Mathematical Finance / Volume 14, Issue 1 / p. 1-18

Hedging and Portfolio Optimization in Financial Markets with a Large Trader

Peter Bank, Dietmar Baum

First published: 24 December 2003
https://doi.org/10.1111/j.0960-1627.2004.00179.x
Citations: 189

Address correspondence to Peter Bank, Humboldt-Universität zu Berlin, Institut für Mathematik, Unter den Linden 6, D100999, Berlin, Germany; e-mail: pbank@mathematik.hu-berlin.de.

We thank Hans Föllmer, Rüdiger Frey, Peter Imkeller, and Martin Schweizer for helpful discussions and comments. We also acknowledge the helpful suggestions of an anonymous referee. Support to the first author from Deutsche Forschungsgemeinschaft through SFB 373, "Quantification and Simulation of Economic Processes," is gratefully acknowledged.

Manuscript received April 2002; final revision received August 2002.

Abstract

We introduce a general continuous-time model for an illiquid financial market where the trades of a single large investor can move market prices. The model is specified in terms of parameter-dependent semimartingales, and its mathematical analysis relies on the nonlinear integration theory of such semimartingale families. The Itô–Wentzell formula is used to prove absence of arbitrage for the large investor, and, using approximation results for stochastic integrals, we characterize the set of approximately attainable claims. We furthermore show how to compute superreplication prices and discuss the large investor's utility maximization problem.

REFERENCES

Back, K. (1992): Insider Trading in Continuous Time, *Rev. Financial Stud.* **5**, 387–409.

Web of Science® | Google Scholar

Baum, D. (2001): Realisierbarer Portfoliowert in illiquiden Finanzmärkten, Ph.D. thesis, Humboldt University of Berlin .

Google Scholar

Bensaid, B., J. Lense, H. Pages, and J. Scheinkman (1992): Derivative Asset Pricing with Transaction Costs, *Math. Finance* **2**, 63–86.

Google Scholar

Bierbaum, J. (1997): Über die Rückwirkung von Handelsstrategien ausgewählter Investoren auf Wertpapierpreisprozesse, Diploma thesis, Humboldt University Berlin .

Google Scholar

Çetin, U., R. A. Jarrow, and P. Protter (2002): Liquidity Risk and Arbitrage Pricing Theory, Working paper, Cornell University .

Google Scholar

Çetin, U., R. A. Jarrow, P. Protter, and M. Warachka (2002): Option Pricing with Liquidity Risk, Working paper, Cornell University .

Google Scholar

Cuoco, D., and J. Cvitanic (1998): Optimal Consumption Choices for a 'Large' Investor, *J. Econ. Dynam. Control* **22**, 401–436.

Web of Science® Google Scholar

Cvitanic, J., and J. Ma (1996): Hedging Options for a Large Investor and Forward–Backward SDE's, *Ann. Appl. Prob.* **6**, 370–398.

Web of Science® Google Scholar

Delbaen, F., and W. Schachermayer (1998): The Fundamental Theorem of Asset Pricing for Unbounded Stochastic Processes, *Math. Annalen* **312**, 215–250.

Web of Science® Google Scholar

Dellacherie, C., and P. Meyer (1975): *Probabilités et Potentiel*, Chapitres I–IV. Paris : Hermann.

Google Scholar

Frey, R. (1998): Perfect Option Hedging for a Large Trader, *Finance Stoch.* **2**, 115–141.

Google Scholar

Frey, R., and A. Stremme (1997): Market Volatility and Feedback Effects from Dynamic Hedging, *Math. Finance* **7**, 351–374.

Web of Science® Google Scholar

Jarrow, R. (1992): Market Manipulation, Bubbles, Corners and Short Squeezes, *J. Financial Quant. Analysis* **27**, 311–336.

Web of Science® | Google Scholar

Jarrow, R. (1994): Derivative Securities Markets, Market Manipulation and Option Pricing Theory, *J. Financial Quant. Analysis* **29**, 241–261.

Web of Science® | Google Scholar

Kramkov, D. (1996): Optional Decomposition of Supermartingales and Hedging Contingent Claims in Incomplete Security Markets, *Prob. Theory & Rel. Fields* **105**, 459–479.

Web of Science® | Google Scholar

Kunita, H. (1990): *Stochastic Flows and Stochastic Differential Equations*. Cambridge , UK : Cambridge University Press.

Google Scholar

Kyle, A. (1985): Continuous Auctions and Insider Trading, *Econometrica* **53**, 1315–1335.

Web of Science® | Google Scholar

Levental, S., and A. V. Skorohod (1997): On the Possibility of Hedging Options in the Presence of Transaction Costs, *Ann. Appl. Prob.* **7**(2), 410–443.

Google Scholar

Papanicolaou, G., and R. Sircar (1998): General Black-Scholes Models Accounting for Increased Market Volatility from Hedging Strategies, *Appl. Math. Finance* **5**, 45–82.

Google Scholar

Platen, E., and M. Schweizer (1998): On Feedback Effects from Hedging Derivatives, *Math. Finance* **8**, 67–84.

Web of Science® | Google Scholar

Protter, P. (1990): *Stochastic Integration and Differential Equations*. Berlin : Springer.

Google Scholar

Schönbucher, P. J., and P. Wilmott (2000): The Feedback Effect of Hedging in Illiquid Markets, *SIAM J. Appl. Math.* **61**(1), 232–272(electronic).

Web of Science® | Google Scholar

Soner, H. M., S. E. Shreve, and J. Cvitanić (1995): There Is No Nontrivial Hedging Portfolio for Option Pricing with Transaction Costs, *Ann. Appl. Prob.* **5**(2), 327–355.

Web of Science® | Google Scholar

Citing Literature

Citation Statements beta

Supporting	Mentioning	Contrasting
1	222	2

Explore this article's citation statements on scite.ai

powered by scite_

Download PDF