

nekst >>

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Special

Code Breaking in World War II



Interview

Emotions



Familiar Faces

Independent Chairman
Bas Ramaekers



Report

Exchange in Canada
and Hong Kong



New Year, New Nekst

Time flies when you are having fun! Very cliché, but we are already in the middle of our second semester. Of course this is not because of all the hard work we've put in, but because of all the exciting days that are ahead of us. New Year's resolutions are already leaving, everyone has recovered from Carnaval, the last winter sports are also over by now and the first days of spring have already passed despite a few Dutch storms.

In this Spring-edition of Nekst we have an interesting article written by Max van der Lee, a former chairman, about how he experienced his time as a board member, but especially afterwards. Besides that, we had a chat with our own Bas Ramaekers, who is currently the Independent Chairman of Asset Tilburg. Another former chairman of our study association also contributed to this edition of Nekst: Thijs Kramer wrote A Graduate's Life. Last but not least and to stay in the trend of our (former) chairmen, Quirien Raat also wrote an article for this Nekst, namely a practical report on the subject he recently graduated with.

In addition to this chairman-thing, we have plenty of other, lighter articles about activities in recent months, but of course also an interesting puzzle and a very special edition of Quatsch. In short, enough reading material to be able to express some study avoidance behavior during this last quarter of the school year. Hang on, summer break is near!

Emma Segers

Editor-In-Chief

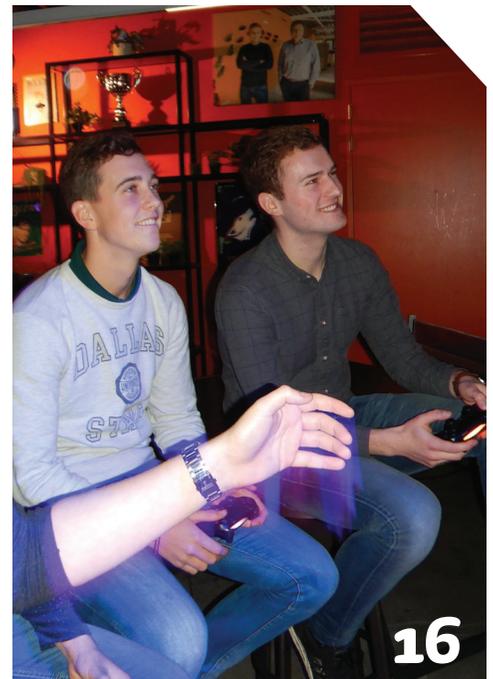


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Dear Members,

Finally we have been able to leave the cold and long nights behind us. Even though I enjoyed the coziness of laying down on the couch with a warm blanket and a cup of tea, I am definitely ready to jump into spring! A lot of exciting things are waiting for us, but before I want to touch upon those, I would like to look back at all the happy memories that winter has brought us.

Starting at the beginning of 2020 where we had our second Department Members Meeting. Not only did we evaluate our policy and budget, but several members joined to talk about their committee. They showed us pictures of the events that already took place and presented their ambitious ideas for the upcoming semester. Listening to all these great stories made me feel very proud to be part of our association. After the Department Members Meeting we invited all our active members to the Active Members Meeting that took place a few weeks after. During this meeting we brainstormed about several topics such as social media and members policy and gained some interesting insights.

Another great memory is about the National Econometricians Day (LED) where more than 130 of our members joined. During the day, students were able to talk to companies to get a better insight into their future career and puzzle over interesting cases. After this intense day of networking, the famous party took place where great memories were made for life.

The last event I would like to touch upon is the Europe Trip to Ljubljana. The organizing committee tried their very best to turn it into a great trip with lots of fun activities. In my opinion they fully succeeded in this goal. Personally, I had the best time ever which I probably told them one

to many times. Together with the group we had some nice dinners, visited a karaoke bar, had a city tour, visited a museum and even had some time on a rowing boat. Due to the great weather we had, the vibe was very relaxed and everyone enjoyed the activities that were planned.

After glancing back at these wonderful moments, it is time to have a look at what the future has in store for us. By the time you are reading this, the Parents Evening and the Econometrics Consultancy Tour have taken place already. Hence, let us look at the other events that are on the top of our calendar. As you all may know by now, the famous Active Members Weekend is coming up very soon and will cause a lot of nice memories. For a more formal event, I would like to invite you to the Connection Day on May 12 in order to help you orientate about your future. During this event you will meet several companies which you will get to know better by solving an interesting case.

Finally, I would like to make you aware of the fact that we are looking for the new board of Asset | Econometrics 2020 - 2021. Are you interested in taking this association to the next level in a board year? In that case, you should definitely send your application to the following e-mail address: applications@Asset-Econometrics.nl before April 12. Do you still have some questions about a board year and if it is something for you? Feel free to stop by the rooms to have a chat with us.

I would like to wish you the best of luck for the last few months of the semester and hope to see you at our events!

On behalf of the board,

Denise Jacobs

Chairman Asset | Econometrics 2019-2020

Exciting Times in Slovenia

From February 13 till February 17, the Europe Trip took place. This year we visited the capital of Slovenia: Ljubljana. For most of us this city was kind of a new territory, so it was a great opportunity to learn more about it. Besides that, it was a good trip to meet some other fellow econometrics students.

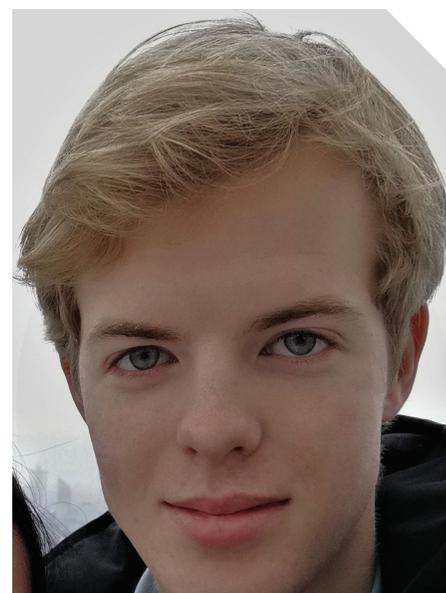
On the first day, Thursday, our flight left Amsterdam and we were on our way to our destination for a long weekend. After a short flight of one and a half hours, we landed in Ljubljana. The sun was already shining and we had a pleasant view at the mountains. The Europe Trip committee had arranged a few small vans that would take us to our hostel. The hostel was located in the middle of the city centre and next to a small Spar and a McDonald's, which most of us were really excited about. After a short break at the hostel, we went out for dinner at an inviting restaurant just around the corner. They gave us a separate room where we enjoyed some great food and wine. After dinner, we went straight to a karaoke bar; before our group arrived it was a bit quiet there. We were able to ask the DJ to play some songs and all of us participated in singing. We had a lovely time with each other and enjoyed some (very cheap) beers. After great singing, we left the karaoke bar and went to a pub just down the road where we had the chance to enjoy some more drinks and to have an enjoyable evening with each other. After a while, somewhere during the night, we found our beds.

We started the second day with some breakfast, either at the hostel or somewhere else. At 11.00 hours our guide for the city tour arrived at our hostel. At first, I was not really excited about this tour and I think I was not the only one.

But when we went on our way, it turned out to be more fun than I expected. Our guide was enthusiastic and knew a lot about the history of Ljubljana. She had a lot of love for her city and was able to teach us some interesting things. The tour got even better when she arranged us some shots at a little local shop.

After lunch we met at 14.30 hours to climb the steep hill to the castle. It was indeed a steep climb, but luckily it was only a few minutes to the top. At the top there was a wonderful castle, where we got some free time to explore it. Most of us were mostly interested in the castle tower, so after a little exploring, most of the group got up there. On top of the tower, we had a lovely view over Ljubljana, with some beautiful nature in the back. Fortunately, the sun was shining and there wasn't a lot of wind, so we were able to relax a bit until we had to go down. After a little walk we arrived back at our hostel; everyone was free to get some food and do whatever they'd like for a few hours.

Later in the evening we went to a rooftop bar where we had some time to get drinks and talk with each other. When we



Troy de Juncker

Bachelor EOR

Age: 21

were done at the rooftop, we went to Metelkova. There were supposed to be some cool bars to enjoy ourselves. However, it wasn't really the place we expected it to be. It was a broken down area with a lot of junkies and walls sprayed all over with graffiti. We quickly walked through this place and decided this was not the place where we wanted to spend the rest of our night. We went back to the pub we were the day before and stayed some time.

After maybe four hours of sleep, it was time for our third day in Ljubljana. Today's planning was to go to Lake Bled. At 09.00





hours we started to walk to the bus and after a bus ride of one hour, we arrived at Lake Bled. It was a big lake with a little island where a church was located. First, we walked a bit uphill with our guide towards Bled Castle. It was a small but beautiful castle where our guide taught us some things about it. When we were done with a small tour through the museum of the castle, we had some lunch inside the small cafe.

Then it was time to go down the hill again, towards the docks where the committee arranged a few canoes for us. We made some groups, and one by one we got into the canoe. On the water it was a great opportunity to enjoy the sun and just lay back, except for the one who was rowing. After some time on the water, there was an opportunity to dock at the island and to visit the church. Next to the church, there was a restaurant where some of the group grabbed a drink or a snack. The ones that entered the church were allowed to ring the bell at the top. Because the island was very small, we didn't spend a lot of time there. Some groups decided it was better just to get back on the water and enjoy some beers with some music. Then it

was time to row back to the shore and go back to the hostel. Here we had a free choice for our dinner again. Some others and I decided to eat at a tapas bar, where we tried some dishes I had never even heard about before.

When we had finished our lovely dinner, it was time to meet up at the hostel and get ready for the pubcrawl. We walked to a pub, where someone was waiting for us. She took us to four pubs where we had some shots and played some drinking games. After the pubs, she walked with us to club Cirkus where she said goodbye. The rest of us spent the rest of the night in the club and after some time inside, it was time to go to the hostel and go to bed.

The next morning we had some time to sleep in. At 11.00 hours it was time to go to the national museum. Here we got a short tour through the museum. During the tour, our guide talked about the history of Slovenia and its inhabitants. At the end of our tour she dressed up two students of our group and when a little role-play was done, she brought us to the last room of the museum. In this room there was a real pharaoh. She talked about how

they preserved it and even showed us some pictures of his X-ray scans.

After this trip to the museum there was some free time until we had to meet again for a short boat trip across the Ljubljanica river. On the river it was nice to just have a bit of fun and talk to each other while enjoying some beers. When we were back on land, we had some time to walk around or just get some rest. Around 18.00 hours it was time for the last dinner of this Europe Trip, so the committee arranged a restaurant to dine all together. After dinner we went back to the hostel. There we had a pub quiz made by the committee. When the pub quiz was finished, most of the people decided to party one last time in this lovely city in Slovenia, but for me it was time to get some rest, because we had to get up at 06.00 hours the next morning to head back to our own country.

All together, the Europe Trip was great and I am very happy I could come along. I got to know a whole new group of people while exploring the beautiful city of Ljubljana. I would like to thank the Europe Trip committee for arranging this amazing trip. ●

Meet the Crew 2.0!

Unfortunately, Wenxin and Jevgeni were only able to be part of this committee for the first and second edition. However, we were delighted to announce that for the third and fourth edition, two brand new members were added to our committee! Therefore, we would like to introduce our new writers to all our readers.

Written by **Janne Vos**



Casper Heemskerk

Casper Heemskerk is 18 years old and is from Oudewater. He is in the first year of his Bachelor and this committee is his very first at Asset | Econometrics. If he could switch lives with someone for one day, he would switch with the front man of the Foo Fighters. The reason for this is that their lives are absolute opposites. Since Casper does not describe himself as someone who wants to be in the spotlight, he would like to experience what that is like for one day and to find out whether he would miss any particular aspects of his own life. Casper definitely likes to go out, however he never speaks of "going out", he refers to going for "een klein stapje" (a small step). Much in line with this characteristic of him is that his motto is to enjoy every day, even if you are hungover. The best party he ever went to was the last day of school before exams at high school. The day was great, since the weather was perfect and everyone was in a good mood. At the end of the day they had a big party in a club in Gouda.

Jarno Ringhs

Jarno Ringhs is 18 years old and was raised in Maastricht. He is in the first year of his Bachelor. Nevertheless, he was already an active member of Asset | Econometrics before becoming a member of this committee, since he already is part of the Freshmen Committee. A talent that Jarno would like to have is to be better at cooking. Ever since he has to cook his own meals, he has produced some absolute shockers, as he states himself. The smurf that he would be if he were to be one, is "leerlingsmurf", so hopefully he will learn how to cook this year. If he could switch lives with someone for one day, he would switch with Mark Rutte. He would switch with the Dutch prime minister because he would like to experience what it is like to work under the pressure that he does. Besides, Jarno thinks he is just an awesome man. If he were to write a biography, he would name it: "Jarno Ringhs: Don't Expect Major Surprises". Perhaps this is a little bit related to the best gift he ever gave someone for his birthday: he once gave an envelope with some money and a card with the text "Happy birthday", which is indeed not a major surprise.



A Real Option in Research

This is my third column. The main idea of my columns this year is to tell you about my background, career, and motivation. In the second column I told you about my research, and, in particular, optimal control theory. I employ this mathematical tool to optimize firm decisions. For instance, a firm's investment decision enlarges its production capacity, so that the firm can produce more. However, this not only holds for today but also in the years to come. This means that with the decision a firm takes, also implications for the future have to be taken into account. Therefore, the optimization technique should be "dynamic".

Optimal control theory thus enables me to capture the fact that a firm should look into the future when making decisions. However, there is also a drawback: optimal control theory is only suitable to capture a deterministic environment. This means that one of the key assumptions is that one knows beforehand how, for instance, demand for a product will behave in the future. This is not how it works in real life. When Nokia was investing in production capacity to produce its mobile phones around 2000, it did not foresee that a few years later competitors introduced the smartphone, which considerably reduced the demand of the Nokia phone. On the other hand, smartphone producers like Samsung and Apple, had no idea that their products would conquer the world like the way it went after 2010.

To make a long story short, optimal control theory does not capture uncertainty. Therefore, in the eighties and the beginning of the nineties I was looking for a "user friendly" mathematical technique that is dynamic and at the same time allows me to take into account an uncertain future. I had the breakthrough at the day before Christmas in the year 1994. One of the last things I did before going home and celebrating the last days of the year, was paying a visit to the library, where at that time there was a

fixed place where the new books were exposed. There I saw for the first time the Dixit and Pindyck book 'Investment under Uncertainty'. For me it was immediately clear that this is what I was looking for all these years. In the book an investment opportunity was seen as a real option, where the firm has the right, but not the obligation, to undertake the investment and thus exercise its option to invest. I took the book home and every day I read a chapter. From that moment on, I had, besides optimal control theory, a new topic: real options theory. With my coworkers we set up a new research field in that we extended this theory with game theory that allows to have several decision makers (firms) in one model. In this way we do not only cover dynamics and uncertainty, but also competition. The latter aspect is of key importance to understand firm behavior.

After the Christmas holidays, I told my boss Frank van der Duyn Schouten about this. He told me that there is only one way to learn a new topic and that is that I should teach it. I am still grateful that he created space in the teaching program at that time for the topic 'Investment under Uncertainty'. From that year on I taught it every year not only in Tilburg, but also in places like Antwerp, Vienna, Helsinki, and Montreal. Over the years there were several students following my course, which inspired them so much that they decided to pursue an academic career, which typically starts by becoming a PhD student. Today several of them already became full professors themselves. Now they work in places like Tilburg (Kuno), York (Jacco, Nick), Lancaster (Grzegorz), Rotterdam (Sebastian), Trondheim (Verena, Maria, Roel), Amsterdam (Marco), Delft (Hettie), Bielefeld (Xingang), and Antwerp (Ruslan, Magdalena, Tine, Glen, Matteo, Maximilian). Without exaggeration it can be stated that my decision to go to the library instead of going home the day before Christmas in 1994 severely influenced the life of these young scientists. ●

Peter Kort

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



My Travel Experience in Hong Kong

On August 22, 2019, after a few months of preparation, I was finally ready to start the greatest adventure of my life. I was going to live in Hong Kong for five months! I never actually visited a country outside of Europe and therefore I was nervous but also excited to get on the plane to Asia. At 17.00 hours, the plane took off from Schiphol Airport and the adventure finally began.

The Journey to Sham Shui Po

Me and my fellow exchange students arrived at Hong Kong Airport after an eleven hour flight. After picking up the suitcases, we needed to buy a sim card and an octopus card (kind of the Dutch OV-card) in order to find our way to the accommodation. After we received the cards, we boarded the Airport Express in the direction of Sham Shui Po. This is the area of Hong Kong where I lived for five months. I was quite curious whether I would like this place because it was not the campus residence of the university where most exchange students were living. However, I ended up in the perfect place called 'Apple Dorm' which is a flat with approximately 100 small rooms of three square metres. You probably think this is impossible but despite the size I miss my Hong Kong room a lot. The best part of Apple Dorm was the rooftop. Every day around 16.00 hours, all exchange students were meeting up there to

talk about the day together with some nice beers and card games.

The first day, I explored the Sham Shui Po neighbourhood that apparently contained plenty of street markets where they sold the funniest stuff. For example, stores that only sell remote controls. The fake iPhone shops are also impossible to miss on every corner of the street. I finished the day in Dragon Centre, which is a huge shopping mall opposite to Apple Dorm. I stopped together with some people from Apple Dorm on the 8th floor to get some dinner. The food court consisted of many super small Asian restaurants where you could buy your favorite Asian dish for less than € 4,00. It turned out that this was going to be our regular dining spot, because cooking is not as common in Hong Kong as in the Netherlands. Now that I am back home, I already miss my favourite chicken and pork dishes and I definitely recommend going to this place if you visit Hong Kong. You can have the real Hong Kong food experience here.

Culture of Hong Kong & The Protests

I always wanted to go to Asia because my father travels often to Asian countries. He told me many stories about his trips that made me interested. Hong Kong was perfectly in the middle of East-Asia which allowed me to travel to many Asian countries whenever I had the opportunity. In the beginning it was strange to be



Hugo de Vries

Bachelor EOR

Age: 21

on my own in Hong Kong. However, after the first few days at the rooftop, everybody knew each other. We drank beers and played games together like we were friends for years. In the beginning, this helped me to feel a bit more at home, because sometimes it feels like you are the only European walking between all the Hongkongers.

However, the culture shock was not as big as I expected. This was probably because the protests were not as violent as I saw on the Dutch news. It was of course true what you saw on the news. But it looked like every place in Hong Kong was attacked which was definitely not the case. The protests took place at really specific spots in Hong Kong and you always got a warning from friends on WhatsApp. Therefore, you were always up-to-date with the latest facts which helped me to avoid the protests.

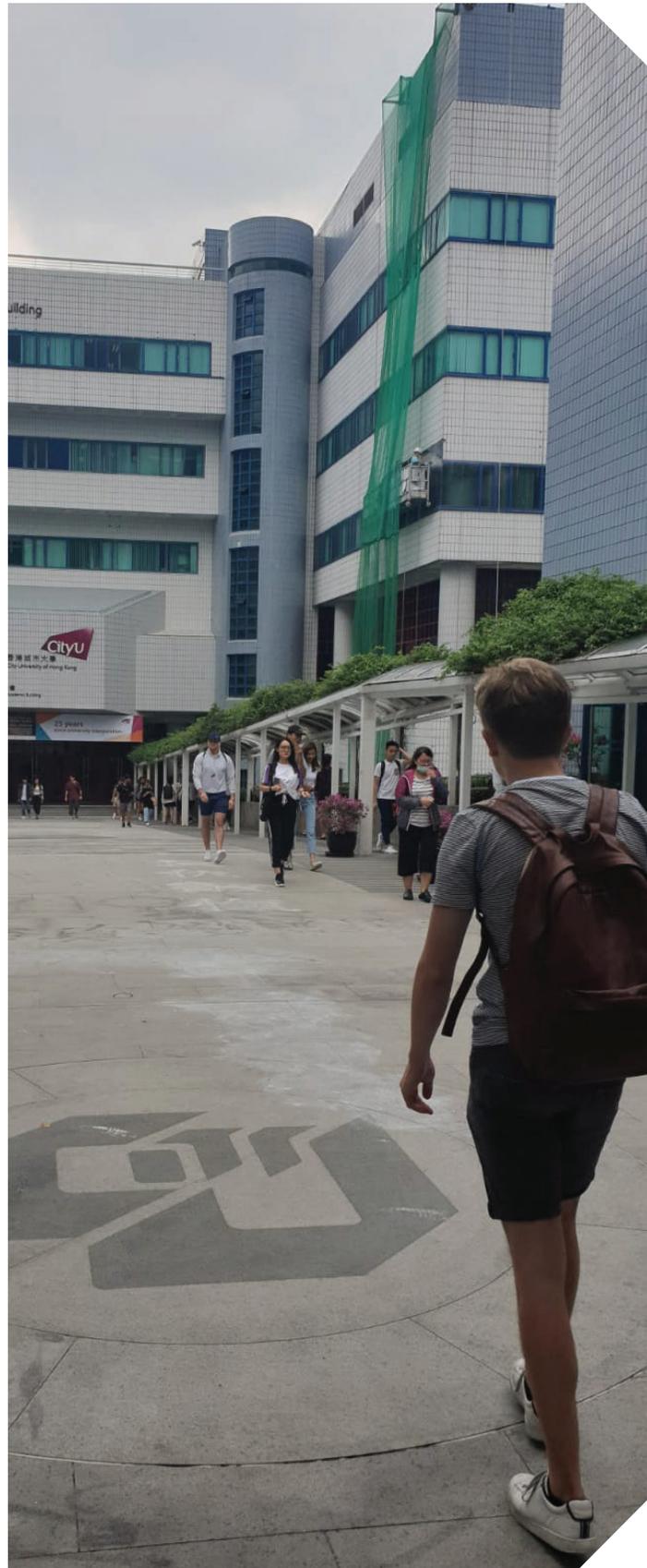
What really surprised me about the culture was that the Hongkongers were very friendly and patient. Especially the students and people my age.

I played many games in the bar together with them because they were always curious what games I played in The Netherlands. Hence, we made the deal: if I teach you a game, you have to teach us a Hong Kong game. This always resulted in the best bar nights at 'Bar Pacific', which was one of our favorite pubs. Sometimes a little bit too many beers, but it was all worth it! As I mentioned, Hongkongers are very patient. For example, they wait patiently in the queue for the metro and bus, which is definitely not the case in The Netherlands.

City University of Hong Kong

I followed two EOR-courses, two Philosophy courses and one free elective which was required in order to transfer 30 ECTS to my Bachelor program. Hong Kong is one of the places where it is possible to follow econometrics courses. Many partner universities of Tilburg University do not offer these courses. However, you should not let this stop you from going on exchange because it is really worth it. It will be the best time of your life, even if you do not obtain all your credits. The first week of the semester consisted of introduction activities. I participated in the campus tour in order to get familiar with the buildings. After the tour, I had lunch together with some exchange students and local students who explained everything about the dining etiquette. Moreover, we learned about typical dim sum dishes such as dumplings, vegetables, spring rolls and more. Then I finally started the first study week. This was different compared to The Netherlands. It was mandatory to go to the lectures in order to pass your attendance grade. Furthermore, the lectures were very interactive and students had to participate because this was necessary for your participation grade. The level of education was relatively low compared to Tilburg University. This gave me and many students the opportunity to explore Hong Kong and nearby countries even more.

In week twelve of the semester, many universities in Hong Kong decided to end the semester because of the protests. Therefore, I had to finish my exams and papers online. This was not a problem for me because I could finish everything quite easily at home and after that it was time to travel!

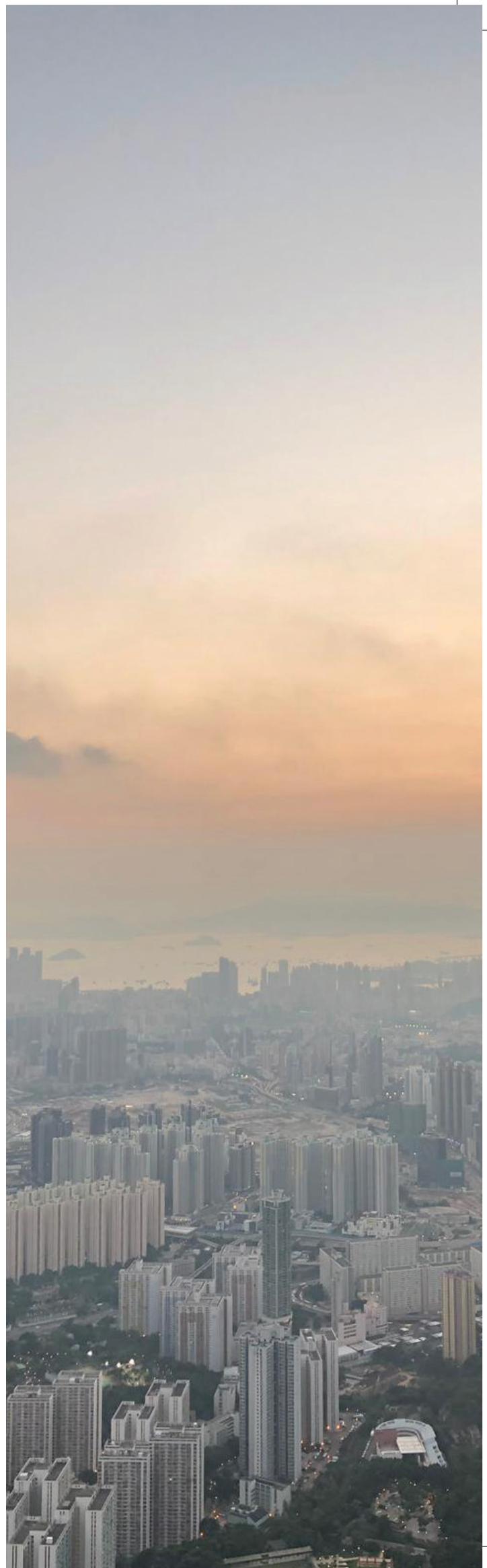


>> exchange: hong kong

A Million Things To Do!

Hong Kong feels like a city but it is much bigger than I thought. Hong Kong is about the same size as the province Utrecht. That is why Hong Kong has so many different interesting spots, which genuinely surprised me. Hong Kong is a combination of skyscrapers and nature. Firstly, we can divide Hong Kong in Kowloon which is the mainland of Hong Kong and we have Hong Kong Island which is the financial district of Hong Kong. Sham Shui Po area is located on the Kowloon side. One of my favorite activities in Hong Kong was hiking. I went to the top of the Lion Rock, Suicide Cliff, Dragon's Back and Victoria Peak. This was not as easy as I expected and after litres of sweat and with heavy legs, the whole group finally arrived at the top! In the pictures you can definitely see that it was worth it! A fantastic view! My favourite sports activity was the hike to the cliff jumping spot in Sai Kung. This place was in the east of Hong Kong in Sai Kung National Park. Firstly, my friends and I took the bus to Sai Wan Pavilion. From here, we hiked for 40 minutes to Sai Wan Village. Finally, we climbed the rocks for 20 minutes in order to reach the cliff jumping spot in the Sheung Luk Stream. We enjoyed the water for hours and enjoyed jumping off the eight meter high cliff.

If you are done hiking, you can enjoy horse racing at the Happy Valley Racecourse every Wednesday. Many exchange students and expats go to this occasion to bet small amounts of money on horses and try to win some money. But the occasion is especially nice to socialize with fellow exchange students. Afterwards, I normally went to Wan Chai which is together with Central area the party district.

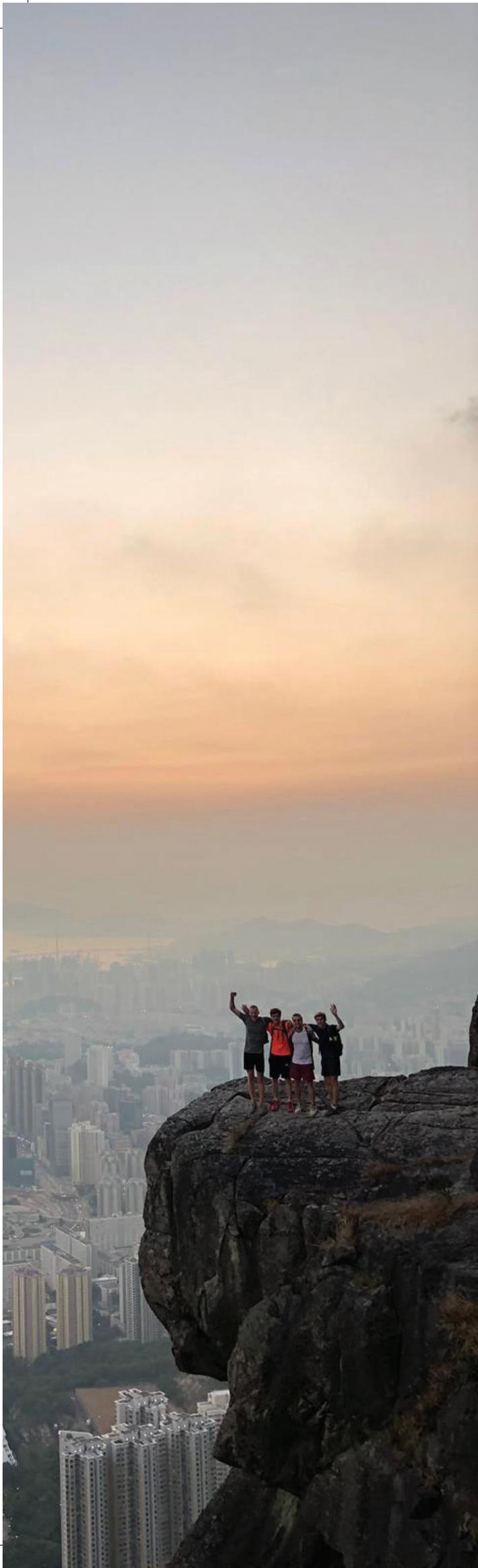


Traveling in Asia

Besides Hong Kong, there are many more beautiful countries in Asia. I noticed that a lot of people had travel plans during and after the exchange period which was not my plan in the beginning because I thought Hong Kong would be enough. However, after a while I thought that if I wanted to see something of the world this is the best time to do it because I already was close to a lot of beautiful countries. Hence, I booked my first trip with my exchange friends to Seoul, South-Korea, after one month. This was a great experience and again a different culture which is interesting to see. Moreover, I visited Beijing together with four exchange students. This was the most interesting experience because nobody spoke English, not even one word. The Chinese were also surprised with our visit because they asked if we could take a picture together with them. It felt like we were some kind of celebrity and of course we said yes to the pictures and we enjoyed our famous minutes. The most beautiful place in China was definitely the Great Wall of China. This is also one of the 'seven wonders of the world'. Truly an amazing experience.

After my exchange period I visited Phu Quoc, Vietnam, together with my friends for one week and we enjoyed all the local food and friendly people. I finished my exchange experience with the greatest trip of all, Thailand. I travelled together with my girlfriend from the south of Thailand to the north of Thailand which was great! I really recommend traveling during your exchange if you have the opportunity!

Now that I am back home, I appreciate my exchange even more when I look at all the pictures and stories I wrote in the Polarsteps app. I definitely recommend Hong Kong as a(n) (exchange) destination if you ever have the opportunity to visit this place! ●



Code Breaking in World War II: The JN25

In the first month of 2020 unfortunately world tension rose due to the conflict between Iran and the United States. Subsequently, on the internet a lot of speculations arose about the so-called 'World-War III'. This got me thinking, what were the roles of econometricians in the second World-War? In that era econometricians did not exist yet but mathematicians and statisticians were their predecessors. One role that they are famous for is the code breaking they did in the second World-War. We all know Alan Turing who became famous for breaking German encryption, the Enigma Code. Beside the Enigma code there is another less known code that may have even swung the tide of battle in the second World-war. It is called the JN25 code. Let's take a closer look at this code used by the Imperial Japanese Navy (IJN) and at how the Americans cracked it. But first let me explain some of the historical context to put the code and the urgency at which the code had to be cracked into perspective.

written by **Constantijn Wessel**

Between May 4 and May 8 the Battle of the Coral Sea occurred. The IJN clashed with the air and naval forces of the United States and Australia. The results were that two aircraft carriers the Japanese used one had sunk and the two aircraft carriers the Americans used both got damaged. One was even so critically damaged that it had to be scuttled. If we do a pure numerical analysis of the losses of the Battle of the Coral Sea the Japanese won since they had sunk and damaged more enemy ships and planes. The Japanese also thought that they had damaged the second carrier of the Americans so heavily that it wouldn't be operational for one of the most important naval battles of the second World-War, the Battle of Midway.

After the battle of the Coral Sea the Japanese thought they had a significant advantage in numbers of aircraft carriers and tried to push their advantage. They had four fully operational aircraft carriers whereas the Americans only had two, they believed. This was a wrong assumption, because the aircraft carrier

that survived the battle of the Coral Sea was repaired in record time and operational again for the Battle of Midway. To push this advantage and to gain full reign over the Pacific Ocean the Japanese wanted to crush the American fleet at the Battle of Midway in early June of 1942. They send all of their naval power on a mission to conquer Midway. The Americans did not know that this offensive was coming and here is

where the Japanese JN25 code becomes interesting.

The Japanese fleet needed to communicate with itself and the mainland, for which they used the JN25 code. In the JN25 a Japanese word appears as a unique 5-decimal-digit number which is called "code group". This cipher text code group [1] is generated as the sum of two other code groups. The first code group (the first layer) is assigned to the

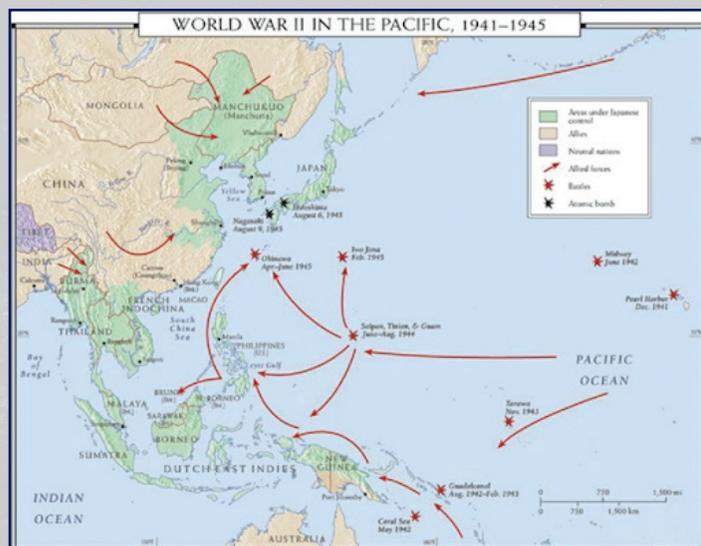


Figure 1: Timeline of the fight for the Pacific Ocean

word itself which is a constant hard mapping belonging to the word. So the word apple in Japanese would for example be encoded as 12345 were this number would be from a Japanese code book. The second code group (the second layer) corresponds to a code from an "additive book" where integers (variables) are linked to 5-decimal-digit numbers. This "additive book" is called super-encipherment and the code layer of code is called additive. In this "additive book" a single integer is chosen by the encrypter, which will be added to the original code. In this code group also for each word in the message a different code is used. These codes are determined by adding one to the integer chosen by the encrypter corresponding to a new 5-decimal-digit number. In the message the integer is also transmitted so that the message can be decoded easier. If you have paid attention carefully you might have noticed that we're adding two 5-decimal-digit numbers meaning that the sum could be a 6-decimal digit number. To prevent this, the two different codes are added by no-carry addition. In no-carry addition the sum of 34 and 96 is 20.

This explanation might have been a bit quick so let's do a short example to further clarify the JN25. We would like to code the message "green apple". This first code group tells us that green is encoded with 54321 and apple with 12345. I as an encrypter now chose the integer 5 to encode the message further. The "additive book" tells me that the integer 5 corresponds with 22333

$$\begin{array}{r}
 2357 \\
 + 6281 \\
 \hline
 8538
 \end{array}$$

Figure 2: Example of no-carry addition

and integer 6 with 54345. After doing the no-carry addition, the message that I will be transmitting is: 5 76654 66680. If you know which books are used for coding, decoding this message is straightforward. In total thirty thousand code groups had to be made up by the Japanese and an additional thirty thousand random additives linked to integers. Before we dive into how the code was cracked, a few mathematical and cryptographic concepts need to be explained first. A 5-decimal-digit code was called "scannable" if it was a multiple of an integer. The relevant integer here is 3. It turned out the first layer of Japanese code was scannable. Another concept to be explained was placing code groups suspected to have the same additive "in depth". This means that all code groups suspected with the same additive will be put in one column. The last concept to be exemplified is traffic analysis. In cryptography traffic analysis is the process of examining encoded messages in order to deduce information from patterns in communications. But how can you deduce information from a message that you cannot read? An example could be the amount of encoded messages right before a big offensive. For example, it is likely that there is a lot of traffic in communications needed to get the aircraft carriers in optimal position. From this, one can deduce an offensive by the amount of encoded messages. Another example is the communications about something that is not secretive but important to both parties (in our case the IJN and the American Navy). Such a thing could be a big storm. Once you know that the Japanese are talking about the storm and you have stripped the additive layer of a code and new codes arise that you have not seen before, you can deduce that these new codes have something to do with the storm.

Now we know how the code works. How was it deciphered? The code was deciphered in two stages. First John Tiltman found out in 1941 with some help of Alan Turing that the code consisted of a 5-decimal-digit number code where another "additive" code group was added onto. Once this was

found out through traffic analysis and forms of brute forcing with a lot of manpower and the use of an international business machine (IBM), Joseph Rochefort and his team eventually cracked the code. But how did Tiltman find out that the JN25 worked in this specific way? This to me is the most interesting part of the deciphering process. Once it is found out how the code works it more or less can be brute forced when enough data is available, more on this later. The most important thing that Tiltman found out is that the JN25 was "scannable". This may seem very easy to check but back in the day simple calculators did not exist and another layer of additives was on top of the "scannable" code. What did exist was the knowledge that if a 5-decimal-digit number is divisible by 3 then the sum of sequence of digits is divisible by 3. So how was this calculated for the huge amount of messages that the IJN sent? It was done using IBM. The IBM machine was used to check if the number of occurrences of the digits 1, 4 and 7 was less than the number of occurrences of 2, 5 and 8. If this was true the number was not a multiple of 3 if the number was not 00000.

But why was the code "scannable" in the first place? This "scannability" of the code is also referred to as "garble check". This naming of the "scannability" as "garble check" is important because it reveals the purpose of the code being "scannable". This "garble check" was in the code such that the Japanese encrypter could check whether or not he had made mistakes in the code he sent or received. This became the flaw that eventually led to the cracking of the JN25. It is worthwhile to note that this "garble check" was essentially useless to the Japanese encryptors, because it required too much time to check each message.

But how exactly did Tiltman find out that the first layer of code was "scannable"? This was due to the fact that he had broken an earlier Japanese Army additive cipher system in 1938. Here he noticed the code was "scannable". In these earlier code books the code now only was a multiple of 11. Because of this experience he sus-

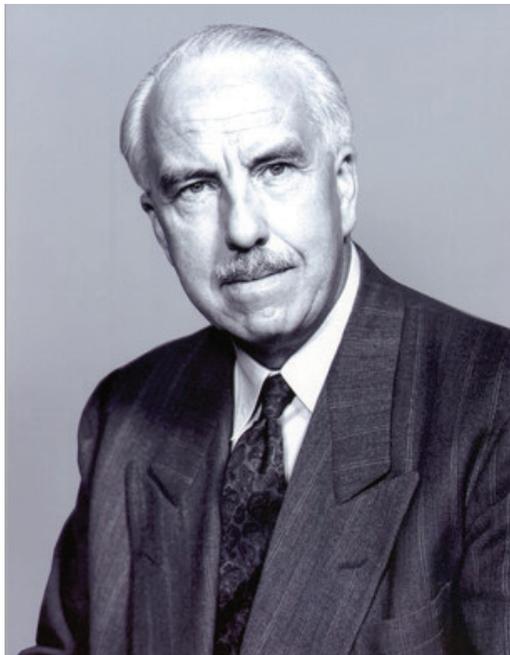


Figure 3: John Tiltman

pected the new code to be “scannable” as well and work with the same type of “additive book” and no-carry addition. He and his team at the cryptography unit in Singapore decided to randomly subtract 5-decimal-digit additives from the code group where the “depth” was 20. Eventually, they found out that it was 3 “scannable”. At the same time the OP-20-G American cryptography unit was doing the same in Washington. Once it is known that the first layer of code is “scannable”, finding the right additive is just a matter of checking whether the first layer of code is “scannable”.

We know that the code is “scannable” but how do we now exploit this weakness? If two intercepted messages have the same code with the same amount of code between them they are provisionally written “in depth”. There needs to be the same amount of code between the code to check for additives. In practice, for numerous enciphered messages would need to be examined before two pairs were found. Once 12 codes could be put in depth

one could start subtracting (brute forcing) 100,000 possible additives and see if the results were a multiple of 3. When the additive was found, the additive layer of code was effectively stripped away. Once enough code was stripped from their additives simple traffic analysis could be used to break the last layer of the code. With this the JN25 code was broken.

The above described process of making the code readable was a very slow and tedious process because the IBM and traffic analysis were not very fast. The code was “solved” by Tiltman and Turing in 1941 but by April of 1942 only about 20% of the code could be read. This was mainly due to the fact that the Japanese switched to a new version of the JN25 in December of 1941. Nevertheless by early June 1942 enough of the code was deciphered for Joseph Rochefort to know something big was about to go down in June of 1942. In Japanese communications there was a lot of chatter about “AF”. Rochefort suspected “AF” to be the Island of Midway Atoll but his superiors

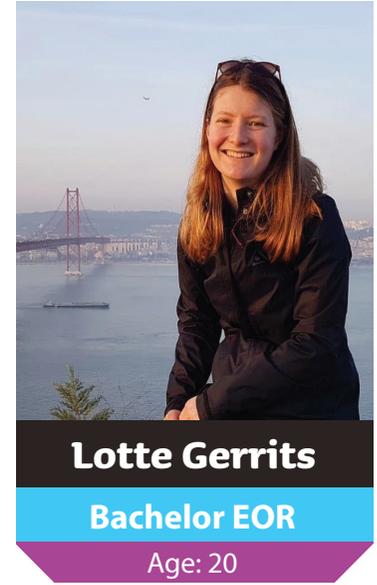
wanted more evidence. Wilfrid Holmes, one of Rochefort’s men, came up with the following idea. He would transmit a message that the water system at Midway was malfunctioning and if the Japanese mentioned something about “AF” and a broken water system he would know for sure that the target was Midway. The Japanese fell straight into his trap and indeed transmitted that “AF” had a broken water system. This was enough for his superiors to set up a counterattack against the coming Japanese offensive. The Japanese offensive on Midway consisted of four aircraft carriers whilst the Americans only had three with one carrier being quickly repaired from the battle of the Coral Sea. Because of the information from the decoded message the Americans were able to outmaneuver and outsmart the Japanese, leading them to score four kills on the Japanese aircraft carriers during June 4 and June 5 whilst only losing one. Because of this disastrous defeat the IJN effectively lost the fight for the Pacific Ocean. ●

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- [1] Peter Donovan (2004). “The Flaw in the JN-25 Series of Ciphers.”
- [2] Peter Donovan (2012). “The Flaw in the JN-25 Series of Ciphers, II.”



An Epic Huifkar Karaoke and Giving “Jantjes”



Firstly, the boys enjoyed some Domino's while socializing with everyone at the Asset rooms. After that the group moved themselves to the Olympia Sports Bar, where the famous FIFA competition was being held. We were all having the time of our life playing against our mates, but what is a male activity without some nice craft beers? Exactly, not a male activity! So, of course, the boys got the pleasant opportunity to enjoy playing FIFA while also having a nice (craft) beer.

The whole boy group was having a nice evening, some giving their mates a triple “Jantje”, others having to drown their sorrows. All in all, everyone had a great night



at the Sports bar. However, a FIFA tournament would not be a tournament if there was not a competition winner. After some fierce games and tasteful craft beers, the best FIFA player won: Juul! Being the best FIFA player of all econometricians is a real honor, so next time the pressure is really on for Juul to defend this prestigious prize! Afterwards, there was still some time at the Sports bar to have a third half and discuss the games.

This was not a normal monthly drink, this time we could have some food during the drink. The Econometricians For Society sold ‘Broodjes knak’ (Hotdogs). The profit went entirely to charity. Finally it was time for the boys and girls to update each other on their activities and to say cheers to a great night! ●

On Tuesday February 4, it was finally time again for my favorite activity of the year, the male/female activity. After the karaoke in the Lollipop of previous year, I thought nothing could be better than that, but I was wrong. The D&A committee organized a karaoke-covered-wagon (huifkar) for the females and it was awesome. We gathered at snack bar ‘De Engel’ to have dinner together.

After eating a lot of fries and after having gossiped enough for the rest of the year (it was the female activity after all) we took our bike and went to the parking lot of the Interpolis. What was waiting there for us was phenomenal. It was not just a huifkar, it was a huifkar with pink disco lights all over it and with a karaoke set with microphones! Everyone took a seat in the huifkar and the driver of the tractor took off. When subscribing for this event, everyone had to fill in which song they thought could absolutely not be missed on a karaoke night. The committee made a booklet with all those num-

bers to make sure everyone could sing along. The karaoke began a bit calm, the female committee members began singing and drinks were being served. After ‘Borderline’ from Merol had been played, the tone was set and everyone sang together. From High School Musical to Miley Cyrus, all guilty pleasures came along.

After driving around for one hour, everyone had to pee and we stopped at the university. Some people just came out of their lectures and looked really weird at us. When everyone was back from the toilet we went on the huifkar again and started singing as if nothing had happened. More childhood memories songs such as ‘Stupid’ by Tess and ‘Click Clack’ by Ralf were played and everyone was singing along. At the end we also played some Never Have I Ever with the whole group meaning even more gossiping time. Unfortunately, at 22:00 hours we stopped at the parking lot again. Everyone was sad because the karaoke was over, but also a little bit happy to see our lovely boys again at cafe De Nachtwacht for the monthly drink. ●

Fact Based Decisions with Cmotions

Cmotions is a fast growing consultancy firm with a focus on advanced analytics, data science and implementations. Their multidisciplinary vision and approach helps them reach optimal results. On February 12, we, Juliette and Stephan, travelled to Cmotions headquarter in Amersfoort to get to know this interesting and impressive company. We spoke with Yvette van Breukelen, a senior consultant at Cmotions, to get her insights into the firm.

written by **Juliette Tillie** and **Stephan Sparreboom**

When entering the building of Cmotions, situated in Amersfoort, we were welcomed by one of the recruiters. With our coffee in our hands we were guided to a closed room in the back of the stylish office. Soon Yvette entered. She had made some time free to talk to us about her experiences working for Cmotions. She told us right after she finished studying Econometrics, a recruiter approached her and convinced her to start as junior consultant at Cmotions. After a period (three years to be exact) of working there, she decided to give another company (Capgemini) a try and she left Cmotions. This decision came because she thought that she wanted something else. But this was not for long. Yvette decided to go traveling, during which she realized that she wanted to go back to Cmotions. Why? The working culture fits her style, the coziness of a team of 65 people suits her desires and the projects she faces include challenging assignments. It is now five years later and Yvette is still working joyfully for Cmotions. She is one of the forty consultants active at the company and has even been promoted to Senior Consultant.

Cmotions is a very young company. It was founded in 2002 by the four partners

and has grown steadily to the company it is now. Currently there are 65 people working of which 40 are consultants. Their main goal is to predict developments which are important for the managing of organizations. Cmotions believes this can be achieved by analytics and not by a gut feeling, therefore their motto is "Fact Based Decisions". A lot of companies still rely on this gut feeling, but want to change this, however they do not have the required knowledge and experience to make this change. At that moment they will go to Cmotions who will help the company not only with advice but also with the implementation of given advice.

This implementation is also what distinguishes Cmotions from other consultancy companies. Normal consultancy firms will only give advice, however Cmotions can be of additional value with its expertise in applying the given advice. When a company goes to Cmotions, most of the time they have heard of terms like big data, Artificial Intelligence and data science. However, they do not really know what these terms mean, but want to implement them into their business. Cmotions will then work together to make a clear data-driven strategy for the

company. The strategy will look at things like the improvement of the governance structure, key performance indicators, earning models and much more. It is clear that they are quite good at their work, as they work for a lot of big, well-known companies. On the site we found a list and we were really impressed. It for example included Bol.com, Ikea, the Dutch bank ING and the Dutch telephone company KPN. Even Nespresso, every student's dream to be drinking all day, makes an appearance. Furthermore, they work for insurers, energy suppliers and even charities.

In addition to advice, Cmotions also offers the recruitment and selection of data-professionals. With their expertise in the data market recruiters will help you as a starter find the job you want and that fits you. Together you will find out what your strengths, interests and goals are. Because of their broad horizon of knowledge about the different data driven companies, they make it possible to find your perfect job. Cmotions also offers interim personnel, which we find very interesting. When a company is in need of a manager, engineer or analyst, Cmotions will lend one of their employees to work temporarily at that firm.

To make it clear what Cmotions really does, Yvette told us about their work at IKEA Belgium in 2014-2015. IKEA wanted better insight into their data and better customer loyalty program. In discussions a specific goal became clear: a better data-driven CRM structure for IKEA, this would be reached through means of data of the IKEA family card. Then IKEA and Cmotions set up a marketing campaign with the marketing division of IKEA. Cmotions used RFM market research to find data about customers and give advice about the marketeers to set up the campaign. While it was ongoing, Cmotions also tested and monitored the results, which are very positive. IKEA was so happy with Cmotions that they are still working together as of today.

Since 2019 Cmotions is part of Broad Horizon, an ICT partner for organizations in retail, finance, education and more. With the technological knowledge of Broad Horizon and the analytics knowledge of Cmotions they are able to help businesses. Because of this take-over the employees of

Cmotions also have the chance to attend meetups in all kinds of fields. Next to the big companies that Cmotions now has as customers, they will also be able to help medium-small companies with their data-analytics.

Cmotions made the papers (AD) and radio recently with something that is typical for them. The team inside Cmotions, advanced analytics, wanted to educate themselves about text mining. In case one is unfamiliar with this term, following is a definition: "Text mining is the process of exploring and analyzing large amounts of unstructured text data aided by software that can identify concepts, patterns, topics, keywords and other attributes in the data." (Rouse, 2018)

The team set up a project which was aimed on learning how reviews on The Fork can be used to predict what restaurants will receive a Michelin star the year after. Although text mining was not included in the bachelors or masters of all of the employees working on the project, they got good at it quickly. From 11.000 restaurants, Cmotions made

a prediction of the top 25 restaurants receiving stars, of which two indeed did!

This is an example of the projects that a consultant working at Cmotions does in his or her spare time. It is a good way for the crew to connect, expand their knowledge and have fun together. Working on these kinds of projects happens on Fridays. On other weekdays, consultants visit their clients and work on location, but on Fridays mostly everyone will be present in the office. Therefore, this day includes, next to working on your own projects, these sort of learning processes. Cmotions thinks it is important to keep learning new skills which may not have been included in any bachelor or master because the field of work is ever changing. It is important to be able to offer your (potential) clients the full package including some of the most recent data techniques like text mining.

So working at Cmotions means you will forever be learning new skills and theory. This starts as soon as you are employed. The company



has set up the Talent Academy; a 6-week kick-start program which teaches new employees, who may have little to no experience, the necessary skills. This not only includes learning useful techniques and soft skills but also advisory skills like 'How do I know what exactly the client wants and needs?'. Via different cases and with the use of tools like R new employees with all kinds of background are prepared for their potential future at Cmotions. Potential since after Talent Academy, recruitment will decide if working at Cmotions fits you and otherwise you will be helped in your search for other employers.

Cmotions not only invented their own Talent Academy, but also has a program called 'Who Cares?'. By organizing small projects like giving lessons about data to high schools or sports events for the employees themselves, the team fulfils their social role and Cmotions takes care of their own employees. In the future, Cmotions aims to provide more and more educational aspects via this program. Think of Python tutorials and master classes in giving advice.

It is clear that Cmotions has a lot of layers to the company. As a

starting econometrician you may be employed as a junior consultant, being the most logical step. Of course there are growth opportunities in length, for example in becoming a senior consultant, but Cmotions also gives loads of opportunities to its employees to grow in 'width'. Within Cmotions there are teams in data visualization, data science, data management, strategy and organizations and more. As an employee, one's basis is working with the client and from there on there are possibilities to look beyond and learn something about new and exciting fields!

The fact that Cmotions is a company of 65 is a positive note, according to Yvette. Everybody helps each other and the hierarchy is hard to find. The director is literally sitting on the same floor, not even in their own office. To give an even better description of what working at Cmotions is like; it is a young company with a 50/50 male/female ratio. Working here means that you are able and want to work with data. Another big part is the customer. Most customers do not know what they want

since they are not aware of the possibilities. During the first conversations with the clients it is the aim to find out and decide what is best for them in order to deliver a wanted and (maybe even more importantly) needed product!

We asked Yvette what the most important skills are for us econometricians. Next to the computational skills you already acquire during your study, it is really important to expand your skillset as a person and explore your talents and possibilities. Your soft-skills are at minimum as important as your hard skills. So go do a boardyear, join a committee, go on exchange or find a really challenging internship.

The combination of consultancy and data science with learning all kinds of new soft skills and even fulfilling your social role is what makes Cmotions special. Judging from her positivity and smile (which she had during the entire interview), Yvette van Breukelen is definitely not planning on leaving the company soon. And on Friday we may expect her to have a small drink with her colleagues to toast on another great week! ●



Ending Up Outside of Econometrics

Life consists of decisive moments. Every now and then, you arrive at a crossroad where you can choose to stay on the same road and continue life as it was going, or to make a turn left/right. I truly believe that either decision you make on that crossroad will be the right one, if you have thought about it carefully. After some crossroads I ended up outside of the econometrics' world, at Albert Heijn. I would not have thought that when I entered university, but life changes.

It has been a long time since writing my last piece for Nekst and writing this article brought back those memories of glancing at my monitor with an empty Word document in front of me. This time it is different, things have changed. Life has changed. It is also the reason I was asked to write this article: "You have a different job than most people who have studied econometrics, will you share your story?".

Entering university back in 2012, I did not think about ending up with a master's degree in Strategic Management instead of econometrics. I was convinced that I would obtain both my Bachelor's and Master's degree in econometrics within four years (well, that didn't work out) and would leave the university as quickly as possible to start working full-time. After the first year I reached my first crossroad and chose to leave the 'study highway' and started to live student life to the fullest. Life changed. A couple years later, a new crossroad appeared when I thought about applying for a board year. Luckily enough, I got the opportunity and during that year I realized that working in a field of econometrics, programming all day or talking about significant results of regressions, was not a position that I wanted to end up in. As I had not held back on expressing my negative thoughts about other Master programs during my first years, I had to put aside my pride and choose for what was making

me happy, instead of staying on the same road and enroll in an econometrics Master program after finishing my Bachelor.

So, I switched lanes and chose for pursuing a Master's degree in Strategic Management, which admittedly is easier than obtaining a degree in econometrics. However, this program gave me more insights into businesses and its applications, something I missed during my bachelor. All in all, both choosing and leaving econometrics were the best choices at that point in time.

After enjoying quite some time off, I decided to apply for a Management Trainee function at Albert Heijn, where another crossroad directly appeared: I had to choose for a specific direction within the company and nor analytics nor management was one of it. After explaining that I had some affiliation with numbers (and a bunch of application rounds) they trusted me enough to start in a financial position, which is not the type of finance you are all familiar with; I am not focusing on Black-Scholes or derivatives. I am just looking at the basics: income through sales and expenditures on wages, operational processes, etcetera.

A job I was not prepared for through either my Bachelor or Master, but as they said during the job interviews: "If you can pass a study like econometrics, you will be able to understand these figures quite easily". An important realization came to mind: if you are not applying as data scientist at a renowned company, employers and fellow candidates are impressed by the fact that you have studied econometrics, even when it is only a Bachelor's degree. Even though I am not using the econometric skillset daily, I do use the analytical mindset the study has taught me and that component is valued by every company.

And now? Life has changed again, this time drastically. From going out various times a week to an alarm ringing at 6.30 hours for



Thijs Kramer

Graduated in 2019

Age: 24

five days a week. Secretly, I am enjoying it. During your studies, your time is controlled by the university through deadlines for assignments or exams. Working full-time gives you the opportunity to take control in your own hands and just close the door on a Friday afternoon and live life during weekends, without having to think about work until Monday morning. Of course, there is no such thing as a free lunch, so you will have to deal with managers that determine your tasks, but the positive aspects outweigh the 'negative' ones. Finally, receiving a full-time salary for the first time is the ultimate feeling.

This is not a piece to let you rethink your choice for studying econometrics or to make you doubt the decisions you have made before; they have brought you here and have made you the person you are today. I hope it helps you to start determining your own path. As I said in the beginning, I believe that every decision you will make on that crossroad is the right one, if you have thought about it carefully.

But keep asking yourself the following question from time to time: is this the road I want to continue, or do I want to make a turn? There is a world outside econometrics, if you want to explore it. ●

Partially Perfect Equilibria

A partially perfect equilibrium is a refinement on the Nash equilibria of a bimatrix games. The idea of a partially perfect equilibria is that one of the two players can make small mistakes by choosing its strategy and therefore the resulting Nash equilibria of this game can be different from the Nash equilibria in which none of the players makes a mistake. Moreover it can be different depending on the player that is making the mistakes and it can be different from both players making mistakes.

Bimatrix games and Nash equilibria

Let us consider an example with 2 players ($N = \{Player1, Player2\}$) that each have two strategies, (e_1, e_2) and (f_1, f_2) respectively. Their payoff depending on what the other players chooses can be represented in a matrix A and B . The total game can be displayed in a bimatrix (A, B) where each row corresponds to a strategy for player 1 and each column corresponds to a strategy for player 2. Hence we can have

$$(A, B) = \begin{matrix} & \begin{matrix} f_1 & f_2 \end{matrix} \\ \begin{matrix} e_1 \\ e_2 \end{matrix} & \begin{bmatrix} 1, 1 & 0, 0 \\ 0, 2 & 1, 2 \end{bmatrix} \end{matrix}$$

In the case player 1 selects strategy e_i and player 2 selects strategy f_j , the payoff for player 1 is A_{ij} and the payoff for player 2 is B_{ij} . For our example if player 1 chooses strategy e_1 and player 2 chooses strategy f_1 the payoff for player 1 and player 2 is both 1.

In a Nash equilibrium none of the players can do better by a unilateral deviation. To find these points we can draw a best reply curve against any choice of the other player. The intersection(s) of the best reply correspondence then gives us the Nash equilibria [1]. If we draw these best reply correspondences for our example we get Figure 1.

From this figure we can determine that the Nash equilibria are $NE(A, B) = \{(e_1, f_1)\} \cup \{e_2\} \times Conv\{\frac{1}{2}f_1 + \frac{1}{2}f_2, f_2\}$. Note we use $NE(A, B)$ as notation for the set of Nash equilibria.

Perfect equilibria

Now we consider a refinement of the Nash equilibria called perfect equilibria. In the perfect equilibria each of the players is considered to have a trembling hand [2]. Because of this trembling hand no strategy can be executed perfectly. Let us define the mistake vectors for this matter,

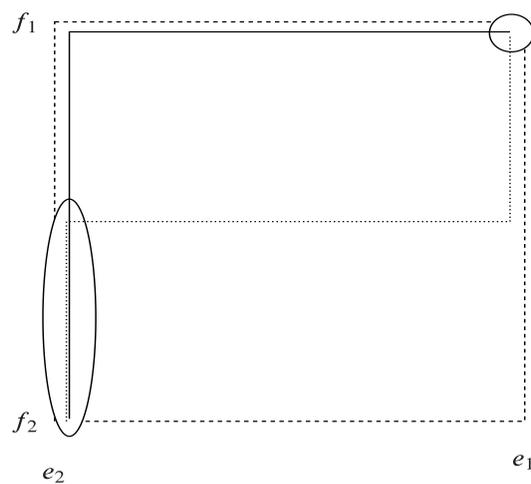


Figure 1: Best reply correspondences

let $\delta \in \mathbb{R}^m, \epsilon \in \mathbb{R}^n$ be such that $\delta > 0, \epsilon > 0, \sum_{i=1}^m \delta_i \leq 1, \sum_{j=1}^n \epsilon_j \leq 1$ then (δ, ϵ) is called the combined mistake vector, where δ is the mistake vector of player 1 and ϵ is the mistake vector of player 2.

For convenience and to save space we will not dive deeper in to the perfect equilibria but immediately go to our example as given before. Consider the combined mistake vector $(\delta, \epsilon) \in \mathbb{R}^2 \times \mathbb{R}^2$. The restricted best reply correspondences (drawn in figure 2) for perfect equilibria imply that each perturbed game $(A, B; \delta, \epsilon)$ has a unique Nash equilibrium given by

$$((1 - \delta_2)e_1 + \delta_2e_2, (1 - \epsilon_2)f_1 + \epsilon_2f_2)$$

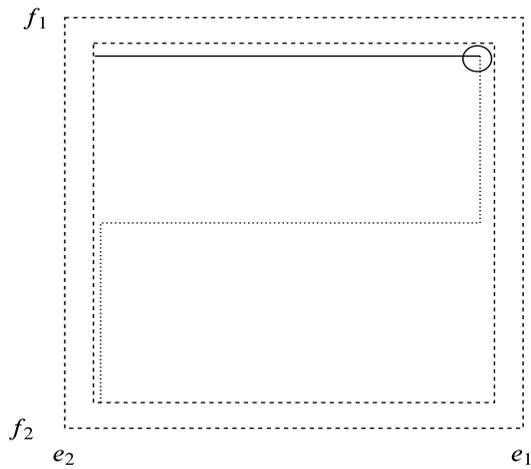


Figure 2: Restricted best reply correspondences for perfect equilibria

Hence for a sequence $\{(\delta(k), \epsilon(k))\}_{k \in \mathbb{N}}$ of combined mistake vectors converging to 0, a corresponding sequence of Nash equilibria is uniquely determined with limit (e_1, f_1) , it follows that $PE(A, B) = \{(e_1, f_1)\}$. Note that we use $PE(A, B)$ for the set of perfect equilibria.

Partially perfect equilibria

Now we can use the same idea for only one of the players making a mistake. This will result in two types of equilibria called partially perfect equilibria with respect to player 1 and partially perfect equilibria with respect to player 2, we will denote these sets respectively with $PE-NE(A, B)$ and $NE-PE(A, B)$.

Let us again look at our example as given before. Consider the mistake vector $\delta \in \mathbb{R}^2$. The restricted best reply correspondences for partially perfect equilibria with respect to player 1 (drawn in figure 3) imply that each perturbed game $(A, B; \delta)$ has a unique Nash equilibrium given by

$$((1 - \delta_2)e_1 + \delta_2e_2, f_1)$$

Hence for a sequence $\{\delta(k)\}_{k \in \mathbb{N}}$ of mistake vectors converging to 0, a corresponding sequence of Nash equilibria is uniquely determined with limit (e_1, f_1) . Hence it follows that $PE-NE(A, B) = \{(e_1, f_1)\}$.

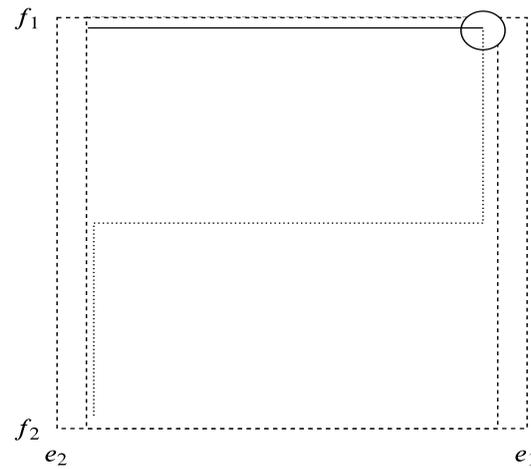


Figure 3: Restricted best reply correspondences for perfect equilibria with respect to player 1

However, we will see that $\{e_2\} \times Conv\{\frac{1}{2}f_1 + \frac{1}{2}f_2, f_2\}$ are partially perfect equilibria with respect to player 2. Consider the mistake vector $\epsilon \in \mathbb{R}^2$. The restricted best reply correspondences for partially perfect equilibria with respect to player 2 (drawn in figure 4) imply that each perturbed game $(A, B; \epsilon)$ has its Nash equilibria given by

$$(e_1, (1-\epsilon_2)f_1 + \epsilon_2f_2) \cup \{e_2\} \times Conv\{\frac{1}{2}f_1 + \frac{1}{2}f_2, \epsilon_1f_1 + (1-\epsilon_1)f_2\}$$

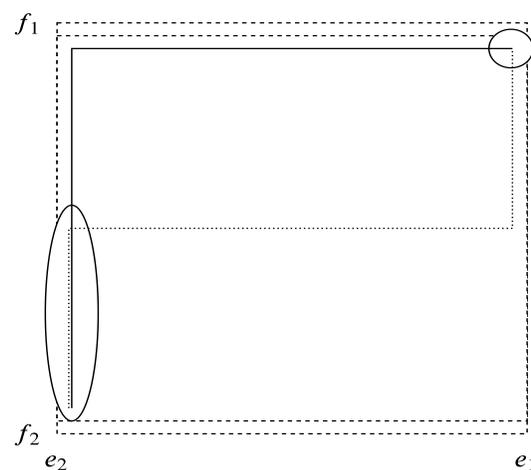
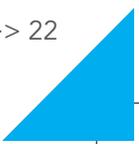


Figure 4: Restricted best reply correspondences for perfect equilibria with respect to player 2



Hence for a sequence $\{\epsilon(k)\}_{k \in \mathbb{N}}$ of the mistake vectors converging to 0, a corresponding sequence of Nash equilibria has a limit determined by (e_1, f_1) and $\{e_2\} \times \text{Conv}\{\frac{1}{2}f_1 + \frac{1}{2}f_2, f_2\}$ and hence $NE-PE(A, B) = \{(e_1, f_1)\} \cup \{e_2\} \times \text{Conv}\{\frac{1}{2}f_1 + \frac{1}{2}f_2, f_2\}$.

Finding equilibria on $2 \times n$ bimatrix games

Now that we know what the different equilibria are and how to find them for 2×2 bimatrix games we can continue to a method for $2 \times n$ bimatrix games, as given by [3]. So let us consider the 2×6 bimatrix game (A, B) given by

$$(A, B) = \begin{matrix} & f_1 & f_2 & f_3 & f_4 & f_5 & f_6 \\ e_1 & [4, 0] & [6, 6] & [1, 8] & [0, 6] & [4, 8] & [-2, 3] \\ e_2 & [0, 8] & [6, 6] & [0, 0] & [1, 6] & [2, -8] & [0, 7] \end{matrix}$$

For this matter we can use a labeling method that is represented in figure 5.

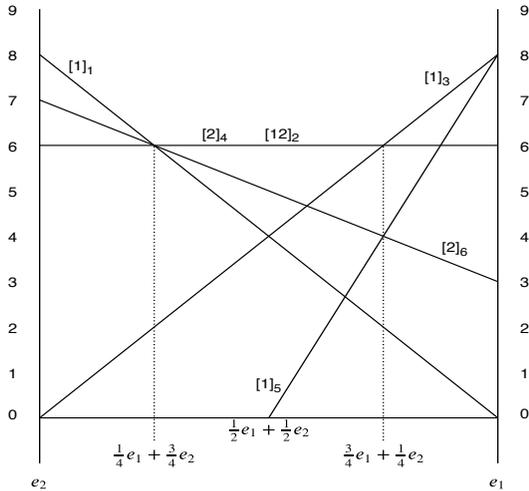


Figure 5: Using the graphical method for $2 \times n$ bimatrix game

To find the equilibria we look at the lines that are at the top and specifically at label [12], the intersection between labels [1] and [2] and the intersection of edge e_1 with label [1] and edge e_2 with label [2]. Thus we get that the game (A, B) has its Nash equilibria given by

$$\begin{aligned} NE(A, B) = & \left\{ \frac{1}{4}e_1 + \frac{3}{4}e_2 \right\} \times \text{Conv}\left\{f_2, \frac{1}{5}f_1 + \frac{4}{5}f_4, \frac{1}{3}f_1 + \frac{2}{3}f_6\right\} \\ & \cup \text{Conv}\left\{\frac{1}{4}e_1 + \frac{3}{4}e_2, \frac{3}{4}e_1 + \frac{1}{4}e_2\right\} \times \{f_2\} \\ & \cup \left\{\frac{3}{4}e_1 + \frac{1}{4}e_2\right\} \times \text{Conv}\left\{f_2, \frac{1}{2}f_3 + \frac{1}{2}f_4\right\} \\ & \cup \{e_1\} \times \text{Conv}\{f_3, f_5\}. \end{aligned}$$

To find the perfect equilibria, let $J([1]), J([2])$ and $J([12])$ denote the sets of pure strategies of player 2 with label [1], [2] and [12], respectively. Now let $(A, B)^{PE}$ be defined as the subgame of (A, B) in which all pure strategies f_j of player 2 are deleted for which it holds that

$$f_j \notin \bigcup_{k=1}^t PB_2(I_k) \cup \bigcup_{k=1}^{t-1} PB_2(p_k).$$

The game $(A, B)^{PE}$ plays a decisive role in determining the perfect equilibria of (A, B) . This brings us by the next theorem as given in [4].

Let (A, B) be a $2 \times n$ bimatrix game. Then

$$PE(A, B) = \begin{cases} NE(A, B)^{PE} & \text{if } J([1]) \neq \emptyset \text{ and } J([2]) \neq \emptyset \\ & \text{or } J([1]) = \emptyset \text{ and } J([2]) = \emptyset, \\ NE(A, B)^{PE} \cap \\ \{(e_1, q | q \in \Delta_n)\} & \text{if } J([1]) \neq \emptyset \text{ and } J([2]) = \emptyset, \\ NE(A, B)^{PE} \cap \\ \{(e_2, q | q \in \Delta_n)\} & \text{if } J([1]) = \emptyset \text{ and } J([2]) \neq \emptyset. \end{cases}$$

Applying this on our example we get that the perfect equilibria are:

$$\begin{aligned} PE(A, B) = & \left\{ \frac{1}{4}e_1 + \frac{3}{4}e_2 \right\} \times \text{Conv}\left\{f_2, \frac{1}{5}f_1 + \frac{4}{5}f_4, \frac{1}{3}f_1 + \frac{2}{3}f_6\right\} \\ & \cup \text{Conv}\left\{\frac{1}{4}e_1 + \frac{3}{4}e_2, \frac{3}{4}e_1 + \frac{1}{4}e_2\right\} \times \{f_2\} \\ & \cup \left\{\frac{3}{4}e_1 + \frac{1}{4}e_2\right\} \times \text{Conv}\left\{f_2, \frac{1}{2}f_3 + \frac{1}{2}f_4\right\} \\ & \cup \{(e_1, f_3)\}. \end{aligned}$$

Now the partially perfect equilibria with respect to player 1 ($PE-NE(A, B)$) can also be found by using the subgame $(A, B)^{PE}$. To find the $PE-NE(A, B)$ equilibria we use that $PE-NE(A, B) = NE(A, B)^{PE}$

Using this on our example we get:

$$\begin{aligned} PE-NE(A, B) = & \left\{ \frac{1}{4}e_1 + \frac{3}{4}e_2 \right\} \times \text{Conv}\left\{f_2, \frac{1}{5}f_1 + \frac{4}{5}f_4, \frac{1}{3}f_1 + \frac{2}{3}f_6\right\} \\ & \cup \text{Conv}\left\{\frac{1}{4}e_1 + \frac{3}{4}e_2, \frac{3}{4}e_1 + \frac{1}{4}e_2\right\} \times \{f_2\} \\ & \cup \left\{\frac{3}{4}e_1 + \frac{1}{4}e_2\right\} \times \text{Conv}\left\{f_2, \frac{1}{2}f_3 + \frac{1}{2}f_4\right\} \\ & \cup \{(e_1, f_3)\}. \end{aligned}$$

Also the partially perfect equilibria with respect to player 2 ($NE-PE(A, B)$) can be found by looking at how the perfect equilibria were found. To find the $NE-PE(A, B)$ equilibria we use:

$$NE-PE(A, B) = \begin{cases} NE(A, B) & \text{if } J([1]) \neq \emptyset \text{ and } J([2]) \neq \emptyset \\ & \text{or } J([1]) = \emptyset \text{ and } J([2]) = \emptyset, \\ NE(A, B) \cap \\ \{(e_1, q | q \in \Delta_n)\} & \text{if } J([1]) \neq \emptyset \text{ and } J([2]) = \emptyset, \\ NE(A, B) \cap \\ \{(e_2, q | q \in \Delta_n)\} & \text{if } J([1]) = \emptyset \text{ and } J([2]) \neq \emptyset. \end{cases}$$

Using this on our example we get:

$$\begin{aligned} NE-PE(A, B) = & \left\{ \frac{1}{4}e_1 + \frac{3}{4}e_2 \right\} \times Conv\left\{ f_2, \frac{1}{5}f_1 + \frac{4}{5}f_4, \frac{1}{3}f_1 + \frac{2}{3}f_6 \right\} \\ & \cup Conv\left\{ \frac{1}{4}e_1 + \frac{3}{4}e_2, \frac{3}{4}e_1 + \frac{1}{4}e_2 \right\} \times \{f_2\} \\ & \cup \left\{ \frac{3}{4}e_1 + \frac{1}{4}e_2 \right\} \times Conv\left\{ f_2, \frac{1}{2}f_3 + \frac{1}{2}f_4 \right\} \\ & \cup \{e_1\} \times Conv\{f_3, f_5\}. \end{aligned}$$

Relationship

Now that we have seen how to find the equilibria for the $2 \times n$ bimatrix games we have seen that the method to find the partially perfect equilibria is based on the method to find the perfect equilibria, because of this some interesting relations hold. We find that $PE(A, B) \subset PE-NE(A, B)$ and $PE(A, B) \subset NE-PE(A, B)$. Furthermore since $PE(A, B) \neq \emptyset$ we know that both the partially perfect equilibria exist.

We have also seen in the examples given that the partially perfect equilibria can differ from each other, but they can also differ from the Nash and the perfect equilibria in a whole.

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Quirien Raat
Graduated Master in Econometrics and Mathematical Economics

Taking a Look Into The World of Stochastic Operations Research

written by **Dirk Baltussen** and **Wenxin Lin**

In June 2019 Johan van Leeuwen was appointed as Professor of Stochastic Operations Research at the Econometrics and Operations Research department of Tilburg University (abbreviated as EOR). Some of you might already know him from the second year Bachelor course Stochastic Operations Research Models (abbreviated as StORM) or from the new Master course Decision Making Under Uncertainty (DMUU). We had the opportunity to have a chat with Van Leeuwen about his working field.

What did you do before you started working at the EOR department of Tilburg University?

I studied Econometrics, back in the days, went on to study Mathematics and eventually obtained a PhD in Mathematics in the areas of probability and stochastic OR. Both areas fit well with Econometrics and Mathematics. I joined Tilburg after having spent many years at Eindhoven University of Technology, the last few years as professor of Mathematics, in a role that is similar to my job in Tilburg. For the years to come, I will remain affiliated to Eindhoven for one day a week, mostly to continue ongoing

research. In Tilburg I will explore new directions and collaborations, for teaching and research. Traditionally, mathematics in OR consists of a stochastic and deterministic side. Some of the pressing challenges need both sides, which offers fascinating possibilities for collaboration with students and many department members.

During our study we frequently stumble upon the term 'probability theory'. But where does the term 'stochastics' come into play and what is the difference with 'probability theory'?

Stochastics, like probability theory, is the mathematics of chance and uncertainty. In my field it is all about making mathematically precise statements about systems in which not everything is fixed in advance and in which chance to a certain extent plays a role. If we roll a die, the outcome is uncertain, but with probability $1/6$ the number of eyes will be 6 and the average of many throws is expected to be 3.5. My main interest is in so-called 'stochastic processes' that can describe a wide range of patterns that are subject to uncertainty, like the weather, stock prices, queues, colliding molecules, the spread of an epidemic, customer demand and production levels. As such, stochastic

processes form a rich subfield of the larger field of probability theory. When you combine mathematical tools from probability theory and stochastic processes with optimization questions that arise in OR, you arrive at stochastic OR.

Do you like teaching, and in particular the course StORM?

I am really happy to teach StORM. It is a wonderful opportunity to experience the beauty of my field in an early stage of the study. To follow the course you must have basic knowledge of probability, algebra and analysis. We then apply that knowledge to create mathematical models that can help you make decisions in situations that are uncertain to a certain extent. In addition to mathematical theories, StORM covers such applications as inventory management, production planning, and queueing theory.

Can you maybe give us an example of the mathematics in StORM?

A Markov chain, named after Russian mathematician Andrei Markov, is a special stochastic process that describes a system that moves through a number of states and jumps step by step from one state to the other. It is a generic concept with a wide range of applications and elegant, powerful



**prof. dr. Johan
van Leeuwarden**

mathematics. I explain during StORM for instance how PageRank, the algorithm behind Google's search engine, is based on Markov chain theory. The states are then the webpages, and the Markov chain follows a stochastic (or random) surfer, a person surfing the web by clicking on links (hyperlinks that connect webpages) uniformly at random. Markov chain analysis then predicts how often the stochastic surfer will be on each webpage, and assigns a PageRank (a score or measure of importance) to each webpage accordingly.

StORM is a course taught in the second year of our study EOR. How is this course followed up during our study?

With colleagues I created a new master course called Decision Making under Uncertainty (DMUU), designed to learn how to develop algorithms for simulating and optimizing complex systems. DMUU combines some techniques taught in StORM with optimization methods and programming in Python. Stochastic optimization in OR contributes to improved operational efficiency and quality in, for example, production environments and service industries. For services, uncertainty about customer arrival and processing times is crucial, and decision rules are needed that can respond to random events or diverging trends. Contexts in which bottlenecks and undesirable waiting times may arise include hospitals, e-commerce, inventory and production management, cloud computing and communication networks. Such topics are covered in DMUU and are central in the stochastic OR field.

When talking about modeling, econometricians often think of prediction using models and regressions. However, stochastic modeling has nothing to

do with statistical predictions. Then what is stochastic modeling?

Real-world cases, although stylized, show how you can translate a practical question into a mathematical model. I call that the art of modeling, and to practice that art you have to practice a lot. That is why there are many exercises available in both the courses StORM and DMUU, and that also explains why attendance during instruction hours is high. Here is a stylized example: "A fair coin is tossed repeatedly. Find the expected number of tosses till the pattern heads-tails-heads appears." You can answer this question by first constructing a Markov chain (the random pattern of consecutive heads and tails). The Markov chain is then the model. Once you have the Markov chain, basic analysis of the Markov chain gives the answer 10. During StORM I explain how this works precisely.

What are you currently doing research on?

My research field covers such topics as probability theory, stochastic processes, and stochastic optimization – topics that are relevant not only for OR but also for many other fields. I really like asymptotic analysis and process limit theorems, tools that are needed when you consider in particular large-scale systems. Perhaps you have seen the central limiting theorem, a classical result in probability theory. Tools like that facilitate analysis of truly large-scale systems, in particular when the system size goes to infinity (think of the PageRank example with infinitely many webpages). I try to develop new mathematics for optimizing such large-scale stochastic systems, and in this way keep pushing the boundaries of stochastic OR. ●

Europe Trip 2020 - Ljubljana





Life After a Turbulent Board Year

Do you ever bump into someone you have not spoken to in a while? An old friend from secondary school or someone who you used to hang out with as a freshman. I never know if to stop for a little chat or if 'hi' is sufficient. It is always nice to hear these people are doing well, and we might give them a thumbs up over social media when they reach a new milestone. Frankly, most of us do not really care too much, especially with our own extremely busy life. Somehow this years' Nekt committee does care about how I am doing. Lots of people might think I have gone completely off the grid. I might surprise those whom may think so with this article. In this column I will go into why I chose to start with a second Bachelor in Delft and what else I have been up to in my two years after being a boardie.

As 20-year old I had the idea it would be cool to chair this great people-driven association after having been part of three committees. Contributing to great events, setting out policies for the coming years and meeting all kinds of interesting people. During my board year I was surprised with the amount of effort it takes just to have all the regular things up and running. There is only little time to come up and work out new ideas to make one's mark. I did make my mark, unfortunately not in a way I was hoping to do so. The other board members did what they thought was right and I think for the right reasons. Rather than fight this I thought it was best to concede.

At first it was difficult to find my ways back into university. I did not feel much for the courses I was following at the time so I decided to take up a few side jobs to make myself useful. Most notable experiences have all been at the university. Who would have ever thought I would become a tutor for the MAK? Or a student assistant at our faculty? After my board year I also had a lot of time to think. Some way or another I came up with the brilliant idea of starting a second Bachelor; Applied Earth Sciences in Delft.

For those interested Applied Earth Sciences has a wide range of applications such as reservoir engineering, mining engineering, geo-engineering, environmental engineering, remote sensing, etcetera. While the corresponding jobs might all sound very specific the program is very broad with physics, mathematics, chemistry, geology and engineering courses. The cherry on top will be in May, when our entire cohort will visit the South of France for a three week excursion. In these three weeks we are asked to create a geological map of a designated 5000 square meter area. To do so we have to identify the rock formations by studying the rocks. Rocks at the surface tell us a lot about the climate and vegetation of the Earth at the time of deposition. In only three weeks of work we will be able to tell a lot about what happened to an area over millions of years.

Combining two Bachelors gives me a lot of energy day in and day out. It has proven to be a challenge in multiple ways but not without its complications. Luckily exams hardly coincide but sometimes important lectures or presentations do. Most people I have spoken with at the universities have expressed their support but unfortunately sometimes my schedule can get a little out of hand. As of yet I have not found a way to clone myself and participate in all conflicting lectures. However, I did obtain more and more credits with each semester and I am hoping to graduate in both programs next year. In my modest opinion, I think students should have more room to find out what works for them like I have. Two philosophy courses and an elective help students very little with developing



Max van der Lee

Bachelor EOR

Age: 23

a strong defined character. Valuable experiences like a board year or an internship help students with their personal development but may also benefit these students with a more positive attitude instead of constantly grinding for ECTs.

During your bachelor you will probably spend most of your time on courses you find difficult in order to be done with them. You will be hoping you will never use them again which is true in a lot of cases. However, by combining two different programs I have been able to change my mindset. These obstacles have pushed me and challenged me to dig deep. Because of the large amount and variety in courses I am following I am always kept busy. There is no margin for postponing work any longer. I have always seen taking on challenges and responsibility as the most important measures for personal development. A lot of people doubted me and I hope to prove them wrong. If things do not go your way all you can do is bounce back. ●



Pepijn Wissing

is currently a PhD student at the department of Econometrics & Operations Research in Tilburg. From 2012 to 2018, he studied at Tilburg University, finishing the Bachelor Econometrics & Operations Research and the Research Master in Business. His research interests include Combinatorics, Graph Theory and Algebra.



A PhD, is it for me?

The first professional steps of an EOR graduate: the conventional route is probably known to you. One gets a Bachelor's degree, then a Master's, followed by a job that has you wondering why you had to learn about Lebesgue integration, convex optimization and the like, if you are just going to be asked to shuffle numbers around Excel sheets all day. On the other hand, there is also the possibility of continuing your academic career. Spending your days with the toughest problems that you will likely never find the answers to: what's not to like?

Jokes aside, I do believe that, in a time where universities seem to be shifting their focus toward the employability of their graduates, the academic side to a university career is not always sufficiently explored. As such, I would like to provide a little insight into the first step any aspiring academic takes: the pursuit of a PhD. PhD stands for 'Doctor of Philosophy' and is the highest academic degree one can achieve. Naturally, to start, you first need your Master's degree. Literally translated as 'teacher who loves wisdom,' the title 'PhD' is normally necessary to be considered for permanent positions at universities. Most PhD tracks take four years, but at Tilburg University, one of these has been converted to a Research Master year. This may be started after finishing a Master, or, if you have made up your mind early enough, be baked into your Master.

Before you can start your Research Master, there is an application procedure that you have to pass. But once you do, a PhD position will be well within grasp. While the main upside of the Research Master construction for the university is financial, it is actually quite advantageous for most candidates, as well. During your Research Master, you will take courses that are much more theoretical in nature, after which you get acquainted with potential supervisors and their research. Finally,

you get a taste of what the day-to-day of a PhD track is like, during your (theoretical!) thesis. If you do not like what you have seen after that, you end the extra year with an extra diploma and leave without hard feelings. But if you do like it, you get to jump-start your PhD, by using said thesis as the basis for your first paper.

In order for a PhD candidate to get his/her doctorate, he/she has to defend a dissertation. Luckily, this thesis is commonly a compilation of several (three or four) smaller, more palpable projects: research papers. Usually, a mathematical paper is concerned with answering a specific question, using various intermediate results to get there. Every one of these steps is essentially an exercise like the ones you are used to answering in tutorials, only now, you are also the one asking the question, and you are not sure that you should be able to answer it. Or, even worse, you might simply be asking yourself to show something that is not even true.

Altogether, this amounts to a few years that are spent on what is basically a massive puzzle that you set for yourself. The particulars of the puzzle are typically such that its answer will, in one way or another, contribute to the betterment of society. Whether it is an almost purely mathematical construct or a mostly applied question (think, for instance, of the Zero Hunger Lab!) the nature of science makes it quite impossible to predict which drop in the bucket will lead to the next big breakthrough. And while it can be depressing to find out that the claim you had been working on for three weeks is simply not true, there are also the times where you have provided yourself with sufficient blocks to build your tower just high enough to provide a conclusive answer to the question that your paper was trying to answer. Those moments are the incredibly rewarding times that, to me, make it all worth it. The feeling of having been the first person in the world to have solved the puzzle, typing up your solution into a coherent story and having it accepted into a prestigious journal, for others to read and use in their own research, is incredible. ●

Chess is Definitely Top Sport!

The way I got into the game of chess was a little weird. When I was four years old, my father wanted to play some games with me, but as he thought that a game of Monopoly would take too long, he taught me how to play chess instead. After that, I was lucky enough to go to a primary school where chess was taught, because otherwise I might not have been playing the game anymore. It was soon clear that I was talented in chess as I started beating people from older ages as well. This made me go to a chess club for the first time when I was eight years old. Also, this got me to start playing chess tournaments. It first started with tournaments around the city Venlo where I lived, then the whole province Limburg and at around the age of ten, I went to tournaments across the country. When I was ten I was allowed to play my first Dutch Youth Championships, which went decent as I ended up around the middle of the field. Even though I could be satisfied with the result, I was aiming higher and I wanted to play for the medals. Eventually this got me to get a private coach when I was almost 12 years old and immediately after results followed. My ranking started to rise and when I was playing a Dutch Championship under 14, I suddenly was the favourite to win. Then high school started and because I had to focus too much on this, my progress with chess was on a low level for a while.

Gap year

This made me want to take a gap year, in order to only focus on chess before I went to university. Results immediately followed, as the first tournament I played after finishing high school I obtained the title International Master. This title is the runner up to becoming a chess Grandmaster. I like to believe that this result followed because it felt like some weight got lifted off my shoulders when I finished high school. Now that I also got this title, I could focus on my next goal: obtaining the Grandmaster title. One of the advantages of my gap year was also that I could play every tournament that I wanted to. Not having to take school into account made it easier for me to plan the tournaments which I normally wanted to play, but couldn't. There were many tournaments abroad which I wanted to visit and play in, and now I could cross some off my list. I played tournaments in Latvia, Serbia, Greece, France, Russia, Macedonia, Germany, Czech Republic and Croatia. Normally when I choose tournaments to play in, I don't look that much at the geographical location. I mainly look at if I have friends who are able to play the same tournament as well. I was lucky that when I took the gap year, three of my best friends did the same. Being able to play a tournament together with people I knew was my main priority. Chess tournaments can easily take up to nine days, not taking the travelling into account, so not going with friends can make them less enjoyable. During my



Max Warmerdam

Bachelor EOR

Age: 19

gap year I also had my biggest successes of my chess career. As normally I used to have exams in the month of January, I didn't have the time to play the Tata Steel chess tournament which is always in the month of January. This is the biggest tournament in the Netherlands, and during my gap year I was finally to participate in the C group of this tournament. I managed to win the tournament and qualified for the B group of the Tata Steel tournament for 2020.

Tournament atmosphere

Normally when I play tournaments I like to arrive the day before the tournament starts. If for example I need to drive for a few hours in the morning and then play a game, it will be hard for me to concentrate during the game. Most tournaments have one game per day, as one game can already last for 6 hours. Playing two of these on one day would be way too tiring, of course. So for most of these tournaments I had more or less the same routine. We would wake up at around 9:30 hours and head for breakfast. Then we would prepare for our games until 12:00 hours and go for

lunch. At most tournaments the games start at 13:00 hours, so that you are still able to go for dinner afterwards if you have a long game. After dinner we often relax or do something in the city where we are. For most tournaments I make sure that we have a flight back the day after the tournaments ends. Now that the tournament has finished, we are able to relax, go sightseeing and do whatever we want as we don't need to be fit and prepare for a next game. Chess has always been seen as a very serious sport. However, very often when I talk to people who don't know much about the sport, they don't realise that while we are playing a chess game, we don't sit on a chair for 5-6 hours. Whenever it's our opponents turn we are allowed to go for a walk, have a chat with some friends and go grab some food or drinks. This makes the game more relaxed and fun I think. What I always like to do during my own game is have a walk and have a look at other games as a way to take my mind of my own chess game.

Combining chess with university

For me, the gap year was a year to put my full focus on chess, so that afterwards I could put my focus on university and do less work on my chess. The problem with chess is that it is a mind game, and even though it is a game I like to play, it is sometimes hard to take my mind off the game. Having started to study Econometrics and Operations Research at Tilburg has definitely become a big chal-

lenge for me. I have mainly stopped playing tournaments for this year. I now almost only play league games as they are only one to two days and don't take up whole weeks. Another advantage of these games is that they are always on weekends, so I don't miss out on any lectures. I play Dutch, Belgian and German league, so my schedule is still very stuffed. For example, for the month of February I played seven games in four weekends. This means that I got to use the time I have during the workdays in the week for university. Having qualified for the 2020 Tata Steel tournament was also somewhat problematic for me. This was the biggest tournament of my life so far, as it not only took two and a half weeks but I was basically only playing strong Grandmasters at the tournament. Of course it's hard for me to miss out on this tournament, but it did cost me a lot of time and it was hard for me to combine with the work I had to do for university. Even though I have basically already decided not to become a chess professional by starting to study Econometrics and Operations Research, I still have goals in chess. I am not a chess Grandmasters yet, but I hope to attain the title in the year 2020. Since during the gap year I obtained two out of the four requirements you need for the title, I am getting close. Some work still needs to be done though, and I hope that I will be able to find a good balance between my studies and chess. ●



Need Some Help With Life? Bas Might Be the Guy For You

It is about 14.00 hours when we meet Bas at the rooms in building E. He entered the building at 8.00 hours this morning and has been occupied ever since. Yesterday he attended an inhouse day, this morning he had a meeting with a representative of the university and had also been busy arranging things concerning a possible partnership with Unilever. Luckily, he was able to free some time in his schedule to speak about his life as independent chairman of Asset and to answer some rather unusual questions we'd asked him.

written by **Janne Vos** and **Jelle Sieben**

To summarize the first 15 minutes of the conversation, here is the standard information you need to know about Bas: Bas Ramaekers is 22 years old and currently in the board of Asset General. He completed his bachelor in Econometrics and Operations Research and is doing a master in Business Analytics and Operations Research. During his bachelor, he decided to become an active member at Asset | Econometrics. After having done multiple committees at our study association, he found himself ready for a bigger challenge and wanted to do something new. He did not feel the need to graduate and get a job; however he wanted to do something useful. Since some of his close friends were in the board of Asset | Econometrics, he already had an idea of what a board year at this department would look like. As he was looking for a new challenge, he decided to apply for the role of independent chairman (IC) of Asset. The Association for Students Studying Economics in Tilburg (ASSET) consists of seven departments and the MAK, hence the general board of Asset consists of eight chairmen and one independent chairman, Bas.

Bas explains his function as follows: As IC you represent Asset to the outside world. He is the contact for the university, some companies and other study associations. His meetings with the university are mostly related to subjects such as career orientation, master orientation or partnerships. For instance, next academic year there will be a new bachelor program at TiSEM. Bas is involved in, for example, looking at how Asset can contribute to this new bachelor. Moreover, he is involved in promoting events, contributing to trainings and making multiple other arrangements. An example of these arrangements is that Asset makes sure days are scheduled lecture free during the EBT weeks.

Since his tasks cover such a wide area, every day is different as IC. Obviously, meetings are planned beforehand. However, besides these meetings, he often does not know exactly on Monday morning what the week will offer him. Often, on a Monday, people start showing up at his desk. They offer him problems that require a solution, remind him of certain problems or inform him of new opportu-

nities. With these things he consequently gets started and processes the obtained information. He also explains that simply gathering information (through meetings) is very time consuming. As the point of contact you obviously need to know everything what's going on with the university and with Asset.

The aspect he likes most about his function is improving things. "Of course, it is satisfying and necessary to solve problems. However, I prefer improving things or coming up with new ideas to see how things can change. A board year is not only simply following the steps of your predecessor".

The thing he probably dislikes the most is solving little arguments. Whenever departments are arguing and don't find a solution, it is Bas' responsibility to find a solution that suits all the involved parties. This often concerns cases that seem important at the level of departments, but don't really matter looking at the bigger picture. For example, who gets how many tickets for the CODE cantus?

The stuff you just read, were written down based on answers we received from Bas. We didn't feel much for only asking standard, somehow boring, questions and after getting to know some things that Bas was doing with his time at Asset, we wanted to ask some different kinds of questions to really get to know Bas.

So let's start with the, possibly uncomfortable, next part. "If you had to choose, which department do you like the most?" "I like every department as much as the others, of course. As I'm the indep.. blablabla" Bas didn't really say blablabla, but surely you can guess the nature of his words. After having to listen to this politically correct answer, we asked him about the Asset boardies' alleged high use of drugs. With the room being silent for a few seconds, we could clearly see Bas's thoughts from his look. How am I going to find another boring and correct answer to this tiresome and provocative question? "Uhm... Within Asset we don't stimulate the use of drugs and there's definitely no such thing during office hours." Thanks Bas!

It was clear to us we wouldn't be able to catch a mistake in Bas's words. Maybe we had more luck asking him a difficult mathematically oriented question. We knew Bas always was a smart guy, but is the board year affecting his mathematical skills? We asked him to solve a pretty difficult integral: it took Bas exactly 8 minutes and 18 seconds to obtain the correct answer. A bit slow, right? This may be because we first accidentally asked him to solve a by-hand-unsolvable integral (well job, Janne).

Alright, back to normal. "Bas, where do you see yourself in five years?" "I hope that, in five years, I've bought my own house and that I have a team, filled with people in all sorts of fields of expertise, amongst me that I'm able to direct. I would like to be able to direct these people as I, hopefully by then, possess some knowledge in every expertise. Maybe this will be at some consultancy firm, but who knows. Maybe I've found my calling completely elsewhere."

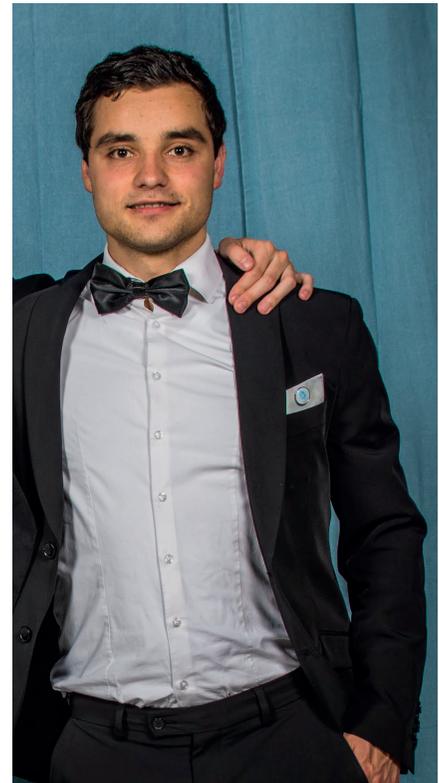
We were wondering if Bas had a good question for himself, that we definitely should be asking him. He did have one,

so that's when we asked him: "How does one become the IC of Asset?" Bas explains. Of course you have to be really driven to get in the position he's currently in. You won't be called at random with the message that you just became the IC. Somewhere in March (or maybe April), you have the possibility to apply. You start with sending a letter of application together with your curriculum vitae, so most importantly your motivation and why especially you would be fit for the job. After this, you're asked to complete some e-assessments that contain for example personality tests or having to hand in some feedback given by the people that stand close to you. Then you would be invited for two conversations where the, at that time, the current IC together with other chairmen will ask some questions about what to do in certain situations and other weird questions. For example, how many ping-pong balls can fit in the Esplanade Building (the building that houses Asset). After having discussed this for probably over five minutes, we continued to the next question.

With the next question, a short story had to be told. "Alright Bas, imagine you're living a beautiful life in a beautiful home. You have two babies: Asset Tilburg and Asset | Econometrics. Suddenly, your house is on fire and you're only able to save one baby. Which baby will you save?" "Well, as Asset | Econometrics is part of Asset Tilburg, I would definitely save Asset Tilburg."

An answer we already expected. Now we changed the story and named the babies Asset | Econometrics and Asset | Marketing. "What will you do now, Bas?" Bas stayed quiet for quite some time and Janne had to count down: "3,2,1, what's your final answer?" Bas couldn't think of a right answer and thanks to his independence, both babies didn't survive.

By now we already knew much more about Bas than we did before, however we were still not satisfied. There was one thing that Janne always wanted to know about Bas, and in the most serious way she could, she asked



**Bas
Ramaekers**

him the following question. "So, Bas, does your position as IC give you a better position on the market?" Bas was looking a bit doubtful after Janne asked him this. "A better position when you concern dating and seducing women." We were both very curious for his answer. Would we, again, get the very politically correct answer we were used to by now? Surprisingly, we did not. "Well, not in a direct way. However, I am aware of the fact that in a lot of committee rankings, I am worth a certain amount of bonus points." Since we are living in 2020 and should in any case be very aware of objectification of women, or in this case men, we were very concerned. "Are you okay with that Bas, are you really okay with that?" Bas chuckled and replied that he didn't care much about it.

To keep this interview abreast of the times, we had to ask Bas something about the coronavirus. "How much money would you have to be paid to 'voluntarily' get infected by the coronavirus?" Bas looked at us as if we were some complete nitwits, but answered the question very rationally, as we could have expected by now. "Well, many of my friends study econometrics, as do I, and they say one in three econometricians becomes a millionaire, so too little money hopefully won't be an issue for me in the future. Also, considering my health is pretty good and the virus is most dangerous for elderly, at least that's what I heard, I'll stick

the price at 150 million euros." Jelle was also curious what Janne's answer would be to this question. Janne explains that she has a relatively weak immune system and gets sick pretty quickly. "The virus will probably bear more risk to me, so I would say more than 150 million euros as I quite like my life", she says.

Time to switch the subject again. We asked Bas what his perfect Sunday mornings look like. On a perfect Sunday morning, Bas prefers to stay in bed a little longer than he does on weekdays. After that, he will go for a morning run and come home to make himself breakfast. Very important is that no coffee is involved in this breakfast. "Coffee is something that you drink to stay awake, which is not necessary on a Sunday", Bas jokes. After breakfast, he prefers to just chill during the afternoon. Maybe visit his grandparents once in a while, watch some sports afterwards. Formula 1, football, tennis; there is no sport that he doesn't like.

A few days before this interview, we were together with the D&A committee of last year. One of the people present was Emma. Since Emma is the Editor-in-Chief of Nekst, we thought it would be useful to ask her for some extra insights. "Emma, is there one thing in your life that you'd like to know that we could perhaps ask Bas?", Janne asked. There definitely was one thing. As a big fan of fries, Emma wondered how many

fries she could eat in one hour. We both nodded and Jelle added this question to the list on his phone of questions we already came up with. After having asked this particular question, as we were used to by now, Bas tried to use logical reasoning to formulate an answer. The first step in his reasoning was to gather all the information necessary. "What kind of fries? Fries from the Tropical or MacDonald's fries? Is she hungry? Is sauce included?". We replied with "MacDonald's, yes, yes" and Bas started thinking. Saying that in one packaging of MacDonald's fries there are 4 rows of 10 fries and Emma could probably eat 10 packagings of fries, he came to the final answer of 400 fries in one hour for our Editor-in-Chief. If you are reading this and are curious to find out whether Emma can satisfy this prediction, we invite you to approach and challenge her.

At this moment of time, the interview started to take a bit long. The Asset Pre-Carnaval Party was taking place that evening and we both had places to go to. Moreover, Bas had independent chairman things to do. We were satisfied with the answers we received from Bas and we had asked all the questions that kept us awake at night. If you ever have some useless questions, we're sure Bas would like to help you analytically come up with a good



Exploring the Snowy Mountains in France

This year the annual ski trip of Asset went to Risoul, a little village in France which has about 185 km of slopes. Last year I participated in this ski trip as well and I had a great time, so it was not a difficult decision for me whether or not I should go. Unfortunately, two resits were planned during the trip, but from my point of view this can be seen as extra motivation to pass these courses on the first try!

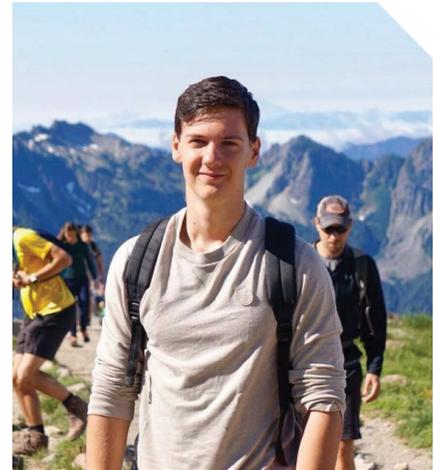
We departed on Saturday from Tilburg university by bus. Everybody was really excited for the ski trip and the atmosphere was great. After a 15-hour drive, we arrived in Risoul at 9:00 hours. Still all pumped up, we immediately hit the mountainsides and started skiing. At the beginning we also met two guys from the marketing department who were looking for other people to ski with, so we adopted them in our little skiing group. It turned out that these guys were good company and we ended up skiing with them the entire trip. Also an important detail; we were almost the only ones there, the weather was great, a clear blue sky and the sun was shining. Just thinking about it makes me want to go back. After skiing for a whole day we went to the famous Yeti bar. This was the place to be for après-ski, but there is a difference between French après-ski and Austrian après-ski, namely the music. If somebody mentions après-ski, I immediately think of songs like 'Anton aus Tirol' and 'Schatzi schenk mir eine Foto'. However, in France the music you'll hear is more likely to be techno and house. Some people experienced it as a bit of a disappointment, but after some drinks nobody cared anymore.

Fast forward to the next day, we were up at 08:00 hours. One of our roommates had skiing lessons so he had to get up at that time every day. Even though he tried not to wake us up, he did. This was not a bad thing, because

it meant we also had to get up and hit the slopes as early as possible, but some days I wished I could just stay in bed for an hour longer. After again a fantastic day of skiing with perfect circumstances, we had the legendary Asset Ski Trip Cantus. This cantus was held in the Yeti bar and of course, because we're econometricians, we were all standing together. For us it is common to sing 'TEV = VET' after the drinking song. This was however not much appreciated by the Ski Trip committee and we had to do a strafadje. They thought that this was enough for us to stop, but due to the perseverance of Britte, we kept on singing the phrase and had to deal with the consequences as well. Thanks Britte.

The next day I wished I could have had that one hour of extra sleep, but nevertheless we went skiing pretty early. You could see this day as a day off. We did everything very relaxed and in the evening nothing noteworthy happened. Energy levels were a bit low that day, so we needed some rest to be fuelled up for the next day.

The second-to-last ski day we went to the far corner of the skiing area. It took us about two hours to get there from the starting point and we had to take a stupid drag lift, but it was definitely worth it. The scenery up there was incredible and we had some time to have a photoshoot with our little ski group. In the evening we had a pub quiz, and maybe you can already guess, it was held in the Yeti



Rein Lommerse

Master EOR

Age: 21

bar. Perhaps this wasn't the best organized pub quiz, but it still was a lot of fun. Luckily we didn't win because the winners had to chug a bottle of Smirnoff Ice.

After four amazing days of skiing, we finally arrive at the last day of the trip. The entire trip we have had great weather and snow, and the last day was no different. At 15:00 hours it was time to pack our bags and say goodbye to Risoul and it's beautiful mountains. I'm really glad that I signed up for this skiing trip, as this is a trip I'll never forget. Not only was the skiing great, but also the night life was something that really impressed me and I certainly did not expect that. I want to thank the committee for making this possible and if it's up to me, they can do it again next year! ●



Living the Canadian Life in Victoria

Whenever I tell people that I spent four months doing an exchange semester in Canada, they always ask me one out of these two questions: “Are the Canadians actually that nice and friendly?” & “Wow, isn’t it really cold out there?”

In the semester of Fall 2019, I went to study at the Peter B. Gustavson School of Business at the University of Victoria (UVic), so basically just a fancy name (very North-American!) for the Business faculty of UVic. I was the first Econometrics student to go there in a very long time, which I found to be weird, as there were many possibilities to also follow EOR courses. I was planning on replacing at least my two elective courses (yes, I’m from the “old” generation) and one of my philosophy courses. It was possible to follow courses from different faculties or departments, that is how I got to follow the course “Introduction of Philosophy of Science” at the Department of Philosophy. There was also a Department of Mathematics & Statistics, which had many courses that would be approved

as EOR courses! You just need to put in the extra bit of effort of investigating and emailing, and hoping that you have no conflicting time tables, which was unfortunately the reason that I did not follow a Data Analysis course.

To come back to the questions I set in the introduction: yes, Canadians actually are that friendly! Wherever you go, people are always up for a chat. For example, the first time I went to a grocery store, I had a 15 minute conversation with one of the employees, just because he was genuinely interested in where I come from, why I came to Victoria and what I would be doing there. Also, hitch-hiking in Canada actually works and has saved me and my friends many times!

This may surprise you, but no, it was absolutely not cold in Victoria. Up to the middle of October, everyone was walking around in t-shirts and dresses and while I was there, it was not colder than 8°C during the day. Victoria actually has a Mediterranean type of climate, with mild, rainy winters and cool, dry summers. It doesn’t even



Rachel van der Velden

Bachelor EOR

Age: 21

snow often, which is not in line with the images most people have of Canada.

From the moment we knew we were going to Victoria, me and three IBA students from TiU had an entire team of International Advisors from the Business School ready for us. There are so many Business exchange students that the faculty organized everything independently of the other exchange students at UVic. Everything was taken care of really well and also really fast. This made me feel pretty secure about flying to the other side of the world without knowing anyone, as I knew that we would be taken care of well. Through these advisors, I



also managed to sublet a room from another Business student who was going to Norway himself. I lived in a student house with five Canadian students at just a 5-minute bike ride away from the university!

The semester started with a two-day introduction, which at first had the usual speeches about cultural and communication differences and the relationship with the Indigenous population. But then a very serious woman from security came to talk to us about how Victoria is an area where earthquakes happen occasionally and where there is a possibility of being attacked by a cougar (you know, the one that actually wants to eat you). Someone should have told me that before I flew out there...

After that, the fun part of the introduction could start! Two days is never enough to get to know all 150(!) Business exchange students. We did some nice activities, including a bus tour around the area and this was in one of those classical yellow school busses. During these days, everyone would go to Felicita's, the pub on campus, in the evenings. No one really knew anyone, everyone just talked to everyone and that is how we got into a conversation with some Canadian students. They are always very excited to tell you all the beautiful places you should visit. So

one of those nights, the idea for a first trip was born! Victoria is situated on Vancouver Island, which is an island of about $\frac{3}{4}$ times the size of the Netherlands. It is located in the Pacific Ocean just outside of Vancouver which is on Canada's mainland. Vancouver Island is actually one of the few places left in the world where there is still a temperate rainforest. Usually, when people think of a rainforest, they think of a tropical rainforest like the Amazon or the ones in Southeast Asia. So some people didn't believe me when I said I went hiking in a rainforest each weekend. The nature on the island is absolutely unbelievable and I would recommend everyone to go there!

During the week, there would be quite a lot of (compulsory) lectures. These were scheduled in such a way that you are free on Fridays, so this is perfect for weekend trips!

The first trip we made was to Port Renfrew, a very small town on the west coast of the island. Unfortunately, this was a weekend where we definitely would not forget we were in a rainforest. Luckily, we persisted and still managed to do many (muddy) hikes and see "Canada's Gnarliest Tree", some beautiful beaches, forests and even two baby bears(!!!). Yes, our very first week-

end getaway and we saw two baby bears and yes we were absolutely terrified. At every trail and beach entrance there would be warning and information notes saying how to act in a situation where you come across a bear or a cougar. You do not expect to actually see them, so when they suddenly showed up out of the bushes only a few meters away from us, we were pretty amazed at first. After being amazed, we were panicking, as their mother would be really close and would be very protective of her cubs. So we made sure to get out of there, taking photos while walking and looking back to make sure no mama-bear was following us.

On the weekends, we would usually rent a car and make a weekend trip, or we would just sleep in Victoria and make two day trips. Amongst others, we went to Canada's surfing paradise Tofino, Salt Spring Island and Mount Arrowsmith. All of these trips were actually on the island, as it was not that easy to leave the island. You can leave the island in two directions: Seattle and Vancouver. These two cities are the big cities that are closest to Victoria.

In November, there is the "reading break". You have Monday, Tuesday and Wednesday off. So obviously everyone takes off the whole week, as you are allowed to skip some lectures.

Most European students went to sunny Hawaii, as it is relatively close. Me however, I went to the cold Canadian Rockies where my boyfriend Guus and I made a roundtrip. Luckily, it was not that busy as it usually is in summer, perhaps because it was around -10 °C. I would definitely recommend going there, either in summer or winter, as it is a very special place with beautiful mountains, lakes, forests and wildlife.

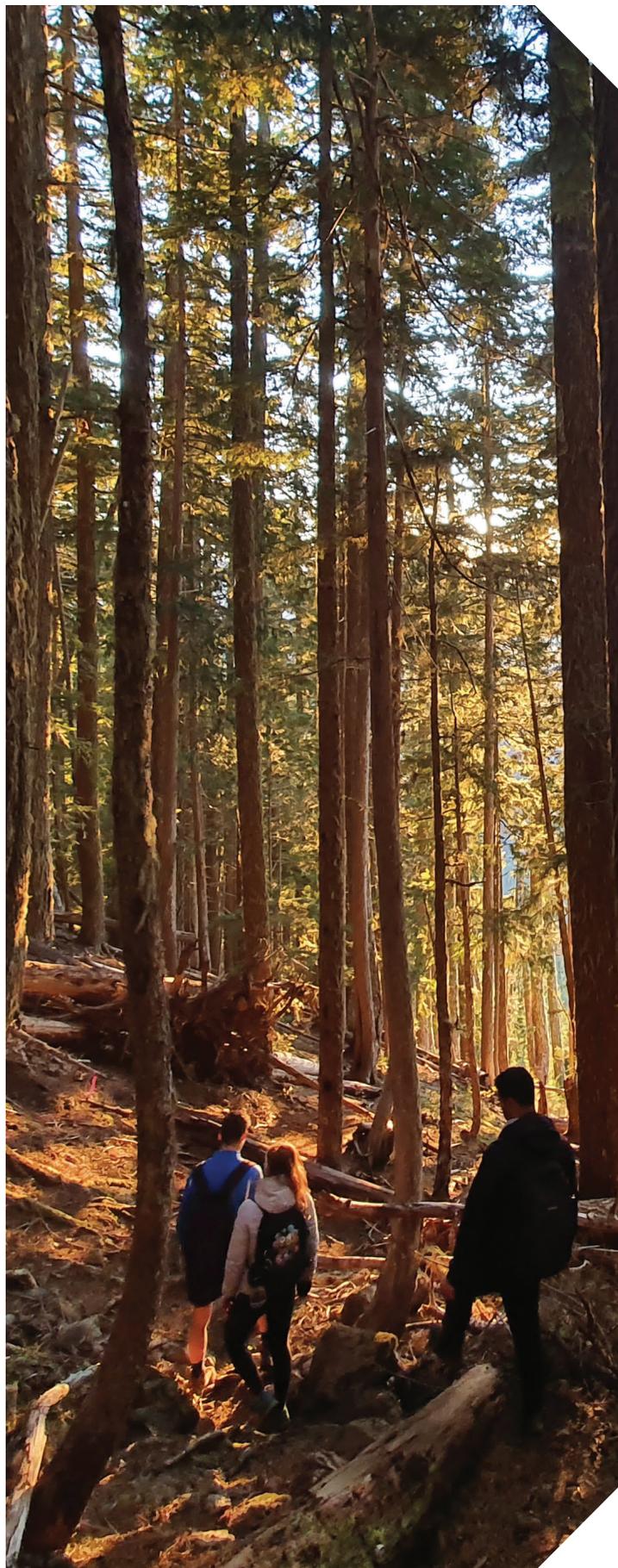
During the semester, I participated in many typical North-American events. I watched a NFL game in Seattle, which is incomparable with the biggest soccer games we have in the Netherlands. Each game, around 70.000 people are at the stadium. Everyone is friends with each other and all of them are cheering and shouting. The Seahawks fans also happened to be the craziest fans in the NFL, which was a very fun experience.

Also I went to two NHL games in Vancouver, where about 20.000 people were watching. In comparison, the Tilburg Trappers have place for 2500 fans.

As you might expect, Halloween is a very big deal in Canada. Already weeks before, you would see pumpkins everywhere. All the houses are decorated and some of them look more like haunted houses including music, lights and moving parts. Of course, many nice events and (house) parties were organized.

During the semester I was part of a committee that was in charge of organizing the Year-End activity. We were in charge of organizing the event which was just after the lectures and before the exams. It was one last evening with everyone where we could enjoy food, receive our official certificates and have a great afterparty before we had to study for exams.

The semester flew by and before I knew it, I was back in the Netherlands on the first day of Christmas. My semester in Victoria has been absolutely amazing and would do everything all over again! If you ever have any questions about UVic/Canada, let me know! ●



A Competition in My Favorite Board Game

Probably you have not heard of it, but you definitely heard of the game that is played at this event: the NK Risk. Last January it was time for already the sixth edition of the national championship of the game Risk. The famous game Risk was invented in 1957 by Albert Lamorisse, a French filmmaker, and went on to become one of the most popular board games in history.

About 2,5 years ago I heard about this tournament for the first time. As I already used to play this game with my friends a lot, I immediately shared it with them and went with one of my friends Bas for the first time to the event in Delft. The year thereafter, I was able to convince even more people to join and we went with five and last January we went with four. During the last two editions, which were organized in Rotterdam, almost 600 people, mostly men between the ages of 20 and 30, joined the event. I'd like to elaborate a bit more on why I think this is such a great event.

First of all, the game of Risk is one of the best games that is ever

invented. It can be described as a game with simple rules, yet of high complexity, which makes it an elegant and thoughtful game. One has to choose a strategy and play according to this one, one needs to have the courage to attack its opponents, but also the patience and the timing to do this at the right time. At the tournament only the older version is played as everybody adores the simplicity of the game.

Secondly, the event is a day with a lot of competitiveness. Almost 600 people start in the first round with five or six people at the table and only two will continue for "the real tournament". The other three or four people will go for "the losers tournament". From the second round on you will have to beat all your enemies at the table to continue in the competition and it ends in the final after 4 rounds.

Third and last, besides a great game and an enormous competition, it is a day with a lot of fun. As already mentioned, most people present are males between ages 20 and 30 and as you can imagine that will be guaranteed fun and drinking beer. You might say you have three types of players: the ones that come to play a lot and drink a couple of beers, the ones that come to drink a lot of



Joris Pirée

Master EOR

Age: 23

beers and play a couple of games and the ones that have to drive the car. Personally I think the NK Risk should be visited by more econometrics students as they all like to play an amazing game, be competitive and drink (a few) beers. I joined for three years already and will definitely be present next year and hope to see some of you there as well, because one thing is for sure: No Risk, No Glory! ●



Let's Talk!

written by **Jarno Ringhs** and **Casper Heemskerk**

A few months of the new decade have already passed. The festive period is over and most students are busy studying again. Therefore, it was time to let them have a break and talk about better times. A lot of people become happy from travelling. Seeing the world and exploring the unknown is something that lits a fire in most of us. That is why we asked them the following question: "If you had to choose one travel destination to visit in your life, what would it be?"

Ishana Dajal, 18 years old, first year studies

"Buenos Aires, Argentina. It is a huge country with beautiful nature reserves and a big biodiversity. I also really like the Argentinian accent."

Juliette van der Velden, 20 years old, second year studies

"Canada is on top of my list. People from my family live there and the country itself seems very cool to see."

Frank Messelink, 18 years old, first year studies

"New York, the Bronx. I just think it is a wonderful place to visit!"

Tim van Eck, 25 years old, third year studies

"As a travel destination I would choose Japan, because I like the culture there and I think it has a wonderful nature."

Jesse Wilbers, 19 years old, first year studies

"I would like to go back to Aruba. The father of my friend lives there. It is a nice place with a beautiful sea, pretty women and the weather is always good there. The people are sociable and they always start up a conversation with you."

Renzo Ringhs, 20 years old, third year studies

"I would have to choose between the USA and Japan. The USA have the NFL, the NBA and it seems very interesting to me to understand their way of living better. I would visit Japan for the food, the culture, its history and the beautiful cities. Luckily, I go on exchange to Japan so the USA will remain as my favorite travel destination."

Times are not always better outside the borders of Tilburg. Most of the time is spent here in friendly North-Brabant. Of course, everyone enjoys different parts of the year, but which month is preferred the most? Which month gets you excited when you see on your calendar that the start of this month has arrived?

Renzo Rings, 20 years old, third year studies

"My favorite month is December. Saint Nicholas, my birthday and Christmas are all in December. Better than that is just impossible."

Jesse Wilbers, 19 years old, first year studies

"August, then is my birthday and of course I'm able to enjoy the summer. Visiting a nice warm country. The only downside is that the football season has stopped."

Ishana Dajal, 18 years old, first year studies

"I would choose April. It's finally warm and sunny again and everyone is a lot happier. Everything is simply better then. It is nothing personal but I just like the happiness of the spring."

Lars Struik, 18 years old, first year studies

"My birthday is in November but I prefer May. The summer starts and that makes me happy. Everyone is also more cheerful."

We are already in the year 2020. Most of us and the people we talked to are born around the year 2000. This new decade is going to be ten years where everything will slowly start to get more serious. Therefore we asked where they see themselves in 20 years when their age has doubled.

Tim van Eck, 25 years old, third year studies

"In twenty years, I see myself working at a large company with a decent salary. I would also have two children by then, knowing my girlfriend, with whom I can spend a lot of time."

Frank Messelink, 18 years old, first year studies

"I hope to have a nice life with a wife and two or three children by then. I also would like to have a nice job which makes my wallet as fat as Django Wagner. Preferably living around Enschede and in the city."

Ishana Dajal, 18 years old, first year studies

"Hopefully, I live in Amsterdam and I work at a consultancy. Married, having children, and a dog. I definitely want a dog. I'm not sure about having children yet. I want to have done a lot of traveling by then and have a fully stamped passport. I shall see what happens."

Jesse Wilbers, 19 years old, first year studies

"It seems cool to me to be an agent for football players by then. I would like to live with a nice woman in the city, because you simply can't leave Brabant. Making a good living and having nice friends, only then I can live without any stress."

Renzo Rings, 20 years old, third year studies

"In twenty years, I see myself working at a bank or insurance company with a good salary. Married and two children. Hopefully I have a black belt in Brazilian Jiu-Jitsu by then and I have the possibility to teach it to others."

Quatsch!



Quatsch?

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

Nienke van der Wal (over iemand anders dan haar vriend)
"Ik moet nu altijd afspreken hoe laat ik met hem ga douchen."

Bastiaan Schutte
"Een klein stapje wil niet zeggen minder drank."

Denise Jacobs
"Kijk, ik heb de nieuwe zaaddonor voor mijn kat uitgekozen!"

Lotte Gerrits (over Juliette van der Velden)
"Zij heeft een te lelijk hoofd om kaal te zijn."

Jaron Kappers
"Mijn darmen borrelen nog harder dan ik gisteren."

Jeannine Beker
"Werkloos is de nieuwe vakantie."

Pierre Verhulst
"Na vrijdag wordt het allemaal weer roze kleur met maneschijn."

RiQuatsch!

Due to the fact that the Nekst committee has received a lot of quatsches of Ricardo, we would like to dedicate an entire page of (Ri)Quatsch to him. Enjoy!

Bij een discussie of er dure wijn of goedkope wijn in een mooi doosje gehaald moet worden

"Dan geven we weer zoi en er is al zoveel zoi in de wereld!"

"Ze moeten gewoon in huilen uitbarsten, dan is de avond geslaagd!"

Op de terugweg van de LED tegen econometriestudenten uit Rotterdam

Ricardo: "Weten jullie waar we naar toe moeten?"

Studenten: "Nee."

Ricardo: "Huh, maar jullie komen toch uit Rotterdam?"

Studenten: "Ja, maar we zijn in Utrecht..."

"Weet je wat zo leuk is aan acht nieuwe bestuurders? Acht potentiële nieuwe Instagramvolgers."

Op de vraag of hij naar de Hackathon zou willen (zonder programmeerskills)

"Dan zou ik twaalf uur van mijn leven zo in de prullenbak gooien."

"Ik volg Asset General niet (op instagram), want Asset General volgt mij niet."

In een discussie over afmetingen van wijnglazen

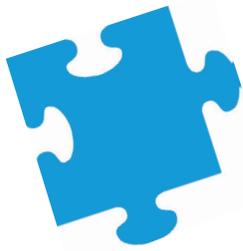
"200ml? Dat is maar één slok!"



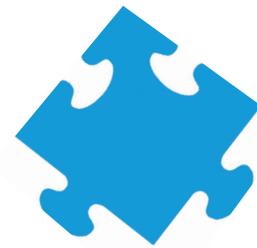
Carnival Photo Contest Winner(s)

The winners of the Carinval Photo contest are the members of the AMW committee! They sent in the photo below while partying together during carnival. Congratulations!





Puzzle



Some statements about all the letters that pass through the Asset | Econometrics boardroom are given below. You may assume - for the duration of this problem - that they are absolutely true in all respects. Based on that assumption, you should be able to give an answer to the question after the statements.

- All dated letters in the boardroom are written on blue paper.
- None of the letters in this boardroom are in black ink, except those written in the third person.
- Britte hasn't put away any of the letters in this boardroom she can read.
- None of the letters in this boardroom written on a single sheet of paper are undated.
- There is a precise overlap between crossed letters and black ink.
- All letters in this boardroom written by Bastiaan start with 'Dear gentleman'.
- All letters in this boardroom written on blue paper will be put away
- None of the letters in this boardroom written on more than one sheet of paper have been crossed.
- None of the letters in this boardroom starting with 'Dear gentleman' are written in the third person.

Can Britte read Bastiaan's letters?

Can you figure out the puzzle?

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

Martijn Tervelde is the winner of the previous puzzle. As a reward, he/she can come and pick up a crate of beer or a pie at room E1.10. The solution can be found at www.Nekst-Online.nl.



Asset | Econometrics congratulates...

Name **Bart Hampsink**

Title Neighbor assignment problems on a graph

MSc EME

Supervisors Prof.dr. P.E.M. Borm, Dr. R.L.P. Hendrickx

Name **Claudia Miesen**

Title The Effects of Promotions on Performance Indicators at Jumbo Supermarkets

MSc QFAS

Supervisors Prof.dr. J.H. Abbring, Dr. O. Boldea

Name **Ege Yigit**

Title Sourcing Decisions with Multiple Unreliable Suppliers and Flexible Backup Supplier

MSc BAOR

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

Name **Yuji Ho**

Title The Impact of Longevity Risks on Variable Annuities

MSc QFAS

Supervisors Dr. A.G. Balter, Prof.dr. A.M.B. De Waegenare

Name **Sander Schenk**

Title Investment under uncertainty in a circular market

MSc BAOR

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

Name **Niek Simons**

Title A Machine Learning Toolkit for Tactical Asset Allocation

MSc QFAS

Supervisors Dr. N.F.F. Schweizer, Dr. D. Kojevnikov

Name **Prowporn Napapongsuriya**

Title Recommending Movies and Movie Genres through Logistic Regression and Feature Selection based on Movie Tags and Ratings

MSc BAOR

Supervisors Dr. O. Boldea, Dr. J.R. de Bresser

Name **Quirien Raat**

Title Perfect and partially perfect equilibria

MSc EME

Supervisors Prof.dr. P.E.M. Borm, Prof.dr. M.Quant

Name **Niall Murray**

Title Examining the Profitability of Technical Analysis in the Broader Cryptocurrency Market

MSc EME

Supervisors Dr. N.F.F. Schweizer, Dr. J.R. de Bresser

Name **Manon Belterman**

Title A strategic approach to claims problems

MSc EME

Supervisors Prof.dr. P.E.M. Borm, Prof.dr. M.Quant

Name **Tijn Fleuren**

Title Optimizing conveyor belt utilization via efficient scheduling Mixed-time mixed-integer programming formulations and stochastic local search algorithms

MSc BAOR

Supervisors Dr. J.C. Vera-Lizcano, Prof.dr.ir. H.A. Fleuren

Name **Luuk de Vlugt**

Title Investment in technological innovations: when and how much

MSc EME

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

Name **Anouk Veenema**

Title Implicit lifecycle investing in a collective pension fund

MSc QFAS

Supervisors Dr. A.G. Balter, Dr. N.F.F. Schweizer

Name **Petrus Bult**

Title Network sequencing problems and cooperative games

MSc EME

Supervisors Dr. R.L.P. Hendrickx, Prof.dr. P.E.M. Borm

Name **Amandev Singh**

Title Quantitative Enterprise Risk Management for ASML

MSc QFAS

Supervisors Dr.ir. G.W.P. Charlier, Dr. N.F.F. Schweizer

Name **Jeannine Beker**

Title A spreading disease in a small-world graph

MSc EME

Supervisors Prof.dr. P.E.M. Borm, J. Schouten MSc.

Name **Max Smedts**

Title Anomaly Detection in Event Logs using Unsupervised Learning

MSc BAOR

Supervisors Dr. J.C. Vera-Lizcano, Dr. J.C. Wagenaar

Name **Arjun Gupta**

Title Complementarity between Exporting, Importing and Productivity: Evidence from India

MSc EME

Supervisors D. Brosch MSc., Prof.dr. T.J. Klein

Name **Max Smedts**

Title Anomaly Detection in Event Logs using Unsupervised Learning

MSc BAOR

Supervisors Dr. J.C. Vera-Lizcano, Dr. J.C. Wagenaar

Name **Niels Jansen**

Title Exploring the Application of Predictive Modeling for Prevention of Lapse in Private Car Insurance

MSc QFAS

Supervisors Dr. P. Cizek, Dr. J.R. de Bresser

Name **Georgia Apostolopoulou**

Title Network Analysis and Sampling Bias

MSc EME

Supervisors Dr. M. Rothfelder, Dr. O. Boldea

Name **Lucas Jacobs**

Title Copula of the Merton model

MSc QFAS

Supervisors Prof.dr. B. Melenberg, Dr. A.G. Balter

Name **Robert Poos**

Title A Robust Approach to Food Assistance Supply Chains

MSc BAOR

Supervisors Prof.dr.ir. D. den Hertog/Dr. J.C. Wagenaar, Prof.dr.ir. H.A. Fleuren

Name **Anouk Casparie**

Title Adding additional value to the employer collectives of small and medium-sized enterprises at CZ by using clustering techniques

MSc EME

Supervisors Prof.dr. H.J.M. Hamers, Dr. M. Balvert

Name **Lars Holtappels**

Title Investment in technological innovations: when and how much

MSc QFAS

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

...on obtaining their
Master's degree

Agenda

THU Asset Gala

9 The yearly Asset Gala will this year take place at De Heuvel Gallery. So, put on your prettiest dress or suit up, and enjoy a night of fanciness with your friends!

APR

TUE Freshmen Activity

7 Get to know your fellow freshmen and second-year students even better during the second Freshmen Activity! The evening will be filled with a huifcarcantus, so make sure to be there!

APR

WED Inhouse Day Optiver

22 Get to know Optiver better during this inhouse day! A select group will go to their working place and experience what it is like to work at Optiver.

APR

THU Beer Games Drink

16 During this annual spectacle, teams will compete against each other in different beer games. The main event is of course the beer estafette. Come and drink (and see)!

APR

THU Econometricians for Society Activity

2 During this activity, (active) members of Asset | Econometrics will have a nice activity for a good cause. Stay tuned for more information!

APR

FRI Active Members Weekend

24 All active members are invited for a legendary weekend! This weekend is meant to thank all active members for their efforts and contributions. The whole weekend will be kept a secret until the very last moment!

APR

SUN

- 26

APR

Due to the current situation and measures, some events are likely to be cancelled. We will keep you up-to-date through our channels!

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



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

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

Together, we unlock potential.

