Seminar Finance: Derivatives & Risk Management

Bachelor Seminar

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Requirements

- Preparation of a seminar paper in groups of up to 3
- Scope: 15/20/25 pages (depending on group-size)
- Independently perform empirical / quantitative analysis
- Use of appropriate statistics software
- Pure literature research is not sufficient
- Presentation of seminar paper in blocked seminar
- Assessment: 60 % written work and 40 % presentation

Procedure

schedule updated, see website

- 24.01.2024 13:00 I-112, Kick-off Meeting
- 31.01.2024 23:59, Submission of preferences via Email
- 01.02.2024, Allocation of topics via email
- 05.02.2024 23:59, Binding registration
- 17.05.2024 23:59, Submission deadline
- May/June (TBA), Presentation
- General information, registration form, Grading specification form, Guideline for writing seminar papers:
  https://www.fcm.uni-hannover.de/de/lehre/seminare/

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Implied Volatility

Task:

- By (numerically) inverting the Black-Scholes formula, one can obtain an option-implied volatility of the underlying asset
- Empirically assess the Black-Scholes implied volatility of a stock market index. Do you find smile or term-structure effects? Can implied volatility forecast realized volatility?

Literature:

- Black, F., & Scholes, M. (1973). The pricing of options and corporate liabilities. *Journal of Political Economy*, 81(3), 637-657.
- Hull, J. C. (2012). Options, Futures and Other Derivatives (8th ed.). Prentice Hall.
- Dupire Bloomberg, B. (1994). Pricing with a Smile. Risk, 7(1), 18-20.

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Practitioner Black–Scholes (PBS) Model

Task:

- The so-called PBS estimates an implied volatility (IV) surface (across strikes and maturities) and then fits a polynomial regression. Then, Black-Scholes prices can be computed for an option anywhere on the surface with predicted IV as an input.

- Describe and implement the model and, e.g., compare its predictions to those other models or test different model specifications.

Literature:

- Christoffersen, P., and K. Jacobs. 2004a. The Importance of the Loss Function in Option Pricing. *Journal of Financial Economics*, Vol. 72, No. 2, pp. 291–318.

- Dumas, B., J. Fleming, and R. E. Whaley. 1998. Implied Volatility Functions: Empirical Tests. *Journal of Finance*, Vol. 53, No. 6, pp. 2059–2106.

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GARCH-based VaR models

Task:

- Volatility is a key input parameter for estimating the Value-at-Risk
- A GARCH process is a popular choice for modeling time-varying volatility
- Estimate and evaluate GARCH-based VaR forecasts

Literature:

- Hull, J. C. (2012), Options, Futures, and Other Derivatives, Pearson Education, Prentice Hall.
- Christoffersen, P. (2012), Elements of Financial Risk Management, Academic Press

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Asian Options

Task:

- Asian options belong to the class of exotic options. The option payoff depends on the average price during a certain pre-specified period instead of just the price at the exercise date. First, different permutations of Asian options shall be described

- Analytically assess the value of Asian options. Value the options using Monte-Carlo Simulations. If possible, compare your valuation with market values of existing Asian options

Literature:

- Hull, J. C. (2012). Options, Futures and Other Derivatives (8th ed.). Prentice Hall.

- Kemna, A. G. Z., & Vorst, A. C. F. (1990). A pricing method for options based on average asset values. Journal of Banking and Finance, 14(1), 113-129.

Barrier Options

Task:

- Barrier options are activated or deactivated by certain events. There are knock-out options and knock-in options. These shall be classified and explained theoretically

- Analytically assess the value of barrier options. Value the options using Monte-Carlo Simulations. If possible, compare your valuation with market values of existing barrier options.

Literature:

- Hull, J. C. (2012). Options, Futures and Other Derivatives (8th ed.). Prentice Hall.

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Spread Options

Task:

- For spread options, the payoff depends on the price difference of two assets. First these shall be described theoretically.

- Analytically assess the value of spread options. Value the options using Monte-Carlo Simulations. Compare the simulated value to that of closed form approximations. If possible, compare both valuations with market values of existing spread options.

Literature:

- Hull, J. C. (2012). Options, Futures and Other Derivatives (8th ed.). Prentice Hall.

- Li, M., Deng, S. J., & Zhou, J. (2008). Closed-form approximations for spread option prices and Greeks. Journal of Derivatives, 15(3), 58-80.

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Structured Products

Task:

- There are plenty of certificates (e.g., Rainbow, Discount, Express, Equity Linked Bonds, ...) traded on financial markets.
- Analytically assess the value of a selected certificate. Value the certificate using Monte-Carlo Simulations. If possible, compare your valuation with market values of existing structured products.

Literature:

- Hull, J. C. (2012). Options, Futures and Other Derivatives (8th ed.). Prentice Hall.

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How to maximize the learning effect

- Why? What you learn now, saves you valuable time when you write your thesis.
- Use R instead of Excel.
- Comment your code.
- Use LaTeX instead of Word.
- Write in English, not German.