Master Thesis Seminar

Modelling and Forecasting Returns and Volatility on Capital Markets and Algorithmic Investment Strategies

dr hab Robert Ślepaczuk

academic year 2024/2025

University of Warsaw
Faculty of Economic Sciences

Assessment rules for the First Term

1. Analysis and presentation of at least two research papers of similar research area to the thesis subject. The presentation should last around 30 minutes.
   - The discussed papers, in particular their methodology section, should be understood, analized and criticised thoroughly.
   - Presentation and the discussed paper must be sent to all seminar participants (at the latest on preceding Monday) or alternatively can be placed in our google drive folder.
   - Postponing the presentation without fixing a new date is not allowed.
   - You are allowed to swap the presentation date with other participants.
2. Formulation of the main aim of the thesis -–> until the end of April
3. Hypothesis and other research questions -–> until the end of April
4. Title and the detailed plan of the thesis (table of contents), together with the description of each thesis parts -–> until the end of May
5. Collecting and describing the empirical data and formulating the methodology -–> until the end of May
6. Describing the methodology used in verification of the research hypothesis and answering research questions -–> until the end of May
7. Class presence is mandatory (maximum two non justified absences)
8. To earn a pass grade you have to submit before the deadline a full report including issues described in points 2, 3, 4, 5 and 6 –> until the end of summer semester

Assessment rules for the Second Term

1. Analysis and presentation of at least one research paper of similar research area to the thesis subject.
   - The discussed paper, in particular its methodology section, should be understood, analized and criticised thoroughly.
   - Presentation and the discussed paper must be sent to all seminar participants (at the latest on preceding Monday) or alternatively can be placed in our google drive folder.
   - Postponing the presentation without fixing a new date is not allowed.
   - You are allowed to swap the presentation date with other seminar participants.
2. To earn a pass grade you have to finish empirical research and present and discuss it during the seminar –> until the end of winter semester

Assessment rules for the Third Term

1. Finishing empirical part of the thesis.
2. Writing a „very good” master thesis.
3. Submitting the final version of the thesis (electronic version): not later than 1 April, 2026 (electronic version + paper version in the classes).
4. There is no possibility to defend in September. We end our classes in the middle of June, 2026.
5. Submitting the final version of the thesis (electronic version + paper version) in order to defend on any other date different than September: not later than 8 weeks before Dean's office deadline.
6. Class presence is mandatory (maximum two non justified absences).
7. The necessary condition to pass the last semester to the seminar is to give back the final version of master thesis (after supervisor' approval) to the Dean's office.

Titles of master and bachelor thesis defended in the last three academic years - I

1. A novel approach to trading strategy parameter optimization, using double out of sample data and walk-forward techniques on cryptocurrency market
2. Ensembling of Weak Investment Strategies Based on Technical Analysis and Machine Learning Models
3. Estimating Value-at-Risk and Expected Shortfall Using Hybrid Deep Learning and GARCH Models and Volatility Regimes Analysis
4. Improving Realized LGD approximation: A Novel Framework with XGBoost for handling missing cash-flow data
5. Statistical arbitrage in multi-pair trading strategy based on graph clustering algorithms in US equities market
6. Deep LSTM Network for Direct Portfolio Optimisation
7. Predictive modeling of foreign exchange trading signals using machine learning techniques
8. The Hybrid Forecast of SP500 Volatility ensembled from VIX, GARCH and LSTM models.

Titles of master and bachelor thesis defended in the last three academic years - II

9. Alternative Black Litterman Model for Asset Allocation using P/E ratios for construction of the views returns vector.
10. Portfolio Optimization Algorithm Based on the Ensemble of Machine Learning Classification Models and Kelly Criterion
11. Supervised Autoencoder MLP in Financial Time Series Forecasting
12. Ensembled LSTM with Walk Forward Optimisation in Algorithmic Trading
13. Optimizing stock portfolio using the mean-variance framework with stock returns forecasted using time series and machine learning models
14. LSTM-ARIMA, A HYBRID APPROACH TO ALGORITHMIC INVESTMENT STRATEGIES
15. Analysis of stock exchange investment systems based on Decision tree and XGBoost predictions
16. A Hybrid Method applying Hurst Exponent, Correlation and Cointegration in Pair Trading on Nasdaq-100 index
17. A comparison of LSTM and GRU architectures with novel walk-forward approach to algorithmic investment strategy

Titles of master and bachelor thesis defended in the last three academic years - III

18. Quantile regression analysis to predict GDP distribution using data from the US and UK
19. The efficiency of various types of input layers of LSTM model in investment strategies on S&P500 index
20. Daily and intraday application of various architectures of the LSTM model in algorithmic investment strategies on Bitcoin and the S&P 500 Index
21. The ensemble models of algorithmic investment strategies based on diverse set of strategies and assets
22. The profitability of pairs trading strategies: distance, cointegration, and correlation methods
23. Robust optimization in algorithmic investment strategies
24. Application of machine learning in quantitative investment strategies on global stock markets
25. Can we create the efficient portfolio based on Nasdaq100 constituents? Markowitz approach versus low volatility anomaly

Titles of master and bachelor thesis defended in the last three academic years - IV

26. The impact of US presidential elections on the stock market
27. The construction of Markowitz theory-based portfolio with constituents of S&P500 index
28. Enhanced Index Replication Based on Smart Beta and the Analysis of Distribution Moments
29. LSTM performance in algorithmic investment strategy based on NASDAQ 100 index prices
30. The Application of Machine Learning Methods in Algorithmic Investment Strategy
31. Predicting Dow Jones, NASDAQ Composite and NYSE Composite index prices using ARIMA and VAR models
32. Time series forecasting performance of S&P 500 index using classical and machine learning methods
33. Application of machine learning techniques in the development of quantitative investment strategies on global stock markets

Titles of master and bachelor thesis defended in the last three academic years - V

34. LOW VOLATILITY ANOMALY IN ALGORITHMIC INVESTMENT STRATEGIES ON S&P500 INDEX
35. Recurrent Neural Networks versus classical methods in investment strategies
36. Value at Risk - the comparison of basic approaches with ARG/GARCH type models
37. Wpływ wyników meczów na ceny akcji klubów piłkarskich
38. VARIANCE GAMMA MODEL IN HEDGING VANILLA AND EXOTIC OPTIONS

Titles of master and bachelor theses defended in the previous years under my supervision - I

1. Algorithmic trading system based on fuzzy logic
2. Alternatywne metody konstrukcji portfela o minimalnej wariancji
3. American option pricing with Least Squares Monte Carlo algorithm
4. An addition of volatility exposure to a diversified portfolio from the perspective of Polish investoritem
5. Analiza czynników wpływających na wyniki strategii typu trend following dla kontraktów terminowych
6. Analiza efektów przelewania się informacji między rynkami akcyjnymi a walutowymi w krajach świata
7. Analiza efektu splitu akcji na Giełdzie Papierów Wartościowych w Warszawie
8. Analiza modeli wyceny kontraktów futures na indeks VIX
9. Analiza Techinczna, jej zastosowanie i jej krytyka
10. Application of Support Vector Machines for Trading on Cryptocurrency Market

Titles of master and bachelor theses defended in the previous years under my supervision - II

11. APPLYING HURST EXPONENT IN PAIR TRADING STRATEGIES
12. Applying multivariate GARCH models and vine copulas in portfolio risk management
13. Artificial Neural Networks Performance in WIG20 Index Options Pricing
14. Autokorelacja stóp zwrotu z funduszy inwestycyjnych a pomiar ryzyka
15. Badanie predykcyjnych właściwości modelu zmienności zrealizowanej z wykorzystaniem danych wysokiej częstotliwośc
16. Betting against Beta - equity risk premium analysis using multifactor models for global equity indices
17. *Cash flow beta* and consumption-based models as an explanation of cross-sectional differences in equity returns and risk premium
18. Charakterystyka wybranych strategii opcyjnych w odniesieniu do inwestycji alternatywnych
19. Cointegration-Based Empirical Analysis of the Efficiency of Pairs Trading Investing Strategy at The Warsaw Stock Exchange

Titles of master and bachelor theses defended in the previous years under my supervision - III

20. Cointegration time series in the practice of investing based on example of commodity futures contracts
21. Does the inclusion of exposure to volatility into diversified portfolio improve the investment results? Portfolio construction from the perspective of a Polish investor.
22. Determinants of price-earning ratios of companies listed on WSE
23. Dywersyfikacja ryzyka w portfelu inwestycyjnym z wykorzystaniem instrumentów pochodnych na zmienność
24. Efektywnosc polskiego rynku papierow wartosciowych – zjawisko wystepowania anomalii kalendarzowych
25. Efektywność warszawskiego rynku akcyjnego w formie słabej w ujęciu praktycznym
26. Empirical analysis of momentum and contrarian effects on WSE in 2003-2013
27. Empiryczna analiza wybranych modeli wyceny na przykładzie opcji na indeks WIG20 notowanych na GPW w Warszawie

Titles of master and bachelor theses defended in the previous years under my supervision - IV

28. Empiryczna weryfikacja adekwatności rezerw na poziomie VaR-u w kontekście zmian na rynku finansowym
29. Environmental, Social and Governance based Asset Selection
30. Equity indices portfolio optimization using Markowitz approach
31. Forecasting Exchange Rates Using Macroeconomic Fundamentals
32. Forecasting of spot electricity prices on Polish Power Exchange using time series models
33. Forecasting of intraday equity returns volatility on WSE. Application of mscGARCH models
34. Forecasting Value-at-Risk by GARCH-type Models and Historical Simulation in Polish Stock Market
35. Fuzzy logic based-technical trading as the way of investments
36. Heat Waves or Meteor Showers? The analysis of volatility spillovers of the USD/JPY exchange rates
37. How Rewarding Is Technical Analysis? Evidence from Central European Stock Markets

Titles of master and bachelor theses defended in the previous years under my supervision - V

38. Hybrid Investment Strategy Based on Momentum and Macroeconomic Approach
39. Incorporation of Fractal Dimension into Technical Analysis
40. Investing in VIX futures based on rolling GARCH models forecasts
41. Kontrakty terminowe na zmienność – zwiększenie możliwości inwestycyjnych poprzez dywersyfikację ryzyka
42. Markowitz theory in terms of multiperiod portfolio selection
43. Maximization of Risk-adjusted Returns on WIG20 Index — Naive vs. Modern Asset Allocation Techniques
44. Measuring Market Risk with Conditional Extreme Value Theory
45. Model Altmana na polskim rynku kapitałowym
46. Porównanie modeli wyceny opcji na przykładzie opcji na WIG20
47. Porównanie modelu Hestona z innymi metodami pomiaru zmienności dla opcji na indeks WIG20

Titles of master and bachelor theses defended in the previous years under my supervision - VI

48. Portfolio Performance Implications of Environmental, Social and Governance based Asset Selection
49. Portfolio Rebalancing Models Using Moments of Returns Distribution
50. Portfolio Selection Models Based on Characteristics of Return Distributions
51. Półsilna forma efektywności informacyjnej Giełdy Papierów Wartościowych w Warszawie
52. Półsilna hipoteza efektywności rynku kapitałowego. Weryfikacja na przykładzie Giełdy Papierów Wartościowych w Warszawie
53. Predicting prices of S&P500 index using classical methods and recurrent neural networks
54. Pricing of Option on WIG20 Using GARCH Models
55. Profitability of Momentum Strategies with Moving Average Filter on the Warsaw Stock Exchange
56. Prognozowanie zmiennosci na rynku kryptowalut

Titles of master and bachelor theses defended in the previous years under my supervision - VII

57. Optimizing VIX futures rollover strategies using Artificial Intelligence algorithms
58. Quantitative Analysis of Financial Markets. The Study on the Effectiveness of Combining Investment Strategies based on Different Data Frequencies
59. Strategia momentum z wykorzystaniem kryterium Kellyego
60. Strategie inwestycyjne pokonujące rynek. Wykorzystanie filtrów opartych na zmienności rynku walutowego
61. Term structure of interest rates in United States in years 2001-2015
62. Testing for the weak-form of the Efficient Market Hypothesis. Market Hypothesis. The case of the cointegration
63. Trading strategies based on forecasting industry returns using macroeconomic variables and principal component analysis
64. The machine learning methods in automatic trading strategies optimization - implementation and efficiency

Titles of master and bachelor theses defended in the previous years under my supervision - VIII

65. The performance of portfolios of developed and emerging markets indicas based on Modern Portfolio Theory.
66. The pricing of options on WIG20 using GARCH models
67. The Relationship Between Investor Sentiment, Stock returns and Volatilities
68. Value-at-risk - the comparison of state-of-the-art models on various assets
69. Value-at-Risk dla otwartych funduszy inwestycyjnych działających w Polsce w latach 2004-2009
70. Weryfikacja skuteczności automatycznej strategii inwestycyjnej na kontraktach terminowych na indeks WIG20
71. Weryfikacja skuteczności strategii inwestycyjnych z wykorzystaniem opcji na indeks WIG20
72. Wpływ czynników ilościowych oraz jakościowych nieruchomości biurowej na czynsz
73. Wpływ danych makroekonomicznych na indeks WIG

Titles of master and bachelor theses defended in the previous years under my supervision - IX

74. Wpływ wykorzystania pochodnych na zmienność na wybór optymalnego portfela w warunkach kryzysu
75. Wpływ publikacji danych makro z USA na rynek giełdowy i walutowy w Polsce. Analiza danych dziennych i intraday
76. Wpływ publikacji kwartalnych sprawozdań finansowych spółek na stopy zwrotu z akcji na Giełdzie Papierów Wartościowych w Warszawie
77. Wpływ rekomendacji na kursy akcji spółek notowanych na Giełdzie Papierów Wartościowych w Warszawie
78. Wpływ wprowadzenia kontraktów terminowych na indeks WIG20 na zmienność rynku spot
79. Wplyw wynikow meczow na ceny akcji klubow pilkarskich.
80. Wybor optymalnego portfela - model Markowitza
81. Wybór optymalnego portfela inwestycyjnego na warszawskiej GPW w oparciu o analizę portfelową
82. Zastosowanie modeli przewidujących bankructwo do budowy strategii inwestycyjnej

Thank you!

Robert Ślepaczuk

rslepaczuk@wne.uw.edu.pl

http://coin.wne.uw.edu.pl/rslepaczuk/MasterThesisSeminar.html