

Master Thesis Seminar

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

dr hab Robert Ślepaczuk

academic year 2026/2027



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, analyzed 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 Github repository - shared with supervisor
- 3 Overleaf project - shared with supervisor
- 4 Formulation of the main aim of the thesis → until the end of April
- 5 Hypothesis and other research questions → until the end of April
- 6 Title and the detailed plan of the thesis (table of contents), together with the description of each thesis parts → until the end of May
- 7 Collecting and describing the empirical data and formulating the methodology → until the end of May
- 8 Describing the methodology used in verification of the research hypothesis and answering research questions → until the end of May
- 9 Class presence is mandatory (maximum two non justified absences)
- 10 To earn a pass grade you have to fulfill conditions described in points 1, 2, 3, 9, and submit before the deadline a full report including issues described in points 4, 5, 6, 7, and 8 → 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, analyzed 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 until **March 10, 2027**
- 2 Writing a „very good” master thesis.
- 3 Submitting the final version of the thesis (electronic version): not later than **March 31, 2027** (electronic version + paper version in the classes).
- 4 There is no possibility to defend in September. We end our classes **at the beginning 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 częstotliwości
- 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 Efektywność polskiego rynku papierów wartościowych – zjawisko występowania 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 Pólsilna forma efektywności informacyjnej Giełdy Papierów Wartościowych w Warszawie
- 52 Pólsilna 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 zmienności 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 Kellygo
- 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 Wpływ wyników meczów na ceny akcji klubów piłkarskich.
- 80 Wybór 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!

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<http://coin.wne.uw.edu.pl/rslepaczuk/BachelorThesisSeminar.html>