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Special

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ASSET  Econometrics

>> Report

International Business
Trip to Mexico City

>> Special

Three Mini-Lectures
iMathematics

>> Familiar Faces

Jochem Bruijninx
and ECCO



New Year, New Nekst

MMXX: 2020 will be a wonderful year for people who love numbers. Will it become a matter of New Year, New Me for myself? Great chances are I will not change, once again. This year we try a few new resolutions. How about delivering some beautiful Neksts, getting my Bachelor's degree and getting out of bed more than half the time at half past eight when it's freezing in the morning?

In this edition we have a very special interview. One of the active members of Asset | Econometrics has set up his own shoe brand, with beautiful shoes for men, to create employment in Albania. In addition, a familiar face from a former board was interviewed about his contribution to student party ECCO. It also explains how econometrics can be used to respond to current issues, such as reducing the speed limit on motorways, for example. We also have an article about a former econometrics student from Tilburg who ended up in Copenhagen. His article can be read in A Graduate's Life, the recurring article introduced in previous edition.

Working on this magazine was a perfect way for me to avoid studying for my exams and to escape from my daily grind. I hope that this will also be the case for you through reading this magazine. Not only a new calendar year, but also a new semester. Let's all work hard together again and keep in mind that it is only 142 days until summer starts.

Yours sincerely,

Emma Segers
Editor-in-Chief

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COLOPHON

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A Graduate's Life: Adventuring in Copenhagen



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Dear Members,

As we are approaching the end of January, you are probably filling your life with all sorts of activities and events. While glancing back at a lovely holiday, some of you are trying very hard to pass that last course of the first semester, while others are living the student life by planning a holiday or spending time with their loved ones. We hope that you had a good time with your friends and family during the holidays and that you had some time to relax and get ready again to start the next semester.

Looking back on New Year's Eve, probably all of us have tried to come up with some new year's resolutions while looking at the fireworks. Personally, I would like to spend more time with my friends and family for example. They are the ones that have supported me to do this board year and have always had my back. Spending time with them gives me a positive, loving feeling which I have learned to not take for granted. While it is important to critically reflect on the past and to see what can be improved, it is even more important to highlight the events that make us smile when looking back at them. One of the events that has made my year, was the Econometrics in Practice Day. Together with Ricardo, I was a part of this committee before joining the board of Asset | Econometrics which made this day a little more special to me. But besides all the nice events that we have organized the first semester, I am very grateful to have my fellow board members. With their positive energy and mindset, they make my day so much better each and every time. While writing this piece, we have just finished making our Christmas photo together. We all went to the Black Box downstairs and made the piano look like it was about to explode from all the Christmas vibes.

After reviewing everything that has happened during the past year, it is time to have a look at what 2020 will bring us. On February 6, the National Econometricians Day (in Dutch: Landelijke Econometristendag, LED) will take place. For people who are about to start their Master's and want to have some insight into specific companies on a formal and informal level, this is the event to go to. Are you however still in doubt about which master you would like to do? In that case you should visit the Master Experience Day which will take place on March 3. During this event, alumni will talk about their careers after completing their Master's degree. They will give you an insight at what kind of company you could start your career and what your daily tasks will look like. Next to visiting these events, we are also starting our Active Member Conversations again. So do you want to become active at our association and be responsible for the organization of an exciting event? Then you should definitely come to our rooms or have look at our website for some more information about our committees and the opportunities we offer within Asset | Econometrics.

Lastly, I would like to end this piece by thanking all our active members who have put their efforts into our association. Without all your help we would not be able to achieve everything we have up to this day. We hope that we have been able to turn our rooms into a place where everyone feels warm and welcome. Please feel free to stop by at our rooms and wish one another a happy new year.

On behalf of the board,

Denise Jacobs

Chairman Asset | Econometrics 2019-2020

From Volunteering to Setting Up Your Own Business

Setting up your own business, creating employment and producing a fair product; that is what JC Kappers is about. Inspired by years of voluntary work in Albania, Jaron Kappers (21) decided to set up a business in cooperation with former unemployed shoemakers from a small town in Albania.

written by **Janne Vos** and **Dirk Baltussen**

Jaron is currently studying Econometrics and Operations Research at Tilburg University. He is finishing up the last few bits of his Bachelor, in order to start both a BAOR and an EME Master. During his studies and before, there were certain activities that kept him occupied. For instance, he has been an active member at Asset | Econometrics since he started in Tilburg and joined multiple sport associations. However, the item that he is definitely most inspired by and enthusiastic about is his voluntary work at Van Oost Naar Oost (VONO).

VONO is an organisation that travels each year from the east of the Netherlands, Apeldoorn, to the east of Europe, which in this program means Albania. "My father has always been one of the supervisors this project, so ever since I was 12, I was yelling that when I would turn 16, the first thing that I wanted to do was to participate". Indeed, this is what he did. When he turned 16 he travelled to Albania for the first time. After that, he returned every year to help

people in need. The aim of the project is to help the less fortunate and to expand the vision and the heart of Dutch youngsters. Activities that keep them occupied are for instance organising activities for children, building up houses and other things. Moreover, each year there is a common purpose. "This year we built a play garden. The thing that is so warming is the amount of joy these small things bring to people. It regularly happens that when I am at university, one of the children sends me a picture or a snapchat of him/her playing in this play garden. Even with a relatively small action such as a building or a play garden you can already make a difference for them."

It was during one of the trips to Albania that he and his father ran into a priest, Grigor, who became a good friend. They started talking and connected easily. The conversation took several turns and ended up discussing different projects in Albania. Five years later Jaron, his father and Grigor would like to set up a foodbank, something like the Dutch

Voedselbank. This project turned out to be a great success last year.

They also want to do something about the unemployment. They did have several ideas to deal with the large unemployment like producing lavender soap or leather shoes. "The idea of producing leather shoes came up to me when I visited a slum in Albania. During my first year of voluntary work, I met a woman who made shoe soles and glued these to shoes. She worked for an Italian company and got paid very poorly. This definitely made an impression on me back then."

Jaron got the opportunity to present his ideas to the Dynamo Business Club in Apeldoorn. They thought his ideas were great and encouraged him to keep going with it. Moreover, they liked the fact that such a young person came with an idea like this.

As a result, Jaron decided to start his business. One of the first actions that had to be taken was to find people who could produce these handmade shoes in Albania.

Accompanied by Grigor, he found two shoemakers. Besides these shoemakers, he also employed an Albanian to put the logo on the shoes and somebody from whom they buy their leather. The first shoemaker has a really small shop and spends all his time making Jaron's shoes. He currently delivers around thirty shoes per month. Due to the maximum capacity he faces, he is not able to produce more. "It is definitely hard to find a way to increase the amount of shoes I produce; finding new shoemakers in Albania may be a bit difficult, since many Albanian shoemakers moved to Italy to work for a company there." Because of this, Jaron's dream is to build a factory in Albania which produces large amounts of shoes. This would solve the problem of finding new shoemakers and provide people, who are not shoemakers, a job as well.

Once these arrangements were made, Jaron's company was officially born. Under the name of "JC Kappers" he registered his company and started with his website. The name JC Kappers was chosen carefully. Jaron decided to give the company his own name. The reason for this is because he is named after his parents. "Without the support of my parents, I could have never done any of this," Jaron states. Multiple shoe brands are

named after a family name, so therefore it seemed like a good fit. Obviously, a brand is nothing without a logo. A creative friend of Jaron helped him design the logo. "The fun part was that, before he told me, I never realized that you could combine the J and the C into a K. Once my friend processed this in the logo, I instantly had a good feeling about it and decided that this would become the logo of my company."

However, nothing goes without setbacks. This is indeed something that Jaron could confirm. He designed the first shoe himself and then sent the design to a shoemaker in Albania. However, the first prototype turned out to not be the way he had expected. At that specific moment, he even shortly considered to quit. Nevertheless, he decided that one setback should not mean the end of a great idea. He continued working for his company and soon created the prototype shoe he wished.

The product that JC Kappers is selling is one type of shoe, available in both cognac and black. This model is named "Fillimi", which is Albanian for "the beginning". The model of the shoes is very neutral, since this is not very likely to get out of fashion soon and is

wearable by many people. However, this model is just the start. Right now he is setting up a model to create personalised shoes. Hence it is possible to put a company logo, name or date on the sole.

Via Facebook and friends Jaron has promoted his company. This way, he was able to expand his reach by a large amount, in only a short period of time. "At first, I did not expect it to get the amount of attention it eventually did. I was not really surprised when my relatives and friends made orders, however this changed; at a certain point I started receiving orders from people in the Netherlands that I was not connected with at all." He got an advertisement on the homepage of pepper.com because many people liked his concept and suddenly people all over the Netherlands visited his site. This is one of the moments that Jaron would describe as the best so far. As Jaron is studying Econometrics at Tilburg University, he was already very familiar with Asset | Econometrics before this interview. Since his freshman year at university onwards, he was part of several committees at the study



association and attended multiple events. For that reason, he was also well acquainted with the board members of this year. He was able to set up a deal with both men in the board. As a result, one can for instance spot the shoes of JC Kappers at the board photos of this year.

The vision of his company is to produce good and fair products. "It is a company after all, so I do intend to make profit. However, these profits do not concern the very big numbers. Moreover, the profit is mostly invested in the project again. My intention is that shoes should be bought mainly for this project after all." One pair of shoes provides in total five working days in Albania.

All in all, the start of JC Kappers is promising a lot for the future. Of course, there are many steps that can still be taken. For instance, it is relatively expensive to send the shoes from Albania to the Netherlands. As a result, Jaron has picked up all the orders so far by himself. He has not been able to find somebody who can produce shoe boxes for his company, so when he is going to pick up his shoes, he takes his own bags with him. For now, this fits him; he is able to keep good personal contact with his shoemakers and it enables him as well to combine this with a small vacation in Albania. However, once the company will grow even further, there has to come a different solution for the transportation of his shoes. When Jaron was asked if this was his goal for the future, to solve matters like these, he replied that he was a bit more ambitious than that. "In the future, I would love it to be able to set up an entire factory in Albania. In this way, I could produce more shoes. Moreover, this would also create employment for people who have different skills than being a shoemaker or something closely related to that."

Only two weeks later we got a message from Jaron that there were already new developments for his company. Besides the two shoemakers who live in the inland of Albania he recently got three new shoemakers in the capital Tirana. They are also able to put the logo on the shoes themselves, so Jaron does not need an extra person to do this. If everything goes according to plan, he will be able to produce

at least 10 times as many shoes as today. With this in the near future, 2020 will start very prosperous.

Jaron's advice to everybody is to have the courage to do something like this when you believe in an idea and when you think you can help others with it. Many people can do this, you just have to put the effort in it! ●



Discovering the Financial World

On November 12, our Finance Expedition started with gathering at Tilburg University. A taxi picked us up and brought us to our hotel in Amsterdam. We had a luxurious stay at the Holiday Inn Express hotel in Amsterdam. After we had arrived at the hotel, everyone got their room keys, dropped off their luggage and gathered at the bar of the hotel to have a free welcome drink.

Everyone went to bed on time since the next morning we had to get up quite early. Our first day was in the theme of risk management. The first company to visit was Nationale Nederlanden (NN) in Rotterdam. Unfortunately, our planned train got cancelled but that only gave us a 15-minute delay. At NN, we were warmly welcomed by the staff. We got a welcome speech of the campus recruiter and after that, some trainees told us all about the different traineeships at NN. After that we did a great case and got a nice lunch. We had to leave in time since our taxi was waiting for us to bring us back to Amsterdam, to PricewaterhouseCoopers (PwC)! Our afternoon program was at PwC and we again had a nice case and after that we had dinner with everyone, organized by the company, at a restaurant near the office of PwC.

We had to go back to the hotel at 9.30 hours, since a taxi was arriving with new participants that had a stayover at the hotel for the second day: asset management! We welcomed the new participants and

said goodbye to some, who had to leave since that was already the end of their Finance Expedition. We bought a welcome drink for the new participants and at midnight, everyone went to bed.

On Thursday morning, we again started our day with a tasteful breakfast. This time we took the train to Utrecht, since we had a company visit at a.s.r. Our visit at a.s.r. kicked off with an interactive presentation, given by the CFO, Chris Figee! He talked about his career path and gave us some great tips. After that we had a really fun case given by a former Astrics member, Rick van de Meulenhof! The company visit ended with a very cheesy lunch.

After the company visit at a.s.r., we said goodbye to everyone who did not participate in the last day, since they took the train to Tilburg from Utrecht, and everyone who stayed went back to Amsterdam. Since this day ended at 14.00 hours, we all had a free afternoon and evening. Since we fortunately had budget left, we had dinner together at a restaurant near the hotel. Again at 22.00 hours, a new taxi with new students arrived at the hotel, and we again had a drink together with them.

On Friday, last but not least, we had the corporate finance day. Fortunately, this day was completely in Amsterdam and we had our morning program at



Max Wilke

Bachelor EOR

Age: 22

Deloitte. This was actually a fun case to solve for econometricians, since we had to solve different kinds of puzzles. After the case we had lunch and took the bus to the last company Nielsen Schuman. Nielsen Schuman is a company specializing in corporate finance and we had a long, but fun case. After that we again had dinner with the company, some of us got tipsy, and after that we went back to the hotel to pick up our stuff and get the train back to Tilburg, to look back at a wonderful quest for excellence! ●



Winning Cycling Dinner, Again

Tuesday November 19, Cycling Dinner took place: cycling through the beautiful city of Tilburg for (hopefully) a delicious three-course meal with different members of Asset | Econometrics. Each group of two or three students must cook either a starter, a main course or a dessert for two other groups. In their course, normally all groups have to implement certain characteristics of a specific theme, but this year it was different... The D&A committee came up with one overall theme and subthemes for the different courses. Given the subthemes, everyone should be able to guess the overall theme, but that turned out not to be that easy as the committee thought. The theme turned out to be Polo Ralph Lauren, but with subthemes as 'Brown', 'New York', 'Fish' and 'Champagne' this was not very straightforward. The person who actually guessed the theme won a price.



I participated with lovely Linda Dekkers. We had to make a main course regarding to 'fast food'. Last year, we won the best main course by eating Raclette, and we wanted to repeat our success this year. Therefore, at the end of the afternoon, we started with the first preparations: we went to the Albert Heijn XL for the fresh ingredients of our main course. At 18:30 hours, the cycling dinner started and at that point in time we were already really hungry! For the starter, we first had to go to Judith and Wenxin, who set up their course using subtheme 'New York'. I enjoyed the meal with apple (because of the Big Apple of course), goat cheese, honey and walnuts circumsolved in puff pastry. Unfortunately, we had to leave early for the last preparations of our own course. If you think about fast food, then you probably think about hamburgers, so we decided to make a Big Mac menu! We designed our own McDonalds cups (with the famous yellow M on it) and put the French fries in a small case to offer the ultimate McDonalds experience. Of course, we did not forget the well-known American 'frietsaus'. Together with the other four members who were eating at our place, we decided to take the cups with us to the drink after the cycling dinner. After our self-made delicious main course, we had to go to Loes and Nienke for the dessert, who had to cook regarding the subtheme 'champagne'. First, we got a champagne mug cake. After that, we got a mixed drink with champagne and a cheap student version of Licor 43. Besides, we played the familiar drinking game Never Have I Ever. As a consequence, it was not just only one mixed drink, but a few



Nadia Cissen

Bachelor EOR

Age: 21

more. You can imagine that we all were a little bit tipsy after the three-course meal.

After the cycling dinner, we and the other four students cycled to De Nachtwacht for the drink (taking our cool McDonalds cups with us of course). Lovely Patricia admitted to fill our cups with beer. Later this evening, the winners of each course would be announced, and ... (EXCITING!!!): YES!!! WE WON AGAIN! Our prize this year for the best main course was a golden large spoon. Unfortunately, my golden large spoon was stolen (if you find it, call me), so after this evening I could not use it to further evolve my cooking skills. After crying about this, I got some beer at the bar (beer is the best medicine, right?), did some excellent dance moves and sang some awesome songs with my friends. After the drink, I was wise for a second (yes, I know, that is special) and decided to go home instead of to continue evolving my singing and dancing skills at the Boekanier. I really enjoyed the evening and our plan for next year's cycling dinner is to match up with the success of the last two years! ●

How I Got Into Research

This is my second column. My idea is to tell you more about my background, career, and motivation. To do so, I will now retype (in other words: “copy and paste”) part of the last paragraph of my first column: “During the year of 1984 I applied for several positions and ultimately Tilburg University, which at that time was called Katholieke Hogeschool Tilburg, decided I could work for them.”

The job that I ultimately got was advertised in a newspaper. In that advertisement Tilburg University asked people to apply for a Scientific Assistant position with the main task to do research within the area of “dynamic models of the firm”. I had no idea what it was but what I did know was that I would like to work at a university to conduct scientific research.

The way I applied was with a handwritten letter. Students that follow my lectures these days and that have to deal with my handwriting when I write on the black/white board, will be surprised, but the letter was successful: in about two weeks after I mailed the letter I was invited to a job interview. There I got to know Professor Piet Verheyen. By now I know him for 35 years, and as always, when we met the first time he was friendly, correct, and very straight. Piet Verheyen was one of the founders of Econometrics and OR in Tilburg, served as dean of our school, was also a member of the board of Tilburg University, and retired in 1996.

During the interview, most of the time he was explaining about the project. It turned out that it was about theoretical research. The term “dynamic model of the firm” had of course to do with the type of model. Over time the firm makes decisions like, for instance, investing, advertising, pricing, borrowing money, innovating, and so on and so forth. Most of these decisions not only affect the situation of the firm today, but also in the

future. The word “dynamic” in fact means that the future is taking into account in the model. The model is an optimization model in the sense that the firm undertakes its actions with the aim to maximize the discounted profit stream over time.

By the time Piet Verheyen finished this explanation the interview time was already over, and his final question was whether I would be willing to carry out this kind of research. I was relieved, because I expected a very different interview in which I would have to answer all kinds of difficult questions. Nothing of that all, instead I got the simple question whether I was willing to do the job. And the only important answer I needed to give was: “Yes”!

The mathematical technique I had to apply is called optimal control theory. Over the years I kept on doing research in this area, producing papers that contributed to the understanding of optimal dynamic firm behavior and extending the theory of optimal control itself. Besides dynamic firm behavior, other applications became the topic of investigation, like, e.g., the crackdown of drug markets, open-source software, scientific production over the life cycle, and “rational” addiction.

Most of the time the papers are written with colleagues that I met at different conferences. When working for several decades on a particular topic you build up a whole international network, which only this year already led to visits to York, Bielefeld (twice), Trondheim (twice), Brescia, Vienna (twice), Dublin, London, Venice, and Montreal. In fact, right now I am writing this column at the Technical University of Vienna, where this morning I participated in an interesting discussion on “the role of abnormality regarding the Matthew effect in research careers”. Hopefully, within a few months the paper will appear in some nice journal. ●

Peter Kort

is professor of dynamic optimization in economics and operations research. His main research topics are dynamics of the firm, investment under uncertainty and industrial organization. In particular, he is interested in how competition, dynamics and uncertainty affect the firm's investment and innovative behavior.



A person wearing a blue suit and brown shoes is standing on a set of stone steps. The person's hand is on their hip, and their legs are crossed at the ankles. The background is a mossy stone wall.

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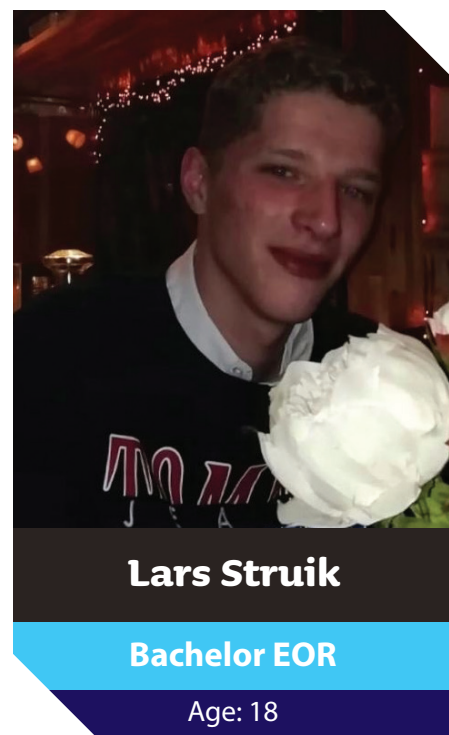
Taking a Stroll Through Delft

On Friday November 22 the active members of Asset | Econometrics visited the beautiful city of Delft. The day started in the train, where Jaron revealed the pink sweater for the AMD committee that organised the trip. When we arrived in Delft, we first walked around for a while through the city. All the people that had never seen the city before agreed about it: Delft is a nice city.

After a while we went to the New Church. This church is very impressive. First, we went upstairs to have a view. When we started with climbing the stairs we had no idea how high it was. Soon it was evident that it would be a long climb. After a long time, when we finally were upstairs, we could enjoy the beautiful view. We could look all the way to Den-Haag, Rotterdam and Scheveningen. Afterwards we looked downstairs at some information about the royal family of the Netherlands. This was very interesting because a lot of people from the royal family are buried in here. There was a big orange carpet where you could walk over and all the people that were buried in the New Church had a place on the carpet, with some information about them and their lives. There was also a family tree of the royal family.

After we visited the New Church, we went to the Old Church. The former being impressive, unfortunately the Old Church was a bit disappointing. There was not much to see in this church and also there was not much information about the church. Furthermore it was very cold inside. So most of the people didn't stay long here.

Hereafter the most beautiful part of the day could finally start. We went to the beer brewery the "Delfts Brouwhuis", where we got a presentation about their process of brewing beers, which was very interesting. It was also interesting how they established their building. The building was an old Greece restaurant first. When they started digging they found a whole basement, which they did not know the existence of. After a lot of digging, the basement has now become a new part of the brewery where you could sit and taste the beers. The most interesting part of the brewery was of course the five beers that we got during the presentation. These beers were brewed by themselves. All the beers had their own story about how they were discovered and how they are made. After the presentation we stayed a bit longer in the brewery to have more beers and have a talk. This was very nice. Finally, the day ended in a restaurant where we had dinner with each other. The day was very nice and good organised by the committee. So thumbs up for the Active Members Day committee. ●



Lars Struik

Bachelor EOR

Age: 18



To All The Kids in High School Who Thought Mathematics Was Useless

As the title suggests, this article is about fun and fascinating (and a bit useful) fields and theories in mathematics. We put together three subjects for you to discover. Have fun and we hope you learn something from this!

written by **Marco Lorusso-Favia**, **Emma Segers** and **Bob Suijkerbuijk**

The Monty Hall Problem

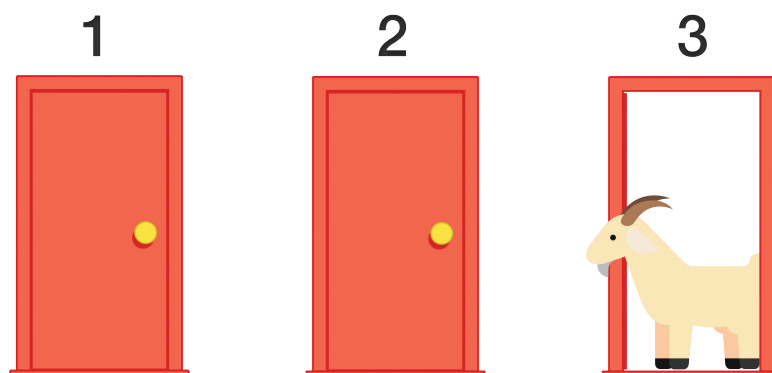
Monty Hall was the host of Let's Make a Deal in the 70s. In this television game show, contestants could go home with the car of their dreams. The game was pretty easy: there are three doors and behind one of them is a car and behind the other two are goats. The contestant has to choose a door first, and then Monty would open one of the other two doors. Behind this opened door, there would always be a goat. Assuming you want a new car more than a goat, what is the best thing to do if you were the contestant? Do you switch to the other unopened door?

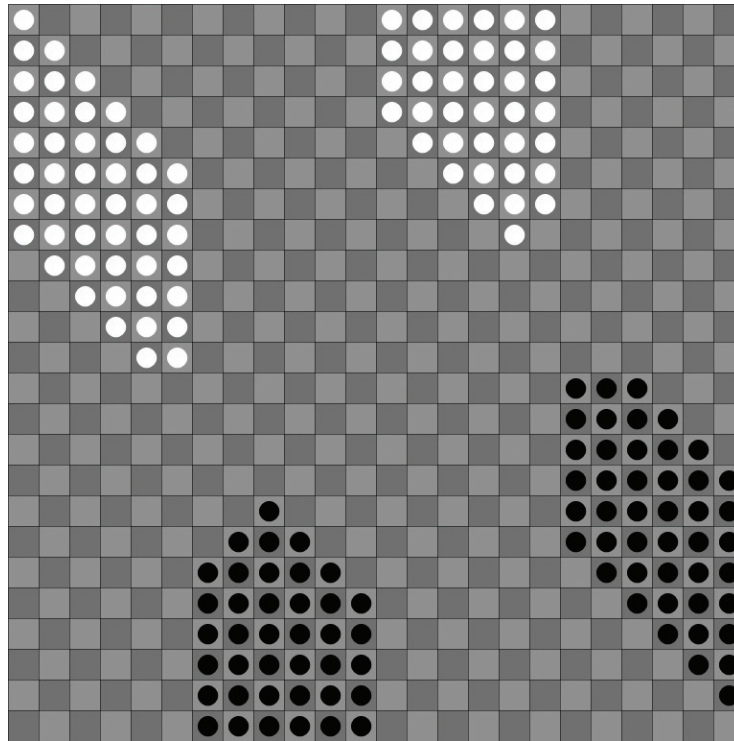
This "problem" is famous in the world of game theory: the study of mathematical models of strategic interaction among rational decision-makers. In game theory, mathematicians often are searching for what we call the "dominant strategy". This is the set of choices one makes to maximize profit in the long run. Now, assume you will be the contestant in Monty Hall's game show and assume that the game does not change in any way. What is the dominant strategy here, if there is one? That means, what choice do you make every game over and over again an infinite number of times, to get infinitely many cars?

The fact that Monty gives you the chance to switch might make you feel like not switching. However, switching will

always be the better choice and, therefore, is the dominant strategy! At first sight, you may think that after Monty Hall opens a door, you have a 50% chance of winning, because there are only two doors left. However, this is not true. On beforehand, the chances of picking the right door is $1/3$, and the chances of picking a losing door is $2/3$. That is, you have a $2/3$ chance that the car is behind one of the doors you did not choose. When you have chosen your door and Monty Hall opens up one of the other two doors with a goat behind it, the entire probability of $2/3$ from the two doors "goes to" just the one door you did not choose but Monty did also not open! And so, infinitely choosing to switch your door will always result in twice as many cars!

This can be explained through Bayes' formula: a formula that calculates the chance of an event happening, given that something else has happened. So, what are the chances of the car being behind door 1, given that there is a goat behind door 2 (or behind 3 for that matter). Since this can be pretty complicated, I will try to give a much simpler and more intuitive explanation. Let's say you have decided on the strategy to always make the switch, an infinite number of times. Picking a losing door will then give you a 100% chance of winning the car. Since picking a losing door happens $2/3$ of the time, switching will always give you a $2/3$ chance of winning. Enjoy your infinitely many cars!





One of the solutions: the queens placed in clusters

Peaceable Queens

Peaceable queens is a chess puzzle played on an $n \times n$ chess board. The general concept of the game is to have an equal number of black and white queens on the board, under the constraint that no queen is under attack by the opposite colour. The objective is to maximize the number of queens on the board. Discussed here are some solutions for small boards.

As the size of the board increases, it remains possible to find a relatively good solution by hand. However, proving it shows to be a very painstaking task - as the process of doing so involves computing every possible solution and picking out the best one. Consequently, people are prompted to use Integer Programming (IP) to solve this problem. What this IP essentially does, is it places the queens, one at a time up to the point where it can no longer place any - due to the constraints - then stores the result and picks the best one. The problem that we incur into is that: as the size of the board grows larger, the set of possible locations for queens increases size in an exponential manner, resulting in a proportional increase in the computation time. Naturally this implies that proving the best possible solution becomes an impossible task, within a reasonable time frame. The largest $n \times n$ board for which we have a definite result is a 14×14 with 28 queens on it.

Due to the long processing time, there is a shift in the goal of the problem. People no longer try to find the maximal number of queens, they limit themselves to find a good solution, one that's ideally better than

any other on a given board. Essentially trying to break a previously instated record. The way people do this is by going from the ordered pairs of coordinates ij to some sort of subset of it. This allows for more creativity. There are two general approaches to this new problem.

The first would be to create a subset of sequences within the set of possible locations for queens. For example, we might decide that placing every queen in any spot that's not under attack on the chessboard is somewhat inefficient. So, we could go from that to placing each queen to the closest viable position relative to the previous queen. Doing so would drastically reduce the set of possible locations for queens. Say we're not satisfied with that solution, it'd be possible to instead of going for the closest square to set a radius around the queen, so the following queen will be placed in a maybe more convenient spot. Then we could very well complicate things by allowing a mix of various subsequences and other such things.

As we move on to even larger boards this method starts taking more and more time. The current best way around this is to fundamentally change the sets of possible locations for queens, going pairs of coordinates to a large ensemble of locations. That way, the queens are no longer placed one by one but rather in large groups. Groups whose size and shape differs almost exclusively from the way a person decides to modify the sets. Doing so allows one to take inspiration from the previously found solutions, draw and code a new pattern from scratch: the choice is yours...

Calculating pi with darts

3.141592653, as any reader of this article probably knows, pi is a mathematical constant with infinite decimals. Pi can be used to calculate the circumference and area of a circle. It is a constant where the value is fixed. But suppose you don't know this value yet, is it possible to calculate it in a different way?

Of course there is a way to do that, otherwise this would be a very short article. In fact, it is possible to calculate pi using darts. This research has been executed by a platform named Physics Girl. This is a resource for fun physics videos and other science materials. A girl named Dianna Cowern has a full Youtube Channel with short videos about physics. During the research, they're throwing darts into a dartboard. Since they're not perfect at throwing these darts, some of the darts will miss the board. To prevent them from ending up in the wall, they made a square around the circle. Together with Derek Muller she did research about how you can calculate pi with darts. She stated this hypothesis: Number of darts in circle/Number of darts in whole square = Area of circle/Area of square. When the diameter of the

circle is as large as the length of the square, the right-hand side of the equation will always equal pi over 4. Now we can rewrite this equation to calculate pi: $\pi = 4 * \text{Number of darts in circle} / \text{Number of darts in whole square}$

For the research there are two important requirements: The dart piles must be thrown randomly! In the example above this is not the case of course, because you want to throw as accurately as possible. To get a proper research we need to throw at least 1000 piles.

On the first day they just started by throwing a few dart piles. They try to throw randomly but it seems a little bit harder than expected. They had the following results: Number of darts in circle: 88. Number of darts in whole square: 103. In this way pi would be measured as follows: $\pi = 4 * 88 / 103 = 3.417476$. This is not that close to pi, since we have a deviation of 8,8%, which is quite a lot. Physics Girl didn't take this for granted, so she tries something else. She concludes that throwing darts randomly was harder than she thought.

On the second day they're trying to get as close to pi as possible, so they try a few new things. First, they are not working with one circle and one square. But lots of circles on one huge square as this could improve the randomness of the darts. Second, they've tried a few new methods to achieve randomness. Like with their eyes closed, standing with your back to the board, with a blindfold, 8 darts a time and they rotated the board 90 degrees a few times. They also reached the 1000 darts limit. After throwing darts for the whole day, they've got the following results: number of darts in circle: 850, number of darts in whole square: 1084. In this way pi would be measured as follows: $\pi = 4 * 850 / 1084 = 3.136531$. As you can see, this is pretty close to pi. There is a deviation of only 0,2%!

When you write a code to throw random 10.000 dart piles, you'll see that you'll get even closer to pi than Physics Girl is. To conclude, if you've ever forgotten the value of pi, but you do have a dartboard and 1000 darts at hand, then it's your lucky day! ●

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3.141592653589793238462643383279
5028841971693993751058209749445923
07816406286208998628034825342117067
9821      48086      5132
823       06647      09384
46        09550      58223
17        25359      4081
          2848       1117
          4502       8410
          2701       9385
          21105      55964
          46229      48954
          9303       81964
          4288       10975
          66593      34461
          284756     48233
          78678      31652      71
          2019091    456485      66
          9234603    48610454326648
          2133936    0726024914127
          3724587    00660631558
          817488     152092096

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Exploring Your Potential

On November 26th 2019, the **Econometrics in Practice Day** took place again. Every year econometricians from the second-year bachelor and onwards come together at this event to meet new companies and work on their future. For the disoriented Bachelor students, The Econometrics in Practice day is the perfect event to discover how the theory taught in courses, is applied in practice. For master students, this day is the perfect opportunity to meet your future employer or to find an interesting traineeship. We as a committee wanted to summarize the whole in one sentence and we concluded that this day is all about **Exploring Your Potential!**

This year I had the pleasure to organize this event with five amazing people. The committee started in February and immediately the most important task on our To-Do list was the acquisition of companies. We aimed for small or medium-sized companies who practice Econometrics in real life. After a few months Xomnia, The Logic Factory, Groenewout, Eyeon, Ortec Finance, and Triple A had agreed to visit our small event. We wanted to have two companies who represented the BAOR/EME masters and two who represented the QFAS master for the presentations and finally a BAOR/EME case and a QFAS case. Luckily for us, 2 companies wanted to do a case in the BAOR/EME field namely, Groenewout, a logistics company, and Eyeon, a forecasting company. Our next mission was to find a QFAS case. However, this caused more trouble than we had anticipated. Our external affairs called every quantitative finance and actuarial science company but unfortunately, we could not find a company that wanted to participate in time. However, this did not demotivate us. It made sure that we wanted this day to succeed even more.

After weeks of hard work which included making flyers, handing out flyers, doing lecture talks, creating booklets, making reservations for coffee and lunch, collecting goodie bags and a lot more, the day was finally here. This year, so many students wanted to participate, we had to reject some of them for the whole day. It made us really happy that our event was popular and that all the effort we had put in was appreciated by many. The day started with the two presentations rounds, each lasting approximately 45 minutes. Xomnia and Triple A did the first round and The Logic Factory and Ortec Finance the second round. After the presentations, the students and the companies headed to the Esplanade building for a delicious lunch. Many students also participated in the speed dates. Each student had five minutes to talk to the representatives of the companies of choice during these 'dates'.

After the lunch, the students prepared themselves for the three-hour cases. Groenewout gave all the students a map of Europe with some distribution centers and factories. The students needed to come up with an action plan for when there would be economic



Mylan Tran

Bachelor EOR

Age: 19

growth in Eastern Europe and if there would be a shift in a factory, company, and customer relationships. The solution was subject to certain constraints also, for example, the fact that customers needed to receive their orders in less than 24 hours. Eyeon had an original case where students had to forecast the sales of two fictive types of cars of Tesla and build the cars using Lego bricks. The goal was to predict the demand for cars as good as possible. The winners of the case won beers and a nice set of sunglasses! The day ended with a lovely networking drink in the Esplanade building.

It was a long but successful day. I want to thank Juul Schuurmans, Emma Segers, Denise Jacobs, Martijn Oerlemans and Ricardo van Belzen for the wonderful teamwork. Organizing this day would not have been this fun without you! ●



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Adventuring in Copenhagen

Probably the best way to get out of your comfort zone – is exactly what my girlfriend and I thought in January 2019 about going abroad. It was not an easy ride I must say honestly, but a really cool one and I have no regrets! Early January I applied for the Digital Graduate Program within Carlsberg in Copenhagen (similar to a traineeship in the Netherlands). After passing the screening interview and the assessment day, I was invited to the final round which was a Skype interview with Mark Dajani, CIO & Sarah Haywood, CTO. I can assure you, this was far from an easy interview – Mark really likes to “peel the onion” and made sure he breaks through all of your preparations.

You can guess what happened afterwards and let me fast forward to the last couple of months. Between graduating and starting my new job in September, I had only eight days off (way too few). Here I was, coupled to my first rotation and assigned to my mentor, Sarah Haywood, for the upcoming two years. What I really like about Carlsberg is its global attitude (e.g. my current team consisting of 25 people has no born Danes), the company culture and the flat hierarchy. During my onboarding together with the Graduate Community, we visited the Carlsberg Research Laboratory, had graduate workshops and two one-hour meetings with CEO Cees 't Hart. My first rotation is within the Process Discipline Team, a team that is mainly focusing on optimizing and standardizing processes in the Western European markets. In this team I am Product Owner of an IT Request Tool and Project Manager in Process Mining. In a short amount of time I really feel an appreciated team member, even though everybody knows that I have my next rotation planned within eight months. I receive a lot of trust from my manager, Virginia, who really gives me space and opportunities to excel. Don't be afraid that I will become a completely different Pepijn – I still look forward to receiving the

photo round of the weekly pub quiz and within Carlsberg I am already known as the crazy Dutchman who can guess 80s songs within two seconds.

I think it is interesting to touch upon the point of applying your study learnings within a graduate program. Yes, it is true that you only use a very small piece of your econometric toolbox – if you want to leverage this, I would not recommend a graduate program. However, what I feel in my daily job is that, due to my analytical and complex problem-solving skills that I have developed during my studies, I can quickly understand difficult problems and easily detect fact-based business value and opportunities. But to really make an impact in a multinational, you need to develop yourself and I am thankful to be able to learn every day on multiple facades (think about developing your own branding, “work hygiene”, leadership).

Copenhagen is a lovely city, it is beautiful and with everybody speaking more than decent English, you can do everything and go everywhere you want. Of course, living abroad is sometimes tough, but with so many good friends visiting us in



Pepijn van den Brink

Graduated in 2019

Age: 24

such a short notice – Tamara and I really feel lucky.

I would like to end with some take-aways:

- 1) If you want to pursue a graduate program/traineeship – make sure to start exploring on time, since there is a hard deadline (and there probably is a lot of competition)
- 2) Planning big future steps ahead can be very beneficial – even with an EU citizenship and an offer six months upfront, it is apparently really difficult to relocate and get the paperwork finished on time
- 3) I do not regret my choice and would certainly recommend the Graduate Program at Carlsberg (note that the deadline is approaching soon). If you are interested in a Graduating Program or you want some sparring about going abroad, feel free to contact me! ●



Facial Reduction applied to Semidefinite Programming

Semidefinite programming (SDP) is considered the most exciting development in mathematical optimization in the 1990's. Since then, it has attracted the attention of many researchers in various fields, among which control theory and combinatorial optimization. Besides its many applications, SDP has been of interest due to the existence of efficient algorithms for solving such problems. However, solving large SDPs in practice remains a challenging task. The difficulty of solving an SDP partly depends on the form in which the problem is written. One of the keys to tackle this issue is called facial reduction. Facial reduction is a method that can be used to rewrite an SDP into a form that has certain 'nice' conditions. In this article, we introduce the basics of semidefinite programming and the idea behind facial reduction.

Introduction to Semidefinite Programming

Semidefinite programming is a subfield of optimization that can be seen as an analogue to linear programming. Instead of having variables that are nonnegative vectors, we work with matrix variables that are positive semidefinite. Hence, SDP is the optimization over the cone of positive semidefinite matrices where the objective function and the constraints are linear.

Before we show how an SDP in standard form looks like, we introduce some terminology. Let \mathcal{S}^m be the set of the $m \times m$ symmetric matrices. We denote by \mathcal{S}_+^m the set of positive semidefinite matrices of order m , i.e., $\mathcal{S}_+^m := \{X \in \mathcal{S}^m : y^\top X y \geq 0 \text{ for all } y \in \mathbb{R}^m\}$. Similarly, \mathcal{S}_{++}^m denotes the set of positive definite matrices of order m . A linear function in terms of matrices is defined using the so-called trace inner product. For any two matrices $A, B \in \mathcal{S}^m$, the trace inner product is defined as $\langle A, B \rangle := \sum_{i=1}^m \sum_{j=1}^m A_{ij} B_{ij}$.

We now consider the standard form of an SDP problem. Let $C \in \mathcal{S}^m, A_j \in \mathcal{S}^m$ for all $j = 1, \dots, k$ and $b_j \in \mathbb{R}$ for all $j = 1, \dots, k$ be given. Then, an SDP is a problem of the form

$$\begin{aligned} p^* = \inf_{X \in \mathcal{S}_+^m} \quad & \langle C, X \rangle \\ \text{s.t.} \quad & \langle A_j, X \rangle = b_j \quad \forall j = 1, \dots, k \\ & X \in \mathcal{S}_+^m. \end{aligned} \quad (1)$$

Observe that apart from the SDP constraint, all other constraints are linear in X . A difference with linear programming is that the optimal solution to the problem (1) does not have to be attained even if the problem is bounded. In other words, it can happen that p^* is finite, while there does not exist a feasible solution X for which $\langle C, X \rangle = p^*$. For that reason, we search for the infimum instead of the minimum.

Note that in the particular case when the matrices A_j and C are diagonal, the problem (1) reduces to a linear programming problem. Hence SDP captures linear programming as one of its special cases.

We can also formulate the dual problem corresponding to (1). The dual problem is again an SDP and its optimal value is denoted by d^* . Similar to the case of linear programming, we can show that $d^* \leq p^*$, i.e., weak duality holds. If we in fact have $d^* = p^*$, we say that strong duality holds. Strong duality between an SDP primal and dual problem does not always hold. A well-known property that is used to verify whether strong duality holds between a primal and its corresponding dual problem is called *Slater's condition*. The problem (1) is called *Slater feasible* if there exists a feasible solution X that is positive definite, i.e., $X \in \mathcal{S}_{++}^m$. If (1) is bounded and Slater's condition is satisfied, then strong duality holds.

Solving an SDP

Many research is performed on efficiently solving SDP problems. As the infimum p^* does not even have to be a rational number, one cannot hope for an algorithm that solves (1) exactly. Instead, the best one can do is finding an algorithm that efficiently computes an ϵ -approximation for any $\epsilon > 0$. This means that the algorithm returns a solution that is guaranteed to be at most ϵp^* away from the optimum. It is well-known that such algorithms exist. Currently, interior point methods are the state-of-the-art methods for solving SDP problems.

Instead of going into the idea behind interior point methods or their implementations, we here focus on the conditions for these methods to behave well. In order for these methods to be stable in practice, it is assumed that the SDP and its corresponding dual problem are Slater feasible. For many SDP problems, e.g., in combinatorial optimization, it is not possible to find a feasible solution that is positive definite. Fortunately, it is often possible to derive an equivalent SDP formulation that satisfies Slater's condition based on projection. The key to do this is called facial reduction.

Facial geometry

To understand the idea behind facial reduction, we first need to know something about the geometrical properties of convex cones and, in particular, the semidefinite cone. Recall that a set \mathcal{K} is called a convex cone if for all $x, y \in \mathcal{K}$ and scalars $\alpha, \beta > 0$ we have $\alpha x + \beta y \in \mathcal{K}$. We are interested in the faces of a convex cone, which are defined as follows:

Definition 1 Let \mathcal{K} be a convex cone. A convex cone $F \subseteq \mathcal{K}$ is called a face of \mathcal{K} if the following holds:

$$x, y \in \mathcal{K} \text{ with } x + y \in F \Rightarrow x, y \in F.$$

It follows from Definition 1 that \mathcal{K} and \emptyset are faces of \mathcal{K} . We call a face F of \mathcal{K} proper if F is not equal to \mathcal{K} or \emptyset . This definition does not immediately provide an intuitive interpretation of a face. Informally, the proper faces of a convex cone \mathcal{K} correspond to the objects that define its boundary. The easiest way to see this is by an example. Figure 1 shows a convex cone in \mathbb{R}^3 . The boundary of this cone is defined by the plane segments A, B and C , which are convex cones by themselves. Indeed, using Definition 1 one can check that these cones must be faces of \mathcal{K} . Since the intersection of two faces of \mathcal{K} is again a face of \mathcal{K} , the half-lines l, k and m and the origin O are also proper faces of \mathcal{K} . It follows that a proper face of a convex cone in \mathbb{R}^3 can either be a point, a half-line or a two-dimensional convex cone and that the lower dimensional faces form the intersection of two or more higher dimensional faces. Finally, observe that any proper face of \mathcal{K} is always disjoint from the (relative) interior of \mathcal{K} .

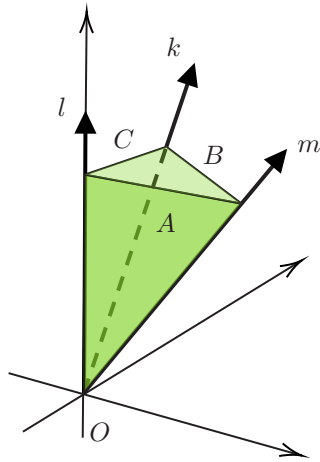


Figure 1: Convex cone $\mathcal{K} \subseteq \mathbb{R}^3$ including its (proper) faces A, B, C, k, l, m, O .

We now apply the concepts introduced above to the positive semidefinite cone \mathcal{S}_+^m . The proper faces of \mathcal{S}_+^m correspond to

objects that define the boundary of \mathcal{S}_+^m . Since the elements of \mathcal{S}_+^m are matrices, it is difficult to draw the faces of \mathcal{S}_+^m . Nevertheless, it is well-known that the faces of \mathcal{S}_+^m correspond to the linear subspaces of \mathbb{R}^m , see e.g., [2]. This result is formalized in Theorem 1.

Theorem 1 Let \mathcal{R} be a linear subspace of \mathbb{R}^m . Then the set

$$F_{\mathcal{R}} = \{X \in \mathcal{S}_+^m : \text{Col}(X) \subseteq \mathcal{R}\} \quad (2)$$

is a face of \mathcal{S}_+^m . Conversely, any face of \mathcal{S}_+^m can be written in this way for some linear subspace \mathcal{R} of \mathbb{R}^m .

Theorem 1 states that any linear subspace \mathcal{R} of \mathbb{R}^m corresponds one-to-one with a face of the positive semidefinite cone of order m . Another useful fact is that for any matrix $W \in \mathbb{R}^{m \times k}$ whose columns span \mathcal{R} , we can write $F_{\mathcal{R}}$ as

$$F_{\mathcal{R}} = W\mathcal{S}_+^k W^\top. \quad (3)$$

This means that any matrix $X \in F_{\mathcal{R}}$ can be written as $X = WZW^\top$ for some $Z \in \mathcal{S}_+^k$. We call the matrix W the transformation matrix.

Facial reduction

Now that we know the basics of semidefinite programming and the facial properties of the positive semidefinite cone, it is time to look at a method where both worlds come together: facial reduction. This approach was introduced by Borwein and Wolkowicz [1].

Let P be the set of matrices that satisfy the linear constraints of (1), i.e.,

$$P := \{X \in \mathcal{S}^m : \langle A_j, X \rangle = b_j \text{ for all } j = 1, \dots, n\}.$$

Then the feasible set of (1) equals $P \cap \mathcal{S}_+^m$. Suppose that (1) does not satisfy Slater's condition. This means that the intersection between P and \mathcal{S}_{++}^m is empty. Since the interior of \mathcal{S}_+^m equals \mathcal{S}_{++}^m , this implies that the feasible set of (1) lies entirely on the boundary of \mathcal{S}_+^m . As discussed in the previous section, the boundary of the positive semidefinite cone is covered by its proper faces. Hence, the feasible set $P \cap \mathcal{S}_+^m$ lies entirely on one of the proper faces of \mathcal{S}_+^m .

The idea behind facial reduction is to find the face that contains the feasible set of (1). Since there can exist multiple faces of \mathcal{S}_+^m containing this set (recall that the intersection of two faces is again a face), we in fact want to find the *minimal* face containing the feasible set of (1). It follows from Theorem 1 that this minimal face is of the form (2) for some subspace \mathcal{R} of \mathbb{R}^m . Let k be the dimension of this subspace. We must have $k < m$, otherwise the subspace \mathcal{R} equals \mathbb{R}^m ,

which implies that the face $F_{\mathcal{R}}$ equals \mathcal{S}_+^m .

Let $W \in \mathbb{R}^{m \times k}$ be a matrix whose columns form a basis for \mathcal{R} . As stated in (3), the minimal face $F_{\mathcal{R}}$ can be written as $W\mathcal{S}_+^k W^\top$. Since the feasible set of the original problem is contained in this minimal face, we know that for all feasible solutions X there exists some $Z \in \mathcal{S}_+^k$ such that $X = WZW^\top$. We use this fact to rewrite the original SDP problem:

$$\begin{aligned} p^* &= \inf_{Z \in \mathcal{S}_+^k} \langle C, WZW^\top \rangle \\ \text{s.t. } &\langle A_j, WZW^\top \rangle = b_j \quad \forall j = 1, \dots, n \\ &Z \in \mathcal{S}_+^k. \end{aligned}$$

Using the fact that $\langle A, BCB^\top \rangle = \langle B^\top AB, C \rangle$ for all matrices A, B and C of appropriate size, we can rewrite this SDP problem to:

$$\begin{aligned} p^* &= \inf_{Z \in \mathcal{S}_+^k} \langle W^\top CW, Z \rangle \\ \text{s.t. } &\langle W^\top A_j W, Z \rangle = b_j \quad \forall j = 1, \dots, n \\ &Z \in \mathcal{S}_+^k. \end{aligned} \quad (4)$$

It follows from the construction that the problems (1) and (4) are equivalent. The problem (4) is again an SDP in standard form, but the matrix variable is now of lower order than before. Intuitively, (4) can be seen as the projection of the original problem onto the minimal face containing its feasible set.

Applying facial reduction before solving an SDP has several advantages. First of all, since we project the original problem onto a lower dimensional space, we end up with a smaller number of variables. Moreover, because the linear constraints are used to obtain W , it can happen that W is constructed such that the constraint $\langle W^\top A_j W, Z \rangle = b_j$ is satisfied for any $Z \in \mathcal{S}_+^k$. Hence, some of the original linear constraints become redundant after the facial reduction. This results in a projected problem involving less constraints. The final advantage of doing facial reduction is of course related to the reason why we applied it: Slater feasibility. Since we project the problem onto the minimal face containing its feasible set, the feasible set of the new problem is full-dimensional in \mathcal{S}_+^k . Indeed, if this would not be the case, there must exist a smaller face containing the feasible set, which is a contradiction. As a consequence, the problem (4) contains a feasible solution Z that is positive definite. Hence, Slater's condition holds for (4), which means that we can solve it efficiently using interior point methods.

The main challenge of applying facial reduction is finding the minimal face $F_{\mathcal{R}}$ and its transformation matrix W . In order

to obtain the minimal face, one needs to investigate which of the linear constraints shift the feasible set towards the boundary of \mathcal{S}_+^m . It is not a surprise that the form of W is very dependent on the problem at hand.

In the literature, facial reduction has been applied to SDP relaxations of several combinatorial optimization problems, e.g., the quadratic assignment problem [4] and the quadratic cycle cover problem [3]. For these problems, explicit expressions for the transformation matrices W are derived. Although it is in general not straightforward to find these transformation matrices, it enables us to solve SDP problems more efficiently or to solve SDPs of larger size.

Conclusion

Facial reduction is a powerful method that can be applied to SDP problems that do not meet the conditions of the state-of-the-art algorithms to solve SDPs. Although finding the minimal face containing the feasible set is not always trivial, it is often worth the effort, as it results in lower dimensional problems that can be solved successfully by interior point methods.

References

- [1] J.M. Borwein, H. Wolkowicz. Facial reduction for a cone-convex programming problem. *Journal of Australian Mathematical Society*, 30(3):369–380, 1980.
- [2] D. Drusvyatskiy, H. Wolkowicz. The many faces of degeneracy in conic optimization. arXiv: 1706.03705, 2017.
- [3] F. de Meijer, R. Sotirov. Semidefinite programming for the quadratic cycle cover problem. *Working Paper*, Tilburg University, 2019.
- [4] Q. Zhao, S.E. Karisch, F. Rendl, H. Wolkowicz. Semidefinite programming relaxations for the quadratic assignment problem. *Journal of Combinatorial Optimization*, 2:71–109, 1998.



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Reading This Article Online or Offline?

Did you know that Nekst has its own website? Well I did not until Emma asked me to become responsible for this site. So I went to Nekst-Online.nl and found a whole website dedicated to our beloved Nekst. There were old articles, puzzle solutions and exclusive interviews ready to be read. "This is really nice", I thought, but I wondered why me and also most of our committee had never heard of it. This has to change, so this year Rick and I will make sure everybody gets familiar with Nekst-Online and make it as up to date as possible.

As I said earlier, on Nekst-Online old articles can be found, uploaded after every Nekst publication. Not all articles from the magazine are uploaded, but the most fun, interesting or special pieces are uploaded and ready to be read. In addition to these, there are also specials uploaded every now and then, like exclusive interviews with the board. So, make sure you check the site to know all about their experiences as a board member. Also every year the IBT (International Business Tour) makes a blog to post about their trip, so if you want to know all about Mexico or see

some nice pictures, you can find them on the IBT blog.

All these things sound well and good, but most people don't know about Nekst-Online or think of it as "the site where you hand in the Nekst puzzle". It was once offline for three months and nobody noticed. The site should be a lot more attractive! The first thing that needed to be done was updating the site as it was not in compliance with the GDPR, also known in the Netherlands as the "AVG". There was also no search feature or a working Nekst archive. So to change this, all the site needed maintenance by me, having no experience working with websites. Fortunately, Nekst-Online is hosted on a Wordpress server which made those things as simple as installing an app on your phone. Namely, Wordpress works with plugins you can install which will then change the site for you! My favorite plugin is the like button, so if you really like a post you can give it a thumbs up!

Recently the Nekst archive has been partly reuploaded. Because of the



Stephan Sparreboom

Bachelor EOR

Age: 22

switch to the new Asset general site last year the files were lost. Luckily, with the help of the board a lot of old Nekst pdfs were found. So if you want to read those and experience how the lives of econometricians were back in the days or if you want to solve an old puzzle, you should head over to the Nekst archive! Currently we are still busy finding old Neksts and adding them to the collection.

What to expect for the future? There will be more exclusive articles on Nekst-Online, so you do not have to wait four months to read all the lovely stories. Furthermore, the layout of the site will be changed to make it look even better. And last but not least, there might be a little challenge hidden on the site, but you have to discover so yourself. ●

www.Nekst-Online.nl



Christmas Dinner 2019



Enjoy Responsibly

On September 24 fourteen motivated students left to visit the main factory of Heineken for an inhouse day. After a pretty long travel to Zoeterwoude we arrived at 12.00 hours. It took some work to figure out where we needed to be at the enormous complex, but after a while we found the right building

When we entered, we were greeted by six employees of Heineken. We all agreed upon the idea to have lunch first before starting with the presentation and the case. There was a wide variety of sandwiches to choose from, and there even was beer for lunch (although it was 0.0%). Then it was time to start with the presentation. In about an hour we got a lot of information about all different possibilities at Heineken, as well as some information about the international expansion of the brand. We also learned what different brands all belong to Heineken. For example, I didn't personally know that Brand belonged to Heineken.

After the presentation it was time for the case. We were divided into groups of four students and got the explanation. Based on the data of the sales figures of different types of beers at differently located bars we had to come up with a recommendation for new beers to sale. There was a wide variety of beers we could recommend. Wheat beers, dark beers, seasonal specials, radlers and alcohol free beers were all potential candidates. We all had

a hard time solving the problems, and choosing a model, but in the end we all came with a set of recommendations. Every team had a totally different bundle for offer, and thus it wasn't easy to see the winner, but in the end a winning team was chosen.

After this case it was time to continue with a tour through the enormous brewery. When we walked out of the building there stood an ancient Double-decker-bus that was painted into a Heineken story. When we climbed onto the second floor of it, it was pretty clear that it wasn't made for modern giants, as some of us had to bend in to be able to walk there.

After a few minutes driving we reached the entrance to the brewery. We first started above the fermentation boilers, where in different stages the beer is made. The smell of the fermentation was clearly present. Some said it stank and others said it smelled delicious. The kettles were gigantic, which is no surprise after we previously heard how many beer Heineken produces every day. Although it was pretty noisy we got a clear instruction about the brewing process. Every one of the seven different steps was mentioned, and some even discussed joining the mania of self-brewing. Now it was time to see the bottling facilities. There were countless assembly lines that produce thousands of beers every minute. There were two lines filling Amstel. Also, Sol and Desperado were filled at a line. However the



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majority was filling Heineken into bottles of all different sizes. The usual 30cl bottles, but we also saw different American sized bottles ranging from around 15cl to 66cl (it is actually in fluid ounces). At the back of the enormous hall were tons of pallets with beer boxes waiting to be shipped. The pallets that were just finished at the filling line moved through an automatic transportation system, which directed them towards the right truck.

After seeing this impressive sight, we returned to the bus to drive back to the company bar. Here we had a drink with many mathematicians of Heineken, and a big variety of beers to choose from. We were even told about the discounts Heineken employees get when buying beer, as for which student wouldn't a very cheap unlimited source of beer be a dream? All together we had a very enjoyable day, and I think many of us became even more interested in the company. ●



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Living to Work, or Working to Live?

Between a high-pressure work environment, a résumé that needs attention, social circles to maintain and that pesky need to sleep a few hours a night, the typical young adult has little reason to be bored. Burn-out rates have never been higher, and the ages at which its signs first appear, even in children, are shockingly low. In this issue, I would like to address one of the essential parts of life, which ambitious, career-focused graduates tend to neglect: hobbies. What qualifies as a hobby, and why is it good for you?

Nowadays, many young adults will find it surprisingly hard to provide a satisfactory answer to the question that used to be so simple in childhood: "What are your hobbies?" Sure, many will answer with "fitness", "going out with friends" or a close tangent to either one. Intuitively, I would say that neither is actually a hobby, generally speaking. Thus, let us try to pinpoint what constitutes a hobby, if possible. Firstly, while it may bring a sense of accomplishment, fitness is typically a means to an end, rather than an activity solely performed for the joy of the activity. This may give us the first necessary property of a hobby: one must enjoy the time spent on the hobby without the need for it to lead to something professionally or socially useful.

I think we can safely claim that time spent going to a bar and dancing is not professionally useful, outside of some niche, generally more frowned upon professions. Strictly speaking, going out definitely has some effect on your social life. In addition to being a source of (frequently short-lived) romantic affairs, I think it is fair to say that groups of friends will bond over events that occurred when they were having a typically alcohol-induced good time. However, this is not

quite the usefulness I was referring to, earlier. In my mind, social usefulness relates to moving a person into 'higher' social circles. Thus, going out still meets the criteria. Why then, would it not be a hobby?

Having seriously considered a few alternatives, I think that I would be happy to add the following second characterizing property of a hobby: one should be able to take pride in the result of the activity. While this still leaves some ambiguity – i.e. the self-proclaimed ladies man will likely take pride in his nightly conquests – I think that we have obtained a decent basis upon which to stool our definition.

Now that we have the semantic question out of the way, let me attempt to argue the point I promised to make. Suppose (somewhat hyperbolically) that one has created a life for himself in which every facet is a means to an end; in which every facet is almost exclusively useful. It makes sense that one would then feel pressured into performing the planned tasks. To specify: one feels pressured as performing the tasks on the agenda will yield him X, which he does not want to miss out on, and the activities are tasks since they were assumed to be only useful, as opposed to enjoyable. Thus, the fictional person's life quickly devolves into a series of hard-to-enjoy chores of which he attempts to do as many as he can muster, so that he will not have to anymore.

Clearly, the problem will evaporate when the person simply enjoys his job. However, I think that everyone who has been working for a while will have had (prolonged) periods that were less enjoyable, for one reason or another. Particularly in those periods, one needs activities in his life that he wants to be doing, simply for the intrinsic value of doing them. Moreover, one then needs something in his life that he can be proud of. One needs a hobby. ●

How Should We Save Our Nature Reserves?

The Dutch House of Representatives currently has many meetings about what we could do to diminish the nitrogen emissions in the Netherlands. A too high amount of nitrogen emissions is harmful for our nature and leads to the disappearance of vulnerable plant species. Two measurements that have been talked about during these discussions are the diminution of the bio-industry and the reduction of the speed limit on the Dutch highways. Since the nitrogen emission has to be diminished by more than 50%, this should be a good moment to talk about the pros and cons of both measures and to look at other measures that could be implemented by the Dutch government.

written by **Juliëtte Tillie** and **Jeffrey Buijk**

According to research of Wageningen Environmental Research, the nitrogen emission in the Netherlands has to be more than halved. This has to be done, since more than 110 protected nature areas in the Netherlands are exposed to an excess of nitrogen emission. This excess varies from 5% to almost 75% in some nature reserves in the Netherlands, as is shown in Figure 1. Hence, we have to take action in order to diminish the amount of nitrogen emission. But when these measures are implemented, some groups will be harmed by these measures. Therefore, it is important to have a good look at the effects of the different measures.

The diminution of the Dutch bio-industry

The highest amount of nitrogen emission in the Netherlands is originating from ammonia in the bio-industry. Therefore, it might be obvious to set measures in this sector in order to diminish the emission of nitrogen. The most rigorous way to do this would be by halving the livestock in the Netherlands, but this measure would lead to angry faces from the Dutch farmers, as they will lose a lot of profit as a result of this measure. Another measure could be to use technological solutions, such as air washers and using a different composition for animal feed, but these measures could become very costly.

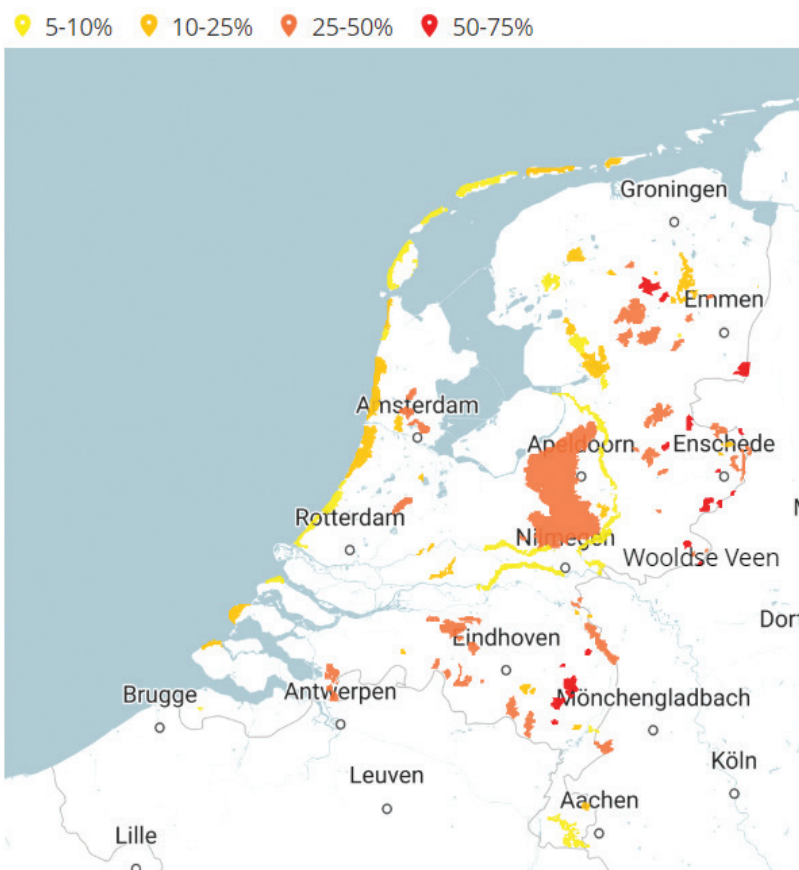


Figure 1

Nitrogen emission in the bio-industry is mainly caused by the excretion of the cattle. Animal feed contains nitrogen in the form of proteins. Animals need these proteins to grow, to produce milk or to produce eggs. But when animals receive more proteins than needed, these will be converted to nitrogen emission via the manure of these animals. The rate of ammonia emission from animal manure does depend on certain external factors, such as the temperature and the surface conditions where the animals are located.

An important factor of the ammonia emission in the bio-industry is the type of housing system. Two different types of housing systems can be distinguished: loose housing barns, where animals can move freely and tie stalls, where animals are bound to a certain place. When comparing loose housing barns and tie stalls under different conditions, we could conclude that tie stalls cause a lower ammonia emission than loose housing barns have. For example, when we compare both types of barns where slurry storage is used to store the waste, loose housing barns produce 25 to 45 grams of ammonia per day, while tie stalls produce 5 to 27 gram ammonia per day. Although this is quite a big difference, there could also be given some arguments against tie stalls. The main argument against tie stalls would be the fact that animals will have no space to move. From an animal welfare point of view, it would be logical to argue against these types of stalls in order to respect the lives of the animals as they should have the freedom to move. Another drawback of tie stalls is that they are generally related to a higher labor demand, regarding milking (in case of cows) and feeding.

A measure that could be used within stables is the usage of air washers. When ammonia is produced from the excretion of animals, in most stables in the Netherlands this air will be blown out of the stables by fans. This way the polluted air could cause a nuisance for the surrounding areas of these farms. A solution to this problem could be found by air washers. When using air washers in stables, the air will be led through the air washers, in which it will make contact with water. The ammonia in the air will dissolve with water, causing a lower emission of harmful air out of the stables. Using these air washers should lead to a reduction of ammonia pollution of 70% to 95%, but unfortunately it turns out that these results will not always be met. A disadvantage of these air washers is that the costs of the construction will be high. An air washer will cost €200,- to €400,- per square meter, with an additional amount of 15.000 euros for the storage of sulfuric acid and drain water.

Except for looking at the excretion of the animal, it is also possible to look at the source of the problem. By lowering the amount of proteins in the food of the animals, the amount of ammonia and therefore nitrogen emissions will lower. The Dutch cattle are being fed a lot of proteins, even more than they reproduce. Only 20 to 30% of the proteins in the current cattle food is indeed consumed by the cow. The excess of proteins in their food will be converted to ammonia in the excretion of the animals. For cows, this reduction could be performed by replacing a part of the grass in the diet with maize, which contains a lower amount of proteins. Experts also believe straw to be a solution. Straw contains carbonaceous

materials, that help animals to capture the proteins. This way the animals will need less food and will there also be less ammonia in their excretion

Another measure that farmers could take is using feed additives in the bio-industry. By using these feed additives, animals will be able to break down proteins easier. These feed additives work like enzymes and help the animals to convert the proteins in the food into meat, milk and eggs, which leads to a lower amount of ammonia in the excretion of the animals. A disadvantage of these food measures is that these will be much more expensive than the food that is currently used in the bio-industry. But when we consider the fact that at this point half of the bio-industry has to disappear to reduce the nitrogen emission to an acceptable amount, it might be worth it for the Dutch farmers to consider one of the measures above.

The reduction of the speed limit on the Dutch highways

Prime Minister Rutte is not too fond of this measure, though, it might be a necessary one. 45 years after raising it, the maximum speed limit for cars on the highway will be reduced to 100 km/h. Between 07:00 and 18:00 hours the speed limit of 130 km/h will still be tolerated, but during the day all drivers have to obey the new rules. As of the implementation of the limit, the Netherlands will be the country with the second lowest speed limit on highways in Europe, right behind Iceland. What speed limits hold in our European neighbors, is shown in Figure 2. A lot of questions arise with this new rule incoming. Will it actually help? Is this a



Figure 2

temporary measure? What about electric cars? Those are all important aspects to understand.

A lower speed limit means that cars work less hard to maintain the same speed. Thereby, the faster a car goes, the more air friction it faces. Driving 30 km/h slower thus saves fuel. This is not just a positive note on the environment but also saves money. One could argue that driving slower also means more hours per year spent driving. This is of course true, though, the difference is thought to be insignificant since in reality in the Netherlands one can never drive 130 km/h for an hour straight. A trip that will take one hour driving 100 km/h will take about 54 minutes driving 130 km/h.

So, how much will it save? According to the RIVM, the total of Dutch cars is responsible for 6.1% of total nitrogen emissions. A lowering of the maximum speed will result in a profit of 0.34%. This is a relatively low profit but it is a certain one. After implementation, a 100 km/h speed limit will almost certainly and immediately pay off, which is why the Dutch government is so keen on it.

Business drivers in the Netherlands drive approximately 40,000 kilometers per year and they drive them cleaner and cleaner. Since this year, 17% of them drive in electrical powered cars. The chairman of the Dutch 'Vereniging Zakelijke Rijders' (VZR), which in translation means the association of business drives, noted the following: "An electrical car driving 100 km/h has no effect on nitrogen whatsoever and a measure with a similar effect cannot

be seen as anything different than symbolic politics. We have to stop bullying the motorist."

The H2-platform is now introducing an alternative, inspired by Austria. Over there, special driving lanes for electrical vehicles have been made available where it is allowed to drive at a higher speed. In Norway, electrical cars are allowed to use the bus lane to pass traffic jams. This way, driving an electrically powered car is rewarded and also encouraged. This encouragement in turn leads to a higher percentage of drivers using green sources of fuel, which may ensure the speed limit to rise one day again. Even though this all sounds nothing but ideal, implementing a certain measure will not be easy in a crowded country like the Netherlands. Opening up a driving lane for a certain group of drivers will in most cases mean that others are obstructed. Unless an extra lane is made for the electric group, normal lanes are sacrificed which may lead to even more traffic jams than the country already faces.

Alternative measures

The whole country agrees that the nitrogen emission in the Netherlands has to be reduced. The diminution of the Dutch bio-industry and the reduction of the speed limit on Dutch highways are two well-known and highly spoken about measures. These are not the only possible measures, though.

Take for example the rules against elderly driving. A lot of retired people start losing some of their abilities, like sight and alertness. It is hard to determine when somebody is not fit enough anymore to

participate in traffic. Right now, if somebody wants to extend their driver's license after the age of 75, they have to include a personal statement. This also includes a doctor's declaration. Still, a lot of old people who claim to be scared to drive, hit the road. This is obviously dangerous. 'Small' accidents when crossing a road or taking a left are typical for elderly, since they simply lose their perception and cognitive and motorial functionalities.

Making the rules for extending such driver's license stricter lead to less elderly people in traffic. This may contribute to not only the safety of a lot of drivers, it also reduces the amount of cars on the road and thereby nitrogen emission. The elderly themselves can cheaply (and safely) travel by public transport.

Another sector where nitrogen emission is a problem is the construction sector. Although the buildings that will be built do not increase the emission of nitrogen, the problem in this sector is mainly focused at the construction phase. Heavy machinery, such as cranes and shovels are needed, while trucks have to transport materials to the construction site. But since there already is a shortage of houses in some cities, it would not be ideal to economize in the construction sector.

It is clear to see that a fitting solution is needed to the nitrogen problem. Which one is still to be decided, probably by time and experience. For now, one can only discuss and estimate the results of the measures that have been exposed in this article. ●

References

- [1] De Volkskrant. "Stikstof moet ruim gehalveerd, saneren van boeren rond kwetsbare natuur niet genoeg."
- [2] G.J. Monteny, J.W. Ersiman (1998). "Ammonia emission from dairy cow buildings: a review of measurement techniques, influencing factors and possibilities for reduction."
- [3] NRC Next. "De boer kan meer

- doen tegen de uitstoot van ammoniak."
- [4] Wageningen University of Research. "Luchtwaters: geur en ammoniak."
- [5] Nauta, W. (2019). "Stro is de oplossing voor het stikstofprobleem."
- [6] Tameling, R. (2019). "Maximaal 100 op de snelweg? Dit betekent het voor jou als automobilist."

- [7] Autoredactie (2019). "Zakelijke rijders tegen snelheidsverlaging: 100 rijden met een elektrische auto heeft geen effect op stikstof"
- [8] SWOV (2015). "Ouderen in het verkeer".

Did you know that...

...in Denmark on New Years Eve, it is tradition to get on a chair and jump off at midnight? This jump should repel bad spirits.

...the term Xmas simply means Christmas? The X stems from the Greek letter *Chi*, which is the first letter of the Greek word *Christós*.

...Santa Claus wears red because of the hugely succesful advertising campaign of Coca-Cola? This campaign featured a big Father Christmas wearing red robes with a white trim. These are of course the colors of Coca-Cola!

...2020 is not the next decade yet? Although many people believe that we are in a new decade, we are not. This is because of the fact that there has never been a year 0: we started counting in the year 1. Therefore, the next decade will start in 2021!

...on the island of Ameland, people do not celebrate Sint Nicholas? Instead, they have Sunneklaas. During the days of Sunneklaas, which also takes place in December, men walk through the streets. They wear weird costumes and scary masks and carry long wooden sticks. The women are supposed to stay inside and if they do not, the men hit them with their wooden sticks. The Amelanders want this mysterious Sunneklaas to stay a secret, for obvious reasons...

...Samoa is the first country to celebrate a new year? The islands of Baker and Howland are the last ones to start a new cycle of 365 days.

Let's Mexigo!

It was late afternoon when we took off in our blue KLM giant, on our way to Mexico City! I had been to many places, but this location was one which I would not have easily picked myself: my brain had anti-romanticized this city as it had always been negatively portrayed in the news. Nothing to worry about, that's what I definitely learned when our plane landed in Amsterdam 12 days later. Actually, it is a city of immense beauty, cultural richness and natural treasures with people who know how to celebrate life (and death). Hence, it was a great International Business Tour (IBT) to look back at!

After a flight of twelve hours, we landed in Mexico City. It immediately became clear that this is a serious city: at an altitude of 2250 meters above sea level, almost 22 million people are using the city's resources. Especially the motorways were very crowded, while it was not even rush hour. We arrived at our lovely hostel, which was located at the large Plaza de la Constitución with the National Palace and Catedral Metropolitana right at our doorstep. The hostel even had a vibrant rooftop bar where we enjoyed the view on Mexico City quite often, usually with a bottle of Desperados in the hand. Our first night was calm though, as most of us were tired and the next day would be filled up with activities.

For the whole trip the committee had arranged taxi vans to drive us around. The first ride was to the Dutch embassy, where we got welcomed by our Dutch ambassador Margriet Leemhuis. Her colleague, Alex de Kerpel, gave an interactive presentation about the relations between Mexico and the Netherlands. It was useful to get all this information on the first day: a very interesting visit. Afterwards we took a group picture and got back to our hostel, which was a trip of less than 10 kilometers which took us over 2 hours (maybe even 3, I lost count) in the Mexican traffic. Back in the historical center we visited Templo Mayor (the ruins of the main temple of the Mexican people) and Catedral Metropolitana (the largest cathedral of the Western Hemisphere). In the evening we had dinner together in a restaurant with live Mexican music and dancers who invited a few of us to learn their Mexican dance.

On Saturday we visited the museum of Frida Kahlo, a famous surrealist Mexican painter. Afterwards we were dropped at the Saturday's art market in San Ángel, where local painters exhibit their work, a bit like Place du Tertre in Paris. It was a peaceful neighbor-



hood to walk around. After all this art, it was time for a different kind of 'art': a colorful Trajinera (flat-bottomed boat) brought us to the Island of the Dolls in Xochimilco. This was an island full of deteriorated dolls hanging from trees with buildings covered in cobwebs and insects: macabre! This island was really horrifying. So were the toilets by the way. Unexpectedly, the tour took a few hours longer, which gave us plenty of time to have some drinks and play

“ It immediately became clear that this is a serious city. ”

games on the boat. But this meant we only had little time left for our dinner, since the next activity was planned directly after dinner: a pool party in a villa for exchange students and us. Fortunately, winter time was setting in that night, so an hour longer to enjoy the traditional Mexican performance with Aztec fire eaters and good music: a great long night!

Sunday was the day the Formula 1 Grand Prix in Mexico City took place. Since tickets for this race were very expensive, some people decided to watch it in a park. Other people, including myself, visited some interesting attractions and historical sites, of which there are plenty in the city center. On Monday we visited two universities. At the private university ITAM we were given an interesting guest lecture about actuarial science in Mexico by a leading actuary. He explained us many aspects of being an actuary in Mexico. At the public university UNAM, a university with more than 350,000 (!) students (Tilburg University has about 14,000), we had a campus tour as well. In the evening we were 'treated' with a tequila and mezcal tasting: for most of us not the favorite liquor but it was definitely interesting to hear about these two really Mexican drinks. I went to bed on time, because I was very excited about the next day: a tour to Teotihuacán, an ancient city with two beautiful pyramids.

And beautiful they were! It was a large complex around the 'Avenue of the Dead' and the two pyramids. From the Pyramid of the Moon you had a stunning view of the Pyramid of the Sun, both of which we climbed. Very impressive! Back in the city we visited a church and went up a skyscraper to enjoy the view on Mexico City and see the Palacio de Bellas Artes from above. Afterwards we went for a taco tasting of 5 different tacos in a fancy restaurant, where we even got served a taco with fried cricket. Unfortunately, the lunch had hit my stomach hard, so 8 hours after lunch, exactly the period medical science describes, I got some kind of food poisoning symptoms. The next day I had to stay in bed as I felt pretty sick of it. This made me miss two interesting company visits: Softtek and Brandloyalty. Therefore I cannot really tell anything about these visits. By the way, most of us had digestive problems by that time. Mexican food is tasty but we seemed to be quite sensitive to it. In the late afternoon I got out of bed and started to feel quite well again. After drinking some water and eating some food I was ready for the evening program: a salsa course! We got to know the basics of this Latin dance and after practicing a lot, we went into

a salsa bar where we all showed our skills to the locals. They must have laughed at us. After this fun night, the next day consisted of two company visits again: SAS and Deloitte. Both were interesting, especially when we compared Mexican business life with the Dutch one.

Friday my alarm clock went off way too early: it was the day of our volcano hike! Packed with a lot of warm clothes and water, my backpack was ready for the hike. And so was I. Little did I know that Mother Nature would be running the show today. We were about to climb the fourth highest peak in Mexico, a 4680 meters high sleeping volcano: Nevado de Toluca. For some reason, the warnings given beforehand by the tour company did not really ring bells and also the altitude seemed to be of little concern for most people. I was aware what altitude could do with the human body, but for some reason I still picked the 'long' hike together with most of the group. Our taxi vans dropped us off at 'base camp'. The first thing that became clear: the warm clothes, hat and gloves were needed right away. "But why do we need a helmet? And why do we need so many guides (1 per 3-4 people)?", we asked ourselves. It



would all become clear very soon. We started walking, immensely slowly: our guides had warned us that one large step would make you out of breath and energy at this altitude. After 100 meters, I already felt they were right: the thinness of air was going to be part of the game. After a few hundred meters, it also became clear to me why our group needed so many guides: we already lost a few who had returned with some people from our group who suffered from shortness of breath, low energy and altitude sickness. Even one guide got altitude sickness! After an hour or so, four of our group and me took a long photo break to enjoy the beautiful crater, but also to regain some energy. Our guide had another plan though: we needed to go faster because the weather was being unpredictable and dramatic clouds sometimes approached us pretty fast. A few hundred meters further, the road stopped and it became clear why we were wearing helmets: only loose rocks from now on. And

those were only the least of our concern: our headaches started to worsen because of the altitude and physical activity. About an hour later, just walking was not possible anymore: the flat path stopped, only climbing from now on. No ropes, no experience, no helpful guide. One wrong step and God knows what would have happened. A wrong step was not even that unlikely to happen: a few of us started to suffer from worsening altitude sickness: dizzy, queasy, sleepy, delusional and a pounding headache. I only felt a light to mild headache and decided to close the group from the back as our guide was climbing up fast. Difficult passages followed and every rock needed precautious assessment of being loose or not. But then, 4.5 hours after we left base camp we reached the peak. It was a breathtaking view and we felt as if we were on top of the world! We made it! There we were, at 4680 meters, an altitude I had never been at before. The peak-rock was just large enough

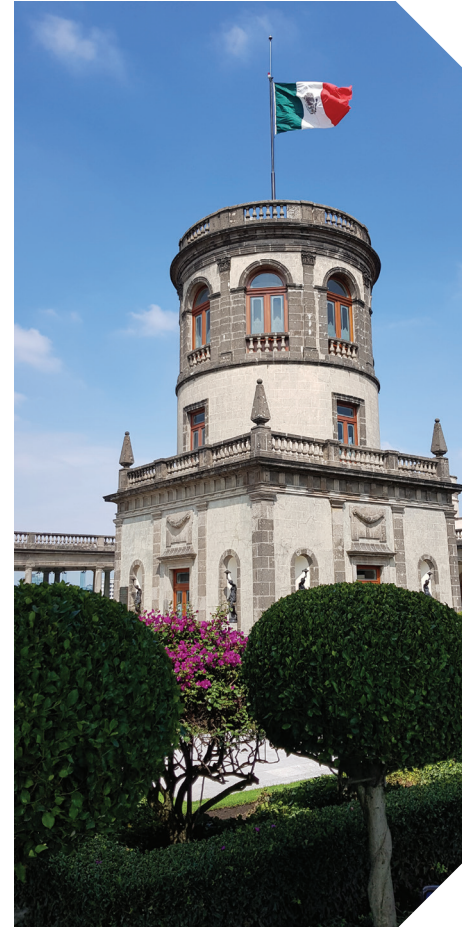
for the five of us. We enjoyed the view and then started our way back: down the ridge, to the right, sharp down. It was a steep route through deep dusty sand. When not paying attention, you could easily hit the rocks on the side and cause a rock avalanche. We walked all the way down the lake again. It looked nearby but took hours. Down at the lake my brain felt a little relieved that I was back again. But we were still in a crater so after half an hour I was walking up again to get out of the crater, which my brain did not appreciate, but the others seemed to be feeling worse so I had no right to complain. An hour later, after 8 hours of hiking, we arrived at the vans which took us all the way down the volcano again. But of course my head decided to do the after-party at 2500 meters when it bursted out in pain. Half an hour of smoggy air helped and I could happily look back at an unexpectedly risky but also an absolutely spectacular hike to the top of this gigantic volcano, it was unforgettable!



After a lot of deserved rest we had a 'free day', which was a special day: Día de los Muertos, the Day of the Dead. This day is one of Mexico's largest festive holidays of the year. Mexicans gather to pray for loved ones who have died and celebrate life. In 2015 the James Bond film Spectre shows a large parade through Mexico City on the Day of the Dead. However, such a parade had never taken place. But after the fame of this 007-movie, Mexico City started to host this huge parade. We filled the day with visiting some highlights in the city, watching a part of the parade and artistic skulls exhibited along the iconic Avenida Paseo de la Reforma: a long and wide avenue through Mexico City. We were happy to experience this vibrant holiday in Mexico. But only 1.5 days were left now in this enjoyable city. On Sunday we visited the beautiful Chapultepec Castle and Park. We also saw cultural treasures in the National Museum of Anthropology. In the evening we had dinner together in a restaurant where 3 different Mariachi bands

were playing Mexican songs, all at the same time: a cacophony of sounds. So, we ate our guacamole, nachos and cactus and went back to our rooftop bar for the last night. Before we went to the airport again the next day, we walked around in San Ángel again and had a lovely lunch in a sunny garden. A relaxed end of a trip never to be forgotten!

It should be obvious that the whole group is very thankful to the IBT 2019 committee: Bas, Bastiaan, Femke, Judith, Karlijn and Sophie. Without them and their dedication to make this trip such a success we would never have enjoyed our time so much! Thank you all! It will become very hard for the IBT 2020 committee: Bastiaan, Juul, Martijn, Michelle, Richardo, Patrick, Pierre and myself to set up such a great trip again, but we are going to do our best and you are all welcome to subscribe and join! See you at Schiphol in October for the next edition of the International Business Tour! ●



ECCO: The ‘Invisible’ Party that Stands Up for Their Students

On Thursday November 21, we went to the Esplanade Café to have a talk with Jochem Bruijninx, who is vice-chairman of this year’s Economen Coalitie (ECCO) board. ECCO is the student party that represents all students of TiSEM in its faculty council. ECCO makes sure that the voices of all TiSEM students are heard at the university, while proposing their own initiatives.

written by **Jeffrey Buijk** and **Constantijn Wessel**

Could you introduce yourself: how old are you, what is your relationship with ECCO and what was your motivation to join ECCO?

I am 23 years old and currently on the final year of my Bachelor Econometrics and Operations Research. In the study year 2017/2018 I have been active as treasurer in the board of Asset | Econometrics. As it happens quite often, I have also joined ECCO after I have done a board year, but with as biggest difference that there has been one year between the end of my board year at Asset | Econometrics and my board year at ECCO. After my board year at Asset | Econometrics I have thought about joining ECCO, but at this point it did not become really serious. When I had a talk one year later with Guus Vlaskamp, who has joined ECCO before as well. After that, I decided that I wanted to join ECCO and managed to register myself as candidate just in time, only 3 hours before the deadline.

You have already talked about the fact that ECCO board is joined by members that have already participated in another board. Do you have an idea what could be a reason for this?

I think that the most obvious reason for this is that most people that have not done a board year before will not know ECCO. I have to be honest, before I did my board year at Asset | Econometrics, I was not familiar with ECCO either. When I was in my Asset | Econometrics board year, I sometimes had issues together with ECCO, from which I started to know it. But this year we are already putting effort into increasing

the brand awareness of ECCO, by giving the party a color which makes ECCO more recognizable and by changing the website. This could make a big difference, since if you look at the university council elections. When you ask someone at the university what the difference is between Front and SAM, they will probably not really know what the difference between the two parties is. They will probably say that SAM is the blue one and Front is the green one.

When comparing a faculty council party as ECCO with the university council parties Front and SAM, what is the difference between these parties?

I think that the biggest difference between doing a board year at ECCO, Front or SAM would be mainly the difference in experience you will get from the year, because of the difference in the amount of time spent in both board years. When comparing sessions in the faculty council and the university council, I dare to say that the university council sessions are a bit more formal. The main difference in the subjects of the two councils is that Front and SAM will mainly address issues related to the whole university, while ECCO will address issues regarding the faculty TiSEM. An example of what could be a subject of the university council is the new sport café that has been built at the sport center of Tilburg University or issues that regard all faculties at the university, such as the possibility to hand in assignments online. However, when we as ECCO have ideas that regard university wide issues, we always have the possibility to talk with the representatives of SAM and Front about these ideas.

Around the election time there is a lot of promotion for the university council elections between SAM and Front, but for the faculty council elections there is always a lot less promotion. What is your opinion about this?

A few years ago one of my housemates was active at SAM, so I decided to help him with the promotions. During the promotion I saw that Linda Torn (who then was active at ECCO) promoting as well and I asked her why she was there, since I did not know there was also a faculty council. Since ECCO can only promote for their own faculty and since there is only one party at every faculty, they tend to promote a lot less than Front and SAM do, which will result in a lower brand awareness. In previous years ECCO even decided not to promote at all around the elections. For the upcoming elections in April we still have to decide whether we want to promote ourselves or not. In my opinion it would be beneficial to promote, such that members of the faculty know that there is a faculty council where they could go to and such that the fraction of ECCO members without a board year history will increase as well. This way we already have one international member of the ECCO board this year, who joined the ECCO board since she saw some opportunities where the university could make a change and wanted to participate in it.



Jochem Bruijninx

Bert & Ernie Questions

Bert/Ernie
Apple Bandit/Wine
ECCO Board/Astrics Board
Tilburg/Rossum
Calculator/Mental calculation
America/Asia

At the faculty council elections there is only one party for every faculty where one could vote for. What impact do the voting results have on the way the board is formed?

Within ECCO we apply on functions, after which the old ECCO board decides which functions will be filled in by who. What is most important for ECCO during the elections is the turnout rates at the elections. When we compare the turnout at the university council elections (50%) and the faculty council elections (19%), we could see that there is a huge difference between them. The reason why this turnout rate is important, is that a higher turnout rate will give us more power during meetings with the university.

How much time do you spend on average every week on ECCO?

The amount of time we spend on ECCO every week will be approximately 6 hours a week, but it changes heavily every week. We are working in cycles of 6 weeks and at the end of every cycle there will be a faculty council session with the management team and the personnel fractions. In the weeks before such a session you will spend more time a week, while in the weeks after this session you will spend less time a week. It is very doable to combine your study with a board year at ECCO. Next to our formal activities at ECCO, we also organize once a while informal activities with the seven of us together, in which we drink together and do other fun stuff. Which is very important to enjoy your board year at ECCO even more and for the team-building of the board members.

How does ECCO have influence on the decisions that will be made at TiSEM?

The main part of our task is to check for everything the management team is working on whether we agree with what they are doing. In addition we also have the right to come up with proposals ourselves. Last year the ECCO board has put in two proposals about video lectures and last chance regulation, which are both on the agenda for the next faculty council meeting, to hopefully finalize them. For the video lectures proposals the target is to increase the amount of video lectures from the 20% where it is currently at into 75% of the lectures, which will be quite a big jump.

The input of ECCO in this proposal is to argue with the university why video lectures are so important for the students. The next step for the management team is to work out this proposal, such that it is for example logistically possible to implement this amount of video lectures. The same way for the last chance regulation, where students who need to finish only one more course to finish their study could get an extra exam opportunity. This new rule should be implemented in such a way that the workload for professors will not become unnecessary high, because of the amount of extra exams that have to be made. Therefore rules had to be discussed to decide which students will be allowed to get this last chance regulation. But currently TiSEM is the only faculty without the last chance regulation.

Why is there a difference between different faculties whether rules such as the last chance regulation are implemented or not?

The different faculties are still really separated from each other. How I think most people will see the university is on top and one layer lower there are the different faculties. But actually you should see the different faculties as separate schools. The different faculties all have their own policies and hence will act separate from each other. Sometimes issues that are discussed in the faculty council should be implemented for the whole university, such as new buildings or the housing of international student, but this is actually a small amount of the subjects. A subject as video lectures will be treated differently for all faculties at the university.

You were talking about the housing of international students, which was a hot topic at Tilburg University last summer. In what way has ECCO contributed on this topic?

The amount of influence ECCO has had on the housing of international students is not that high, since it is more a university wide subject. During the first faculty council we have asked questions to the management team about for example the amount of students at TiSEM that have had problems last summer with housing. Since we are a large faculty and we therefore know that there will be a lot of our students that have had problems with housing last summer, the housing of international students is an issue that definitely has some importance for us in our opinion. Therefore it is important that we have good contact with Front and SAM, who as university council had to deal with this problem.

Are there more subjects where ECCO currently is working on?

The main subject we are currently busy with is the startup of a new Bachelor, namely Entrepreneurship. Since a few weeks it has been decided that this new Bachelor will start in September next year. But currently there is no numerus fixus for this Bachelor, which means that everyone who applies for the Entrepreneurship Bachelor will be allowed to follow the Bachelor. This is actually tense for the faculty, since it is not known how much interest there will be for this new Bachelor. The amount of visitors at the first open day of this new bachelor was three times as high as what was expected before. When the amount of subscriptions will also be three times as high as expected, this will cause logistical problems. Another question that is in general important when discussing about a new Bachelor study is whether the courses that will be taught make it possible to move on to one of the Masters given at TISEM.

Is there at the moment already a Bachelor in the Netherlands that is comparable to this new Entrepreneurship master, which could be used to predict the amount of subscriptions?

I don't think there is a very similar Bachelor at the moment, although they have in Nijmegen a Master Entrepreneurship.

We have indeed already checked whether there are comparable Bachelor studies at for example the Erasmus University in Rotterdam, such that we could compare the different subjects of the Bachelor and the amount of mathematics given in both Bachelor's. But we could not really find similar Bachelor's to this one in Tilburg.

When you compare your board year at ECCO until now with your board year at Asset | Econometrics, what is the main difference between these two board years?

While I had a lot of responsibilities at Asset | Econometrics in which we have organized big events and worked together with many different students, the board year at Asset | Econometrics also had a lot of informal activities. Although I really liked this, I also wanted a year in which I would have a more formal role at the university. It is still possible to make jokes at the meetings of the faculty council, but the agendas and minutes are on a higher level than they were at Asset | Econometrics.

What did you like the most about your board year at ECCO so far?

What I like the most about it, is that you have a board year with persons from different studies. When we have activities with the board members of ECCO we like to talk with each other about how we have experienced our board years at the different study associa-

tions. For example, AIESEC and EBT have totally different board years compared to a board year at Asset | Econometrics. One of our members did a board year at MAK last year, in which they have worked on different meeting techniques. He suggested to implement these techniques at our meetings as well this year, from which we could also learn a lot.

Where do you see yourself in ten years?

The answer to this question could go two different sides I think. Firstly, I could continue in the field of Econometrics. The second possibility is that I will continue with building web applications, such as I have done with Career Platform. Currently I am working with Guus Vlas Kamp and Maarten Simon on a web application that keeps track of the study progress. The aim is to test in February, at the start of the second semester, at our study.

Is there anything else you want to tell to the readers of NEKST?

When there are students that have ideas about what could change at the university, do not hesitate to put yourself on the list for next year's ECCO. It would be nice to see more students without a board year history joining the ECCO in the upcoming years. ●



A Special Committee for Old People

Last year some older students complained because there was a freshmen committee but not a special committee for the older students. So, the board came up with the idea of introducing a new committee: The Olden Goldies (OG) committee! After I joined the Lustrum committee last year, I still wanted to be active this year. And since I am one of the "older" students, I decided to join the OG committee. Together with Linda, Loes, Willeke, and Marieke we form the first OG committee!

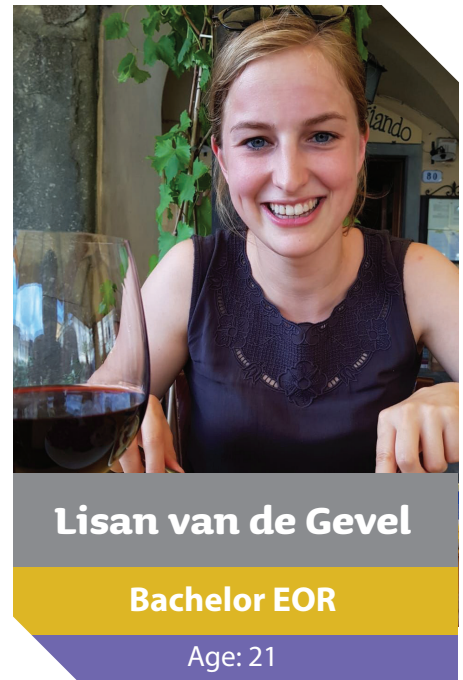
The OG committee consists of five members with experience so the organisation of the first event went very smoothly. In the beginning, we needed to decide which students were invited. We came to the conclusion that we indeed only wanted to invite the older students. So, for the first activity only fourth year and older Econometrics students were invited. Or, as Loes would describe it: "The ones who are still struggling to be taken seriously and still need to pass Statistics even though they already had four chances."

Before we even had our first meeting Loes already designed a logo. The first draft was on the backside of a beer mat. But after some refinement everyone liked the logo and the shirts were ordered. To organize the activity we only needed one meeting to choose an activity and to make a division of all the tasks.

A few weeks later, on November 12, the first OG activity took place. Together with 30 members we went to Stadsbrouwerij 013. They have a special location: The Albatros, which is a boat

in the Piushaven. We had burgers and some special beers on tap and we caught up with how everyone was doing. After the burgers and beers, most of the members didn't want to go home already, so we went to the karaoke bar. Here, everybody shared their outstanding singing voices and some exciting performances took place. Some of them were more beautiful than others, but everyone tried their best. To conclude, it was a very successful first activity!

Next year on May 7, there will be a second OG activity. The activity itself is still a surprise (also for the committee), but we will make sure that it will be just as successful or even better than the first activity. We are looking forward to seeing you there! ●



Lisan van de Gevel

Bachelor EOR

Age: 21



Let's Talk!

Us Econometrics students get to hear stereotypes pretty often. Some of them are obviously a treat to hear every time you announce your field of studies. Others may be bleaker. Nonetheless, stereotypes do not define us as human beings. It is best to break them and show the world that you are more than a stereotype! So, are the Asset | Econometrics students really the socially awkward, ever-studying nerds that outsiders pretend they are? Or do they break these ideas? Today I am heading out to find out what stereotypes do and do not hold for the Econometrics student.

written by **Juliëtte Tillie**

Nathan Bun, 20 years old, third year bachelor

"I am somebody that likes a party and sharing a beer with friends." I stopped him there: "And now one that we can actually place in the Nekst?"

"Oh sure, I definitely do not have a graphical calculator with me at all times!"

Juliëtte van der Velden, 19 years old, second year bachelor

"I think joining a sorority is something that does not necessarily fit the stereotype. Especially not in your first year! I passed all my courses, though."

Robin van de Laar, 19 years old, second year bachelor

"Many people, when they think about Econometrics and Operations Research, think about awkward, socially incapable nerds. Whenever somebody asks me what I study I will joke about it and name another study, since they will always answer with the same annoying stereotypes. Namely that it is extremely hard and if you get your degree you will get very rich. It gets annoying."

Martijn Oerlemans, 21 years old, fourth year bachelor

"I would say that I am not 'contact crazy' and I would not consider myself to look like a total nerd."

Lennard Vossen, 21 years old, third year bachelor

"I think more and more people make the choice to study Econometrics and Operations Research based on the salary. I think knowing that it promises a higher wage in the future is a motivation for a lot of students, which in turn may be a stereotype as well. Myself, I did not know about this until I had already enrolled in the program. I choose this study out of interest! This suspicion was confirmed when I heard that the success rate of the final of Introduction Analytics and Probability was extremely low. I guess a big part of the freshmen do not have a huge affinity with mathematics?"

Quirien Raat, 25 years old, eighth year studies

"What stereotypes do I break you ask? Well, that must be the autistic one!" Quirien is talking about the stereotype that all econometricians must be autistic." If I were autistic then it must be very slightly." I stopped him for a moment and said "Quirien we are talking about what stereotypes are not applicable, not which ones you find to describe you best!" That is when he made a comment that described the autistic stereotype best. "That is what I meant! I do not know if you noticed already but I am quite extravagant. This is something that people in general do not think of econometricians. I do appreciate a good bit of socializing. I would almost say that it is an addiction. Coziness with my friends and especially at the association is something I adore. I need that companionship!

That is also the reason why I am still here today, see?"

He said that last part with a big smile on his face. Not so sure if you should be as happy as you are with still being here because of 'companionship' but I do know that we are surely happy about it.

No Asset | Econometrics without our 'Q'.

Céline van der Hall, 19 years old, second year bachelor

"I think a lot of people look at econometricians as nerds, which I think is correct, however not in a negative way. Econometricians don't need to act like they are awesome, they know they already are. That is why, in my opinion, they are typically less arrogant than others and be more themselves. If this is seen as being a nerd, then let's all be nerds!"

Floris Somers, 19 years old, second year bachelor

"People think econometricians can't be social, but I think that's only a stereotype. For example; I live in quite a socially active student house. I also still hang out with my friends from high school and I am active within my study association!" We agree Floris that is a rather social life for somebody who is supposed to be unsocial according to the stereotypes.

Miaozhuo Cui, 28 years old, third year bachelor

"When I tell people that I am studying econometrics in the Netherlands, the first answer that I get most of the time is: "Wow, that study is hard. You are smart!" The thing for me is; I do not know if I am smarter than other students with different studies. I cannot compare that. I think there is no such thing as 'smart' or 'not smart'. Everyone simply has their own talent and interests."

There you have it. The average econometrics student is not at all as socially awkward as people may think them to be. We are not weirdly smart or the typical Big-Bang-Theory-like nerds. Our social lives may even include friends from, what students would call it, 'home-home' (meaning their parental house) and sororities. And if someone ever needs a calculator, do not rest assured that your fellow econometrics friend will carry one with them! With this we can conclude that the students of Econometrics and Operations Research at Tilburg University broke the stereotypes.

Quatsch!



Quatsch?

Over the past few months, the editorial staff of Nekst received many quotes that relate to the study of Econometrics and to the activities organized by Asset | Econometrics. Hereby, we present to you a selection of some striking and funny quotes! Please mail all remarkable quotes you have heard to Nekst@Asset-Econometrics.nl!

Stephan Sparreboom

"Even een domme vraag: dragen jullie 's nachts nog luiers?"

Nikita Veldhuis

"Ik ben allergisch voor hooikoorts."

Bob Suijkerbuijk (zesdejaarsstudent)

"Waar moet je je ook alweer inschrijven voor tentamens?"

Job Hoven

"Mijn huiswerk heeft mijn hond opgegeten!"

Pierre Verhulst

"Mijn trein komt om 17:81 uur aan, dus hoop dat ik het red."

Stefan ten Eikelder

"Haha, deze student schrijft echt in `\mathcal{}`."

Rick Greeber

"Zo'n vakantiepark voor kinderen, de honingpot."



Puzzle



48

Many numbers, especially those of lower orders, can justifiably claim to be of particular importance. In the realm of squares, 48 is a special curiosity. If you add 1, you get a square [$48 + 1 = 49 = 7 \times 7$], and if you divide it by 2 instead and add 1 to the result, you get another square [$(48/2 = 24) + 1 = 25 = 5 \times 5$]. The two conditions are obvious on their own, but combined, they are not so obvious. In fact, 48 is the smallest number that satisfies both conditions. Can you find the second smallest number that meets both conditions?

Can you figure out the puzzle?

Please enter your solutions at www.Nekst-Online.nl/Puzzle. A crate of beer or a delicious pie, whichever the winner prefers, will be waiting for whoever has sent the best (partial) solutions. Please note that, as before, every recipient of this magazine is eligible to send in their solutions, so members of the department are invited to participate as well. Good luck!

Luiz Hermida is the winner of the previous puzzle. As a reward, he can come and pick up a crate of beer or a pie at room E1.10. The solution can be found at www.nekst-online.nl.



Asset | Econometrics congratulates...

Name **Puck Vlaskamp**

Title Forecasting the Development of the Solvency
II Ultimate Forward Rate Using ARIMA Time
Series Modeling

MSc EME

Supervisors Prof.dr. A.M.B. De Waegenare, Dr. F.C. Drost

Name **Sander Hermens**

Title Do you pay for doing good? An empirical analysis of the performance and risk characteristics of socially responsible stock indices

MSc QFAS

Supervisors Prof.dr. B. Melenberg, Dr. R. van den Akker

Name **René Wijnen**

Title Variable recovery rates and the credit spread puzzle under the Merton model

MSc QFAS

Supervisors Prof.dr. B. Melenberg, Prof.dr. B.J.M. Werker

Name **Manal El Abdellaoui**

Title Using Facial Expressions to improve the Performance of Recommender Systems

MSc BAOR

Supervisors Dr. J.C. Vera-Lizcano, Dr.ir.ing. M.J.P. Peeters

Name **Victor van Dongen**

Title Valuation of Dutch Mortgages with a Partial Prepayment Option

MSc QFAS

Supervisors Dr. F.C. Drost, Dr. A.G. Balter

Name **Martijn Kodde**

Title Optimal Retirement for Heterogeneous Individuals Determinants of the Retirement Age and Consumption Pattern

MSc QFAS

Supervisors Prof.dr. B.J.M. Werker, Prof.dr. T.E. Nijman

Name **Willem Kneppelhout**

Title No-arbitrage Term Structure Modelling with Supply and Macroeconomic Variables: The Effects of Large-Scale Asset Purchases

MSc QFAS

Supervisors Dr. F.C. Drost, Prof.dr. B. Melenberg

Name **Luc van der Heijden**

Title A Study of Latent Dirichlet Allocation: Evaluating Quality Metrics and Sentence Structures

MSc BAOR

Supervisors Dr. J.C. Wagenaar, Dr. Y. Merzifonluoglu

Name **Christel Opheij**

Title Synchronisation Opportunities for the Dairy Collection and Transportation Problem

MSc BAOR

Supervisors Prof.dr. G. Kant, Dr.ir.ing. M.J.P. Peeters

Name **Toon Klein Avink**

Title Female football players in the Netherlands. Predictions and club allocation.

MSc BAOR

Supervisors Dr. C. Dobre, Dr. S. Sadikoglu

Name **Leendert van Egmond**

Title Timing and capacity decisions under demand uncertainty

MSc BAOR

Supervisors Prof.dr. P.M. Kort, Prof.dr. K.J.M. Huisman

Name **Robin van der Veken**

Title Strategic capacity investment in duopoly with endogenous exit for iso-elastic demand.

MSc BAOR

Supervisors Prof.dr. P.M. Kort, Prof.dr. K.J.M. Huisman

Name **Sergi Lafoz Garrido**

Title Multi-Criteria Stochastic Optimization for Last-Mile Relief Network

MSc BAOR

Supervisors Dr. Y. Merzifonluoglu, Prof.dr.ir. H.A. Fleuren

Name **Louk Mahieu**

Title A Study of Latent Dirichlet Allocation: Evaluating Quality Metrics and Sentence Structures

MSc BAOR

Supervisors Dr. Y. Merzifonluoglu, Dr. J.C. Wagenaar

...on obtaining their
Master's degree

Carnaval Photo Contest

For the next edition of Nekst, we challenge you to make a photo during Carnaval, in your most creative outfit. Send this photo to info@Asset-Econometrics.nl or to any of the committee members. For inspiration, below is the winning photo of last year. Good luck!



Agenda

THU Department Members' Meeting

16 On this day, the semi-annual Department Members' Meeting will take place. During the meeting the board will update you on the ins and outs of the past semester and discuss their plans for the upcoming semester
JAN


THU New Year's Drink

16 LaTeX is often used to write scientific documents as it offers an easy way to write mathematical formulas and such. During this training, you will learn how to use LaTeX effectively. So, are you looking for a better way to write reports or even your thesis? Take your chance and come to this training!
JAN

SA Asset Ski Trip

18 During this year's Ski Trip, 53 members of Asset will visit Risoul. Several activities are organized by the committee, but there is also plenty enough time to snowboard, ski and ofcourse, après-ski! This third edition will be an amazing experience, just like the previous editions.
JAN
FRI
- **24**

THU National Econometricians Day

 **6** On this day, commonly known as the LED (Landelijke Econometristen Dag), all students who study EOR in the Netherlands will come together for the largest annual career event. It is available for third years and higher and takes place in Nieuwegein.
FEB


MON LaTeX Training

10 LaTeX is often used to write scientific documents as it offers an easy way to write mathematical formulas and such. During this training, you will learn how to use LaTeX effectively. So, are you looking for a better way to write reports or even your thesis? Take your chance and come to this training!
FEB


THU Europe Trip

13 During this year's Europe Trip, thirty econometricians will explore the capital city of Slovenia: Ljubljana! Several activities are organized by the Europe Trip Committee, during which we will discover the city together. It is going to be an unforgettable journey, so make sure you are there!
FEB
MON
- **17**
FEB

TUE Master Experience Days


 **3** Are you a bachelor student at a Research University or a student at a University of Applied Sciences and are you still in doubt about your next step? Come to the Master Experience days, where we aim to introduce you to the different Master's programs you can follow at Tilburg School of Economics and Management!
MAR

TUE Econometrics Consultancy Tour

 **3** Have you ever wondered what a day of a consultant looks like or whether this field is something for you? In two days, you will visit three consultancy companies, both in the field of strategy consulting as well as data consulting. For more information, go to our website!
MAR
WED
- **4**
MAR

Register and find more information about our events at

www.Asset-Econometrics.nl/events



You've nearly completed your degree, and you're ready for what's next: a job that will inspire you, make you think and put your skills to the best use.

Our unique perspective allows us to see the connections between talent, assets and ideas that can drive performance and growth. Powered by market analytics, behavioral insight and a culture of seamless execution, our colleagues work with you to design and implement lasting solutions that turn risk into a path to growth.

Together, we unlock potential.

willistowerswatson.com

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