BEAUTIFUL MINDS

BSc Thesis Econometrics & Operations Research

Poster Symposium

June 23rd 2021

Session Booklet

Last update: Friday 18th June, 2021, 09:57

Maastricht University

Foreword

Maastricht, June 23rd 2021

Dear students, dear visitors,

at our annual poster symposium the students of the Bachelor programme Econometrics & Operations Research will present the findings of the research that they have done for the past 12 weeks for their bachelor thesis projects.
You will see interesting problems, ideas and analyses from the four disciplines that our students have encountered throughout their studies: Actuarial Sciences, Econometrics, Mathematical Economics, and Operations Research. The projects include current societal topics such as "Will we be vaccinated soon? A study of the volatility of the pharma sector using GARCH and GAS.", "Does the presence of police reduce crime?", or "Scheduling schools in pandemic times", and equally important "Does Machine Learning find Nicolas Cage in a Swimming Pool?". Feel free to engage in the discussions with the students and challenge them with your questions.
@Students: This is the most comprehensive and final piece of work of your bachelor studies. I hope that you can demonstrate what you have learned throughout the past few years and that you can also enjoy this moment of achievement. I wish you all the best for your upcoming careers and personal lives.

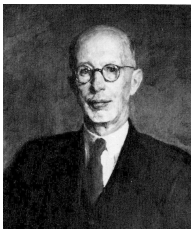
André Berger
Programme leader BSc Econometrics & Operations Research

Meeting Information & Schedule

All sessions will take place via Zoom meetings. Each student will highlight the main findings of his/her thesis in a short pitch. Afterwards participants of the session can ask questions and discuss the results. Please adhere to the following rules:

- Use your real name when entering the Zoom meeting.
- Turn on your camera and stay muted while students are presenting.
- Silence the alerts on your device(s).
- Raise your hand or use the chat if you want to ask a question.

The sessions will take place in four parallel meeting rooms, named after some of the great contributors to the different research disciplines that are part of the Bachelor programme. Below you find the meeting IDs and direct links that will open the respective session in your browser or in your zoom app. The session links in the schedule take you to the booklet page with information about the students presenting in that session.

	John Nash Room	**Jan Tinbergen Room**	**Alan Turing Room**	**Filip Lundberg Room**
				
Host	Marc Schröder	Martin Schumann	Christof Defryn	André Berger
Meeting ID	98616586795	92226561671	96053865890	96142480864
Link	ZOOM	ZOOM	ZOOM	ZOOM
09:00-09:10	Opening (Filip Lundberg Room)			
09:10-09:15	Break			
09:15-10:15	Session 1	Session 2	Session 3	Session4
10:15-10:20	Break			
10:20-11:20	Session 5	Session 6	Session 7	Session 8
11:20-11:25	Break			
11:25-12:25	Session9	Session 10	Session 11	Session 12
12:25-12:30	Closing (Filip Lundberg Room)			

Session 1

Time: 09:15-10:15
Location: John Nash Room [www.bit.ly/SBE-Nash]

Cas van Leijden

Greedy algorithms for Swiss-system tournaments

Supervisor: Marc Schröder

Finding the upper and lower bounds for the duration of Swiss-system tournaments for groups of $k \geq 3$ players using both a theoretical and a computational approach.

Zohaad Fazal

Bernoulli Congestion Games

Supervisor: Marc Schröder and Anna Zseleva

A study on the Price of Anarchy bounds for atomic congestion games with exogenous and homogeneous player entrance probabilities. This thesis focuses on quadratic cost functions.

Lucas Hoff

Restrictions on n-Period Cournot and Stackelberg Competition

Supervisor: Anna Zseleva and Marc Schröder

This thesis aims to find an equilibrium state in a n-period Cournot (Stackelberg) model, while imposing restrictions such as a minimum output requirement or if a firm is unable to deviate from its strategy once decided.

Alexander Bastek

Equilibria and efficiency in pay-as-bid auctions

Supervisor: Dries Vermeulen

This paper aims at researching basic technical implementations of game theoretical concepts in pay-as-bid auctions. Furthermore, it investigates and highlights equilibria and their respective implications on efficiency and welfare. Additionally, it provides an analysis of the auction format and induces structural characteristics and deficiencies of the pay-as-bid concept with respect to the electricity market.

Nhi Nguyen

The performance of Uniform price auction in Energy market

Supervisor: Dries Vermeulen

This thesis aims to analyse the performance of uniform-price auction that has been used for the energy market for a long time, based on the two main criteria: Allocation efficiency and social-economic welfare. The main result of this thesis is that uniform-price auction does not perform efficiently in the energy market.

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Session 2

Time: 09:15-10:15
Location: Jan Tinbergen Room [www.bit.ly/SBE-Tinbergen]

Rebecca Walter

Forecast reconciliation for hierarchical time series

Supervisor: Ines Wilms

Forecast reconciliation for hierarchical time series is the adjustment of incoherent individually forecasted time series that are structured into levels. Next to examining basic forecast reconciliation methods, this thesis will examine approaches that are suggested to be more optimal. Moreover, the thesis considers the use of my own combination of two forecast reconciliation methods. In a final step, the different approaches will be applied and evaluated on a data set of Australian Tourism.

Time Series comes in different granuality (e.g. GDP of Spain is the sum of the GDP of Andalusia + GDP Catalonia etc+
- Bulid models that estimate L1 with L2 and vice versa.
- Use Causal, ML, and Econometrics, NLP

Steef Hebben

Optimal Hedging in Incomplete Markets

Supervisor: Li Yang

Marie Ortmans

Interest Rate Models with zero lower bound

Supervisor: Li Yang

Nowadays, interest rates are really low and even negative. Sometimes, negative interest rates may harm the economy and even the entire world system. Hence, in this thesis, we compare models that compute normal interest rates with some constrained models that set a so-called ZLB (zero lower bound) in order to avoid negative interest rates. Next, bond and stock prices have a huge place in the worldwide economy. However, in some models, the ZLB isn't taken into account yet. Therefore, we try to find a better approximation for bond prices (under the ZLB).

Léa Fernandez

The Effect of Youth Alcohol Consumption on Mortality

Supervisor: Martin Schumann

In this thesis, the causal relationship between alcohol consumption and mortality will be estimated using a regression discontinuity design from the minimum legal drinking age. We will also discuss the harmful effects of alcohol on your health and the main determinants of mortality for this specific subset of the population, i.e. young adults (18-22).

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Caron Soomers

Effect of Alcohol Consumption on Mortality

Supervisor: Martin Schumann

This thesis investigates the effect of alcohol consumption on mortality in the US, a relationship which causality is hard to investigate. We use the minimum legal drinking age (MLDA) of 21 as the score for two discontinuity regressions, which are then compared and checked for robustness. Throughout this thesis, we reflect on the research of Carpenter and Dobkin (2009), which uses an identical procedure. Our main result is that a significant increase in alcohol consumption at the age of 21 is correlated with a similar increase in mortality.

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Session 3

Time: 09:15-10:15
Location: Alan Turing Room [www.bit.ly/SBE-Turing]

Jelle Willekes

A Deep Learning approach on Multivariate Short-Term Traffic Flow Forecasting

Supervisor: Tim Oosterwijk

In a short-time interval before and after major events like concerts and football matches the traffic flow in the vicinity of the GelreDome in Arnhem substantially increases, resulting in extreme congestions on the county roads in Gelderland. This thesis uses Deep Learning models such as Recurrent Neural Networks, Gated Recurrent Unit networks and Long Short-Term Memory networks to predict short term traffic flow and advice the Province of Gelderland on an improvement of their traffic models.

Siemen Lambertus Nooren

Social distancing in network congestion games

Supervisor: Tim Oosterwijk

We will take a look at a situation where a number of players need to move from one location to another. However, the players are in a global pandemic and do not want to get infected by any other player. This is why they need to keep 1. 5-meter distance from each other. We will take a look at the optimal pathing from the viewpoint of each individual player and from the viewpoint of a central planner. Furthermore, the total social costs of the two will be compared.

Peyo Pelletier

Scheduling a subset of jobs

Supervisor: Tim Oosterwijk and Tjark Vredeveld

This thesis delves into a typical OR problem of scheduling but with particular restrictions in order to be able to select the jobs we want to use. After researching in depth multiple approaches, I have attempted my own approaches that I converted into code in order to attempt to find a solution.

Max Kikken

Alternative voting: the future standard of American elections?

Supervisor: Tim Oosterwijk and Veerle Timmermans

This thesis investigates whether the Alternative Voting method should be implemented in the American presidential election system. The thesis discusses the possibility of introducing a nationwide election, where the Alternative Voting system would directly determine the next president. Furthermore, the possibility of introducing the Alternative Voting method on statewide level is discussed. For the statewide elections, the Alternative Voting system is being compared with the FPTP method, which is currently used. The thesis discusses both theoretical and practical characteristics of the Alternative Voting method and the FPTP method to decide which one would be a better method to use.

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Joep Peters

Scheduling the outbound area of Swiss Sense

Supervisor: Christof Defryn and André Berger

In this thesis, the current outbound area of Swiss Sense is measured with the help of a heuristic. After the current situation is analyzed, several adjustments are implemented and the performance of these adjustments are analyzed. The goal is to find a method that is proved to be better than the current method.

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Session 4

Time: 09:15-10:15
Location: Filip Lundberg Room [www.bit.ly/SBE-Lundberg]

Marnik Deimann

Labour scheduling at Agora schools

Supervisor: André Berger

Agora is a secondary school organisation that tries to innovate the educational system. The new system faces difficulties with keeping the expenses within the budget. At Agora schools there is a need for two types of teachers, which are coaches and experts. At the moment all Agora schools hire experts independently, which is inefficient and increases the costs. In order to give Agora a right to exist, a good construction should be built in which students get high quality education and budget limits are not exceeded. This study explores a way in which the Agora schools collaboratively hire expert teachers.

Kaiwen Shen

Explicit information under bounded rationality

Supervisor: Christopher Kops

In this thesis, it investigates a mathematical model which can extract the information that entering DM's decision making process.

Nirmay Panchal

Dynamic Hedging — Portfolio Insurance Versus State Dependent Benchmarking

Supervisor: Thijs Kamma

Due to underfunding situations in the pension industry over the past decade, a shift from defined benefit schemes to defined contribution schemes is inevitable. My thesis aims to investigate the effect of investing strategies with and without benchmark on the terminal wealth at retirement age.

Meet Shah

Allocating Revenues in the Book Subscription Sharing problem - An axiomatic Approach.

Supervisor: Bas Dietzenbacher

The book subscription sharing problem refers to the problem of allocating revenue to various right-holders on a platform like Kobo Plus or Kindle unlimited. In this thesis, an axiomatic characterization of allocation rules in this context is presented. The fact is that a single right-holder (publisher, self-published author, etc.) may have revenue rights to several books on the platform, and the major question is whether he should be compensated per book, or upon his aggregate contribution.

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Henry Schröder

Revenue Allocation Among Artists on Music Streaming Platforms

Supervisor: Bas Dietzenbacher

As music streaming has become the prominent way to consume audio content, the fair distribution of the revenue generated through subscribtion fees has become a key point of discussion. We developed a model, designed a number of allocation rules and evaluated these on their fairness properties. Join us in our journey of researching fairer revenue allocation for artists!

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Session 5

Time: 10:20-11:20
Location: John Nash Room [www.bit.ly/SBE-Nash]

Catarina Monteiro dos Ramos

How to estimate a VAR after March 2020: An impulse response analysis

Supervisor: Alain Hecq

This thesis aims at estimating vector autoregressive models by dropping the pandemic sample and their impulse response functions by taking shocks similar to the COVID-19 impact on the 2019 Belgian economy.

Econometrics, Christian can probably help

Martin Beelen

Common bubbles in cryptocurrencies

Supervisor: Alain Hecq and Elisa Voisin

This thesis investigates whether bubbles, present in cryptocurrency timeseries, are common among several different cryptocurrencies. If so, this opens up the idea of constructing portfolios of cryptocurrencies and reducing or eliminating the bubble effect.

Jorrit Wijckmans

Will we be vaccinated soon? A study of the volatility of the pharma sector using GARCH and GAS?

Supervisor: Alain Hecq and Daniel Velasquez

Using GARCH and GAS, I have analysed the volatility of the stock prices of pharmaceutical companies which have tried to develop a COVID-19 vaccin. The aim of this research is to estimate and compare several models and to see how they explain the volatility after positive or negative news during the pandemic.

Floor van den Akker

Nowcasting the economic activity in the UK during the pandemic.

Supervisor: Alain Hecq

In this paper I have nowcasted/forecasted the movements in quarterly GDP from the UK, via a high frequency indicator. This high frequency indicator is constructed by combining high frequency variables with movements that coincides with the GDP. Constructing this indicator is done using the Principal Component Analysis. The PCA reduces the dimensionality of the variables, to increase the interpretability and minimise the information loss. There are multiple indicators created and compared to the movements of the quarterly GDP, the best indicator is chosen.

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Stefan Štraleger

The effect of foreign direct investment on domestic investment in developing countries: A panel data analysis

Supervisor: Denis de Crombrugghe

This thesis examines the effects of foreign direct investment on domestic investment in developing countries. In order to do so, we make use of the system GMM estimator, in combination with a large, up-to-date and easily reproducible dynamic panel.

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Session 6

Time: 10:20-11:20
Location: Jan Tinbergen Room [www.bit.ly/SBE-Tinbergen]

Combines Networks, Econometrics (perhaps baysian), and ML

Jun Hu

Boosting for Learning Graphs from high-dimensional Data

Supervisor: Michael Eichler

Networks are very common occurrences in our daily lives and important in a variety of applications. In mathematical terms, network structures can be studied using graph theory. This thesis looks at the connectivity of graphical models by adopting a specific boosting algorithm. It is applied to high-dimensional financial data, in particular, to analyze conditional dependencies in financial networks. In contrast to other algorithms, this one is not limited by small sample sizes and is computationally less expensive.

Ellen in de Braekt

The Bayesian Group Lasso for the identification of Granger Causalities in VAR models

Supervisor: Michael Eichler

By using a Bayesian approach posterior distributions can be obtained on groups of parameters in VAR models. The group lasso uses an additional penalty on regular OLS which shrinks groups of coefficients to zero, implying that when the effect of a variable is fairly small, it will be set towards zero under the group lasso. This feature enables the identification of Granger Causalities: previous values of one time series helps predict the current value of another time series, meaning non-zero and significant regression coefficients.

Mix of ML, econometrics

Kristina Dimitrova

Bayesian estimation of partial measures of causality

Supervisor: Michael Eichler

In this thesis, we analyse the method of Hosoya (2001) for measuring causality between two time series in the presence of a third series. Moreover, we employ a Bayesian approach for uncertainty estimation.

Mix of ML, Causal and e

Marie Corillon

Boosting for learning graphs from high-dimensional data

Supervisor: Michael Eichler

The goal of the thesis is to find a model that estimates the coefficients of high-dimensional time series from vector autoregressive models using a boosting algorithm. The algorithm will then provide a graph of the network produced based on those estimated coefficients.

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Session 7

Time: 10:20-11:20
Location: Alan Turing Room [www.bit.ly/SBE-Turing]

Thomas Waltmans
Reducing order picking time with local search algorithms

Supervisor: Stan van Hoesel

In this thesis we will use the well-known 2-opt and Lin-Kernighan local search heuristics for solving a TSP problem that originates from a warehouse order picking problem. The underlying structure of a warehouse is a so-called grid graph which is a special case of planar graphs. Orders can be found on so-called aisle edges. We are interested in how well local search heuristics can solve such problems, specifically the 2-opt and Lin Kernighan heuristics.

Roderik Turksema
An Adaptive Dynamic Strategy For The Inventory Rationing Problem Simulation

Supervisor: Stan van Hoesel

An Investigation into at what inventory levels it is optimal for a supplier to stop supplying to secondary clients to ensure that they maintain enough stock to supply their priority clients.

Tobias Bechthold
Bin packing with Overload Cost

Supervisor: Tjark Vredeveld

In my thesis I investigated the bin packing problem, relaxed the capacity constraint and add overload cost if the capacity is exceeded. I programmed 4 algorithms: an ILP, Best-Fit, Worst-Fit and First-Fit and tested them with different instance to compare the results of each algorithm.

Amel de Kok
High school timetabling in pandemic times

Supervisor: Tjark Vredeveld

COVID-19 has caused Dutch high schools to partially lock down. This thesis analyses the best ways to schedule hybrid education, using Integer Linear Programming and heuristics.

Anne Janssen
Extensible Bin Packing

Supervisor: Tjark Vredeveld

This thesis examines algorithms to solve the extensible bin packing problem. The extensible bin packing problem is a generalization of the famous bin packing problem. Therefore, in this thesis several bin packing algorithms are adjusted to fit the extensible bin packing problem. In addition, an empirical analysis is performed on these adjusted algorithms to provide an insight on which algorithm performs best.

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Session 8

Time: 10:20-11:20
Location: Filip Lundberg Room [www.bit.ly/SBE-Lundberg]

Dave Croes

Applying Independent Component Analysis to the Carter-Lee model

Supervisor: Antoon Pelsser

For decades, Independent Component Analysis has grown to be the most widely used tool in multivariate data analysis. However, it is based on grotesque assumptions that collide head-on with reality. In this paper/presentation, I will show and expose the fatal flow of Independent Component Analysis and also provide a suitable alternative that is more in line with reality, in the form of Independent Component Analysis. Finally, ICA will be applied to the Lee-Carter model to hopefully improve it.

Damian Załęski

Dependence modeling of high-dimensional risk-drivers with Principal and Independent Components

Supervisor: Antoon Pelsser

The main objective of this research paper is to employ both the independent component analysis (ICA) and principal component analysis (PCA) to investigate the relationship between market risk, PCA and ICA in the U. S. financial market. To measure the degree of financial system connectedness, the principal component analysis (PCA) is employed. As PCA assumes Gaussian-distributed variables, a complementary technique easing these requirements is in demand. The independent component analysis (ICA) suits perfectly to complement PCA. It allows the capture of high-order properties of financial time series and is a preferable measure in analyzing multivariate financial time series.

Ramon Jansen

Fitting Long-term Yield Curves under Solvency

Supervisor: Antoon Pelsser

Solvency II provides a framework for pension funds and insurance companies to price its liabilities, represented by their customers cash flows. However, to discount cash flows to the present times, one would need the appropriate interest rate. Normal market tools cannot predict interest rates for very long time periods and thus new models have to be introduced that can estimate a so-called Ultimate forward rate. This interest rate for very long time to maturities is helpful for pension funds to make calculations on. What model performs best in estimating this rather important UFR?

Joris Booij-Liewes

Location Pricing Problem

Supervisor: Andre Berger

Ever wondered why fast-food chains have so many facilities in major cities? Or why the same product is cheaper at a different location? In this thesis, we develop a heuristic that helps a company decide on the location of its facilities and the corresponding product prices. Moreover, we compare the results of this heuristic to the optimal solu-

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tion.

Yifeng Han

Collective decisions with some Pareto free alternatives pairs

Supervisor: Ton Storcken

There are some counterintuitive facts about voting. Firstly, there are a lot of different voting systems, even with completely identical ballots, some of them generate completely different outcomes. Secondly, every voting system has at least one flaw, there is no perfect voting system in the world. Thirdly, the only voting system that fulfills unrestricted domain, Pareto efficiency, and independence of irrelevant alternatives these three fairness conditions is the dictatorship. Therefore, this paper intends to find the 'fairest' possible system which is non-dictatorship.

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Session 9

Time: 11:25-12:25
Location: John Nash Room [www.bit.ly/SBE-Nash]

Caroline Lange

Auctions meet Epistemic Game Theory

Supervisor: Andrés Perea

This thesis examines optimal bidder strategies in the setting of First-Price Auctions while taking into account the reality of incomplete games. The analysis is motivated by the investigation of peoples' reasoning when making decisions and revolves around the existence of rational bliefs in all bidders.

Hongwei Mao

Common belief in future rationality in price competition

Supervisor: Andrés Perea

The thesis is about using game theory tools to analyze price competition between firms. In particular, l apply the concept Common Belief in Rationality to solve sequential pricing models. After comparing several cases, the conclusion is that the firm that at later stage could always set a lower price than firms at earlier stages, thus also generate a higher profit. Besides, I also compute social welfare in these models, hereby I could see through the consumer side in these models by computing consumer surplus.

Victoria Niehues

Competition between firms: A game-theoretic Analysis 1

Supervisor: Andrés Perera

In my thesis I am making use of the assumption "Common Belief in Rationality" to analyse how 2 firms, which produce comparable goods at different levels of quality and thus have different marginal costs, compete in price. Furthermore, using the Hotelling model with an asymmetric distribution of consumers, I assess how a firm chooses the characteristics of its product (e.g. if a firm decides to produce a "basic" car or wants to add a TV etc.) to maximize its profit.

Jules Guez

The chain store paradox with uncertainty

Supervisor: Janos Flesch

The chain store problem depicts a simple game in which a chain store decides to implement in 20 towns in a sequential order. In each town he faces a potential competitor who decides whether he enters the market or not. As a response, the chain store will decide to respond one of two ways : aggressively or cooperatively. Depending on what the players choose what are the outcomes and optimal strategies for the players?

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Wenning Zhang

Hotelling's model under different market share

Supervisor: Marc Schröder and Anna Zseleva

In real life, manufacturers compete in the market in various forms, among which price competition, output competition and so on are common. For enterprise management, it always pursues its own profit maximization. In this process, it is necessary for enterprises to choose the products to be produced and sold, and then achieve the goal by choosing the appropriate sales place and product price. This paper analyzes the differences in transportation costs and market share of enterprises in the market.

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Session 10

Time: 11:25-12:25
Location: Jan Tinbergen Room [www.bit.ly/SBE-Tinbergen]

Toby Pfeiffer

Does Democracy Cause Economic Growth?

Supervisor: Alain Hecq and Martin Schumann

Amid backsliding and the economic success of authoritarian states like China Democracy is in crisis. Increasingly its legitimacy and ability to produce good economic outcomes are questioned. This thesis aims to investigate if Democracies support economic growth. For the analysis I use dynamic panel data (Anderson-Hsiao and Arellano-Bond estimators), IV's, and GMM.

Isa Widdershoven

Nowcasting the economic activity in the Netherlands during the pandemic

Supervisor: Alain Hecq

The GDP is an important indicator for the economic activity in a country. Unfortunately, the GDP is only measured in a quarterly frequency and published with at least a month delay. In this thesis a weekly activity indicator is constructed for the Netherlands by use of principal component analysis. This indicator can help by giving an indication of the GDP growth for each week, which is especially useful during rapidly changing times like the current pandemic.

Mix of ML, econometrics, NLP

Andreas Coco

Does the presence of police reduce crime?

Supervisor: Martin Schumann

In this thesis, we investigate whether police deployment has an impact on crime rate in a given place by using difference-in-differences estimation methods. For this, we evaluate the effect on crime of an abrupt increase in police activity that was launched in response to terrorist attacks in London in 2005.

Katalin Bayer

Saving Soviet Science: The Impact of Grants When Government R&D Funding Disappears - Replication and Critical Evaluation of Ganguli (2017)

Supervisor: Martin Schumann

In this thesis I apply Regression Discontinuity Design (RDD) methodology in order to investigate the impact that emergency grants (funded by George Soros and the International Science Foundation) had on soviet scientists after the fall of the USSR. RDD exploits changes in an exogenous variable around some cut off. This approach allows for causal inference despite the presence of unobservable, confounding variables, which invalidate regular, simple regression analysis. I expand on Ganguli's results by providing critical analysis of research methodologies and implementing new robustness checks.

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Vien Gia Anh Trieu

Lifetime earnings and the Vietnam era draft lottery

Supervisor: Martin Schumann

One of the most important question of the manpower policy is whether veterans are fully compensated or not. To investigate this problem, the relationship between income and veteran status must be analyzed. However, simple regression model cannot be used due to the endogeneity of the regressor. Angrist and his colleagues (1990) suggest using instrumental variables method and recommend draft lottery number as a reasonable instrument. This paper replicates the main results of Angrist's research, investigates the long-term effects of Vietnam era conscription and evaluates the validity of lottery number as an instrument.

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Session 11

Time: 11:25-12:25
Location: Alan Turing Room [www.bit.ly/SBE-Turing]

Daniel Veldhoven

The effect of gun prevalence on gun violence: an extensive literature review

Supervisor: Stephan Smeekes

My thesis will discuss in detail the development of the research of gun violence and crime rates with gun prevalence and the main findings and statistical pitfalls of this particular research subject.

Aisja Thijssen

Prediction Accuracy of Different Machine Learning Methods in the Presence of Spurious Correlation

ML & econometrics

Supervisor: Stephan Smeekes

This thesis aims to find out how spurious correlation affects the prediction accuracy of the machine learning methods random forest, gradient boosting of regression trees, and neural networks. It uses Monte Carlo simulation and five different data generating processes of which three lead to spurious regression and two contain co-integration.

Amber Rerimassie

The Impact of Non-Pharmaceutical Interventions and Behaviour Change on the Covid-19 Pandemic in the EU

Supervisor: Stephan Smeekes

This thesis quantifies the effects of seven non-pharmaceutical interventions (NPIs) and human mobility on Covid-19 infection and death growth rates in the EU. We estimate a causal model which acknowledges that the spread of Covid-19 is not only directly affected by NPIs, but also by (voluntary) behaviour change. We find that our mobility is significantly reduced by the implementation of NPIs. Additionally, imposing all policy measures together reduces case and death growth rates by 0. 26 and 0. 28, respectively. More than half of these reductions are attributable to the indirect effect of policies through behaviour.

Max van den Broek

Does Machine Learning find Nicolas Cage in a Swimming Pool?

Supervisor: Stephan Smeekes

In this thesis we investigate whether machine learning methods are susceptible to spurious regression. Traditional methods can present quite funny and unrealistic relationships such as: the number of drownings and the number of movies Nicolas Cage appears in are positively related. Do machine learning methods also predict these weird results?

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Session 12

Time: 11:25-12:25
Location: Filip Lundberg Room [www.bit.ly/SBE-Lundberg]

Tobias Breuer
Mixed Integer Programming and the Graceful Tree Conjecture
Supervisor: André Berger

In this thesis I test whether it is possible to use linear programming relaxations and mixed integer linear programs to find graceful labelings for tree graphs, and whether this poses a more efficient alternative to standard integer linear programs for the problem. I test different formulations for this, some of which use notions from scheduling problems, namely variables indicating precedence.

Lieke Vliex
Scheduling Primary Schools in Pandemic Times
Supervisor: Tjark Vredeveld

This thesis will tackle the allocation problem that has arisen from COVID-19 restrictions in primary schools. An algorithm will be proposed that allocates students into two shifts so that only half the school body is in school at all times. The solution will maximize parent's and student's satisfaction with the allocation by allocating siblings to the same shift and making sure each student has at least two friends in their group. Moreover, teachers will also be happy as activity level, grade level and gender of the students will be equally divided among the two groups of one class.

Philip Johannes Salomons
Just-in-Time Scheduling with Quadratic penalties
Supervisor: Tjark Vredeveld and Moritz Buchem

In this thesis we will discuss a version of just in time scheduling, where we have weighted penalties for any job finishing before or after their intended due date. We then develop a heuristic to solve this problem. It will further test the effect that the due dates have on the schedule and the total penalties, at what rate do penalties increase when we approach the due dates to one another.

Tessa van Kleef
Scheduling with Contact Restrictions
Supervisor: Tjark Vredeveld, Moritz Buchem

In this thesis, we consider the relatively new concept of scheduling with contact restrictions. Whereas a job only consists of processing time in the regular scheduling problem, it now consists out of three components: arriving time, processing time and leaving time. The jobs have to be scheduled such that on conflicting machines the arrival and/or leaving times do not overlap. Moreover, we develop a time-indexed LP and we develop heuristics for this problem.

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