

[Home](#) > [Annals of Operations Research](#) > [Article](#)

The AURORA Financial Management System: Model and Parallel Implementation Design

Published: December 2000



Volume 99, pages 189–206 (2000) [Cite this article](#)[Save article](#)[View saved research](#) >[Annals of Operations Research](#)[Aims and scope](#) →[Submit manuscript](#) →G.Ch. Pflug¹, A. Świętanowski², E. Dockner³ & H. Moritsch⁴[260](#) Accesses [19](#) Citations [Explore all metrics](#) →

Abstract

The AURORA financial management system under development at the University of Vienna is a modular decision support tool for portfolio and asset-liability management. It is based on a multivariate Markovian birth-and-death factor model for the economic environment, a pricing model for the financial instruments and an objective function which is flexible enough to express risk aversion.

The core of the system is a large scale linear or convex program, which due to its size and structure is well suited for parallel optimization methods.

As the system is still at an early stage of development, the results are preliminary in nature. Only a few types of financial instruments are handled and just two types of objectives are considered. The parallel optimization modules are still in the development phase.

 This is a preview of subscription content, [log in via an institution](#)  to check access.

Access this article

[Log in via an institution](#) →

Subscribe and save

Springer+

from €37.37 /Month

- Starting from 10 chapters or articles per month
- Access and download chapters and articles from more than 300k books and 2,500 journals
- Cancel anytime

[View plans](#) →

Buy Now

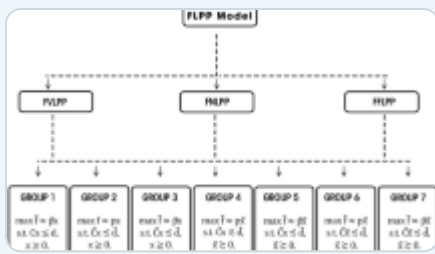
[Buy article PDF 39,95 €](#)

Price includes VAT (Poland)

Instant access to the full article PDF.

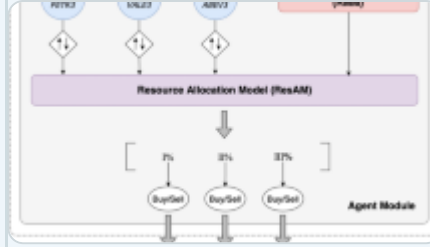
[Institutional subscriptions](#) →

Similar content being viewed by others



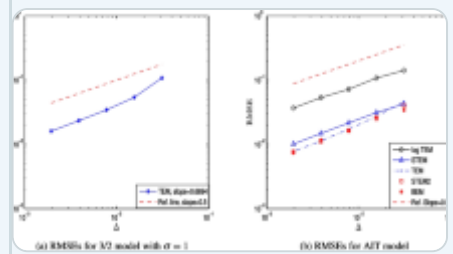
[A Systematic Review on Fuzzy-Based Multi-objective Linear programming](#)

Article | 20 July 2023



[AURORA: an autonomous agent-oriented hybrid trading service](#)

Article | 25 September 2021



[Positivity-preserving approximations of financial SDEs with highly nonlinear](#)

Article | 22 May 2026

Explore related subjects

Discover the latest articles, books and news in related subjects, suggested using machine learning.

[Aurora](#)

[Database Management System](#)

[Financial Econometrics](#)

[Financial Engineering](#)

[Mathematical Finance](#)

[Financial Technology and Innovation](#)

References

- [1] Ph. Artzner, F. Delbaen, J.-M. Eber and D. Heath, Coherent measures of risk, *Mathematical Finance* 9 (1999) 203–228.
- [2] D.P. Bertsekas, *Constrained Optimization and Lagrange Multiplier Methods* (Academic Press, 1982).
- [3] J.R. Birge, Decomposition and partitioning methods for multistage stochastic linear programs, *Operations Research* 33 (1985) 989–1007.
- [4] J.R. Birge and L. Qi, Computing block-angular Karmarkar projections with applications to stochastic programming, *Management Science* 34(12) (1990).

- [5] R.E. Bixby, Progress in linear programming, ORSA J. on Computing 6(1) (1994) 15-22.
- [6] F. Black, E. Derman and W. Toy, A one-factor model of interest rates and its application to treasury bond options, Financial Analysts Journal 3 (January/February 1990) 33-39.
- [7] M.J. Brennan, E.S. Schwartz and R. Lagnado, Strategic asset allocation, Journal of Economic Dynamics and Control 21 (1997) 1377-1403.
- [8] D.R. Cariño, T. Kent, D.H. Myers, C. Stacy, M. Sylvanus, A.L. Turner, K. Watanabe and W.T. Ziemba, The Russell-Yasuda Kasai model: an asset/liability model for a Japanese insurance company using multistage stochastic programming, Interfaces 24 (1994) 29-49.
- [9] J.C. Cox, J.E. Ingersoll and S.A. Ross, A theory of terms of interest rates, Econometrica 53 (1985) 385-407.
- [10] G.B. Dantzig and P. Wolfe, Decomposition principle for linear programs, Operations Research 8 (1960) 101-111.
- [11] M.A.H. Dempster and R.T. Thompson, Parallelization and aggregation of nested Benders decomposition, Working paper WP 01/95, The Judge Institute of Management Studies, Cambridge University (1995).
- [12] J. Dupacova, Stochastic programming models in banking, Working paper, International Institute for Applied Systems Analysis (1991).
- [13] A. Gupta, G. Karypis and V. Kumar, Highly scalable parallel algorithms for sparse matrix factorization, IEEE Transactions on Parallel and Distributed Systems 8(5) (1997).

- [14] P. Hoel, S. Port and Ch. Stone, *Introduction to Stochastic Processes* (Houghton-Mifflin, Boston, 1972).
- [15] P. Kall and S.W.Wallace, *Stochastic Programming* (Wiley, Chichester, 1994).
- [16] S. Karlin and H. Taylor, *A Second Course in Stochastic Processes* (Academic Press, Boston, 1993).
- [17] H. Konno and H. Yamazaki, Mean absolute deviation portfolio optimization model and its applications to Tokyo stock market, *Management Science* 37 (1991) 519-531.
- [18] M.I. Kusy and W.T. Ziemba, A bank asset and liability management model, *Operations Research* 34 (1986) 356-376.
- [19] H. Markowitz, Portfolio selection, *Journal of Finance* 7 (1952) 77-91.
- [20] J.M. Mulvey, Nonlinear network models in finance, in: *Advances in Mathematical Programming and Financial Planning* (JAI Press, 1987).
- [21] J.M. Mulvey, An asset-liability investment system, *Interfaces* 24 (1994) 22-33.
- [22] J.M.Mulvey, Multi-stage financial planning systems, in: *Operations Research Models in Quantitative Finance*, eds. R.L. D'Ecclesia and S.A. Zenios (Physica-Verlag, 1994) pp. 18-35.
- [23] J.M. Mulvey and A. Ruszczyński, A diagonal quadratic approximation method for large-scale linear programs, *Operations Research Letters* 12

- [24] J.M. Mulvey and A. Ruszczyński, A new scenario decomposition method for large-scale stochastic optimization, *Operations Research* 43 (1995) 477-490.
- [25] J.M. Mulvey and W.T. Ziemba, *Worldwide Asset and Liability Modeling* (Cambridge University Press, 1998).
- [26] J.M. Mulvey and H. Vladimirou, Stochastic network programming for financial planning problems, *Management Science* 38 (1992) 1642-1664.
- [27] V. Norkin, G.Ch. Pflug and A. Ruszczyński, A branch and bound method for stochastic global optimization, *Mathematical Programming* 83 (1998) 425-450.
- [28] W. Ogryczak and A. Ruszczyński, From stochastic dominance to mean-risk models: Semideviations as risk measures, *European Journal of Operations Research* 116 (1999) 33-50.
- [29] G.Ch. Pflug, Risk-reshaping contracts and stochastic optimization, *Central European Journal of Operations Research* 5(3-4) (1998) 205-230.
- [30] G.Ch. Pflug, *How to Measure Risk?* Festschrift to F. Ferschl (Physica-Verlag, 1999).
- [31] G.Ch. Pflug and A. Świętanowski, Dynamic asset allocation under uncertainty for pension fund management, *Control and Cybernetics* 28(4) (1999).
- [32] A. Ruszczyński and A. Świętanowski, Accelerating the regularized

decomposition method for two stage stochastic linear problems, *European Journal of Operations Research* 101(2) (1997) 328-342.

- [33] A. Ruszczyński, An augmented Lagrangian decomposition method for block diagonal linear programming problems, *Operations Research Letters* 8 (1989) 287-294.
- [34] A. Ruszczyński, Interior point methods in stochastic programming, Technical Report WP-93-8, International Institute for Applied Systems Analysis, Laxenburg, Austria (1993).
- [35] A. Ruszczyński, Parallel decomposition of multistage stochastic programming problems, *Mathematical Programming* 58 (1993) 201-228.
- [36] A. Ruszczyński, On convergence of an augmented Lagrangian decomposition method for sparse convex optimization, *Mathematics of Operations Research* 20(3) (1995) 634-656.
- [37] O.A. Vasicek, An equilibrium characterization of the term structure, *J. Financial Economics* 5 (1977) 177-18.
- [38] H. Vladimirou and S.A. Zenios, Scalable parallel computations for large-scale stochastic programming, *Annals of Operations Research* 90 (1999) 87-129.
- [39] S.A. Zenios, *Financial Optimization* (Cambridge University Press, 1993).
- [40] S.A. Zenios and R.L. D'Ecclesia, eds., *Operations Research Models in Quantitative Finance* (Springer, 1994).

Author information

Authors and Affiliations

**Department of Statistics and Decision Support Systems, Vienna University,
Universitätsstr. 5, A-1010, Wien, Austria**

G.Ch. Pflug

**Department of Statistics and Decision Support Systems, Vienna University,
Universitätsstr. 5, A-1010, Wien, Austria**

A. Świętanowski

**Department of Management, Vienna University, Bruennerstr. 72, A-1210,
Wien, Austria**

E. Dockner

**Department of Management, Vienna University, Bruennerstr. 72, A-1210,
Wien, Austria**

H. Moritsch

Rights and permissions

[Reprints and permissions](#)

About this article

Cite this article

Pflug, G., Świętanowski, A., Dockner, E. *et al.* The AURORA Financial Management System: Model and Parallel Implementation Design. *Annals of Operations Research* **99**, 189–206 (2000).

<https://doi.org/10.1023/A:1019297118383>

Issue date

December 2000

DOI

<https://doi.org/10.1023/A:1019297118383>

Search

Search by keyword or author



Navigation

Find a journal

Publish with us

Track your research