. G. B. (2000): "Evolutionary Multiperiod Asset Allocation," In: Whitley, D., Goldberg, D., Cantti-Paz, E., Spector, L., Parrnee, I., Beyer, H. -G. (Eds.), Baglioni, S., Sorbello, D., Pereira, C., Tettarnanzi, A. G. B, 597-604. Morgan Kaufmann

[Google Scholar](#)

1.8 Balakrishnan, A. (1987): Kalman Filtering Theory. Optimization Software

[Google Scholar](#)

1.9 Balakrishnan, A. (1988): State Space Theory of Systems. Optimization Software

[Google Scholar](#)

1.10 Bauer, R., Jr. (1994): Genetic Algorithms and Investment Strategies. Wiley

[Google Scholar](#)

1.11 Billot, A. (1995): Economic Theory of Fuzzy Equilibria: an Axiomatic Analysis. Springer-Verlag, 2nd edition

[Google Scholar](#)

1.12 Bojadziev, G., Bojadziev, M., Zadeh, L. (1997): Fuzzy Logic for Business, Finance, and Management. World Scientific

[Google Scholar](#)

1.13 Boguslajskij, I. (1988): Filtering and Control. Optimization Software

[Google Scholar](#)

1.14 Bonabeau, E., Meyer, C. (2002): Swarm Intelligence: a Whole New Way to Think About Business. Harvard Business School Press

[Google Scholar](#)

1.15 Chang, K., Osier, C. (1994), "Evaluating Chart-Based Technical Analysis: the Head-and-Shoulders Pattern in Foreign Exchange Markets," Working Paper, Federal Reserve Bank of New York

[Google Scholar](#)

1.16 Chen, S.-H. (2002a): Evolutionary Computation in Economics and Finance, Physica, Verlag

[Google Scholar](#)

1. Chen, S.-H. (20021r): Genetic Algorithms and Genetic Programming in Computational Finance, Kluwer

[Google Scholar](#)

1.18 Chen, T., Chen, H. (1995): Universal Approximation to Nonlinear Operators by Neural Networks with Arbitrary Activation Functions and Its Application to Dynamical Systems. IEEE Transactions on Neural Networks, Vol. 6, 911-917

[Google Scholar](#)

1.19 Cordon, O., Herrera, F., Hoffmann, F., Magdalena. L. (2001): Genetic Fuzzy Systems. World Scientific

[Google Scholar](#)

1.20 Crisan, I). (2001): Particle Filters-a Theoretical Perspective. In: Doucel A., Freitag, N., Cordon, N. ( 2001 ) ( Eds.), Sequential Monte Carlo Methods in Practice, Springer-Verlag, 17-41

[Google Scholar](#)

1.21 Cristiarrini, N., Shawe-Taylor, J. (2000): An Introduction I Srtpport Vector Machines and Other Kernel-Based Learning Methods. Cambridge University Press

[Google Scholar](#)

1.22 Deboeck, G., Kohonen, T. (1998), Visual Explorations in Finance with Self-organizing Maps, Springer-Verlag

[Google Scholar](#)

1.23 Deng, J. (1982): Control Problems of Grey System. System and (. 'ou trol Letters, No. 5, 288 299

[Google Scholar](#)

1.24 Deng, J. (1989): Introduction to Grey Syeierrri Theory, Journal of Carey

[Google Scholar](#)

- 1.25 Dorigo, M. (1992): Optimization, Learning and Natural Algorithms, 1'h. I ). Thesis, Politecnice di Milano, Italy, in Italian

[Google Scholar](#)

- 1.26 Dorigo, V1., Marrirezzo, V., Colorni, A. (1996): The Ant System: Optimization by a Colony of Cooperating Agents, IEEE, Transactions on Systems, Klan. and Cybernetics, Part B, Vol. 26, No. I, 29-41

[Google Scholar](#)

- 1.27 Duffy, J., McNelis, P. D. (2001): Approximating and Simulating the Stoehas,k: Growth Model: Parameterized Expectations, Neural Networks, and the (icnet is Algorithm. Journal of Economic Dynamics and Control 25(9), 1273 130: 1

[Google Scholar](#)

- 1.28 Eberhart, R., Simpson, R, Dobbins, R. (1996): Computational Intelligence PC Tools. AP Professional

[Google Scholar](#)

- 1.21) Epstein, J., Axtell, 11. (1996): Growing Artificial Societies: Social Science from the Bottom Up. MIT Press

[Google Scholar](#)

- 1.30 Farr, J., Gijbels, I. (1996): Local Polynomial Modeling and Its Applications. Chapman & Hall.

[Google Scholar](#)

1.31 Fischer, R. (2001): "The New Fibonacci Trader: Tools and Strategies for Trading Success. Wiley

[Google Scholar](#)

1. Fogel, D. (1995): Evolutionary Computation toward a New Philosophy of Machine Intelligence. IEEE Press

[Google Scholar](#)

1.33 Fogel, D., Chellapilla, K., Angeline, P. (2002): Evolutionary Computation and Economic Models: Sensitivity and Unintended Consequences. In: Chen, S. 11. (Ed.), Evolutionary Computation in Economics and Finance, Physics Verlag, 215-269

[Google Scholar](#)

1.34 Vogel, L. (1964): On the Organization of Intellect, Ph.D. Thesis, UCLA

[Google Scholar](#)

1.35 Vogel, L. (1997): A Retrospective View and Outlook on Evolutionary Algorithms. In: Reusch, B. (Ed.), Computational Intelligence: Theory and Applications, 5th Fuzzy Days, Springer-Verlag, Berlin, 337-312

[Google Scholar](#)

1.36 Fogel, L. J., Owens, A. J., Walsh, N. J. (1966): Artificial Intelligence through Simulated Evolution, Wiley

[Google Scholar](#)

1.37 Carey, N., Johnson, D. (1979): Computers and Intractability, a Guide to the Theory of NP-completeness. Freeman



1.38 Gately, E. (1996): Neural Networks for Financial Forecasting. Wiley

[Google Scholar](#)

1. Gencay, R., Selcuk, I., Whitcher, B. (2001): An Introduction to Wavelet, and Other Filtering Methods in Finance and Economics, Academic Press

[Google Scholar](#)

1.40 Granger, C., Fatinala, M. (1964): Spectral Analysis of Economic Time Series. Princeton

[Google Scholar](#)

1.41 Goffe, W. (1996): SIMANN: A Global Optimization Algorithm Using Simulated Annealing. Studies in Nonlinear Dynamics and Econometrics. Vol. I. No. 3

[Google Scholar](#)

1.42 Goffe, W., Ferrier, G., Rogers, J. (1992): Simulated Annealing: an Initial Application in Econometrics. Computer Science in Economics and Management. Vol. 5

[Google Scholar](#)

1.43 Goffe, W., Ferrier, G., Rogers, J. (1991): Global Optimization of Statistical Functions with Simulated Annealing. Journal of Econometrics. Vol. 60. No. 1/2. January/February. 65-99

[Google Scholar](#)

1.44 Cross, S., Aron, S., Deneubourg, J. L., Pasteels, J. M. (1989): Self-organized

[Article](#) [Google Scholar](#)

1.45 Hampton, J. (1997): Rough Set Theory The Basics (Part 1). Journal of Computational Intelligence in Finance, Vol. 5, No. 6, 25–29

[Google Scholar](#)

1.46 Hampton, J. (1998): Rough Set Theory—The Basics (Part 2). Journal of Computational Intelligence in Finance, Vol. 6, No. 1, 40–42

[Google Scholar](#)

1.47 Hampton, J. (1998): Rough Set Theory The Basics (Part 3). Journal of Computational Intelligence in Finance, Vol. 6, No. 2, 35–37

[Google Scholar](#)

1.48 Harvey, A. (1989): Forecasting Structural Time Series Models and the Kalman Filter. Cambridge

[Google Scholar](#)

1.49 Hiemtra, Y. (1996): Applying Neural Networks and Genetic Algorithms to Tactical Asset Allocation, NeuroveSt Journal, 4 (3), 8–15

[Google Scholar](#)

1.50 Keber, C. (2002): Collective Intelligence in Option Pricing-Determining Black-Scholes Implied Volatilities with the Ant Programming Approach, working paper, University of Vienna

[Google Scholar](#)

1.51 Kirkpatrick, S., Gelatt, C., Vecchi, M. (1983), Optimization by Simulated Annealing, Science, Vol. 220, 671-680

[Google Scholar](#)

1.52 Kitagawa, G., Sata, S. (2001): Monte Carlo Smoothing and Self-organizing State Space Model. In: Doucet, A., Freitas, N., Gordon, N. (2001) (Eds.), Sequential Monte Carlo Methods in Practice, Springer-Verlag, 177-196

[Google Scholar](#)

1.53 Kohonen, T. (1982): Self-organized Foundation of Topologically Correct Feature Maps. Biological Cybernetics 43, 59-69

[Article](#) [MathSciNet](#) [MATH](#) [Google Scholar](#)

1.54 Lin, C. -T., Yang, S. -Y. (1999): Selection of Home Mortgage Loans Using Grey Relational Analysis. Journal of Grey System, Vol. 11, No. 4, 359-368

[Google Scholar](#)

1.55 Lin, C. -T., Chen, L. -H. (1999): A Grey Analysis of Bank Re-decreasing the Required Reserve Ratio. Journal of Grey System, Vol. 11, No. 2, 119-132

[Google Scholar](#)

1.56 Lin, C. -T., Chang, P. -C. (2001): Forecast the Output Value of Taiwan's Machinery Industry Using the Grey Forecasting. Journal of Grey System, Vol. 1.3, No. 3, 259-268

[Google Scholar](#)

1.57 Lo, A., Mamaysky, H., Wang, J. (2000): Foundations of Technical Analysis: Computational Algorithms, Statistical Inference, and Empirical Implementation, Journal of Finance. Vol. LV, No. 4, 1705-1765

1.58 Mansur, Y. (1995): Fuzzy Sets and Economics: Applications of Fuzzy Mathematics to Non-cooperative Oligopoly. Edward Elgar

[Google Scholar](#)

1.59 Marks, R. (2002): Playing Games with Genetic Algorithms. In: Chen, S. H. (Ed.), Evolutionary Computation in Economics and Finance, Physica-Verlag, 144

[Google Scholar](#)

1.60 Messier, W. J., Hansen, J. V. (1988): Inducing Rule for Expert System Development: an Example Using Default and Bankruptcy Data. Management Science 34, 1403-1415

[Google Scholar](#)

1.61 Modzek, A., Skabek, K. (1998): Rough Sets in Economic Applications. In: Polkowski, L., Skowron, A. (Eds.), Rough Sets in Knowledge Discovery 2: Applications, Case Studies and Software Systems, Physica-Verlag. Chap. 13

[Google Scholar](#)

1.62 Mortensen, R. (1987): Random Signals and Systems. Wiley

[Google Scholar](#)

1.63 Osier, C., Chang, K. (1995): Head and Shoulder: Not Just a Flaky Pattern. Staff Report: No. 1, Federal Reserve Bank of New York

[Google Scholar](#)

1.61 Pan, Z., Wang, X. (1998): Wavelet-Based Density Estimator Model for

[MathSciNet](#) [Google Scholar](#)

1.65 Mackard, N. (1990): A Genetic Learning Algorithm for the Analysis of Complex Data, Complex Systems 4, No. 5, 543-572

[MathSciNet](#) [Google Scholar](#)

1.66 Pedrycz, W. (1997): Computational Intelligence: An Introduction. CRC Press  
1.67 Peray, K. (1999): Investing in Mutual Funds Using Fuzzy Logic. CRC Press

[Google Scholar](#)

1.68 Quinlan, R. (1986): Induction of Decision Trees. Machine Learning 1(1), 81-106

[Google Scholar](#)

1.69 Quinlan, R. (1987): Simplifying Decision Trees. International Journal of Man-Machine Studies 27 (3), 221-231

[Article](#) [Google Scholar](#)

1.70 Quinlan, R. (1993): C4.5: Programs for Machine Learning. Morgan Kaufmann

[Google Scholar](#)

1.71 Rechenberg, I. (1965): Cybernetic Solution Path of an Experimental Problem. Royal Aircraft Establishment, Library Translation No. 1122, August. Farnborough, UK

[Google Scholar](#)

1.72 Refenes, A. -P. (1995): Neural Networks in the Capital Markets. Wiley

[Google Scholar](#)

1.73 Refenes, A.-P., Zapranis, A. (1999): Principles of Neural Model Identification, Selection and Adequacy: with Applications in Financial Econometrics. Springer

[Google Scholar](#)

1.74 Shadbolt, J., Taylor, J. (2002): Neural Networks and the Financial Markets- Predicting, Combining, and Portfolio Optimisation. Springer

[Google Scholar](#)

1.75 Schmertmann, C. P. (1996): Functional Search in Economics Irving Genetic Programming. Computational Economics 9(4), 275 298

[Google Scholar](#)

1.76 Schwefel, H. -P. (1965): Kybernetische Evolution als Strategien der Experimentellen Forschung in der Strömungstechnik. Diplomarbeit, Thesis, Technische Universität von Berlin

[Google Scholar](#)

1.77 Schwefel, H. -P. (1995): Evolution and Optimum Seeking, Wiley

[Google Scholar](#)

1.78 Skalkoz, C. (1996): Rough Sets help Time the Bi X. Mathematical Journal. Nov./Dec., 20-27

[Google Scholar](#)

1.79 Slowinski, R., Zopounidis, C. (1995): Applications of the (tough Set. Approach to Evaluation of Bankruptcy Risk. International Journal of Intelligent Systems in Accounting, Finance and Management 4. 27-41

[Google Scholar](#)

1.80 Smithson, M. J. (1987): Fuzzy Set Analysis for Behavioral *anda* Social Sciences. Springer-Verlag, New York

[Book](#) [Google Scholar](#)

1.81 Sugeno, M., Yasukawa, T. (1993): A Fuzzy-Logic-Based *Approach* to Qualitative Modeling. IEEE Transactions on Fuzzy Systems, Vol. I, 7: 31

[Google Scholar](#)

1.82 Suykens,I., Vandewalle. J. (1998): The K.U. Leuven Time Series Prediction Competition. In: Suykens, J., Vandewalle, J. (Eds.), Nonlinear Alodeling: Advanced Black-Box Techniques, Kluwer, 241-253

[Chapter](#) [Google Scholar](#)

1.83 Takagi, 'T., Sugeno, M. (1985): Fuzzy Identification of Systems and Its Applications to Modeling and Control. IEEE Transactions on Systems, : Alan, and Cybernetics, Vol. 15, 116-132

[Google Scholar](#)

1.84 Tac, N., Linn, S. (2001): Fuzzy Inductive Reasoning, Expectation Formation and the Behavior of Security Prices. Journal of Economic Dynamics and Control. Vol. 25, 321 361

[Google Scholar](#)

1.85 I.85 Taylor P., Abdul-Kader, Vl., Dngdale. D. (1998): Investment Decisions in

[Google Scholar](#)

1.86 Thomason, M. R. (1997): Financial Forecasting with Wavelet Filters and Neural Networks. C" DorpoLational Intelligence in Economics and Finance, Vol. No. 2, 27 32

[Google Scholar](#)

1.87 Trippi, R. It., "Turban, E. (1993): Vernal Networks in Finance and Investing. Irwin

[Google Scholar](#)

1.88 Ici, Y.-C., Lin. C.-`I., "Tsai, II.-.1. (2001): `Ilre Performance Evaluation Model of Stock-Listed Banks in Taiwan liv (irev Relational Analysis and Factor Analysis. 'Che Journal of (trey System n. Vol. 13, No. 2, 153-164

[Google Scholar](#)

1.89 Vapnik, V. (1998a): Statistical Learning "Theory. Wiley

[Google Scholar](#)

1.90 Vapnik, V. (1998b): The Support Vector Method of Function Estimation. In: Suykens, J.. Vandewalle,.1. (Eds.). Nonlinear Modeling: advanced Black-Box Techniques. Kluwer, Boston, 55-85

[Google Scholar](#)

1.91 Von Altrock, C. (1996): Fuzzy Logic and Neurofnzzy Applieatious iu Busirncae and finance. Prentice Hall

[Google Scholar](#)



1.92 White, IL (1988): Economic Prediction Using Neural Networks. the Case of IBM Daily Stock Returns. Proceedings of IEEE International Conference on Neural Networks, Vol. 2, IEEE, New York, 451-458

[Chapter](#) [Google Scholar](#)

1.93 White, II. (1992): Artificial Neural Networks-Approximation 'Theory and Learning Theory. Blackwell

[Google Scholar](#)

1.94 Wolberg, J. (2000): Expert Trading Systems: Modeling Financial Markets with Kernel Regression. Wiley

[Google Scholar](#)

1.95 Zirilli, J. (1996): Financial Prediction Using Neural Networks. International Thomson Publishing

[Google Scholar](#)

1.96 Zopounidis, C., Pardalos, P., Baourakis, C. (2002): Fuzzy Sets in Management, Economy & Marketing. World Scientific

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