

Curriculum Vitae

Professional Experience

As of Dec 2011	Full professor for Mathematics and Finance, Vienna University of Economics and Business.
2001 –2011	Full professor (C4) for Financial Mathematics and Optimization, Universität Leipzig.
2011	Offer of a full professor position for "Stochastic Methods in Economics", TU Wien (declined)
1999 – 2001	Assistant professor for Quantitative Finance, Universität Zürich.
1996 – 1999	UBS-research-fellow in financial mathematics (postdoctoral position), department of mathematics, ETH Zürich.
1994 –1996	Research assistant, faculty of economics, Universität Bonn.

Education

2001	Habilitation in Finance, Universität Zürich.
1992 – 1996	PhD in Financial Economics, Universität Bonn (supervisors Prof. Hans Föllmer, Prof. Dieter Sondermann)
1993 – 1994	Doctoral education in Paris (DELTA, ENSAE, Paris VI).
1992	Diploma in mathematics, Universität Bonn.

Research Interests

Financial mathematics and quantitative risk management; Financial economics; Stochastic processes.

Awards

2021	WU Best paper award, sponsored by the city of Vienna for the paper 'How safe are European Safe Bonds? An Analysis from the Perspective of Modern Credit Risk Models'
2009 –2011	Member of the board of the Deutsche Gesellschaft für Versicherungs- und Finanzmathematik (DGVMF).
1996	Annual price for the best PhD-dissertation at the Faculty of Law and Economics, University of Bonn (Preis des Präsidenten der italienischen Republik).

Editorial Activities

Associate Editor of *Mathematical Finance*

Section editor for the *Encyclopedia of Quantitative Finance*, Wiley, 2010.

Referee for various journals including Finance and Stochastics, Annals of Applied Probability, Stochastic Processes and Applications, Mathematical Finance, Review of Financial Studies, Journal of Banking and Finance, ASTIN-Bulletin, Insurance: Mathematics and Economics, Journal of Economic Dynamics and Control, SIAM Journal on Control and Optimization and SIAM Journal for Financial Mathematics.

Supervision of PhD students

Dr. Ulrike Polte	On hedging and pricing of derivatives in illiquid markets : A PDE approach (2007).
Dr. Monika Popp	Simulation Techniques for Credit and Operational Risk Management (2008).
Dr. Jochen Backhaus	Pricing and Hedging of Credit Derivatives in Models with Interacting Default Intensities: A Markovian Approach (2008).
Dr. Roland Seydel	Impulse Control for Jump Diffusions: Viscosity Solutions, Quasi-Variational Inequalities and Applications in Bank Risk Management (2010).
Dr. Ling Xu	On Galerkin approximations for the Zakai equation with diffusive and point process observations (2011)
Dr. Lars Rösler	Stochastic Filtering in Pricing and Credit Risk Management (2016)
Juraj Hledik, PhD	Systemic Risk in Banking Networks (2018)
Kevin Kurt, PhD	Markov Modulated Affine Processes: Theory and Applications (2021)
Camilla Damian, PhD	Statistical Inference for partial Information Models in Finance (2021)
current students	Verena Köck, Theresa Traxler

Third party funding

2015 – 2020	Project leader for the project ‘Stochastic filtering and the modeling of corporate and sovereign credit risk’, financed by the Vienna Science and Technology Fund WWTF.
2011-2014	Project leader for the DFG project ‘Filtering techniques in the modeling, pricing and hedging of interest-rate and credit risk’ (joint with Prof. Thorsten Schmidt, TU Chemnitz).
2008 –2010	Project leader for the DFG project ‘Credit Risk under Incomplete Information and Nonlinear Filtering’.
2004–2007	Leader of research project ‘High-dimensional models for credit risk management’, funded by the BMBF (Bundesministerium für Bildung und Forschung), Germany.
Since 2002	Scientific member of the Graduiertenkolleg ‘Analysis, geometry and applications to the sciences’, Universität Leipzig.
Since 2004	Scientific member of the International Max Planck research school ‘Mathematics and applications in the sciences’.
2000-2001	Substantial involvement in writing the project proposal for the NCCR ‘Financial Valuation and Risk Management’, Zürich

Scientific Management

2008 – 2010 dean responsible for studies (Studiendekan), Department of mathematics, Universität Leipzig
Member or chairman of several hiring committees in Vienna, Leipzig and Zürich
as of 2016: member of the academic Senate of WU, vice chairman of the Department of Finance, Accounting and Statistics, WU as of 2020: Program director for doctoral studies, WU

List of Publications

Books

- MCNEIL, A., R. FREY, and P. EMBRECHTS (2005): *Quantitative Risk Management: Concepts, Techniques, and Tools*, in *Princeton Series in Finance* (D. Duffie and S. Schaefer, series eds.) Princeton University Press, Princeton, New Jersey. Second, fully revised version in (2015).
- HOFERT, M. AND FREY, R. AND MCNEIL, A. (2020) “The Quantitative Risk Management Exercise Book”, Princeton University Press, Princeton, New Jersey. (online version)

Publications in refereed journals

- FREY, R., and D. SOMMER (1996): “A Systematic Approach to Pricing and Hedging of International Derivatives with Interest Rate Risk,” *Applied Mathematical Finance*, 3, 295–317.
- FREY, R. (1997): “Derivative Asset Analysis in Models with Level-Dependent and Stochastic Volatility,” *CWI Quarterly, Amsterdam*, 10, 1–34.
- FREY, R., and A. STREMME (1997): “Market Volatility and Feedback Effects from Dynamic Hedging,” *Mathematical Finance*, 7(4), 351–374.
- FREY, R. (1998): “Perfect Option Replication for a Large Trader,” *Finance and Stochastics*, 2, 115–148.
- FREY, R., and D. SOMMER (1998): “The generalization of the Geske-formula for compound options to stochastic interest rates is not trivial – a note,” *Journal of Applied Probability*, 35, 501–509.
- FREY, R., and C. SIN (1999): “Bounds on European Option Prices under Stochastic Volatility,” *Mathematical Finance*, 9, 97–116.
- FREY, R., and W. RUNGGALDIER (1999): “Risk-minimizing hedging strategies under restricted information: the case of stochastic volatility models observed only at discrete random times,” *Mathematical Methods of Operations Research*, 50, 339–350.
- FREY, R. (2000): “Superhedging in Stochastic Volatility Models and Optimal Stopping,” *Finance and Stochastics*, 4, 161–188.
- FREY, R. (2000): “Risk-Minimization with incomplete information in a model for high frequency data,” *Mathematical Finance*, 10, 215–226.
- MCNEIL, A., and R. FREY (2000): “Estimation of Tail-Related Risk Measures for Heteroscedastic Financial Time Series: an Extreme Value Approach,” *Journal of Empirical Finance*, 7, 271–300.
- FREY, R., and W. RUNGGALDIER (2001): “A nonlinear filtering approach to volatility estimation with a view towards high frequency data,” *International Journal of Theoretical and Applied Finance*, 4, 1–12.
- FREY, R., and A. MCNEIL AND M. NYFELER (2001): “Copulas and Credit Risk,” *RISK*, October 2001.
- FREY, R., and A. MCNEIL (2002): “VaR and expected shortfall in portfolios of dependent credit risks: Conceptual and practical insights,” *Journal of Banking and Finance*, 26, 1317–1334.
- FREY, R., and A. MCNEIL (2003): “Dependent defaults in models of portfolio credit

risk,” *Journal of Risk*, 6(1), 59–92.

EBERLEIN, E., R. FREY, M. KALKBRENER, and L. OVERBECK (2007): “Mathematics in Financial Risk Management”, *Jahresbericht der DMV*, 109, 165–161.

FREY, R., M. POPP, and S. WEBER, (2008): “An approximation for credit portfolio losses”, *The Journal of Credit Risk*, 4 (1), p 3-20.

FREY, R., and J. BACKHAUS (2008): “Pricing and hedging of portfolio credit derivatives with interacting default intensities” , *International Journal of Theoretical and Applied Finance*, 11 (6), 611–634.

FREY, R., and T. SCHMIDT (2009): “Pricing corporate securities with noisy asset information,” *Mathematical Finance* 19, pp. 403–421.

FREY, R. and SEYDEL, R. (2010): “Optimal Securitization of Credit Portfolios via Impulse Control”, *Mathematics and Financial Economics*, 4 (1), pp. 1–28

FREY, R., and J. BACKHAUS (2010): “Dynamic hedging of synthetic CDO-tranches with spread- and contagion risk”, *Journal of Economic Dynamics and Control* 34, pp. 710–724.

FREY, R., and W. RUNGALDIER (2010): “Pricing credit derivatives under incomplete information: a nonlinear-filtering approach,” *Finance and Stochastics*, 14 (4) pp. 495-526.

FREY, R. and POLTE, U. (2011) “Nonlinear Black-Scholes Equations in Finance: Associated Control Problems and Properties of Solutions”, *SIAM Journal of Control and Optimization*, 49 (1), pp. 185–204

FREY, R., and T. SCHMIDT (2012) “Pricing and hedging of credit derivatives via the innovations approach to nonlinear filtering”, *Finance and Stochastics*, 16, pp.105–133.

FREY, R. and GABIH, A. and WUNDERLICH, R. , (2012) “Portfolio optimization under partial information with expert opinions”, *International Journal of Theoretical and Applied Finance*, vol 15 (1)

FREY, R. and SCHMID, T. and XU, L. , (2013) “On Galerkin Approximations for the Zakai Equation with Diffusive and Point Process Observations”, *SIAM Journal of Numerical Analysis* 51, pp 2036–2062.

FREY, R. and RÖSLER, L. (2014), “ Contagion effects and collateralized credit value adjustments for credit default swaps”, *International Journal of Theoretical and Applied Finance*, 17 (7): 1450044/1–29 .

FREY, R. and GABIH, A. and WUNDERLICH, R. (2014), “Portfolio Optimization under Partial Information with Expert Opinions: a Dynamic Programming Approach” *Communications in Stochastic Analysis* 8 (1), 49-79.

DAMIAN, C. AND EKSI, Z. AND FREY, R. (2018) “EM Algorithm for Markov Chains Observed via Gaussian Noise and Point Process Information: Theory and Case Studies from Credit Risk” *Statistics and Risk Modelling* 35, 51-72.

FREY, R. AND HLEDIK, J. (2018) “Diversification and Systemic Risk: a Financial Network Perspective” *Risks*, 6, 54–

FREY, R., RÖSLER, L. AND LU, D. (2019), “Corporate security prices in structural credit risk models with incomplete information”, *Mathematical Finance* 29, 84-116.

COLANERI, K. AND EKSI, Z. AND FREY, R. AND SZOELGYENYI, M. (2020) “Optimal liquidation under partial information with market impact” *Stochastic Processes and Applications*, 130, 1913-1946.

CECI, CLAUDIA AND COLANERI, KATIA AND FREY, RÜDIGER AND KÖCK, VERENA (2020) “Value adjustments and dynamic hedging of reinsurance counterparty risk” *SIAM journal of financial mathematics*, 11, 788–814.

FREY, R. AND KURT, K. AND DAMIAN, C. (2020) “How safe are European Safe

Bonds”, *Journal of Banking and Finance*, 119, 1–18.

COLANERI, K. AND FREY, R. (2021) “Classical Solutions of the Backward PIDE for Markov Modulated Marked Point Processes and Applications to CAT Bonds”, *Insurance: Mathematics and Economics*,

Contributions to books (mostly refereed)

FREY, R. (2000): “Market Illiquidities as a Source of Model Risk in Dynamic Hedging,” in *Model Risk* (Rajna Gibson ed.), Risk Publications, London.

EMBRECHTS, P., R. FREY, and H. FURRER (2001): “Stochastic Processes in Insurance and Finance,” pp 365 – 412 in *Handbook of Statistics*, vol. 19., ed. by D. Shanbag and C.R. Rao, North Holland.

FREY, R., and PATIE, P. (2002): “Risk Management for Derivatives in Illiquid Markets: A Simulation Study”, in *Advances in Finance and Stochastics* (K. Sandmann and P. Schönbucher, eds.), Springer, Berlin.

FREY, R. (2003): “A Mean-Field Model for Interacting Defaults and Counterparty Risk,” in *Bulletin of the International Statistical Institute*.

FREY, R., C. PROSDOCIMI, and W. RUNGALDIER (2007): “Affine credit risk models under incomplete information” in *Proceedings of the 6th RITS Symposium on Stochastic Processes and Application to Mathematical Finance* (S. Ogawa, J. Akahori, S. Watanabe, eds.), World Scientific.

EBERLEIN, E. , R. FREY, and E.A. v. HAMMERSTEIN, (2008): “Advanced credit portfolio modelling and CDO pricing”, in *Mathematics - Key Technology for the Future* (W. Jäger, H.J. Krebs, eds.), Springer, Berlin.

BORDAG, L. and R. FREY, (2009) “Pricing options in illiquid markets: symmetry reductions and exact solutions”, in *Nonlinear Models in Mathematical Finance – New Research Trends in Option Pricing*, Nova Science Publishers, Hauppauge, NY.

FREY, R., and W. RUNGALDIER (2011): “Nonlinear Filtering in Models for Interest-Rate and Credit Risk”, Chapter 32 in *Handbook of Nonlinear Filtering*, D. Crisan, B. Rozovski, eds., Oxford University Press .

FREY, R., and T. SCHMIDT, (2011) “Filtering and Incomplete Information in Credit Risk”, Chapter 7 in *Recent Advancements in the Theory and Practice of Credit Derivatives*, Damiano Brigo, Tom Bielecki and Frederic Patras, ed., Wiley, New Jersey.

Preprints and current projects

FREY, R. AND KÖCK, V. (2021) “Deep Neural Network Algorithms for Parabolic PIDEs and Applications in Insurance Mathematics”, preprint, Vienna University of Economics and Business, available on [arXiv](#).

KURT, K. AND FREY, R. (2021) “Markov-modulated Affine Processes”, preprint, Vienna University of Economics and Business, available on [arXiv](#).