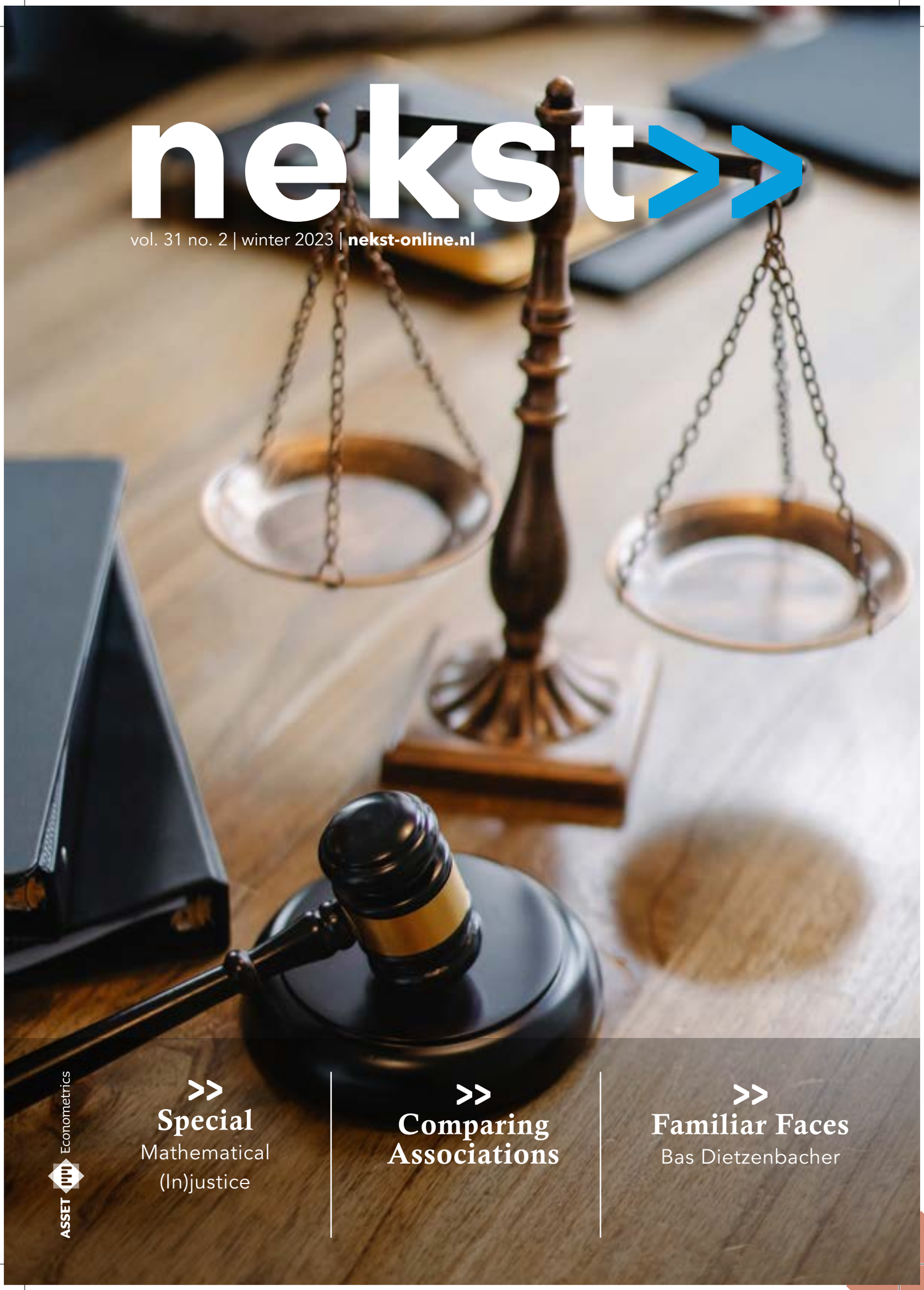

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ASSET Econometrics

Special
Mathematical (In)justice

Comparing Associations

Familiar Faces
Bas Dietzenbacher

The Nekst Promise

As the cold winter has come and our days are mostly dark, the winter brings a little light with it every year, namely New Year's promises. Maybe you promised yourself to go to the gym more or to finally keep up with your study. But these promises are difficult to hold up, so I hope this could be a small reminder for you to try it one more time to keep up with those promises!

The Nekst committee also made a promise to you, to deliver our best work in this second edition of the Nekst. I am proud to tell you that that is exactly what they did. This edition we have chosen a theme that will come back throughout the Nekst several times, namely Law. With that, I will recommend you read the special about Mathematical (in)justice. We also made an article about the other econometrics study associations, so make sure to check that out as well. In addition to that, we interviewed our statistics teacher professor doctor John Einmahl for the last time before his retirement.

I also want to give a special thank you to Dahli Koskamp who helped us create this Nekst as a designer. We do have to say goodbye to Sara who is a member of the board of Asset | Econometrics from now on, but I do want to thank her for creating two beautiful editions of the Nekst and wish her the best of luck with her board year. For the coming two editions Anne Verbeek will be our designer and I wish her the best of luck!

So as I make you the promise that we will put our hearts into the third edition as well, grab a cup of hot chocolate and enjoy the second edition of the Nekst!

Yours sincerely,

Laurentien Diepenhorst
Editor-in-Chief

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COLOPHON

Nekst is the quarterly magazine of Asset | Econometrics ©2023 Insertion of an article does not mean that the opinion of the board of Asset | Econometrics or the editorial staff is verbalized.

Correspondence
Asset | Econometrics
Tilburg University
Room E 110
P.O.Box 90153
5000 LE Tilburg
Telephone: 013 466 27 47
info@Asset-Econometrics.nl
www.Asset-Econometrics.nl
www.Nekst-Online.nl

Editorial staff
Joep Adriaanse
Selina Bötzel
Huub Hoven
Timo Klabbers
Martin Kubíček
Floris van de Moosdijk
Floris Somers
Guus van der Velden

Event: Cycling Dinner

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Advertisements

Articles

Editor-In-Chief
Laurentien Diepenhorst

Lay-out editor
Sara Darwinkel
Dahli Koskamp
Anne Verbeek

Nekst-Online
Timo Klabbers

Coordinator
Juliëtte Tillie

Contributions
Wout Damen
Bas Dietzenbacher
Nick Drost
John Einmahl
Bram Erven
Luc Geurts
Dahli Koskamp
Koen van der Mijle
Eva Schoenmakers
Emma Segers
Alexander Theloudis
Felix Tillie
Gina Tillie
Mylan Tran
Pierre Verhulst
Christoph Walsh

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Dear Members,

As we are now in in our seconde semester, it is per excellence a great time to both reflect and look ahead. Luckily, there are a lot of positives to reflect on and even more to look forward to.

On the formal side of our association, a lot has happened. Eight formal events have been organized, by different committees or our External Affairs Officers. The greatest strength of our formal events is the variety that is offered to all students in different phases of their career development, and this was proudly on display this year once again. You can start your career orientation off at a lunch lecture, but also directly have conversations with future employers at, for example, the Finance Expedition. Also, for the next semester, a multitude of events will be organized, so make sure to take a look at our website and social media channels!

One event that happened I would like to highlight is the National Econometricians Day, better known as the LED. Over 750 students attended this day in congress center 1931 in 's Hertogenbosch. Here you were be able to meet multiple companies out of the 70+ companies attending while experiencing cases, speeddates, a company fair, lunch, and dinner. Everything, from the opening speaker until the last bite of dinner, was taken care of by our LED board. I would like to take another moment to thank Emma, Mylan, Ferdy, Koen, Luuk and Job for their continuous dedication and togetherness when it mattered most. Matthijs and I have thoroughly enjoyed working together with you and are proud of what we have accomplished.

Next to this, we have had the pleasure of organizing all kinds of attractive informal events. Our first ever rail trip to Hamburg and Berlin was a whopping success as 25 students joined us on a sustainable trip by train to explore two very different, but equally attractive cities. After a tour through the harbor of Hamburg and eating some lovely carrot cakes, we continued cycling around Berlin and clubbing in its exciting nightlife.

Then of course, we also had our annual Christmas dinner, followed by the announcement of our newest board members: Sara Darwinkel and Selina Bötzel. We are very happy to welcome them and use their strengths to further ameliorate our association. Next to new board members, we are also able to welcome new members to Asset | Econometrics. I would like to take a moment to welcome all our new (active) members to our association. I hope you will enjoy our activities and build friendships as much as your predecessors have and am excited to see you at future events!

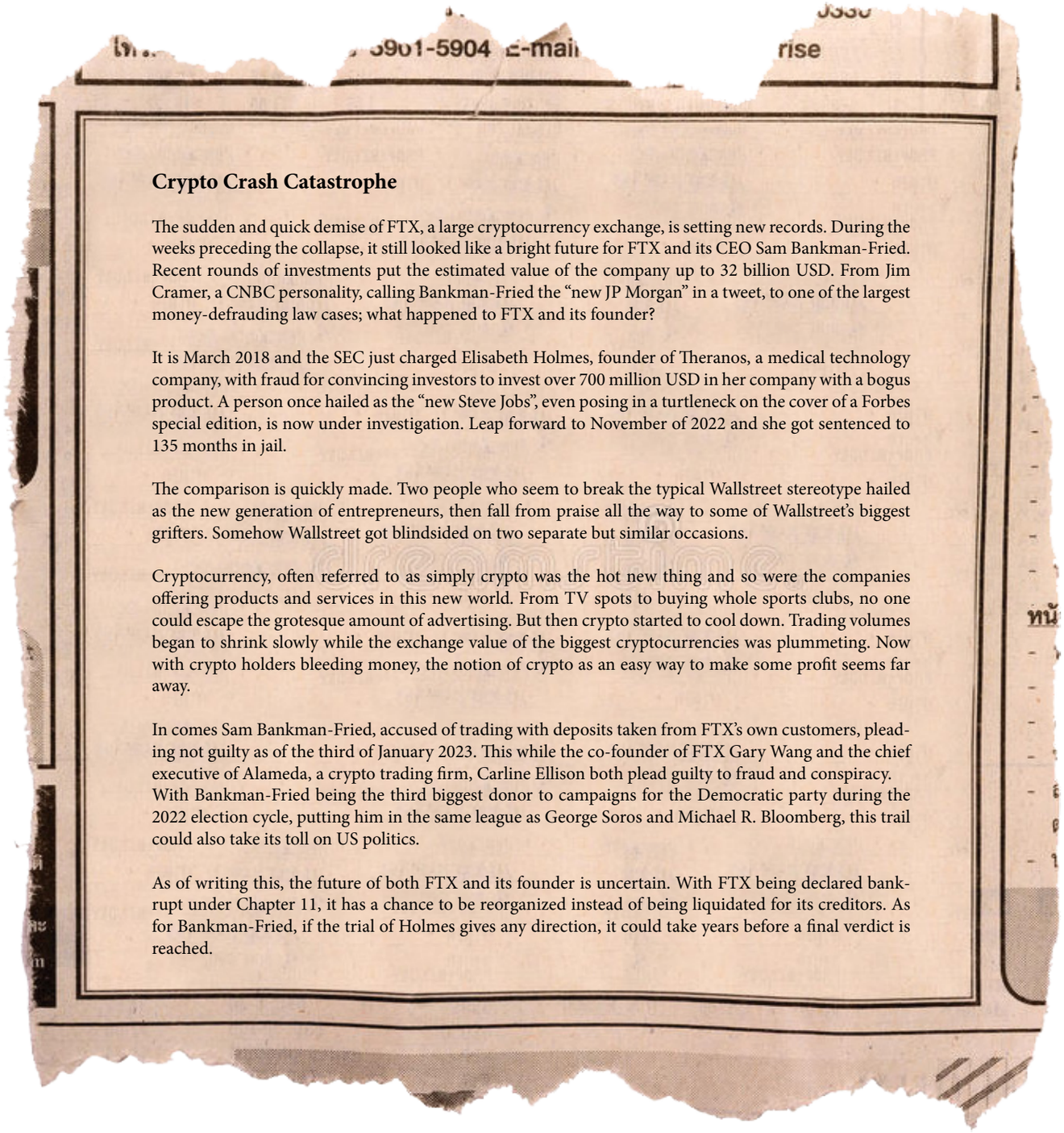
For now, I will not keep you from reading the Nekst much longer. I would like to extend my gratitude for the hard work that the committee and editorial team have put in to make this magazine a success once more. And to you, the reader, enjoy all articles and do not hesitate to challenge yourself with the puzzle.

On behalf of the board,
Luc Geurts
Chairman Asset | Econometrics 2022-2023

The Latest

In this edition of the Nekst, The Latest is about the collapse of FTX and the outfall it created for the whole financial sector.

written by **Huub Hoven**



Crypto Crash Catastrophe

The sudden and quick demise of FTX, a large cryptocurrency exchange, is setting new records. During the weeks preceding the collapse, it still looked like a bright future for FTX and its CEO Sam Bankman-Fried. Recent rounds of investments put the estimated value of the company up to 32 billion USD. From Jim Cramer, a CNBC personality, calling Bankman-Fried the "new JP Morgan" in a tweet, to one of the largest money-defrauding law cases; what happened to FTX and its founder?

It is March 2018 and the SEC just charged Elisabeth Holmes, founder of Theranos, a medical technology company, with fraud for convincing investors to invest over 700 million USD in her company with a bogus product. A person once hailed as the "new Steve Jobs", even posing in a turtleneck on the cover of a Forbes special edition, is now under investigation. Leap forward to November of 2022 and she got sentenced to 135 months in jail.

The comparison is quickly made. Two people who seem to break the typical Wallstreet stereotype hailed as the new generation of entrepreneurs, then fall from praise all the way to some of Wallstreet's biggest grifters. Somehow Wallstreet got blindsided on two separate but similar occasions.

Cryptocurrency, often referred to as simply crypto was the hot new thing and so were the companies offering products and services in this new world. From TV spots to buying whole sports clubs, no one could escape the grotesque amount of advertising. But then crypto started to cool down. Trading volumes began to shrink slowly while the exchange value of the biggest cryptocurrencies was plummeting. Now with crypto holders bleeding money, the notion of crypto as an easy way to make some profit seems far away.

In comes Sam Bankman-Fried, accused of trading with deposits taken from FTX's own customers, pleading not guilty as of the third of January 2023. This while the co-founder of FTX Gary Wang and the chief executive of Alameda, a crypto trading firm, Carline Ellison both plead guilty to fraud and conspiracy. With Bankman-Fried being the third biggest donor to campaigns for the Democratic party during the 2022 election cycle, putting him in the same league as George Soros and Michael R. Bloomberg, this trail could also take its toll on US politics.

As of writing this, the future of both FTX and its founder is uncertain. With FTX being declared bankrupt under Chapter 11, it has a chance to be reorganized instead of being liquidated for its creditors. As for Bankman-Fried, if the trial of Holmes gives any direction, it could take years before a final verdict is reached.

Togetherness in the Family

Spending time with a partner is a major gain from marriage/partnership. Surprisingly, little is known about how couples value togetherness (time spent together with the partner), what benefits and costs togetherness accrues, or how it interacts with other uses of time. I address these issues in my new paper Togetherness in the Household, to appear in the next issue of the American Economic Journal - Microeconomics.

The evidence
The LISS survey in the Netherlands suggests that over 90% of households report having some joint leisure, namely leisure in the company of each other. Often, joint leisure is almost one-half of each person's total leisure. Part of childcare is also joint between partners, e.g., in the form of family outings. The data thus suggest that togetherness, be it in the form of leisure or in the form of childcare, is a substantial part of family time use.

The benefits and costs of togetherness
While joint leisure is desirable on the grounds of companionship and joint childcare is beneficial on child developmental grounds (enhancing communication and closeness in the family, and improving children's cognitive skills), the two have large costs.

First, togetherness requires spouses to synchronize their schedules to be physically together at the same time. So those who like joint time may have to renounce a job that requires flexibility. Yet, being flexible at work often pays a wage premium, e.g., in high responsibility jobs where work schedules are irregular or unpredictable. Togetherness requires synchronization of schedules which may be impossible without restricting one partner's flexibility at work and possibly reducing their earnings.

Second, joint childcare hampers division of duties between partners and hurts specialization at home. Young children typically need attention for a given amount of time, say eight hours per day, which usually requires only one adult. Suppose that each parent has four hours available per day for childcare. If parents supply childcare privately, they supply eight hours in total. If they supply it jointly, they only offer four hours while, for the remaining time, care must be provided by another, perhaps costly, caregiver.

A model of family time use
We develop a model of family time use featuring the above-mentioned benefits and costs of togetherness. The model allows us to understand how time use is affected by economic circumstances, such as wages in the labor market, the timing of market work, or the costs of day nurseries. It also allows us to monetize the additional value that joint time has over private time: we find that households on average are willing to pay up to 17% of their wage to replace private leisure or childcare with joint.

Togetherness and the gender gap
Our model suggests that the spouse who works fewer hours in the labour market is also the one who forgoes work flexibility to increase togetherness. In the Netherlands, women work fewer hours than men due to lower pay or other reasons. Our model suggests that women will then restrict flexibility on the job to synchronize work with their husband's and increase togetherness. Women, not men, forgo flexibility because it is less costly for them to align their fewer work hours with their husbands'. If flexibility pays a premium, women then forgo such premium, which in turn reinforces any preexisting gender wage gap. ●

Alexandros Theloudis
"I am an assistant professor in the Department of Econometrics & OR. My work is on quantitative household economics, studying the interplay between decision making in the family and inequality in its many forms. I also work on income dynamics, which is in many ways a related topic. I am a Greek, who studied in England and who lives in Amsterdam."

Challenge Helps us Grow

written by **Selina Bötzel** and **Martin Kubiçek**

On Wednesday January 18, we were delighted to interview Koen van der Mijle and Bram Erven, energy-oriented consultants at Itility. Itility is an engineering and consultancy firm specializing primarily in the energy, manufacturing, and agriculture industries. Their objective is to link a business problem to an efficient solution involving technology. Most of Itility's customers are big high-technology companies. The company has four offices worldwide, with one located in Eindhoven, which we were able to visit. While Koen graduated in System & Control at the Delft University of Technology, Bram finished his degree in Strategic Management at Tilburg University. Both gentlemen gladly answered our questions about their work at Itility and the company itself.

What are some of the interesting cases that you have worked on?

Koen: "We do many different and interesting projects. Nowadays, we are doing more and more domain-dominant projects. One of the projects that I am currently working on is the Home Energy Management System. The goal is to make the energy transition to renewable energy sources possible by controlling smart electrical components in the household, such as heat pumps or your electric vehicle. Thereby this is a great example where we have a lot of knowledge of a certain domain, and there is also a business case since we must sell our project. It incorporates IT knowledge, statistical models and optimization algorithms are implemented as we build this product."

And what is the scale of the project in this particular case?

Koen: "We focus on specific buildings, meaning households or commercial buildings, but the interesting case is when you look at the challenges tied to the whole neighborhood. For example, when the sun starts shining, all the houses start generating energy with their solar panels, which is challenging for the grid since there is a limited amount of copper in the ground to transport all that energy. Therefore, it needs to be optimized on the whole neighborhood level. And there are different interests because the end user in the household cares about minimizing costs and does not focus on the neighborhood. For the energy supplier, the neighborhood is challenging due to the logistics and congestion. So, it very much depends on the perspective. Ultimately, we try to satisfy all of the participating stakeholders."

Bram: "Koen mentions one project out of hundreds, so the variety is vast. Let me tell you about a different case. You have probably heard about chips being in high demand. And we work for many companies that manufacture chips or make components used in the chip manufacturing process. In this case, the issues are with the supply chain. Everyone is dependent on other companies, so they cannot continue producing their components or chips as they wait for other companies to deliver their product.One of our customers makes graphite plates, which are used in making chips. You have a wafer of chips, basically a silicon plate, that is put onto the graphite plate from our customer, and that is how a part of the chips is manufactured. What we here in Itility do is supply chain simulations. They have a problem with manufacturing enough plates, as their customers demand more, but they are often limited by the deliveries from other companies, the amount of graphite, or they do not have enough inventory in their factories. And what we do is simulate how products travel through the supply chains, and based on that, we create a model of what goes in and out of the model, finding the lead time and the major constraints. That allows us to give the company very concrete advice, so they can alleviate certain bottlenecks, minimize costs, or reduce the lead time."

How does Itility differ from other companies employing econometricians?

Bram: "The typical companies where econometricians tend to work have a department of mathematicians and econometricians who develop models all-day. They become specialists in the specific field. In our case, you are challenged to think beyond your model. You need to understand how your project works in prac-

'In the end, we are not only focused on your expertise, but you are expected to do everything broader.'

tice, who will use your product, and you will talk to people of various expertise to create one solution, where your model is one part of it. Therefore, you are pushed to think of business problems instead of being a specialist focused on your models. The same thing applies to the energy case. Many people are focusing on math, but no one, who can only do the math, makes models, and does not think of how to solve the energy problem."

Koen: "Since Itility is a smaller company, we have people from specific expertise like optimization or modeling, but you always must be able to explain why you are building this and what the added value is for the people that will use this model. We are all consultants, so we all have a broad skill set to talk to customers and to think critically about problems, but we also have certain expertise based on our backgrounds. In the end, we are not only focused on your expertise, but you are expected to do everything broader."

Does that make Itility a good starting point when you are freshly out of your study?

Bram: "Yes, I think this is appealing about consultancy, as you get a basis in how to develop something, how to talk to customers, how to communicate clearly, and at the same time you talk to people of different expertise, which helps you grow. What is great for young people at Itility is that you switch projects quite regularly. So, not only do you acquire more skills over time, but you see different customers and different domains, which helps you learn much faster than if you worked on one thing for a long time. At least that is how I always felt."

Koen: "Another reason for starting here right after studies is that we are a very young group of people. We also have a YPP, Young Professional Program, focused on university graduates who want to become consultants. We help them gain the basic skill set and later have them specialize."

Bram: "It is a pressure cooker, where you are with other people who just started from various degrees. You are given the assignment to work on something with an actual customer. It is great because you learn by creating something that will be used instead of attending lectures and learning from a textbook. And in a few months, you will not be sitting here in the office but with a customer, and you will build something useful. So, it is not only a theoretical journey. You will be out there in the real world, and through the YPP we try to prepare you for that."

Could you tell us more general information about the project teams?

Bram: "On average, a team consists of five people on one project. We try not to make it too big, so even on large projects, we still divide into smaller teams to stay effective. Typically, you stay anywhere between a few months and a few years with one customer, depending on your preference. Some people like to switch a lot, while others enjoy staying with a customer for a longer period. But the average time is around a year per customer and you can have several customers if you like that."

'We strive to be the best, so the learning curve should be high.'

"Regarding the choice of a project, we have people responsible for the customers and track which projects are coming up. We also have people dedicated to looking at personal development, so everyone gets a senior who coaches them throughout the time they are here, thus we know your preference and ambition. And these two groups combine their knowledge to assign you the best project, focusing on your development and regularly checking whether you enjoy your work."

Koen: "Sometimes you may be unhappy at a certain project. You can discuss that, and it is possible to switch in a relatively short time frame."

What can you say about the atmosphere in Itility?

Koen: "It is a nice atmosphere, quite open. You do not see everyone, as many people are with their customers, but I like that we are highly willing to help each other whenever someone needs it."

Bram: "We are a bunch of geeks who do cool stuff, but we also challenge each other. We strive to be the best, so the learning curve should be high. We do a lot of nice stuff, but we are also direct with each other to improve each other. Many newcomers say that it is fun because of the things you do, but it is also challenging, and you also sweat a bit. Otherwise, you cannot make steps toward personal growth. The whole point is to grow and have fun, and the idea is that if people individually develop, then we develop as a company. It is hard work, but it is fulfilling."

How would you describe Industry 4.0?

Bram: "First of all, it is a buzzword. Many people use it even though they do not know what it means. In the end, it is simply making factories smarter by connecting data, getting inside out of it, and based on that, making changes in your factory. The result is that your factory runs smoother, for which you need software that will store machine data or how products are going through that factory. So, it is about changing the flow and decisions made in a factory based on data, and that can be many different ways."

We would like to thank Itility and especially Koen and Bram for the amazing oppertunity to interview them and gain so much insights about Itility.

Troubadour on Tour

Pierre Verhulst

Msc Data Science & Entrepreneurship

Age: 25

In our beautiful city Tilburg, old bars are often characterized by their wooden interior and rusty wheels (radjes). During the first Olden Goldies activity, we visited some of the oldest bars in Tilburg and made their wheels spin round and round. Together with our favorite old econometricians, we organized The Tour of the Troubadour where we visited some historic bars. Maybe we will even leave Tilburg for some older, browner bars....

The date and time were October 5, 15.21 when the Olden Goldies committee was formed. Six seasoned but highly fanatical students were brought together, and we had the honor of organizing two activities for the fourth-year and older students studying econometrics. During the first meeting, a lot of ideas were put forward for the first activity. These activities had an overarching idea; they should be of use to you after your studies. This is because the target group has almost all finished their study. That is why we came up with ideas like a golf clinic, going to a horse race, and much more.

We soon found out that we also had to take into account a limited budget. So, we started thinking about what else older people like to do. After a few rounds of ideas, we found it: Troubadour on Tour! We are going to visit several brown cafes in and around Tilburg. This is to give the members a taste of all the beautiful brown cafes in Tilburg and the surrounding area. Since the fourth-year students are also getting older, we could not let them walk or cycle to all the pubs. For this reason, we arranged for a covered wagon (huifkar) to take us to each new cafe. Luckily, Juliëtte van der Velden knew the owner of the covered wagon well, so this could easily be arranged! We knew that the name of the activity, Troubadour on Tour, is a pleonasm. Yet we have chosen to leave it that way as we are on our way from pub to pub while singing along to the best hits (and of course because it sounds nice).

Now that the idea was complete, we could start looking for the nicest brown cafes in Tilburg. During this search, we found out about a pub in Tilburg called the Troubadour. So, we had to start our tour at this pub! After spending some time at the Troubadour, we walked over to the covered wagon to take us to the next pub in Riel. However, the participants did not yet know that they were dropped off at each pub with a covered wagon. So, this was an extra surprise for them, which was very much appreciated!

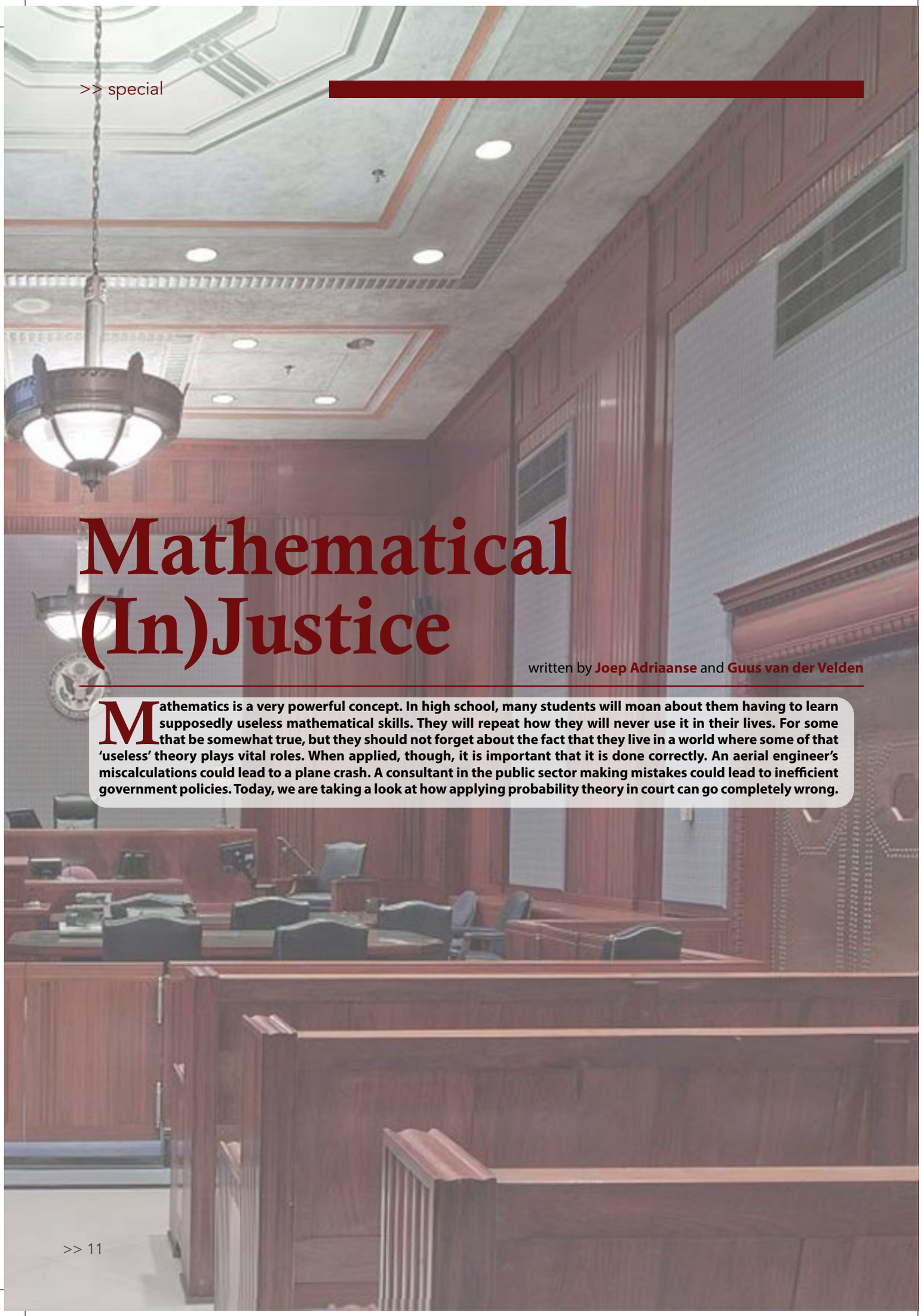
While we were on the covered wagon to the next bar, we sang along to the best hits. To keep the throats well lubricated, Schrobbelèr and wine were present on the covered wagon.

As a third cafe, we went to Goirle, to cafe d'n Brands. Many people immediately got a familiar feeling from this pub. This was because there was a wheel here that could be swung (radje draaien). Just like in the Boekanier, where we can often be found. After swinging on the wheel for half an hour, it was already time to visit the last pub in Tilburg, Cafe Tribunal. Once back in Tilburg, we sadly had to say goodbye to the covered wagon and continue our journey on foot. After playing some table football, and throwing some darts the activity was over.

The activity might be over, but that did not mean everyone went home. As mentioned before, Cafe de Boekanier is our favorite pub and that is why we ended up there.

As can be seen on the group picture, unfortunately, this one was taken without Juliëtte van der Velden as she could not be at the activity, we had designed some amazing committee clothes. It was a nice brown body warmer with a small, embroidered logo of a troubadour on it, which completely fitted into the idea of the activity. We only found out the next day that a body warmer had been stolen from us, namely by the LED committee. The next morning a debauch letter (bras brief) was sent to us. This letter contained a number of tasks that we as the Olden Goldies committee had to do to get our body warmer back.

We did not feel like completing these tasks so we did what any adult would do; stealing the LED ties so we could trade them back for our body warmer. ●



Mathematical (In)Justice

written by **Joep Adriaanse** and **Guus van der Velden**

Mathematics is a very powerful concept. In high school, many students will moan about them having to learn supposedly useless mathematical skills. They will repeat how they will never use it in their lives. For some that be somewhat true, but they should not forget about the fact that they live in a world where some of that 'useless' theory plays vital roles. When applied, though, it is important that it is done correctly. An aerial engineer's miscalculations could lead to a plane crash. A consultant in the public sector making mistakes could lead to inefficient government policies. Today, we are taking a look at how applying probability theory in court can go completely wrong.

People v. Collins

This first case is a prime example of bad mathematics, with severe consequences. The story takes us back to 1968, when an elderly woman called Juanita Brooks was on her way home after some grocery shopping. While she was dragging around her wicker carryall, someone must have noticed that her purse was on top. Mrs. Brooks was pushed over and got hurt. When she managed to look back up, she could vaguely distinguish a blonde woman running away with her purse. She was now about forty dollars poorer.

Luckily, she was not the only witness. Another man, who was situated a little further up the street while watering his lawn, had seen a blonde woman get into a yellow car. This car was driven by a black man, is what the witness told the police. He had noticed that this man had a beard and a mustache, but that was about all the information the police had on the couple who were now wanted for this robbery. When asking around at gas stations in the neighborhood, one of the owners was able to recollect that there was indeed an interracial couple that would fill up the gas tank of their yellow car every now and then.

This newly married couple was Malcolm and Janet Collins. They were now prime suspects, although there was a lack of hard evidence. According to them, on the day of the robbery, Janet had first been to work. When picked up by her husband, they supposedly drove to a friend's house. Their alibi was not exactly convincing. Their looks and yellow car were the only things actually linking them to the case, albeit only vaguely. Janet

did indeed wear a ponytail, but the color of the hair was said to be a little off. Malcolm did have both a beard and a mustache, but then again it was said that he was beardless at the time of the robbery. Moreover, neither Mrs. Brooks, nor John Bass were able to confidently identify any of the two when subjected to a police identification test. It looked like the prosecutor was going to have a hard time getting a conviction. That is where mathematics came in.

A local mathematics instructor, employed at a state college, was called as a witness. He was there to give them a small, but disastrous lecture about probability. Let us take our minds to the second semester of the first year of the Bachelor Econometrics and Operations Research. That is when you are introduced to so-called independent events. It is taught that two events are independent if and only if: $P(A) = P(A|B)$. In English, this comes down to having observed the occurrence of an event B does not affect the probability of a different event A happening. An important use of independence is the validation of multiplying probabilities. Hence: $P(A) = P(A|B) \leftrightarrow P(A \cap B) = P(A) \times P(B)$. This rule was used by the mathematics instructor.

He presented the following list of probabilities, that were connected to this case:

Black man having a beard	1 in 10
Man having a mustache	1 in 4
A white woman having blonde hair	1 in 3
A woman having a ponytail	1 in 10
An interracial couple in a car	1 in 1000
A car being yellow	1 in 10

A quick calculation reveals that, according to him, the chance of the Collins matching all criteria was therefore

$$\binom{1}{10}\times\binom{1}{4}\times\binom{1}{3}\times\binom{1}{10}\times\binom{1}{1000}\times\binom{1}{10}=\frac{1}{12000000}$$

This calculation is completely invalid, though. Apart from the fact that the mathematician literally came up with the probabilities himself, not providing any proper substantiation, the multiplication rule is also applied incorrectly. Let us call a black man having a beard event A and a man having a mustache event B. The necessary condition $P(A) = P(A|B)$ certainly does not hold, as the probability that one has a beard is significantly higher when that person is known to have a mustache.

The jury, clearly consisting of people who have a lacking knowledge of probability

The **prosecutor's fallacy** is a fallacy in which the effect given the outcome is incorrectly equated to the outcome given the effect. Consider the following example, about a defendant who has the same blood type as the perpetrator. It is known that only 10% of the population has this blood type. The prosecutor could argue that, based on this fact alone, there is already a 90% certainty that this person is guilty. It is important to note, though, that the defendant will probably have been arrested on other charges. The matching blood type does not necessarily have as much value, it could be a coincidental match. Say the defendant lives in a town of a thousand people. Then a hundred of them have this same blood type, making the chance of the defendant being guilty only 1%. Probabilistic evidence must always be handled with care, and thoroughly scrutinized. It may be tempting for a prosecutor to present calculated probabilities in a certain way, as they seem easy to grasp for a jury, but the evidence is only considered on a very superficial level. That has turned out to be very dangerous.

theory, was convinced. For them, this proof was even stronger than 'regular' arguments heard in court because this worked with rock-hard numbers rather than suspicions and thoughts thrown at one another by the defendant and the prosecutor. It was beyond reasonable doubt that the Collins couple had committed the crime and they were therefore sentenced to jail time.

This should never have been allowed to happen. As mentioned, the probabilities did not really make sense, but even when taking the words of the mathematician as the undisputed truth, the outcome of one in twelve million is not as decisive as it sounds. It was calculated [1] that, given that probability, there was a probability of over 40% that the couple could be 'duplicated'. Regarding that figure, there is still plenty of room for reasonable doubt. Malcolm appealed the case, and the Supreme Court did indeed void the initial verdict. By that time, Janet had already served her entire sentence and Malcolm did so for a large part too. Also, the damage to the trustworthiness of mathematics in court was done.

To limit the damage that improper use of probability theory could do to innocent people, a new set of rules was put into place. The new Collins test ensures that, before any probability theory can be used in a court case, it is checked that:

The probability factors are accurate
The calculations are correct, and the formulas are applied correctly
All the factors calculated apply to the parties involved
The evidence proves that there is only one possible result

This all came too late for the Collins couple, though. They undeservedly spent time in jail for a crime they did not commit. The true perpetrators, who had become a staggering fourty dollars richer, were never found. Justice was not served.

People v. Sally Clark

Another sad example of improper use of probability theory in the courtroom is People v. Sally Clark. Mrs. Clark was a mother who was found guilty of the murder of her two infant sons. Both sons died of Sudden Infant Death Syndrome. SIDS is the death of young babies, usually between the second and fourth month, without any clear cause, even after an autopsy. Sometimes intentional suffocation is misdiagnosed as SIDS.

The fact that both of her kids died so young, raised some law-enforcing eyebrows. They found it suspicious and deemed it necessary to further investigate what had happened. One interesting fact was that the second baby was found to have a broken rib. This might further raise suspicions, but according to the parents that had been caused during resuscitation efforts. Pediatric Professor Sir Roy Meadow then testified for the prosecution that the odds that a child, in the circumstances, died of SIDS were around 1 in 8500 and since two children died the probability that SIDS was the cause was 1 in 73 million. Again, a simple multiplication rule was applied here. This Sir Roy Meadow was not just some professor. His name carried a lot of prestige, especially in the field of child abuse. His testimony was of high value. He even had a theorem named after him, called Meadows law, that states that one death from SIDS was unfortunate, two deaths are a coincidence, and three deaths are murder unless proven otherwise. While 1 in 73 million is an insanely low chance, it was incorrect. Not only did the prosecution fall into the prosecutor's fallacy, but they also incorrectly multiplied the odds.

In this case, that means that the prosecutor assumed that if SIDS did not occur, then it must be murder, completely ignoring the fact that a double murder is also a very rare event. Then they assumed the fact that SIDS occurring between two children in the same family are independent, while in reality they are dependent. Just as in the other case, it seems that what is taught in the first year of the Bachelor of Econometrics and Operations Research gets us further than the expert called to court.

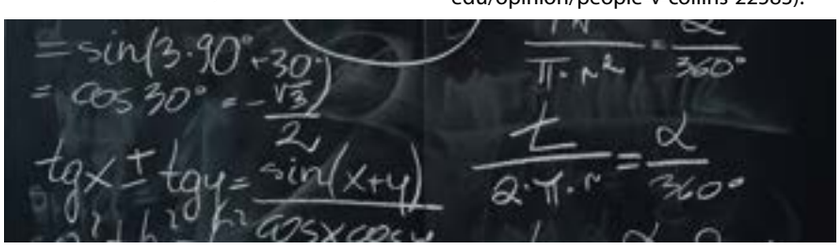
The real probability that the cause of death was SIDS, was around 40%. Sadly, the faulty math was fixed late for Sally as by the time she got an acquittal she had spent seven years in jail. She never actually got better and committed suicide afterwards due to the mental trauma.

Mathematical abuse

As we can see, mathematics can be very useful, but also incredibly easy to mess up. In addition to the fact that the use of math is prone to mistakes, it is also easily abusable, since the average jury is likely not able to understand what the results mean. A one in 73 million probability that two kids in the same family die of SIDS seems very low, but it is still possible to happen. Not likely, but possible. Especially if you take into account the fact that there have been over a billion parents with two or more children, it is very reasonable to assume that this has happened. Also, a calculation of multiplying made up odds of dependent events does not lead you to the actual perpetrator. However, a jury is most likely going to focus on the extremely low odds, and (wrongly) convict a suspect or at least be biased. ●

References

[1] SCOCAL, People v. Collins , 68 Cal.2d 319 available at: (https://scocal.stanford.edu/opinion/people-v-collins-22583).



Sheffield: England's Tilburg

I spent last semester on exchange in Sheffield. I ended up here because I wanted to study in an English-speaking country. To be honest, Sheffield is not the most appealing city for an exchange, but I still had the best time being here. Sheffield, like Tilburg, is an old industrial city. As a result, it is not the most beautiful city, but the people I met made my time here unforgettable. I learned from them that it does not matter where you are as long as you surround yourself with great people.

Before going on exchange, I expected to mostly interact with people from England. However, this is not true at all. I mostly hung out with people from the Netherlands, Germany, and a lot from Australia. We got along quickly because people from England already have their group of friends and we are all experiencing the same as exchange students. We did a lot of things together. For example, nights out, studying together, but also day trips, weekends away, and other fun activities. One of the things we also did was go to a lot of football games. Most of the time we went to the games of Sheffield Wednesday. Even though Sheffield United is the better club. The guys preferred going to the Wednesday games and I did not really care. I just like the vibes of a game.

The trip to Edinburgh and the weekend at the cottage were two of the best things I did here. Those two weekends together were so much fun. In Edinburgh, it was mostly about enjoying the city and walking around all day to see everything, whereas in the cottage, it was mostly about relaxing, enjoying nature, and playing games. I believe Edinburgh is one of the most beautiful cities I have ever been to! I loved it so much! I will definitely go back again someday!

Other highlights were the visits from friends and family. I have never had to show the same places so many times because you want to show everyone the highlights of the city. But it was a lot of fun to show everyone what I was talking about in my stories and where I was staying. Everybody was surprised to see that I lived in such a beautiful accommodation. I have a bathroom (all to myself) and a big kitchen/common room that I have to share with six other people. Downstairs we have a pool table, a Ping-Pong table, and a lot more that we share with way more people, but it is still amazing. All that is placed in an old church, so it looks beautiful as well.

Sheffield University is much smaller than Tilburg University. I was in a classroom with about 50 other people. It felt like I was back in high school. Furthermore, education is much easier than in the Netherlands, in my opinion. This pleased me because it meant that I would have plenty of free time to enjoy my time here. I went on a lot of hikes in Peak District which is a half-hour drive away from Sheffield.

To talk a little more about my friends here, it is great to meet and spend time with people from other countries. Everyone has their own traditions and seeing so many different traditions in one group of friends is fun. For example, I taught the others Dutch words and let them taste Dutch sweets, while the Australians gave me Australian food to try. Because you spend so much time with each other in such a short period

Eva Schoenmakers

Bachelor EOR

Age: 21

of time, you form a special bond. It will be strange to say goodbye after seeing each other almost every day for the past four months. It is easy to visit people from the Netherlands and Germany, but it is not that easy to go to Australia. This is of course an excellent reason to travel to Australia and I will definitely do that one day.

Even though I had the best time here. I am still glad to go back home and see all my family and friends, and most of all my dog again! I am not someone who misses people easily, but after so many months away, you do start to miss people. ●

John Einmahl: A Generation of Statistics

written by **Timo Klabbers** and **Joep Adriaanse**

Prof. dr. John Einmahl

It is January 17, and we are headed toward the Koopmans building for an exciting interview. The statistics exam was only a week ago, and we are still awaiting our marks, but now is the time to interview the person that has taught this course for the very last time this year: prof. dr. John Einmahl. We take the elevator up to the fifth floor and quickly find Einmahl in his office, sitting behind his desk. He offers us a cup of coffee and sits down with us for this interview. As mentioned, this is the last year Einmahl was responsible for teaching us the fundamentals of statistics. This is therefore the last chance to interview him, and we were eager to ask him some questions.

The fact that John has been around at Tilburg University since 2001 makes him a true veteran. However, this university is not where his academic career started. He completed his study in Nijmegen. This is also where he got his Ph.D. During this time, he already acquired some experience in the teaching field at a high school. As soon as he finished, he started looking for a job as what would now be called an Assistant Professor.

He was offered the position of Assistant Professor in two cities, Enschede and Maastricht. He chose the latter of the two, as the university's position and the direction it was headed for were more appealing to him. It just so happens that he originally comes from this region, too. Later on the next step in his career took him to Eindhoven. After that he went slightly westward which would take him to Tilburg. That is the place where he thus remained until he felt it was time to stop working as a professor at Tilburg University.

But will Einmahl stop working? No, he will not. Engaging in a conversation with him is very interesting as the fascination for his academic discipline is never more than a triggering question away. We believe that mathematics and statistics are what make prof. dr. John Einmahl. During the past 22 years, he has been engaged in doing research at least equally as much as in teaching. There seems to be no doubt in his mind that he will continue doing research for some more time. "Maybe I will work some shorter days or take a day off sometimes" is what he says almost reluctantly. The question arises: is there such a thing as being addicted to mathematics? When explaining why he is feeling privileged, he compares his retirement to that of a bus driver. "When a bus driver retires, his bus remains with the company. The bus driver loses his bus and cannot drive around any longer." Einmahl comes across as if his passion and curiosity are not planning on leaving him alone any time soon.

Another interest Einmahl has is the Italian language. He tells us that he wants to learn this language in the bits of extra free time he will soon have on his hands. He does not want to do this because it is a rational decision: he does not intend to move or go on holiday in Italy, but he thinks Italian is "just a beautiful language". This is quite unlike him, as we notice, but he also mentions himself. He is normally about as rational as a human being can be. As he mentions his goal, he remarks that by telling this to the Nekst, he imposes it a little more upon himself. Now the word is out, and he cannot deny it in the future. No excuses, professor!

When looking back on his research, two publications stick out. Not necessar-

Bert & Ernie Questions

Education or Research	**Research**
Statistics or Probability	**Statistics**
Dutch or English	**English**
Bicycle or Car	**Bicycle**
Summer or Winter	**Summer**

ily because Einmahl deems these to be the most important or fundamental, but because these have reached the largest audience. John has always had a special interest in extremes. Research on the fastest possible time for the 100 meters or the limit of people's age has reached millions, if not hundreds of millions of people across more than a hundred countries. He himself calls these specific topics frivolous applications of the mathematical theory, but something about the concepts being easy to grasp for more people has led to great publicity. From the Dutch newspaper De Telegraaf to a Colombian radio station, many people seemed to be interested in his findings.

We were very interested in whether there is such a thing as a role model in the academic world. "Not necessarily" is the answer we got. There are, however, many people who have done amazing research and published articles that have been crucial in many ways. John finds it important to mention that he has a deep respect for these people. Awarding the title of role model to one single person is not appropriate, he says. One name that does come up, though, is Paul Erdõs. He is honored not merely for the quality of his work, but even more, for the vast quantity of articles published. When hearing the number 1500, we were both staggered. In the academic world, there is such a thing as Erdõs number. The man himself is the only one with Erdõs number zero. People who have written an article with him, which is a great honor, have number one. People who have written an article with a fellow researcher carrying number one have Erdõs number two. John Einmahl is one of these people, he says proudly. Our statistics professor also fondly remembers how he was a speaker at a congress, sharing the podium with the Hungarian mathematician. No number is attached to this achievement, though.

Professor Einmahl has been interviewed for the Nekst before. Namely, five years ago in 2018-2019 and 2002-2003, exactly twenty years ago. At that time this magazine was still in Dutch and The Teacher was still simply called 'De Docent'. We asked him some questions to find out if he still thinks the same about education and university as twenty years ago. That academic year 2002-2003 was the start of the Bachelor's-Master's doctorate system, and that was therefore a hot item. In this almost ancient edition, prof. dr. Einmahl was asked for his opinion on the matter. He answered that in general, it was good that European countries aligned their studies, but the focus on the normal subjects slackened somewhat. Now we are used to the system and hardly know any difference.

When we ask Einmahl again about his view of the system, he starts talking about something else: "I find it inconvenient that a Master's is only one year. As a result, the bar is not set that high for a Master's degree. If someone comes to study for a year, you cannot set the bar so high. You cannot keep someone busy with difficult subjects for several years, as that would be very inefficient." According to Einmahl this lack of time in the Master's is partly due to the hard cut (first get your Bachelor's degree before you can start your Master's). "It used to be much more fluid. You had already started your Master's long before you had completed your Bachelor's degree, which were still called Candidate and Doctoral back in the day. That Candidate was not an obstacle at all for me. I would rather see that it would be two years Bachelor's and two years Master's, or both 2.5 years as it was before". In addition, the Bachelor's thesis may disappear, according to prof. dr. Einmahl. He thinks one thesis during the Master's is more than sufficient and would rather fill the freed-up time with a few interesting courses.

With Einmahl's retirement, the course Statistics will also be given by a different teacher next year. It turns out that Einmahl himself does not know much about this part. It is not yet known who the successor will be and whether the successor will adjust the course. Einmahl is willing to provide the person willing to give a try to fill the vacuum that will be left behind with all the material he has made in recent years. When he started, he completely redesigned the course, but "that took an enormous amount of time". So, the chance that the course will be completely different is not very high.

We want to thank prof. dr. John Einmahl for his time and willingness to bless us and all readers of the Nekst with his interesting stories and anecdotes. It was an honor to be able to interview someone who played such a big role in the Econometrics department just before his retirement.

An Introduction to Our Sisters!

written by Juliëtte Tillie and Floris Somers

As you will know, you cannot only study Econometrics and Operations Research in Tilburg but in many other cities in the Netherlands as well. We were curious to know what student life is like at our sister associations. That is why we set out to pick up contact with them and ask them some of our most pressing questions… like do they have a so-called 'stamkroeg'?

In this article, you will find what our sister associations answered. For those of you who are unfamiliar with the other associations, here is a small overview of them (in alphabetical order): FAECTOR (Erasmus University), Kraket (Vrije Universiteit Amsterdam), Vectum (Maastricht University), VESTING (University of Groningen) and VSAE (University of Amsterdam). Definitely check them out.

Now all that is left is to wish you a lot of fun reading about Econometrics and Operations Research in the different cities!

Do you celebrate carnaval?

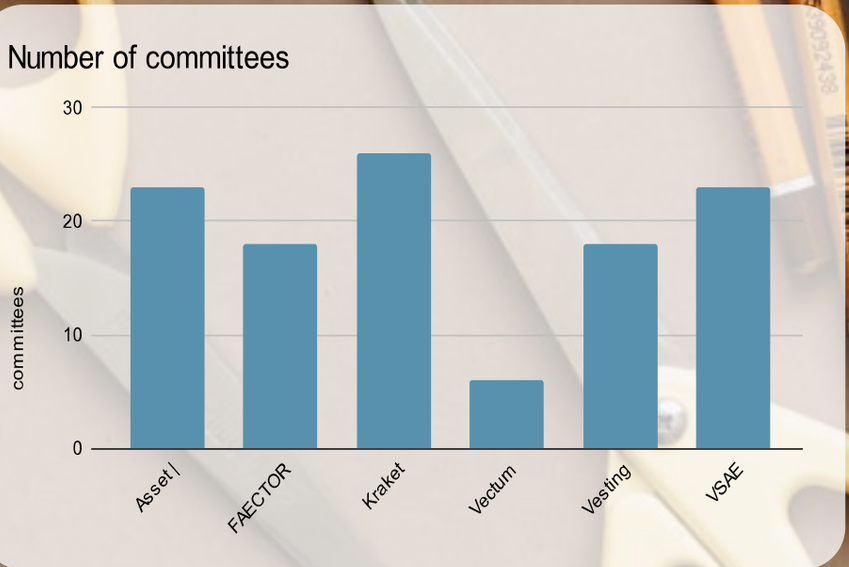
Astrics	Yes
FAECTOR	Yes, we have a Brabo in our board
Kraket	No
Vectum	Yes
VESTING	No
VSAE	No

Limburgs or Brabants carnaval?

Astrics	Brabants
FAECTOR	Brabants
Kraket	None
Vectum	Limburg
VESTING	Brabants
VSAE	None

What is seen as the most difficult course?

Astrics	Statistics for Econometrics
FAECTOR	Introduction to Analysis & Introduction to Statistics, the first courses you get in your first year
Kraket	Analysis 1
Vectum	I do not think there's a consensus on the subject, but maybe Probability Theory
VESTING	Difference- and differential equations
VSAE	Econometrics 1



What do most students use most to get to lectures? (Bike, foot, train, tram, metro, go scooter)

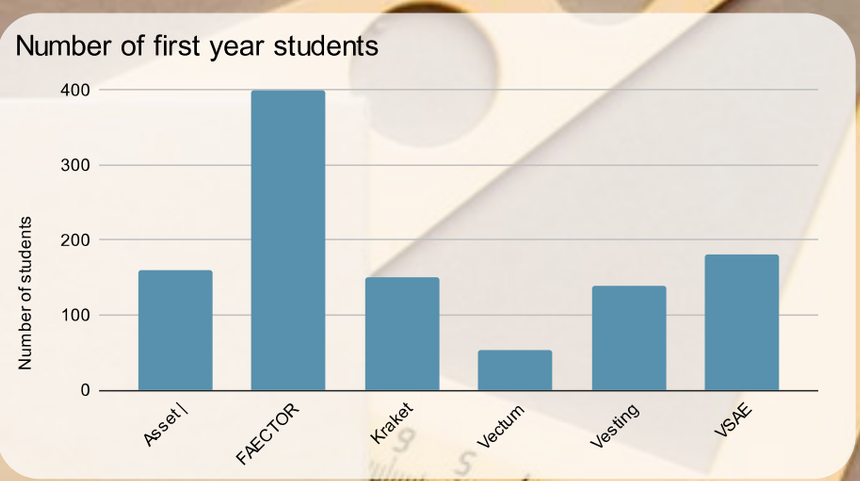
Astrics	Bike, most of us are too broke to use the go scooter on a daily basis.
FAECTOR	Bike, train, metro or a felyx/go
Kraket	Foot
Vectum	Bike
VESTING	Bike
VSAE	Bike

Do you have a stamkroeg? (yes/no)

Astrics	Yes, we have the Heuvel at which we have our constitution drinks, monthly drinks, and big parties
FAECTOR	Yes, De Vrienden
Kraket	Yes, The Gieter at Leidseplein
Vectum	Yes
VESTING	Yes, 't Vaatje
VSAE	Yes

What is the favorite student cafe of the econometricians of your city?

Astrics	The Boekanier
FAECTOR	De Vrienden
Kraket	De Gieter of course
Vectum	Coffee Lovers
VESTING	't Vaatje
VSAE	Heeren van Aemstel



What is your favorite place to go to after lectures?

Astrics	To the rooms, we have a few rooms for our members to hang out at.
FAECTOR	Café in de Smitse, our campus bar
Kraket	Kraketkamer
Vectum	Go to the library or home to study
VESTING	The Vesting kamer (VK)
VSAE	Heeren van Aemstel

What is the most annoying afko used at your association?

Astrics	Combo vs Combi, IAK vs Inleiding, and all the other changing afko's for our courses
FAECTOR	Havercappu
Kraket	HDP!
Vectum	If I understand correctly and it is an abbreviation, I do not think we have an annoying one
VESTING	"Sor" for sorry
VSAE	KRES

And what is your absolute favorite afko?

Astrics	TEV
FAECTOR	VrijMiBo
Kraket	EGW (Ectrie Goes Wild)
Vectum	Preuv
VESTING	VK for Vesting kamer
VSAE	WiSpo

What's the biggest frustration at your university?

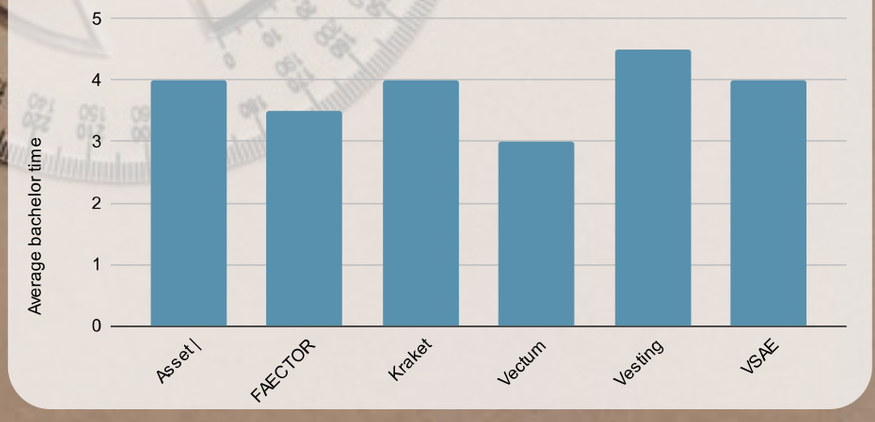
Astrics	The price of coffee and tea, which goes up five cents per year.
FAECTOR	It is impossible to find the person who has the final responsi bility for your problem
Kraket	The ugly main building
Vectum	Not enough spots at the library during exam week
VESTING	The fact that the campus is a fifteen minute bike ride from the city centre
VSAE	No gluhwein before 15.00

Which party of the year are you most excited about?

Astrics	Cycling dinner
FAECTOR	Opening party at the start of the academic year & closing party of the Econometric Career Days
Kraket	Party after the LED of course
Vectum	Summer break
VESTING	The end of the year party
VSAE	Lustrum gala

What do you sing after Trink, Trink?

Astrics	TEV is VET
FAECTOR	Trink, trink, Brüderlein trink Cites entire lyrics (love it)
Kraket	Nothing
Vectum	We do not sing it sorry haha
Vesting	Trink, trink, have a drink!
VSAE	Nothing



Let Us Explore the World of Consulting!

Are you interested about going into consultancy after finishing your studies but are you still unsure in which sector, or at what kind of company you want to kick off your career? Then do not worry, because in March we are organizing the perfect trip for you together with our friends from Vectum from Maastricht, namely the Econometrics Consultancy Tour, better known as ECT.

During the ECT we will visit four awesome companies, among which we have two of the big four companies, namely EY and Deloitte. However, since not everyone would like to work for such an enormous, corporate firm, we will also ensure that there is one medium-sized company and a (relatively) small company participating. In this way, you can truly experience how working in consultancy is in several very different environments. The third company that we will visit is Gupta Strategists, a small consultancy company working in the healthcare industry. Since they operate in a somewhat niche corner of the consultancy world, you are certain to gain some new insights during our visit. Finally, you might ask, what is the fourth company? Well, at the time of writing this article, I was informed that the fourth and final company that we will visit, is a small company, that combines Data and AI for their solutions. I am talking about MIcompany! We are very excited about the combination of four different companies, in terms of culture, size, and their approaches. Luckily, these four companies also have at least one thing in common: they are all based in beautiful Amsterdam, so we will not need to travel too much.

What you might wonder is whether you are going to have to behave formally for two and a half days straight. Of course not. Since these case days are very intensive and formal, we try to arrange some entertainment outside of the companies' programs. Following the great success of the pub quiz last year, we will bring that part of the ECT back this year. This way, we can get to know some more about our colleagues from Maastricht, the companies, and maybe even something about our own association and its members. The program of the trip will be as follows: On Wednesday evening, we will travel to Amsterdam together, where we have arranged a nice hotel for us to stay in during the trip. This means that we have made a major upgrade in terms of staying overnight, as compared with the Stay Okay of last year. It is a corporate trip after all, so we must have a taste of every aspect of corporate life. Then on Thursday and Friday, we will visit two companies on each day, how cool! During these company visits, we will get office tours, presentations, and we will work on solving some interesting business cases. Also, each company will arrange a great lunch or dinner after the visit, which we can enjoy and have some good conversations with each other and the employees of the companies, too. Thus, there are plenty of networking opportunities throughout the trip!

So, if this also sounds like a great opportunity to explore the labor market for you, then block March 1 until 3 in your calender. Also, make sure that your CV is up to date since there are very limited spots available and thus the companies will be selecting the participants based on CV selection. On behalf of the ECT committee, I can say that we are all very excited to organize the trip and host you on another adventure to explore your future! ●

Nick Drost

Master BAOR

Age: 21


Active Membe
April 21
More information w

The Nekst committee offered the midpage for the Econometricians for Society auction. The Active Members Weekend committee won the midpage.

The Secret Language of Encryption

written by **Huub Hoven** and **Timo Klabbers**

Encryption is a powerful tool that has been used for centuries to protect sensitive information. From the ancient Greeks, who used simple substitution ciphers to encode messages, to modern day computer algorithms that scramble data, encryption has always played a vital role in keeping information secure.

Today, good encryption is more important than ever. With the proliferation of the internet and the increasing amount of personal information being shared online, the need for secure communication has never been greater. From online banking and shopping to messaging and social media, we rely on encryption to protect our sensitive data from being intercepted and compromised.

But what exactly is encryption and how does it work? At its core, encryption is the process of converting unencrypted data, called plain text, into encrypted data, called cipher data. This is done through the use of an algorithm, known as a cipher using a key. The key is a piece of information that is used to decrypt the ciphertext and reveal the original message.

Encryptions can be divided into two main types: symmetric and asymmetric. Symmetric encryption uses the same key for both encryption and decryption. while asymmetric encryption uses a pair of keys – a public key and a private key – for the encryption and decryption process.

In the digital world, encryption is often used to secure online communication, such as e-mail and instant messaging. It can also be used to protect the confidentiality of data stored in the cloud or on devices, such as laptops and smartphones.

But while encryption is an essential tool for protecting information; it is not foolproof. As technology has advanced, so too have the capabilities of those who seek to break encryption and access sensitive data. This has led to an arms race between cryptographers and code breakers, with new encryption methods and techniques to crack them being developed all the time.

In this article, we will take a closer look at the history of encryption, how it works, and the current state of encryption technology. We will also explore the ongoing debate surrounding encryption and the role it plays in protecting our privacy and security in the digital age.

The idea of hiding messages from others is as old as time, but how people did it consistently evolved and changed over time and periods. The most simple and earliest way of hiding messages is something we all have done once in our life. Remember passing notes to others in class when you were a kid? The goal was obvious, namely, to convey a message only to be seen by some. Maybe you were also once a witness of one of these notes being intercepted, bringing along the drama of its contents. Little you might have known back then what the art of doing such a thing is called, but you were already a practitioner of it.
Steganography: the art or practice of concealing a message, image, or file within another message, image, or file (Merriam-Webster). The word itself might sound hard, but its meaning is not. The ones that know some Greek might not even have needed the meaning to be worded out with steganos meaning covered. Steganography is one of the simplest methods of cryptography, but that does not mean that it has completely fallen out of use.

Besides children admitting crushes, dispersing quarrels, and being a general nuisance to the teacher; adults use it too, and have been for a long time. The earliest accounts go back all the way to 500 BC. Back then the methods were unmistakable, with the simplest being, just as the little steganography users from the classroom did, hiding the message somewhere, and smuggling it to the recipient. But even back then there were more imaginative methods.

If unhurried, one would shave their head to write a message down on their scalp. After having jotted down that important message, one leisurely waits for their hair to regrow. For them to move to their final destination after. Here with the head shaven again, the message is covertly received. Yes, someone once went through that effort, at least according to Herodotus.

Even today steganography has its uses, from clever ways of wrapping a lint of characters around a dowel to read its contents, to invisible inks that need to be activated. Its Achilles heel is its simplicity, if someone knows that there is a message to be found it is only a matter of time before the true message is exposed.

Plain	A	B	C	D	E	F	G	H	I	J	K	L	M
Cipher	Z	Y	X	W	V	U	T	S	R	Q	P	O	N

But people are resourceful and come up with alternatives to simply hiding a message. Perhaps the most well-known example is what is called a Caesar cipher, but what exactly is this type of encryption and why did it get this name?

A Caesar cipher is a specific form of a substitution cipher, where one character simply gets swapped out with another. To achieve this one has to painstakingly go through the plain text and swap every letter with the corresponding substitute as given in the key. This is quite some effort to scramble data, but for a long time it was thought to be impossible to break.

With a small bit of thinking you will find that there are (26! - 1) different possible ciphers. Which means that if you do not have the cipher, it is nearly impossible to find it by chance. Modern computers are able to do this by trying every possible combination with brute force, but there is a more elegant way of figuring out the substitution cipher.

If you take a random letter from a random word, on a random page of a book, what is the chance that this letter is the letter "Z"? There is no need to be a rocket scientist to know that this chance is slimmer than 1 over 26. "Z" just doesn't show up that much in English. Eureka! Some letters in the alphabet are more frequent than others. According to the law of large numbers, if you take a long enough text you will find an accurate estimation of all frequencies of every letter. Now calculate the same frequencies of your cipher. The most commonly used letter in English is the letter "E", so the most frequent letter in your cipher will most likely be a substitute for "E". If you keep following this logic the true message will soon show up. And thus, without the use of a big computer, you have decoded the message.

But we strayed off, what is a Caesar cipher? Well, it is simply a substitution cipher with the key being the alphabet, but backwards. So, an "A" becomes "Z", "B" becomes "Y", and so forth. It is called this because

back in ancient Rome, Julius Caesar used it for his private communication. Because it is so simple, it does not offer much security on its own today.

We have already seen that computers are often used in attempts to crack encryptions. But what if I told you that the origin of computers and the science behind them is credited to someone who made them exactly for this purpose? Alan Turing, to many this will ring a bell because of the famous 2014 movie "The Imitation Game".

During the second world war, the Germans used an Enigma machine to encode their messages. Alan Turing found a way to crack it, which was key to winning the war for the allied forces. His revolutionary use of electromechanical machines birthed the field of computer science. With many things named after him, like the well-known "Turing test". This means that the whole of computer science can be led back to cryptography. The life of Turing was very tragic though, the 1983 book "Alan Turing: The Enigma" goes deeper into his personal life. This book is also what "The Imitation Game" is based upon.

The current state of encryption is constantly evolving as technology advances and new threats emerge. One of the biggest challenges in encryption today is

M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
N	M	L	K	J	I	H	G	F	E	D	C	B	A

the development of quantum computers. These powerful machines have the potential to break even the most advanced encryption algorithms currently in use. To address this threat, researchers are developing post-quantum encryption methods that will be resistant to attacks by quantum computers.

One of the most promising post-quantum encryption methods is the use of lattice-based cryptography. This method is based on the mathematical properties of lattices and is considered to be one of the most secure post-quantum encryption methods. A lattice is a multi-dimensional grid of points, and lattice-based cryptography is based on the difficulty of solving certain problems related to lattices. The most well-known lattice-based encryption scheme is called the Learning With Errors (LWE) scheme. In this scheme, a secret key is used to encrypt a message by adding a small amount of random noise to it. The process of decryption involves solving a system of linear equations to remove the noise and reveal the original message.

Two other methods are multivariate cryptography, which is based on the solution of a system of multivariate equations, and code-based cryptography, which is based on the properties of error-correcting codes. This last method is considered to be one of the most efficient post-quantum encryption methods, as it requires relatively low computational power.
Another issue in the current state of encryption is the ongoing debate between privacy and national security. Governments around the world are pushing for access to encrypted data in order to combat terrorism and other criminal activities. However, many privacy advocates argue that this could compromise individual privacy and lead to a loss of trust in technology companies.

Despite these challenges, encryption continues to play a vital role in protecting sensitive information. Strong encryption methods, such as AES and RSA, are widely used in various applications. Additionally, end-to-end encryption is becoming more common in messaging and communication apps, which ensures that only the sender and the recipient can read the message.

In conclusion, encryption is a powerful tool that helps to keep our information safe and secure in the digital age. It is important to understand the basics of encryption and how it works, in order to make informed decisions about protecting your own data. Additionally, multiple layers of encryption can provide an added layer of security.

However, it is important to note that encryption is not foolproof and there are always ways for determined attackers to bypass it. Furthermore, it is important to understand that encryption is a two-way street. It can protect you from malicious actors, but it can also be used to protect them as well. Encryption can be used by cybercriminals, terrorists, and government agencies to hide their activities from the public.

In the coming years, encryption will continue to evolve and become more sophisticated. Governments and tech companies will need to work together to find a balance between protecting citizens' privacy and national security. This is a delicate balance, but one that is necessary for the continued growth and prosperity of our digital world. It is important to remember that encryption is just one piece of the puzzle in protecting ourselves and our data in the digital age, but it is an essential one. ●

Econometrics and Loan Sharks

In the last issue, I wrote about one of my research papers on the illegal drugs market. This time I will talk about one of my papers on a different illegal market: the illegal money lending market. This is the market for loans taken from "loan sharks", who are unlicensed money-lenders that charge exorbitant interest rates. They also punish borrowers heavily for late payments, both by harassing them and charging financial penalties. These are truly the lenders of last resort for borrowers who cannot get money from anywhere else. Because these lenders take advantage of financially vulnerable borrowers, trapping them into loans they cannot repay, law enforcement has made many efforts to eradicate this market. In fact, laws banning these lenders go back at least as far as 1750 BC in Babylonia. Even though this market is very large, prevalent throughout the globe, and has existed for millennia, there has been no comprehensive dataset collected on loan shark transactions. The reason for this is because it is an underground illegal market, making data collection both difficult and dangerous. But this lack of data means we cannot accurately learn which approaches are effective at dismantling the market.

In this project, we aim to fill this gap. We carried out interviews with over 1,000 people who had taken out loans from loan sharks. We also went back to these borrowers every year for six years to follow up on the new loans they had taken out. Overall, we collected data on about 11,000 different loans. In our sample, most borrowers are addicted to gambling, drugs, or alcohol and borrow money to finance their bad habits. In 86% of loans, borrowers missed at least one payment and got punished, but 98% of the time borrowers eventually repaid their loans. This is because lenders harassed them until they were repaid. We also asked borrowers what harassment methods the lenders used. Interestingly, unlike what we see in Hollywood movies, lenders never used torture methods on borrowers. Instead, they tended to use shaming methods to get borrowers to repay, for example, by putting graffiti on the borrower's home outing them as a borrower.

During our sample period, the police started to crack down heavily on the market and arrested about half of the lenders. This crackdown also made it more costly to run the lending business because the "runners" who conducted the harassment for lenders started to charge more for their services. The cartel of crime syndicates controlling the market then responded by raising the interest rate that lenders charge.

The main goal of our paper is to estimate the effects of this police crackdown on borrowers and lenders. To do this, we develop a model of borrowing and lending and estimate it using our data. In the model, borrowers choose how much to borrow and which lender to borrow from, while the lenders choose how much to lend and how harsh to be with the borrower. By "harshness" we mean how likely the lender uses a destructive harassment method after a borrower misses a payment. We find that borrowers put in more effort to repay when lenders are harsher, which rationalizes why lenders incur the cost to harass borrowers.

Our model estimates that the cost of harassing borrowers more than doubled after the crackdown. This made lenders use harassment methods more cautiously, which in turn made borrowers perform worse on loans. We then use our model to predict what would have happened if the police didn't crack down on the market and compare this with the baseline situation where they did. We find that the crackdown lowered loan demand by 47%, lender profits by 52%, and borrower welfare by 9%. ●

Christoph Walsh

"I am an assistant professor in the econometrics group of the EOR department. I am originally from a small seaside town called Tramore in County Waterford on the southeast coast of Ireland. Tramore literally means "Big Beach" in the Irish language. I then did my Bachelor in Trinity College Dublin and then my PhD at Boston University, USA before moving to Tilburg in 2018."

If you are interested in reading the paper, you can find it on my website at walshc.github.io

Feature Selection in Marketing Mix Models

Several times a day, we as consumers make choices regarding whether or not to buy a particular product. Often we make these choices subconsciously. Think of the times when consumers first research online about which vacation to book or thoroughly peruse the advertising flyer from the mailbox. With increasing screen time, online marketing is also becoming increasingly important. Both offline and online, there are plenty of opportunities for advertisers to take advantage of these different decisions. As an advertiser of these products, you want to affect these choices to increase your sales.

Introduction

The purchasing decisions consumers make are based on many different factors, which are referred to as drivers. When the advertiser understands at what point the consumer makes each decision and what types of advertising were involved in this, it can be used most effectively. Marketing Mix Models (MMM) provide insight into the effect of each individual driver on the Key Performance Indicators (KPI's). The multiple drivers that affect purchasing decisions can be boosted using media to reinforce baseline drivers; consider pending campaigns, competitor engagement, weather, seasonality, and many more. Using the model, we can estimate what part of the KPI consists of the baseline and what part is affected by media deployment.

Model Introduction

The model provides insights into which variables can still contribute to a better return on investment, such as TV ads or social media campaigns. The model also provides information on how much of the KPI is driven by factors outside of our control, such as weather or PR events (e.g. news coverage). Media affects the KPIs, but this does not occur in a linear one-to-one fashion. More pressure does not always result in more sales. The MMM takes this non-linear relationship between media and KPI into account by transforming the data, where some assumptions about how media affects the KPI are made. These assumptions involve lags, half-life and diminishing returns. Some channels have a direct impact, others need more time. The model accounts for the building of effects through time. We refer to this as lags. Certain types of media, such as TV or radio, have effects that linger. Campaigns on one day still affect the consumer the next day. Repeated exposure builds up over time, impacting sales even after the campaign has ended. We refer to this as the carry-over effect, also called adstocks. These assumptions also include diminishing returns. A key assumption is that media pressure needs to reach a certain threshold before becoming effective. Once this threshold is reached, increasing pressure will result in increases in the KPI, to some extend. Media will slowly lose effectiveness the higher the pressure becomes, where the same increases in pressure result in smaller increases in the KPI. This is called diminishing returns. Danaher and Rust (1994) developed a formula for determining the optimal level of media spend, which considers the maximization of the productivity, profitability, and return of investment of the advertisement. One aim of the MMM is to find the optimal point and prevent media channels from being too saturated.

The goal of the model is to predict the KPI based on the media-pressure of various channels. The better the model prediction fits the actual data, the more accurate the insights on how much each media channel contributed will be. Model fit is often determined by R^2 (the correlation between prediction and actual squared) (Miles, 2005). An important note is that the MMM is not fully data-driven. Channel inclusion and insights also require a logical explanation to relate media spend and campaign objectives to the model results. Since there are many different factors that can affect final performance, feature selection is an important part of MMM. The main question here is which variables need to be in the model itself. The reason to perform feature selection is bi-partite. Statistically, it should ensure less overfitting. Practically, it is important to assign the value of variables to the correct, most important ones. Unfortunately, multicollinearity between multiple variables can occur from this automated process. By going through the feature selection process properly, the performance of the model may be improved and multicollinearity can be avoided.

Multicollinearity

Currently, multicollinearity is frequently experienced between channels (Daoud, 2017). Multicollinearity is undesirable, so different methods should be explored to solve this problem.
Before we start to consider the various methods of solving multicollinearity, it is first important to understand exactly what the problem is. This difficulty occurs when several independent variables in the model are correlated with each other. Perfect correlation occurs when the correlation coefficient has an absolute value of one. The correlation coefficient (Sedgwick, 2012) is calculated as follows:

$$\rho(X,Y) = \frac{cov(X,Y)}{\sigma(X)\sigma(Y)} = \frac{\mathbf{E}[(X-\mathbf{E}[X])(Y-\mathbf{E}[Y])]}{\sigma(X)\sigma(Y)} \quad (1)$$

Here, $cov(X, Y)$ is the covariance of X and Y, $\sigma(X)$ and $\sigma(Y)$ the standard deviation of X and Y respectively, and $\mathbf{E}[X]$ and $\mathbf{E}[Y]$ the expected value of X and Y respectively.

Multicollinearity can occur when two independent variables are highly correlated, but also when an independent variable is calculated from other variables in the dataset. In addition, multicollinearity can occur when two independent variables produce similar results in the model. One way to detect multicollinearity is to use the variance inflation factor (VIF) and the tolerance of a variable, which are defined as follows:

$$\text{Tolerance}_i = 1 - R_i^2 \tag{2}$$

$$VIF_i = \frac{1}{\text{Tolerance}_i} = \frac{1}{1 - R_i^2} \tag{3}$$

Here, R_i^2 represents the R^2 value obtained by regressing variable i on the remaining variables, $0 \leq \text{Tolerance}_i \leq 1$ and $VIF_i \geq 1$. Normally, variables with a VIF greater than 10 are referred to as multicollinearity. However, when the model is weaker, multicollinearity can already be spoken in the case of a VIF greater than 2.5.

A common problem of multicollinearity within MMM is that it could generate negative values for the coefficients among media variables. This is a result of the fact that when your variables are positively correlated, your coefficients are negatively correlated (Wheeler and Tiefelsdorf, 2005). Even though this would not be the biggest problem, a negative coefficient in MMM does not make sense. This would imply that if you practice relevant marketing pressure, this will have a negative effect on your final KPI, which is not realistic and will only occur in extreme cases.

Model (RFxSS)

There are many different methods of applying feature selection. However, this does not solve the problem of multicollinearity. To automate this process without causing multicollinearity, we are going to combine two different methods and try to speed up and improve the process. A random forest will be used and subset selection will be performed after. The main reason we are working with a random forest is that it returns variable importance as output. We are interested in this list because later, based on this order, we will check different conditions for each variable and add or drop the variable to the model. If we need to choose between two variables, we can use this list to have the algorithm automatically choose the most important one.

Before we begin to build the random forest, the media variables must be transformed. This has to do with the effects described the Model Introduction. We call these transformations hyperparameter tuning. Now, we can start building a random forest using a test and training split. A total of 1000 different trees are created to build the random forest. According to Lazic (2009), 1000 is the lower bound for the number of trees that is used to build a significant model. Ideally you would like a larger forest, however, this makes it more complicated from a computational point of view. Using this random forest, we can extract the variables importance list. In this list all variables are sorted from the variable with the highest importance to the variable with the lowest importance. Consequently, we use this importance list as input to build the model where subset selection is used.

In fact, we start with an empty model, where we are going to add a variable one by one, in order of the importance list. Each time a variable is added, and the model is built, we will verify two conditions:

1. The coefficients of all media variables so far in the model must be positive.
2. The p-values of all variables so far in the model must be less than or equal to 0.1.

When both conditions are satisfied, the variable is added to the model. If one or both conditions are not satisfied, the variable is dropped.

Hyperparameter Tuning

TAs described earlier, hyperparameter tuning is used during the process. This implies that we will try to find the most optimal portfolio of transformations per media variable. Each media variable should be assigned a value for lag, half-life, saturation, and inflection. Ideally, you would want to iterate over all the different combinations and possibilities to find the optimum. However, this is now not possible from a computational point of view, so we use a grid search, iterating over predefined values. The selection of these values is based on the values that are most common to assign, looking at previous MMM conducted. For each portfolio of transformations, the random forest is built with the other variables remaining constant. Based on accuracy, the best portfolio for each media variable is determined. This process is repeated for each media variable until all optimal portfolios are assigned. With those final transformations, the process continues. The accuracy of a model is calculated using the mean absolute percentage error (MAPE). This is calculated as follows:

$$MAPE = 100 * \frac{1}{n} \sum_{i=1}^{n} \left| \frac{y_i - \hat{y_i}}{y_i} \right| \tag{4}$$

Here, $\hat{y}_i$ defines the predicted value of actual variable y_i with n observations. Then, using the MAPE, the accuracy can be calculated:

$$\text{Accuracy} = 100 - MAPE \tag{5}$$

Model Assumptions

To properly framework the study, exogeneity is assumed. This means that the assumption is made that the error terms have mean zero and are not correlated with our independent variables. The formal definition for exogeneity is given below:

$$E[\epsilon_i|x_1, x_2, ..., x_n] = 0 \text{ for } i = 1, 2, ..., n \quad (6)$$

Here, ϵ_i is the error term and x_i the observed values for of observation i.

Despite exogeneity is assumed, practice shows that this is not always the case, and that, especially within the channels TV and radio, random factors are still sometimes encountered (He and Klein, 2019). However, for convenience, we still assume exogeneity. This is mainly due to the fact that the model that is currently used makes the same assumption and this allows us to make a fair comparison.

In addition, a practical assumption is made for a possible extension to this study. The previous years have been different than usual. This relates to the years 2020 and 2021 and the COVID-19 crisis that was going on. Of course, this also had a great impact on consumer buying behavior. Many stores had to close due to the lockdown, which led to a big shift to online shopping. However, the crisis also caused economic problems which made it difficult for some people to make certain purchases at all. Of course, these effects vary enormously from advertiser to advertiser and from brand to brand. Since it is not yet clear what the long-term effects of this crisis will be, we assume that the situation before the COVID-19 crisis is comparable to the situation afterwards. For this reason, we use a pre-crisis dataset (2018 to 2019).

After the model is built this way, all VIFs are 0, which means there is no multicollinearity.

Conclusion

Overall, we can derive the following conclusion about which models are useful for conducting MMM. First up is the LASSO model, which is not suitable for MMM, because it does not take multicollinearity in consideration in any way, since this method does not consider the possible correlation between different independent variables when adding or dropping variables. There is a lot of multicollinearity within MMM, because the media channels are related to each other in different ways, so this model is not suitable, despite performing highly, looking at the R2, AIC and BIC as performance metrics. When making the trade-off between the current model used in the company and RFxSS model, it gets a little more complicated. The RFxSS model performs better looking at multicollinearity, it does not need to be run manually, and there is not very much difference in the performance R2 of the models. However, the current method used again gets the advantage when you look at the variables the model selects, because it distributes attribution across multiple channels instead of assigning the full value to just two or three channels. There are sometimes marketing technical reasons why a variable may or may not belong in the model. The RFxSS model can simply drop such a variable from the model to avoid multicollinearity. However, marketing technical considerations may sometimes be that this very variable is preferred over another variable. This could be solved when, after running the RFxSS model, a researcher still examines the model. The preliminary work is then already done automatically, but some constraints regarding variables may still need to be added to make the model more appropriate for the corresponding advertiser and situation In conclusion, it is thus possible to partially automate the feature selection process within MMM, when using a random forest in combination with subset selection and using a grid search for automatically transforming variables without causing multicollinearity.

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Emma Segers
Master EME Graduate (2022)

Cycling Dinner Around the World

Hi, my name is Wout Damen, and the Drinks and Activities committee is the first I have been part of. The Cycling Dinner was the first event I ever hosted for Asset | Econometrics. It was a great success with 63 participants, all of them very enthusiastic.

Wout Damen

Bachelor EOR

Age: 19

It is kind of a yearly tradition to have the Cycling Dinner, and I quickly figured out why. Having dinner together is a great way to get to know new people. The concept is easy, every duo meets two new duos at every course. One of the courses, you will have to cook yourself within a given theme. We wanted to choose a subject that would refer to our overarching theme of this year, so we picked continents. Maybe you can guess our theme at the end of the year, with all the small hints we are giving.

As a committee, making the planning for the cycling dinner was the most challenging. It took us a while to figure out how we could make sure two duos would not meet each other twice, econometricians are not always that smart. There were a lot of things which we had to take into account. For example, multiple people live in the same house. They could not be placed in that house simultaneously. Then we also looked into the locations, to try to save people from cycling a lot, although it is called a cycling dinner for a reason.

Together with Dahli, I had the main course with the theme South America. We had already done some preparations in the afternoon to make sure we did not have to do much anymore. We made enchiladas in combination with tacos, only to realize later that it might be Mexican and therefore not really South American. Furthermore, we made sure we were together as a committee at Matthijs' place to have dessert, although Matthijs did not cook (Stans did). We had a delicious spekkoek together with some mango.

Then it was time to look at all the photos we received. We were very enthusiastic that people had put so much effort into making a meal. Mylan and Lieke made the best appetizer according to us. They had to make a meal in the theme North America. What is more typically American than hamburgers with fries? It came down to the Budweiser and milkshakes to really convince us, though. The best main course was made by Gitte and Nynke, my fellow committee members Ton and Peter were there to enjoy it. They made us choose the delicious couscous. All meals were themed very well, some even made a whole show out of it. If you had your dessert at the Vatican church, you would get a cross marking on your forehead. A perfectly Asian-themed dessert made by Jelle and Joost was chosen as the best in the latter course.

After these desserts, it was time to finish the evening at the Nachtwacht. We got a lot of positive reactions about the event and as a committee, we felt the same way. We had already done all preparations for the event, so we could relax a bit during it. Nevertheless, we had to be on time at the Nachtwacht

to welcome everybody and announce the winners later that evening. We prepared an extra dessert for the winners, a vlaai. The duo which could eat the pie the fastest would win the limited edition Asset | Econometrics cooking apron. We did not expect the participants to be this determined to win the prize. As soon as the challenge started, they split the uncut piece of the pie into two pieces and started to eat as if their lives depended on it. Jelle and Joost won the challenge in the end, by all surprise they did not have enough yet and helped the others to eat their piece of the pie.

The remainder of the evening was well spent with some drinks and laughter, the Kap'tein was also introduced this evening and will remain an important part of our events. I would like to thank Ton, Peter, Dahli, Stans, and Matthijs for organizing this event together. ●

Bas Dietzenbacher: Explored the World, but Never Really Left Us

written by **Joep Adriaanse** and **Floris van de Moosdijk**

It is halfway through January, and we are getting ourselves ready to talk to a Familiar Face. Bas Dietzenbacher's face is not that familiar to us, as he notes early on, but he certainly is to many other members of Asset | Econometrics. For our third-year students or below, you are at least two years late to the party. Bas started his study in 2010, completed his Bachelor's in three years but stayed for five more to eventually get his Ph.D. We prepared an interesting set of questions to find out how he remembers the association and to get to know more about what has kept him busy since graduation.

The choice of Tilburg University was easily made for Mr. Dietzenbacher. It was quite close to home, but more importantly, it saved him a lot of money. He strikes us as a very intelligent man, which cannot have been a development in recent years. In the last years of his high school career, he applied for a special program, and after doing well on the associated test he got picked out to get a significant discount on his tuition fees for university. The university was happy to have him. Bas did not have to travel very far to get to campus from home, which is why he stayed in Best during his Bachelor. Looking back on the feat, he regrets that this meant he did not get actively involved with Asset | Econometrics a bit earlier. He moved to Tilburg during his Master's in Operations Research and Management Science, a Master's we cannot choose any longer but which is closely related to the current BAOR master.

During the writing of his first thesis, the passion for research buried within Bas suddenly surfaced. He realized that he would want to go through that process many more times, which is why he chose the academic route. He felt more for this than for working in the world of large enterprises. In his research, Bas focused mainly on game theory, as that is where his interests mainly lie. After completing his Ph.D., he moved to Russia. He lived and worked in Saint Petersburg for two years, where he had a postdoctoral position. During these years he had the opportunity to write full-time on research publications. He valued the experience abroad highly and was glad to experience a postdoctoral position before attaching himself more firmly to a university. During his time in Russia, he also had the opportunity to fly to different parts of the world to visit universities and meet inspiring professors.

Eventually, he ended up in Maastricht as an Assistant Professor in the Quanti-

Bas Dietzenbacher

Bert & Ernie Questions

Carnaval or Oktoberfest	**Oktoberfest**
Reading or Writing	**Writing**
Worstenbroodje or Vlaai	**Vlaai**
KOALA bears or KOALA committee	**KOALA committee**
Ticket to Ride or Catan	**Catan**

tative Economics department. He has been around there for two and a half years now. His passion for game theory remained, which shows through his continued engagement in related courses. He even teaches his own Master's course: Collective Decision making. He tells us about the different approaches to learning in Maastricht, which causes a heavier burden on professors. The group of students is split up into smaller classes than the case is in Tilburg. Bas is able to have a more direct connection with students as he often teaches only fifteen of them at once. This does mean however that he must more or less repeat the same story more often. Knowing about Maastricht's methods like he experienced now before he started studying in Tilburg would not have lured him over. Let us just say he has never regretted that he studied in Tilburg.

One of the reasons for this absence of regret is the fact that he enjoyed his time with Asset | Econometrics so much. Surprisingly, his most active years were during his Ph.D. Bas, therefore, calls himself a late bloomer. One might add that he suffers from separation anxiety too, which is a good thing as he is still involved with Asset | Econometrics. Mr. Dietzenbacher is a proud KOALA-committee member and was happy to take part in organizing the KOALA dinner last November. A slight disadvantage of living in Maastricht is the distance from the larger cities, which is where many of his econometrics friends have ended up. This cannot withhold him from meeting up with them every now and then. Activities like the ones organized by his committee form excellent opportunities to maintain contact.

During his student days, he wrote for the Nekst, participated in six (!) International Business Tours and generally really enjoyed bonding with fellow econometricians. We do not need to dive deep into the Nekst archive to find Bas' last appearance with us. In 2019 he wrote a column on traveling professors. It seems that going around the entire globe is a recurring theme in Bas' life. I present to you exhibit A: the staggering list containing metropolises like New York, Hong Kong, and Mexico City which he all toured on various IBT's. These trips, faring through some of the world's capitals with 23 fellow students, have brought Bas some cherished memories.

Luckily, there is still some time on hand besides teaching and doing research in Maastricht. Although he also relishes these moments, enjoying being part of an academic community he respects highly, some of life's happiness is found in other areas. Music has been a part of him since way before studying. This is what made up most of his social life before Asset | Econometrics times, rehearsing and practicing his handling of the saxophone. Hanging behind him on his wall is a blue poster of a man playing a music instrument. Bas does not hesitate to tell us that it is just a simple IKEA poster, but that does not compromise the appropriateness of the image, according to us.

The border crossing elements recur once more, as he has played in Austria, France, Germany, and China with his orchestra. To us, this indicates that Mr. Dietzenbacher is not only talented in the mathematical department, but also in the musical sense. This does come with a lot of practice, is what he explains to us. Even now, he still plays three evenings a week, being active as a musician in both Eindhoven and Maastricht.

A quick Google search reveals that we have a world champion on our hands in this interview. Bas played part in the wind orchestra from Maastricht that conquered what would be the Champions League for orchestras, back in 2017. The fact that two saxophones were stolen from his car just before gives this story an extra touch.

The last hobby we got to talk about was playing board games. According to Bas, love for board games comes pre-installed with many econometrics students. He decided to bless us with some recommendations. If you do not know what to pick when staring at your board game cabinet, maybe try Barrage once. When 'bragging' about the 250 games Bas supposedly owns (truly bragging is absolutely not something we consider Bas to do, ever), he also mentions Brass Birmingham. There is more than enough to explore!

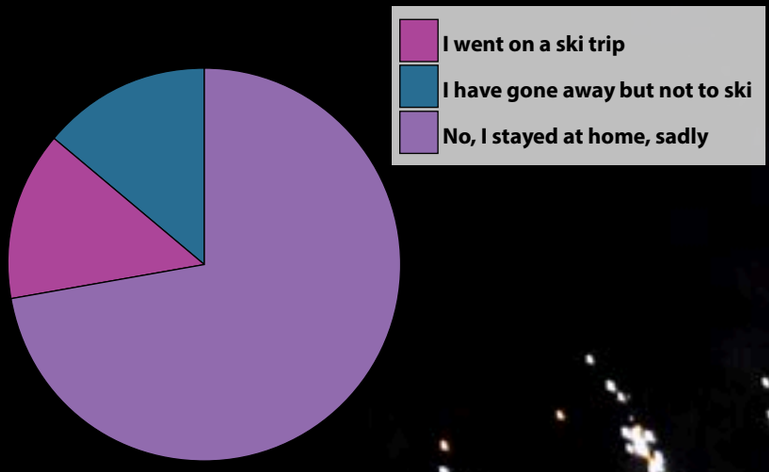
We would like to thank Bas Dietzenbacher for his time and storytelling. We really enjoyed the talk and the interesting anecdotes and views he shared with us. Luckily, as someone who is still active in the association, Bas himself will receive this edition of the Nekst too! Maybe he will return in a future edition. Anyhow, we are sure he will be around every now and then for some more time to come! ●

Let's Talk!

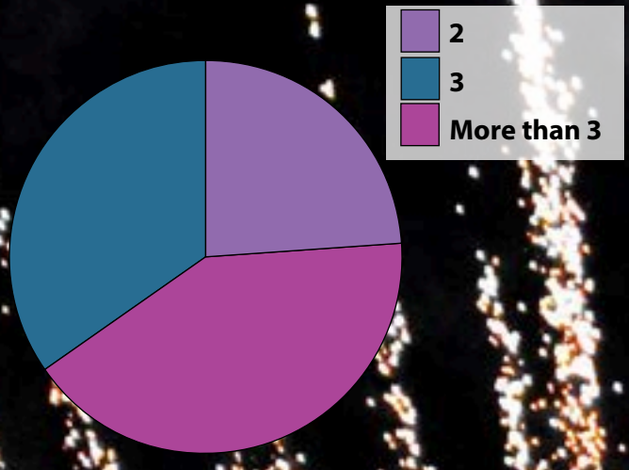
Since it is the season of festivities again, let's talk about the holidays! After a few weeks of thoroughly studying we can finally take some time away from the university. Since we jump from studying straight to Christmas, this usually means a fancy dinner with the family and lots of presents. After Christmas, we head to New Year's Eve. There are two main ways to spend New Year's Eve, fireworks or drinking, preferably not both. Even if you did not set off any fireworks yourself, all you had to do was look up to enjoy other people's private fireworks shows. Now that we have had a couple of wild days behind us, we have to return back to hard studying on campus. However, not everyone celebrates the holiday season in the same way which is why we have asked you to share your holiday season with us.

written by **Guus van der Velden**

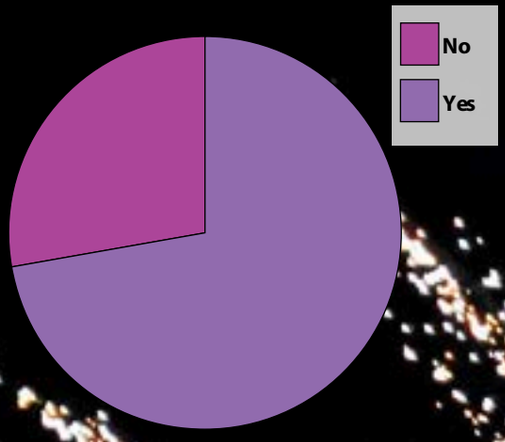
Have you gone on vacation?



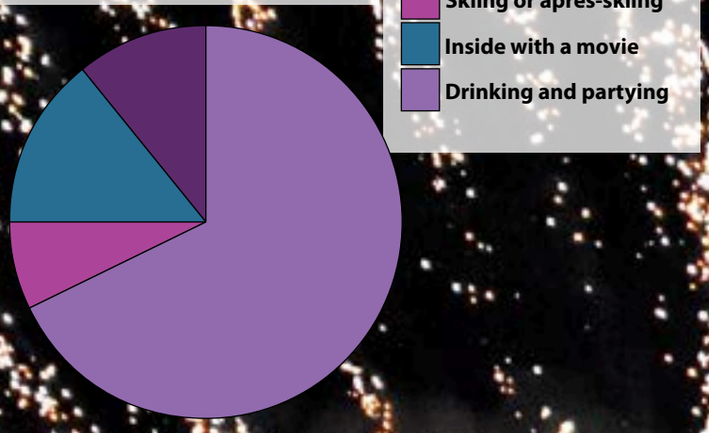
How many Christmas dinners did you have?



Did you have a Christmas dinner with friends?



How did you spend New Year's Eve?



With the new year comes New Year's resolutions. Although, for most people these are just something that would be nice if they can keep up (on average New Year's resolutions last a meager 12 days), for some people a good New Year' s resolution can really help improve their lives. That is why we have also asked for your New Year's resolutions.

"Stop spending so much time on TikTok."

"I want to start and finish my Master's thesis. Visit at least two countries that I have not visited yet. Also, I would like to learn a new language, probably Arabic."

"Drink more"

"Eat healthier"

"Get good grades during my Master's degree"

"I want to stop playing on my phone in bed before sleep"

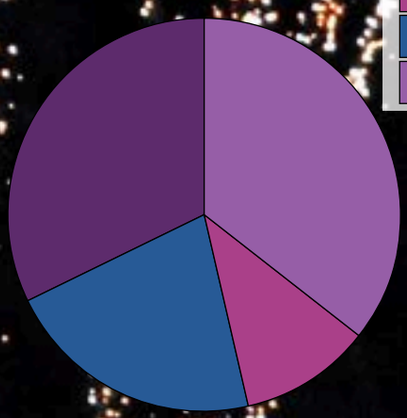
Finally, the holidays are always chaotic times with lots of opportunities for things to go wrong. Therefore, here are some of the funny stories you guys came up with.

I have seen prince Maurits at the après ski.

I had a Christmas dinner with my family at a fancy restaurant. Apparently, it was way more crowded than usual, so the food was a little cold because the servants could not handle the extra amount of work. After lots of people had complained, the restaurant manager announced that the entire evening would be on the house. It would have cost over 300 euros for us. From now on, 2022 will be known as the cheapest Christmas ever.

I ate a can of tuna for an anytimer in de Boekanier.

Do you still have to study after the break?



Keep On Studying Once You Work, It Is Over

written by **Selina Bötzel** and **Martin Kubiçek**

On January 6, we were delighted to talk to Gina and Felix, the great parents of our Juliëtte Tillie. Once her parents began telling us about their student years, it was instantly apparent where Juliëtte's ambitions emanated. At the age of only 22 years, Gina already worked full-time and studied her post-HBO in Business Administration during her evenings. Yet Gina always wanted to start a company which she later brought to life at the age of 31. Her studies culminated in her dream of being an independent sales agent with furniture and decorations. She is now a representative for other companies, which allows her to meet retailers, shops, architects, and restaurants daily.

Felix had a vibrant educational journey as he studied three studies at the Eindhoven University of Technology. Initially, Felix began with two years of Mechanical Engineering, after which he switched to Building Sciences with a later specialization in execution. After a year in Building Sciences, Felix added another study, the study of Technology and Society, which partly intertwines with the Building Sciences hence the studies went well together. Felix finished his studies with a Master's degree in 1999. In his third year, Felix joined the SSRE student association for two years, yet he could not be much active due to his occupation with double degree studies.

After graduation, Felix carried on in the construction industry as a project manager mainly focused on the logistical warehouses. Since starting a project for Sony Logistics here in Tilburg 20 years ago, Felix continues honing his skills in the warehouse construction field. Over the years, Felix had switched between multiple international companies, which helped him learn his strengths. The advice comes from experience and applies to anyone who wants to succeed in their career.

Both Felix and Gina invested quite some time into their careers, and they are both inspirational as they both operated independently in their field of study for decades. They also said they really do the job they aspired to do and followed their dream instead of a steady nine-to-five job. During their college years, Gina and Felix met each other via the organization of a ski trip. Looking back, Felix told us about how the continuous increase in popularity of the ski trip later resulted in a few injuries. Felix was also a good runner in his university years, as he ran the last stage of the Batavierenrace and helped his team to place eighth in the overall standings.

The study of Technology and Society, where Felix pursued the International Technological Development Sciences, was directed toward technological aid in emerging economies. This opened the couple an opportunity for a seven-month stay in Tanzania, where Felix did his practical research on the roofing tile use in Dar es Salaam. Being abroad led Felix to realize the importance of social aspects, even in the technical industries such as the already mentioned Building Sciences.

Lastly, we talked to Felix and Gina about their daughter Juliëtte. When asked whether they expected her to choose econometrics in Tilburg, we were a bit surprised by their answer. Gina told us how invested in either theatre or film Juliëtte was. Ultimately, it was her teacher who persuaded Juliëtte about her talent in mathematics. And although Juliëtte set her sights on the Film Academy in Amsterdam, she could not enroll there and attended a Communication study related to film at Fontys instead. But at that point, it was evident that a math-related subject was a better fit for her.

On the other hand, Juliëtte's aspiration to be on the board of Asset | Econometrics was supported and also anticipated by her parents. Ever since her childhood, Juliëtte was an energetic and active child who loved being in the spotlight, which is drastically different from her parents. They presented themselves as more passive and were wondering from whom Juliëtte might have inherited such traits. For illustration, Gina told us a story of a seven year old Juliëtte who had decided to sing her own written song at a celebratory pool opening. We can conclude that after all those years, our Juliëtte "Tillie" is still as ecstatic and active as she was in her childhood years. ●

Juliëtte

Interview with Joost de Jong
Energy Trader at Northpool

'THE ENERGY TRANSITION IS THE THEME OF OUR GENERATION'

When Joost de Jong came into contact with Northpool, he was still a student. "I met the company at the career days at Delft University in 2019. I visited the event again one year later and Trisha - one of my colleagues now - recognised me. 'How did your thesis go?' she said and she remembered the topic I told her about a year before. That made me feel really valued and I decided to try it out at Northpool."

Many opportunities

Since June 2020 Joost has been working as an energy trader. "I get a huge feeling of opportunity and a bit of restlessness too. The energy market is still developing and although more competitors are entering, I expect volatility to remain high. Especially with the amount of renewables we are placing on the grid."

From junior to independent trader

After learning the basics of the energy market as a junior, Joost was able to quickly sit in on the shifts and see everything in action. "As a junior trader you will train in our own simulation environment just to get you ready for the real deal. You will start out small just with one or two delivery hours per country. From there on, you expand. Step by step you become more independent until you are able to trade all countries and lead your own shifts. It's a steep learning curve but I think you can go from junior trader to independent trader within a year."

It can be stressful, Joost explains. "You are involved with money making decisions all the time and you can constantly ask yourself: 'Could I have seen this move coming, should I have timed the market differently?'. But you have to realize that the most important thing is consistency. You can't win every hour but if you are consistent you will do better in the long run. Tomorrow is another day, another puzzle, so you can try again."

Working on the future

As a 24/7 trading company Northpool works in shifts. "We want you to be able to do every type of shift so you will need to see them all regularly. By trading the energy markets we stabilize the grid and are a part of the price formation process. We can literally flow surplus wind power from the UK via underseas cables to a cloudy France where there is less solar generation than expected. It avoids them having to turn off wind turbines and burn extra gas. With more renewable energy to be installed it becomes increasingly challenging to keep the European grid stable and efficient. This energy transition is the theme of our generation and we are just a part of that. That's why working at a company like this really feels like working on the future."

We like to share our knowledge and are always looking for talent. So if you have an analytical mind, superb mathematical instincts and you can't rest until you solve the task: apply!

WWW.NORTHPOOL.NL/VACANCIES

NORTHPOOL
TRADING ENERGY

Puzzle Time

This edition is a logical deduction puzzle. Someone was murdered in a student house and you need to figure out who did it. This student house has six inhabitants including the victim and the murderer. This means that there are five suspects. Luckily, everyone in this house tends to strictly follow a tight schedule. However, on this specific day one of the inhabitants deviates at the time of the murder. To complete this puzzle we need to know when the only possible time is that Freek got murdered and by who. Freek's death was noticed at 17.00. The day starts at .:00.

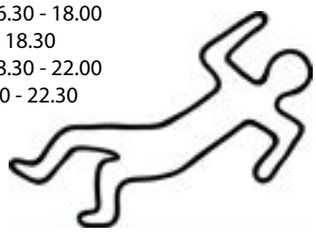
written by **Huub Hoven** and **Martin Kubiçek**

Law 1: If someone notices someone else diverge from their daily schedule, they immediately check up on them.
Law 2: If two or more people are in the same room, they notice each other's presence.
Law 3: Movements and actions can only happen every quarter, the murder too.
Law 4: Every time someone moves to a room or outside, they always pass through the hall where they can also see each other.
Law 5: Everyone has their own bedroom, if it is not specified assume that everyone uses their own bedroom.
Law 6: No one is able to get out of the periods of work or university.
Law 7: People cannot see each other at university or at work

Adam:
Bedroom 22.00 - 7.45
Bathroom 7.45 - 8.00
Kitchen 8.00 - 8.30
University 8.30 - 15.00
Living Room 15.00 - 17.30
Kitchen 17.30 - 19.00
Living Room 19.00 - 22.00

Bob:
Bedroom 22.00 - 8.30
Kitchen 8.30-9.00
Living Room 9.00-9.30
Eva's Bedroom 9.30-11.00
University 11.00-17.30
Kitchen 17.30-18.30
Living Room 18.30-19.15
Bathroom 19.15-19.30
Living Room 19.30-22.00

Clara:
Bedroom 22.30 - 8.30
Kitchen 8.30-9.30
University 9.30-16.30
Living Room 16.30 - 18.00
Kitchen 18.00 - 18.30
Living Room 18.30 - 22.00
Bathroom 22.00 - 22.30



Dylan:
Bedroom 23.00 - 6.30
Bathroom 6.30 - 6.45
Kitchen 6.45 - 7.00
At Work 7.00 - 10.30
Living Room 10.30 - 10.45
Kitchen 10.45 - 11.30
At Work 11.30 - 16.00
Living Room 16.00 - 18.00
Kitchen 18.00 - 19.00
Living Room 19.00 - 23.00

Eva:
Bedroom 00.00 - 10.30
Living Room 10.30 - 10.45
Kitchen 10.45 - 11.30
University 11.30-15.00
Living Room 15.00-18.30
Kitchen 18.30-19.00
Living Room 19.00-19.15
Bedroom 19.15-19.45
Bathroom 19.45-20.00
Living Room 20.00-00.00

Freek:
Bedroom 22.00 - 8.30
Bathroom 8.30-8.45
Kitchen 8.45-9.00
Living Room 9.00-9.30
Bedroom 9.30-17.00
Living Room 17.00-17.15
Kitchen 17.15-22.00

Can you figure out the puzzle?
Please enter your solutions at www.Nekst-Online.nl/Puzzle. A goodiebag 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!

Koen de Jong is the winner of the previous puzzle. The solution of the previous puzzle can be found at www.Nekst-Online.nl.

Asset | Econometrics congratulates...

Name **Joshua Kalisvaart**
Title Constrained K-means Clustering and Vehicle Routing
MSc BAOR
Supervisors Dr.ir.ing. M.J.P. Peeters, Dr. J.C. Wagenaar

Name **Guohao Liu**
Title The Impact of U.S. Pension Funds' Assets on National Savings and Capital Market
MSc QFAS
Supervisors Dr. P. Cizek, Dr. D. Kojevnikov

Name **Luuk van Son**
Title Semi-Supervised Learning for Imbalanced Classification with Label Scarcity in the domain of Financial Fraud Detection
MSc BAOR
Supervisors Dr. M. Zamani, Dr. M. Delorme

Name **Dirk Cremers**
Title Enhancing Time Series Forecasting On the use of cohort LightGBM models to achieve better performance
MSc BAOR
Supervisors Prof.dr. K.J.M. Huisman, Prof.dr.ir. H.A.M. Daniels

Name **Matthijs Kokken**
Title Using the solidarity reserve in the new Dutch pension contract to reduce the probability of year on year pension income reductions
MSc QFAS
Supervisors Prof.dr. T.E. Nijman/E.C. Erk MSc., Prof.dr. B.J.M. Werker

Name **Monique Groen**
Title A three-population model to analyze the hedge effectiveness of a U.K. mortality index including socio-economic differences
MSc QFAS
Supervisors Prof.dr. B. Melenberg, Prof.dr. A.M.B De Waegenaere

Name **Gillian Bon**
Title Designing an Inbound Supply Chain Network Using Two-Stage Stochastic Optimization: A Case Study at Kramp
MSc BAOR
Supervisors Dr. Y. Merzifonluoglu, Dr. G. Kant

Name **Vid Tomljenovic**
Title Reinforcement Learning and Heuristic Approach to solving the Container Delivering Problem
MSc BAOR
Supervisors Dr. Y. Merzifonluoglu, Dr. G. Spigler (TSHD)

Name **Ramsy Ghedamsi Dhifallah**
Title Challenging the Probability of Default Model of Achmea Bank with Interpretable Machine Learning Techniques.
MSc QFAS
Supervisors Dr. R. van den Akker, Dr. N.F.F. Schweizer

Name **Tijmen van Zutphen**
Title A study on the feasibility of predicting helicopter breakdown probabilities using statistical learning techniques
MSc BAOR
Supervisors Dr.ir.ing. M.J.P. Peeters, Dr. G. Kant

Name **Thomas Herrings**
Title Estimating Time Preferences of the Teachers in Duflo, Hanna, and Ryan (AER 2012)
MSc EME
Supervisors Prof.dr. J.H. Abbring, Prof.dr. T.J. Klein

Name **Bernard van den Broek**
Title Choice of the Utility Function in the Risk Preference Study of the new Dutch Pension System
MSc EME
Supervisors Dr. J.R. de Bresser, Dr. A.G. Balter

Name **Lonneke Heijnen**
Title Minimizing Waste in the Fruit and Vegetable Supply Chain: Role of Inventory Management
MSc BAOR
Supervisors Dr. Y. Merzifonluoglu, Dr. J.C. Wagenaar

Name **Sven van Vliet**
Title The impact of the Solvency II review on hedging interest rate risk at Aegon Nederland
MSc QFAS
Supervisors Prof.dr. B.J.M. Werker, Prof.dr. T.E. Nijman

Name **Arvid Wamelink**
Title Yield curve scenario generation using generative adversarial networks
MSc QFAS
Supervisors Dr. R. van den Akker, Dr. C. Hambel

Name **Steyn Oversteegen**
Title Collective investment for heterogeneous individuals: A numerical approach
MSc QFAS
Supervisors Dr. A.G. Balter, Dr. N.F.F. Schweizer

Name **Jesse Swinkels**
Title Crop Residue Burning in Telangana
MSc BAOR
Supervisors Dr. J.C. Wagenaar, Dr. Y. Merzifonluoglu

Name **Wouter Ruissen**
Title Two parallel machines sequencing problems and corresponding games
MSc BAOR
Supervisors Prof.dr. P.E.M. Borm, Dr. M. Quant

Name **Konstantinos Alexiou**
Title The effect of COVID-19 vaccination on mental health outcomes
MSc EME
Supervisors Dr. B.M. Siflinger, Dr. P. Cizek

Name **Mieke Couwenberg**
Title Crop Yield Predictions based on open, medium-resolution satellite imagery in Karnataka
MSc BAOR
Supervisors Dr. J.C. Wagenaar, Dr. M. Balvert

Name **Pim Smulders**
Title Large-scale brownfield hierarchical facility location network design
MSc BAOR
Supervisors Prof.dr. G. Kant, Dr.ir.ing. M.J.P. Peeters

Name **Jasper Roos**
Title Radiomics and Machine Learning in Prostate Cancer
MSc EME
Supervisors Dr. C.B.T. Walsh, Dr. O. Boldea

Name **Gökce Güvenc**
Title Time Series Classification: A Fault Detection Model for Solar Panel Yields
MSc BAOR
Supervisors Dr. J.C. Vera-Lizcano, Dr. C. Dobre

...on obtaining their Master's degree

Quatsch!

¯_(ツ)_/¯

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 send in your quotes at:
www.Asset-Econometrics.nl/more/nekst/Quatsch

Siebe
"Ik vind banaan niet echt tellen als fruit, ik vind het meer een aardappel"

Matthijs
"Ik ben niet geiced, ik heb het gewoon als eerste gezien"

Elise
"Loop jij mondiaal? Ik bedoel Liniaal."

Siebe
"Jelte was vroeger lang"

Ikie (Over het olympisch stadion in Amsterdam)
"Is dit de kuip?"

Selina (Over extra blessuretijd tijdens het wk)
"Oh komt dat door het tijdsverschil?"

Matthijs (Over soep)
"Oh dit is... Hoe heet dit ook alweer?"

Juliëtte
"Gazpacho! Maar dat is koude soep, dat is dit niet"

Luc
"Nee, dit is warm"

Matthijs
"Oh ja dit is warme gazpacho!"

Luc (Over een touchscreen)
"Is dit een toetsscreen"

NOTHING BEATS **TRADING**

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Agenda

WED **01** MAR – FRI **03** MAR

Econometrics Consultancy Tour

During this two-day, two-night tour we visit several companies that work in the field of consultancy. Every company will talk about their field of work and will provide an interesting case. The participants will be chosen by the companies according to their CVs.

MON **06** MAR

QFAS Inhouseday

On Monday March 6 a group of QFAS-oriented students will visit Allianz and Zanders to find out all about what it is like to work there. This does not mean you will have to study QFAS; if you are interested in the master or the companies, this day will be for you!

TUE **07** MAR

Econometricians for Society Activity

A few times this year, the Econometricians for Society Committee will organize an activity focused on charity. What this activity will be is still unknown… but we will make sure you will have fun while also helping a good cause! Make sure to note this down in your agendas!

WED **08** MAR

Stress Training

Feeling a bit stressed from time to time? Maybe you have a busy schedule, exams take their toll, there is a different reason, or maybe you are interested in learning how to cope with stress in different situations. During this first edition of the Stress Training the trainers of Young Colfield will teach you techniques that will help in your everyday life.

THU **09** MAR

COdE

Active members, beware. The COdE will return. On March 9 we will all toast again on our association and have a good time. More information on the registration process will follow later on, but make sure to block your agendas!

WED **15** MAR

Board Information Session

Have you ever wondered if a board year at Asset | Econometrics is for you? Are you interested in knowing more about the everyday life of a boardie, and what the different functions actually involve? You are all welcome at the Board Information Session. After the session, the applications for this summer will open. Opening functions: Chairman, Secretary, Treasurer and External Affairs Officer.

THU **16** MAR

OG Troubadour de l'Amour

Are you old, gold and excited for an amazing night filled with love? Of course you are! Our Olden Goldies committee is playing cupid and invites all fourth year and older students to the second edition of the Astrics Date Dinner, this year known as 'Troubadour de l'Amour'.

FRI **17** MAR

Parents Evening

Tired of explaining every detail of your Astrics adventures to your parents? Or do you want to show them what the university, and what our study is actually like? We invite you and your parents to the parents evening. During this evening they will learn more about studying EOR in Tilburg via a talk of a professor, a fun pub quiz and a drink.

MON **20** MAR

Lunch Lecture

The Belastingdienst is not only busy with sending out blue letters. The FIOD department is responsible for investigating financial and fiscal crimes, for example by fraud detection. One of their employees will give an interesting talk about this during our Lunch Lecture. And you are invited to listen, while enjoying a free luxurious lunch.

Register and find more information about our events at
www.Asset-Econometrics.nl/events


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