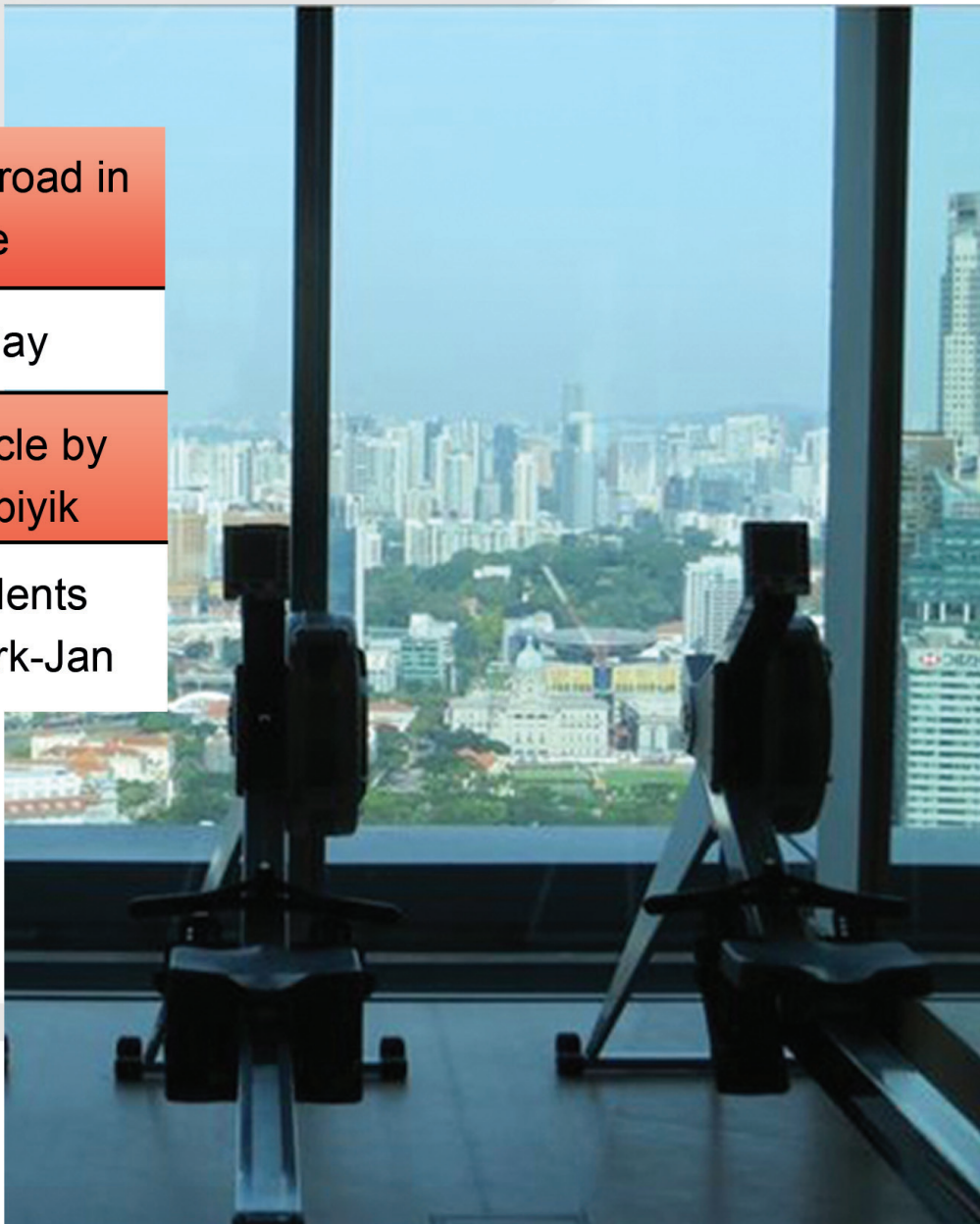Wim's Study Abroad in Singapore

The Case Day

Research Article by Hande Karabiyik

Meet the Students Florentijn & Dirk-Jan

Word from the President

Dear Econometricians,

Sadly, time is flying by and this will be the last time I will be writing the word of the president. In a few weeks not only this academic year will come to an end, but also my board year and with that my life as a student. Next year will bring new challenges and opportunities for all of you. The first year students who survived the first year will have the hard choice of choosing the destination of their exchange semester. The second year students will experience their foreign exchange. The third year students will graduate from their bachelor and start as new master students. The master students have to face the challenge of finding a job and to leave student life behind them.

It was an honour to be the president of SCOPE | Vectum during the last year of my studies and I enjoyed every minute of it. Together with my fellow board members, it was a year in which we were able to develop ourselves and bring SCOPE | Vectum to a next level. To give an overview of the current academic year, I would like to dedicate this word of the president to look back on the current academic year.

During the Faculty Introduction Days in the beginning of the year, we presented three pillars to give the new students a clear picture of what SCOPE | Vectum has to offer them. These three pillars were career events, social activities and academic activities. Personally, I was glad with the amount of career activities we were able to arrange this year. Next to the yearly returning events like the LED (organised together with the other LOES associations), the Business Trip and the Kempen en Co Inhouseday (organised together with SCOPE | Focus), we expanded our portfolio of career events. I want to thank Marie for putting a lot of effort in coming up with creative ideas for career events. This resulted in events like the Deloitte lunch lecture

(together with SCOPE | 3MA) and the MIcompany recruitment dinner. Next to these two events, we also had our first SCOPE | Vectum case day with four very interesting companies. We hope that we have provided you with enough information about what possibilities there are for you as an econometrician after you have graduated. I think that there was a great variety in social activities this year. I want to complement Ellissa on the amount of new activities that she has introduced this year. We organised activities like a walking dinner, Oktoberfest, beer tasting, an adventure tour in the caves and many more. For the grand finale, we will have our famous Members Weekend. I would like to highlight the squash event of last block. I was really glad to see that there was a social activity in which the KE department participated in the person of Dries Vermeulen. I hope that in the future we can have more social events with participation of the KE department. I want to thank Fabienne for organising the trip to Brussels during the last resit period. I hope that in the next years, there will be a yearly foreign trip. We hope that you enjoyed the social activities of this year as much as we did. Next to the career events and the social activities, we also had the academic activities. In the beginning of each block we organised an interesting research lecture. We tried to combine the research lecture this year with other information eve-

nings, like the board information evening and the foreign exchange stories. Next to the research lectures, we also had the master and PhD information evening and the LaTex workshop. All these events were in cooperation with the KE department and I want to thank them for their cooperation. Last but not least, I want to thank all the members of our committees who had a part in organising all these events.

At the moment, it is already clear who will be the proposed board of SCOPE | Vectum for next academic year. We will present the proposed board to you during our annual GMA on the 24th of June. I want to take this opportunity to invite you all to our GMA where you can vote on the proposed board. We, as the future old board, have a lot of confidence in the proposed board and wish them (after your approval) an enjoyable year with a lot new experiences.

As the end of the year is coming closer, I would like to seize this opportunity to express my gratitude to a number of people. First of all, I want to thank all of our members who participated in our events this year and especially the ones who organised them. Without you the events would not have been as great as they have been. The KE department definitely has to be mentioned. Next to the research lectures, they help us with a lot of things. They

provide us with articles for the Per-Vectum, give us advice, offer us opportunities and are willing to reschedule lectures for our events. SCOPE | Vectum is part of the SCOPE framework. I want to thank the other boards for their cooperation in the last year. A special word of thanks goes to the presidents as I worked closely together with them on personal and professional level. I think that we made a lot of steps this year in our cooperation within the SCOPE framework and I hope that more steps will follow next year. Two people who are also closely related to the SCOPE framework are Remco de Rijck and Leann Poeth. I want to thank them for their cooperation and for narrowing the gap between the SBE and the SCOPE framework. I also want to thank all the other econometric associations that are part of the LOES. I think that this is a really fruitful cooperation with great events like the LED and the LEVT. A special word of thank to the presidents who made it worth travelling to Utrecht once in a while. At last, a special word of thank to all our sponsors, who once again have shown their interest in our association and students.

I want to conclude this last word of the president with a very special word of thank for three very special ladies. Marie, Fabienne and Ellissa have conquered a special place in my heart.

They amazed me more than a couple of times this year and I want to thank them for a great year. But ladies do not be sad, it is not over yet!

I would like to wish you all the best! Enjoy your holidays and maybe we will meet again at an Alumni activity or maybe even as colleagues.

Jim Bemelen
President SCOPE | Vectum 2013-2014

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Case Day

by Case Day Committee

By Frederique van Leewen

I was lucky to play the role of a consultant for Q-park Nederland. After the welcome session with a very welcome cup of tea or coffee, Q-park started their case. They began with a little introduction about their firm, which made clear what their firm is actually doing. After that, they explained the case we had to solve. It was about setting different parking fees for different timeslots and what the effects would be on the total revenue of the firm. We had to make a model in which we considered the different prices, but also the maximum prices for every timeslot. The case was to my opinion very interesting. Unfortunately, we did not have enough time to get to the final solution, but nevertheless every team came up with a very nice piece of work, what led to a smile on the faces of the Q-park-staff. There was no specific case winner, because we all did such an amazing job. However, after this successful case we got a reward nonetheless: a delightful lunch at restaurant Reube!

By Jeannot van den Berg

Thursday morning at ten, I attended the case of Kleynen Consultants, a company I did not have any prior knowledge about. I was however immediately surrounded by familiar faces, as some of the people who work at Kleynen Consultants also study or have studied econometrics at Maastricht University. This made me feel a little more in my comfort zone. After a brief introduction about the company by mr. Kleynen himself, we were introduced to the case. Hedging pension funds against interest rates. My first thought obviously was that I would have rather stayed in my bed. After having dropped this initial thought, I started to work on the case together with my team. The first step was to get familiar with the data that had been provided to us. After some trial and error procedures, my team quickly got familiar with the provided excel sheet. We were asked to find a portfolio of bonds such that we replicated the payoff structure of the pension fund, then 100 different interest rate scenarios were used to calculate the difference in bond payoff and pension fund payout. If this difference was negative, the fund would go bankrupt. The main goal was to maximize this difference for the worst of these 100 scenarios. After a lot of heated debate within the group, we finally formed together our final answer. In retrospect, I can say that I was very happy I left my bed that morning.

By Martijn Schoenmaker

During the lunch was the first time we got the opportunity to meet Van Lanschot. Floor Auer, the recruiter from Van Lanschot, was there during the lunch and she was able to already give us some information about the possibilities for us econometricians at Van Lanschot.

After the lunch we went back to the SBE to start the second case round. First of all, Floor provided us some general information about Van Lanschot as a company and the possible departments. Dennis had also arrived at this time and he was able to provide us with some insights in the daily work of a private banker at Van Lanschot. He mainly stressed the different aspects of the job, which contains both contact with the clients as well as working out their optimal portfolios. He also explained briefly in what types of investments you should invest during certain economic states, which would be useful during the case.

After this brief introduction to what Van Lanschot was doing and their job opportunities, we started working on the case. During the case we were supposed to find out in what state the economy currently was, based on a few newspaper articles. After we had found out what the state of the economy was, we were supposed to spread our portfolio over the different investment opportunities. Although some of us would have preferred the case to be a bit more quantitative, the case give us good insight in their investment procedures and their job opportunities.

By Bram Vandermeulen

After a great lunch at restaurant Reube – where we already had the opportunity to get to know the two Gupta Strategists-representatives informally – we returned to the SBE to get started with the second round of cases. Since only a few students were familiar with Gupta Strategists, we were first explained what the company name stands for (it's just an Indian versian of 'Van Dijk' or 'Jansen') and what they actually do at Gupta strategists. It seems that Gupta is a rather small consultancy company with a focus on everything related to healthcare (hospitals, health insurance companies, pharmaceutical companies). There are approximately twenty consultants (from all kinds of fields), no secretaries and no office buildings, which makes the whole company very efficient.

For the case we had to 'act' as if we were consultants, thereby considering a hospital with three specialised areas (e.g. cardiology). We were given population data for the Netherlands and for the specific area around the hospital. Additionally, there was data about the 'demand' for each of the specialised areas – countrywide and regionally again. From this data we had to draw a conclusion on which specialised areas the hospital should continue with and which, if any, not – thereby focusing more on the others. In the end, we all had to give a short presentation explaining our results.

Impressions from **Case Day**

The Econometric Game

By Kaya Verbooy

Back when I was a first-year student I learned about this day where econometricians from all corners of the Netherlands gathered to explore the possibilities within companies after their studies. It was called the 'LED' –the national econometrics day - and I thought that this event was the biggest nerd-convention of the year. I was wrong, the Econometric Game easily wins from the LED. It is a gathering of 120 students from 30 schools all over the world (from Canada to South Korea). In three days the 30 delegated teams were supposed to find elegant solutions to this year's topic: Researching poverty with incomplete consumption data.

Om Monday evening we - Hande, Hanno, Peter and I – got on the train from Maastricht station. We had plenty of time to explore the world of card games as the NS decided once more to delay our journey by half an hour. Our team bonded over a few rounds of 'toepen' and a Turkish game of which I already forgot the name.

In Amsterdam we stayed in the Lancaster hotel, which was across the street from the Artis Zoo. Most of the teams were already in the hotel because they had to fly in. The lobby was therefore filled with students who

were either working on their studies or scrolling through Facebook. There weren't many other guests in the hotel because all 120 of us were staying there. At breakfast I saw only one family who looked surprised to see this many students in the hotel.

Tuesday morning one of the organizers took us to the old Tuschinski Theater which is located in the center of Amsterdam and has been transformed into a cinema. They handed us the books with introductions of participants and the name of the topic. Afterwards we were welcomed by the president of the organizing committee, the case maker

and someone who is involved in projects that make logistic solutions for distributing food and other necessities in areas that need help.

After the lunch we were escorted to the business school of the 'Universiteit van Amsterdam'; on a higher floor with a view over the canal, a hall was equipped with everything necessary to comfortably accommodate the teams. We spend the rest of the day reading papers and finding material related to poverty, income proxies and household surveys as all of us were not familiar with data from the latter.

The case was already given to us but we could not access the data yet, we would get our sample the next day. At six it was dinner time. In two groups we moved to the restaurants, and on

our way it was very amusing to see how some of the participants were caught off guard by the presence of cyclists. Of course most of the topics that were explored during the dinner-were not too intellectually challenging after a long day of thinking. That night was spend reading more related material.

Breakfast was served early on Wednesday morning; we were expected to start working on the case at 8:00. Again we could use the business school of the UVA, around the corner of our hotel. Then we got 10 hours to research our data and write a paper. While we had discussed a method of solving the case the day before – we were asked to predict the 2002 data with data from 1996 and 1999 – our team was not convinced that the sim-

ple procedure was sufficient.

Unfortunately, after handing in our paper we did not make it to the top 10 which meant that we would not have to compete the third day. Apart from a city tour that was not mandatory we got Thursday off. At first we were disappointed about our paper which was by far not our finest work, but the other teams that didn't make it to the finals seemed not to mind. Most of them could only spend a few days in Amsterdam and not having to work on the case for another day to them was a free day to explore the capital of the Netherlands. Thus, soon we found ourselves amid a group of people who were just relaxing and very pleased to be the ultimate tourist; visiting cheese stores and trying beers.

In the late afternoon we went to the congress where we listened to the presentations of ING who sponsored the event, some students of the UVA, who did the mini-version of the case from day one, and the finalists – who only got exactly five minutes to present their work which led to very entertaining rambling. The location was a charming small comedy theatre which had the perfect size to host our group of students, not to mention the bar that was right next to the audience making it possible to get a drink during presentations. After the event we were moved next door, where we enjoyed dinner in a weirdly modern Irish pub that had elements of a church intertwined with the walls and ceiling. The

day ended in a café where the winners were announced around midnight.

Friday around noon we headed back to Maastricht, again engaging in a few games of 'toepen' to kill the hours in the train. All in all the Econometrics Game turned out to be a great week with nice people, nice food and statistics. What more does an econometrician want?

Dear Active Members

We would like to take this opportunity to thank all of our active members for all the hard work you did this year. You helped us with the orginization of our events and the PerVectum. We can conclude that you made it possible to have a great Business Trip, Case Day and wonderful social events. Next to that, we are very pleased that you were willing to help us with the start of some new committees. We enjoyed working with you and we hope to see you next year.

Thank you!

The board of SCOPE | Vectum 2013-2014

Panel Data Models with Cross-Sectional Dependence

Hande Karabiyik

Panel data consists of observations on multiple entities observed over a multiple time periods. These entities could be rms, countries, consumers, employees etc. An example of a panel data set is the collection of annual unemployment rates for each country in the European Union as observed over the last ten years. The usage of panels may allow the researcher to analyze important economic questions that cannot be addressed using cross-sectional or time series data only. For instance studying the dynamics and the trend in unemployment of European Countries is better suited to a panel data model. It allows the researcher to study more complicated behavioral models by allowing the usage of modelling techniques that are available only to panel models.Continuing with the previous example, the analysis of the eect of technological change on unemployment would call for a panel study. Also, panel data provides the researcher with a large number of data points, hence has the potential to increase the accuracy and the reliability of the estimation. These two advantages and the growing availability of data sets make it attractive for the researchers to use panel data. But besides its advantages, there are also issues spe-cic to panel data models.

One of the challenges that one might face with panel data models is the phenomenon called "cross-sectional dependence". It arises when the individual units are not independent from each other. For instance, if you take several rms in an industry, then it is highly likely for their prots are aected by common shocks. This creates a dependence among them. Cross-sectional dependence may have serious consequences, like misleading estimation results and wrong inference. The literature on economic applications of panel data shows that cross-sectional dependency is rather a rule than an exception. As a result we see a growing interest in the investigation of improving the analysis and methods to deal with cross-sectional dependence.

In this article, I will introduce a simple panel data model with cross-sectional dependence. Subsequently, I will briefly discuss the methodologies developed to characterize cross-sectional dependence.

The Model
Panel data is represented with a double index notation. Usually the number of entities in the data set is denoted by N

and the time dimension is denoted by T.

A data point in the data set can be denoted by y, which is the observation on the variable "y" for individual $i \in \{1, 2, \ldots, N\}$ and time

$$t \in \{1, 2, \ldots, T\}$$

.

Consider the following panel data model:

$$y_{it} = \beta' x_{it} + \varepsilon_{it}, \qquad (1)$$

where in this model y_{it} is the observation on the *dependent variable* for individual i at time t. x_{it} is a k x 1 vector of *regressors* on the ith unit at time t, β is the corresponding k x 1 vector of coecients and ε_{it} is the *error component*. Crosssectional dependence can be introduced in the model above by considering the cross correlation of errors. Let ε_{it} be the error term of the model for individual i and ε_{jt} be the error term of the model for individual j, then we say that the errors are cross-sectionally correlated if

$$Cov(\varepsilon_{it}, \varepsilon_{is}) \neq 0.$$

for some t, s with possibly t $\neq$ s and some i $\neq$ j. The cross correlation of errors might be caused by omitted common eects, spatial eects, or can stem from the interactions within socioeconomic networks. Correlation across units does not always cause severe estimation problems. A situation,

in which the dependence of errors across cross-section units causes problems is that when the source generating the cross-sectional dependence is correlated with the regressors, x_{it}.

Modelling cross-sectional dependence

The issue of modelling cross-sectional dependence is not a straightforward task. There is a natural ordering of the observations in time-series data, in which we can model the dependence as a function of the distance measured by time. But this is not the case with cross-section data. For this reason, the literature has adopted two dierent strands, namely *the spatial approach* and *the factor structure approach*. The spatial approach assumes that the dependence is a function of a distance measure, i.e., economic distance, geographical distance or social distance. For instance, when modelling trade between countries the geographical distance can be used to model the cross-sectional dependence.

In the factor structure approach, there is no need to assume the presence of a distance measure between entities. The assumption of this approach is that there exists an unobserved component in the disturbance which is a linear combination of a xed number of factors. This can be modelled mathematically as

$$\varepsilon_{it} = \lambda_i' f_t + v_{it}, \qquad (2)$$

where f_t is a m x 1 vector of unobserved factors (common shocks), λ_i is an m x 1 vector of factor loadings, which combines the unobserved factors linearly specific to entity i and measures the exposure of in entity to the common shocks. Having modeled the cross-sectional dependence explicity, v_{it} is the disturbance term independent across cross-section units. Combining the models (1) and (2) gives

$$y_{it} = \beta' x_{it} + \lambda_i' f_t + v_{it}. \qquad (3)$$

As an example, take the estimation of production-cost functions. x_{it} can represent wages, raw material costs and other input prices of firm i at time t. The unobserved factors f_t can represent changes in the regulations in the industry or the political situation in the country that the firms operating in. Finally the factor loadings λ_i represents the impact of a change in the unobserved factors on firm i, that might depend on the size of the rm in the market. As one might think, the unobserved factors in this example are likely to be correlated also with input prices, which can be modelled as

$$x_{it} = \Lambda_i f_t + \eta_{it}. \qquad (4)$$

This correlation would make the estimation misleading when the unobserved factors are ignored. A simple estimation with taking into account the presence of the common factors is not feasible, since the factors that should be included as regressors to the model are not observed. Pesaran (2006), proposes to use cross sectional averages of the observed variables y_{it} and x_{it} to obtain an approximation for the unobserved factors, f_t, then proposes to estimate the model (3) after replacing the factors with their approximations. This method is called the "Common Correlated Effects" method. Using cross-sectional averages as an approximation, makes the resulting approximation error disappear asymptotically. To show that formally, let $z_{it} = (y_{it}, x_{it}')'$ be a (1 + k) 1 vector of the collection of observed variables for individual i at time t, then by combining the models (3) and (4) we have $z_{it} = C_i f_t + u_{it}$, where C_i is a (k+1) x m matrix of factor loading for z_{it} and u_{it} is the cross-sectionally independent error term. Taking the cross-sectional averages yields

$$\bar{z}_t = \overline{C} f_t + \bar{u}_t,$$

where

$$\bar{z}_t = \tfrac{1}{N} \textstyle\sum_{i=1}^{N} z_{it}, \quad \overline{C} = \tfrac{1}{N} \textstyle\sum_{i=1}^{N} C_i$$

and $\bar{u}_t = \frac{1}{N}\sum_{i=1}^{N} u_{it}$. A rearrangement of the terms yields

$\bar{z}_t - \bar{C}f_t = \bar{u}_t$.

Since the individual u_{it}'s are cross-sectionally independent, the average of errors is asymptotically negligible. This implies that the unobserved factors, f_t, can be approximated by $\bar{z}_t$ up to a rotation matrix, $\bar{C}$, under certain conditions imposed on C_i. The next step is to augment the model (3) with the approximations. The augmented model can be written as

$$y_{it} = \beta'x_{it} + \lambda_i^{*'}\bar{z}_t + v_{it}^*, \qquad (5)$$

where $\lambda_i^{*'} = \lambda_i'(\bar{C}'\bar{C})^{-1}\bar{C}'$ and $v_{it}^* = v_{it} - \bar{u}_t$ The properties of v_{it}^* allow us to estimate β consistently by using the simple OLS estimator. But under the usual panel assumptions, the estimation is possible only if the number of unobserved factors are smaller than or equal to the number of observed variables, $m \leq (k+1)$. This is necessary for $\bar{C}'\bar{C}$, that appears in the denition of $\lambda_i^{*'}$, to be invertible. If this condition is not satised, then the estimation can still be made possible by imposing further conditions on the factor loadings, such as the *random coeffecients assumption,* which simply to assume that the heterogeneity across cross-section units in the factor loadings are inde-

pendent. Considering the empirical works in the literature, one might say that this assumption is not very realistic. To solve this issue, Karabiyik et al. (2014) proposes to use some external information as a proxy for the factor loadings. This method makes the estimation possible even if the number of factors are larger than the number of observables and does not require the unrealistic assumption of random coecients for the factor loadings. Consider the production-cost function example. As it is mentioned above, the factor loadings might depend on the size of the rm in the industry. We propose to make use of this information. Formally, our methodology proposes to approximate the factor by

$$\bar{z}_t^* = \frac{1}{N}\sum_{i=1}^{N} w_i \otimes z_{it},$$

where w_i is a r x 1 matrix that contains the information that is highly correlated with the factor loadings but not correlated with the regressors. We propose to use r number of dierent linear combinations of the observed data across cross-section units. Then the Kronecker multiplication denoted by $\otimes$, yields an approximation $\bar{z}_t^*$ of size r(1 + k) x 1. This allows us to replace the requirement that m $\leq$ (k + 1) with the condition m $\leq$ r(1 + k), which

less restrictive than the former.

Conclusion

In this article, after introducing cross-sectionally dependent panel data models, I focused on the "common correlated effects" method developed by Pesaran (2006). Then I introduced the method that is proposed in Karabiyik et al. (2014), that overcomes a major shortcoming of the "common correlated effects" method. The literature on this branch panel data econometrics is growing, but there is still much work to be done. For instance, the literature dealing with cross-sectional dependence in non-stationary, non-linear or dynamic panel models is still scarce and awaits for researchers to develop new methods or to propose extensions of the existing methods to those setups.

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Study Trip Brussels

by Dennis Stander

After a lot of last minute adjustments and phone calls in languages we did not even speak ourselves, we still managed to leave on time. As the sun was slowly appearing, temperatures were rising steadily and before our arrival in Brussels everybody was already "shining".

After a short coffee break we headed out into town to walk past some nice views and monuments. Unfortunately, Celine who had planned the city tour, could not be present but luckily we had many enthusiastic participants who seemed not to be disappointed by the route that we had planned. One of our first stops was the old market of Brussels, at which the idea came up to start a sort of quiz in which everybody could earn points. These points were of course very prestigious to obtain and were only awarded to the most intelligent people. With Ellissa as our quiz master we could not have had a more enthusiastic and valuable addition to our trip committee.

One of our first stops was "Manneke pis" at which Ellissa presented one of the questions. As I was looking around I could see nothing but jealous faces of people standing by wanting to join our amazing quiz, I mean who wouldn't want to do that?

Once at the "Grote Markt", we were astonished by all the surrounding buildings which stemmed from the 14th and 15th century. Most of them were built in a gothic style which was very overwhelming. After a short look around and being one of the many tourists on the square, we continued our city tour.

Next stop! "La Bourse", which is the Brussels Stock Exchange. Currently the building is being transformed into a museum full of beer, Belgians... The museum will be finished in 2018, who knows Vectum might organize another trip around that time. As we already walked quite a bit and became a bit hungry, it was time for a break.

During our break we split up and had some lunch at a variety of places. As some of us were confused about what a Croque-Madame actually was, they took a jump into the deep and were not disappointed when they got their plates in front of them. After a nice break and some relaxing in the sun we decided to move on again.

Time was not to waste as we had an appointment at the European Commission in the afternoon, at which we would be given a presentation about Competition Policy. During our trip

sweat broke out as temperatures were already fluctuating around 23 degrees Celsius. However, nothing stopped us from moving on. Well…almost nothing. The famous "Biertempel" in Brussels caught most of the guys' attention which was definitely worth the visit. After we left the Biertempel we crossed the front garden of the palace which yielded a lot of beautiful photos.

After a thorough walk through the city we arrived at the European Commission, which welcomed us. We were at least 15 minutes late, but that was not a problem at all as one of us spoke perfect French and managed to delay our reservation at the restaurant. Enfin, we were welcomed by a Portuguese woman who quickly reviewed the history of the European Commission after which we were held a presentation about two subjects. The first one did not seem to excite most of us as some of us fell asleep. However, in the break we were given the opportunity to grab a coffee which seemed to more or less keep people awake. As the second presentation started, more people became involved in the presentation as this presentation was actually about competition policy and most people had written a small paper about this subject. With an American lady explaining how they handle mergers, prevent abuse of market power and giving some actual examples it definitely was a good and interesting presentation which improved most of our views on the visit to the European

Commission. When the presentation ended we were escorted to the door as quickly as possible, which was not that professional of them but it is the European Commission after all, what did you expect?!

As we only walked for 2 or 3 hours, we had enough energy left to "run" back to the restaurant. Everybody was ready for a nice meal, and after the long day we deserved one. Once the restaurant was in sight, I was sort of worrying if everything would go according to plan. Nevertheless, these people did not speak any English nor Dutch which came as a surprise. But econometricians are always up for a challenge! Luckily we pre-arranged everything and everybody was able to choose whatever they wanted. Well, at least until the waiter came and told us that we could not choose tapas anymore. However, nothing was going to ruin this amazing trip and everybody satisfied their needs with other choices on the menu.

After a short bite to eat we headed back to the train station to return to Maastricht. Everybody was quite tired as this was a long day with long walks, but before I even closed my eyes we had already arrived in Maastricht, which was the end of this fantastic trip.

We want to thank you again for coming to our trip and we will hopefully see you at the next one!

Study Trip Brussels

Impressions from **Research Lecture**

Impressions from **Walking Dinner**

Meet the Students

Could you introduce yourself?

Florentijn Hogerwerf:

I am 21 years old. I am a Dutch master student Econometrics & Operations Research (specialization OR). I was raised in a small village called Melissant that is located close to the sea in the southwest of the Netherlands. My hobbies are technology and new inventions, tennis, workouts, TV & film, cooking with company, and of course IOS programming.

Dirk-Jan Rutten:

I am 22 years old. I am a Dutch master student for Econometric & Operations Research with a specialization in OR. I spent my childhood living from the age of 10 onward living in Geneva (Switzerland), I moved back to Holland when I joined the university 4 years ago. My hobbies include programming, playing piano and running.

How did the idea of a company emerge?

The story starts in the second year of the bachelor for Econometrics and Operations Research, we were given a c++ programming course by Mr. Muller. Back in those days we had never done any programming and we didn't really know what to expect. Every econometrics student has faced this course or will face this course in the future and they will know that it always starts with the same two beautiful words: "Hello World". After advancing beyond the basic "Hello World" program we continued with the different c++ assignments throughout the block and we both found it to be a lot fun and we were eager to continue. In the news we constantly heard about success story that people had after posting an iphone/ipad app in the iOS app store and we both naively thought we could replicate this success without knowing about the other 100,000 app developers trying this. On a warm summer day in 2012 we wrote our first "hello world" program for the iPad. Following this initial success we got a big programming book and both started to work through it. After our exchange semester from September 2012 –January 2013 we started our first real iOS app. We wanted to start easily so we decided to make a graphical calculator, this would link well with the mathematical background associated with econometrics and in addition we were sick of the expensive texas instrument calculators that we are forced to use in high school.

After a couple of months of programming we both decided to make a de

veloper account with Apple, allowing us to test the app on an actual iPad instead of using the simulator that Apple provides on the computer. However when creating the account we immediately ran into a problem, we had to be a registered company to get an account. So in the summer of 2013 we jumped in the train to Sittard where the Kamer van Koophandel is situated and we registered as a V.O.F. under than name Gappture.

Running a business involves many more tasks than just making the product itself. You also have to promote it, do many financial tasks such as taxes etc. How do you know how to deal with this?

For most of the tasks associated with the company we simply learned every-thing by doing, making mistakes and checking google. Some of the things we have learned by doing since starting the company: how to do taxes, create an invoice, how to legally set up a company at the KVK, handle customer relations, deal with the company finances and bank account. New companies are also a target for advertisement so we regularly get called with special offers "just for us" which we always try to reject quickly.

Is it difficult to present yourself on the market?

Trying to create an app for consumers in the app store is the same as winning a million in the lottery. There are over a million different apps in the store so even with a great app it may not be pos-

sible to get noticed. Stories like What-sApp, Snapchat, Flappy bird and Angry birds are very inspiring however there are only very few apps that reach this level of success and it involves a combination of luck and skill. At the time of writing we are not actively seeking customers yet because we still need to finish university however we have found that many companies are very interested in the app market. We have decided to focus ourselves on dashboard apps that allow companies to represent data on their iPad and we have found there to be significant interest in this.

What makes you so passionate about programming/developing an app:

We have both been very interested in technology for a long time so programming was a natural extension of this. Our biggest attraction to programming is the endless freedom it provides to directly test and implement any idea we can come up with. An architect can design a house in any style or form that he desires and in a similar way programming allows us to map our ideas straight on the screen.

We also found programming to be quite an rewarding hobby. Programming involves solving very many small puzzles and combining these together to create the entire program. Thinking about these puzzles together and coming up with an elegant solution is sometimes a very challenging task but if you do finally come up with a solution that works then it is very rewarding.
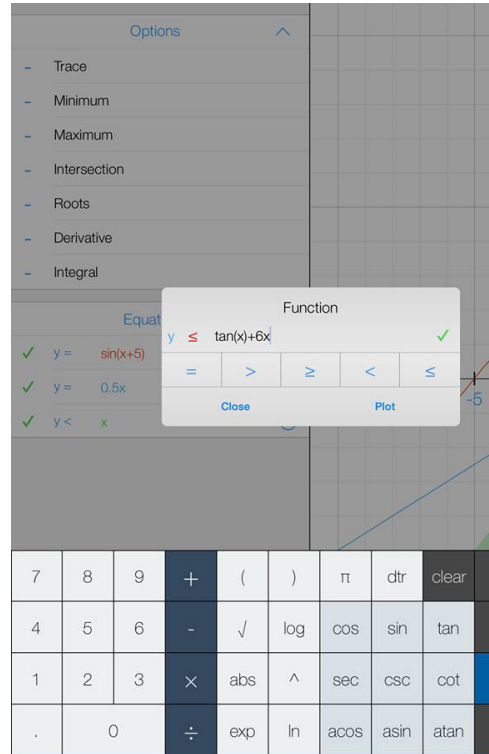
We found out the hard way that programming can be very addictive. There are 2 main situations that can occur when it is impossible to stop; when you are "in the flow" and when a bug is ruining your day. Whenever we are "in the flow" it means we are making quick improvement in the program and it becomes very difficult to stop. The second situation occurs whenever we are in debugging mode, this means that a certain part of the program isn't functioning and it needs to be fixed before you can even consider quitting. It is not unusual for a certain bug to steal a couple of hours of our day. Any programmer will only really run into these two situations and hence managing the amount of time you spend programming throughout the day can become a difficult task.

After we started programming for iOS we were faced with the challenge of designing user interfaces. The programs we had implemented in c++ only involved computations for Operations Research type problems and hence we did not run into the design aspect of programming before this time. We both think that coming up with elegant user interfaces that are easy and intui-

tive to use but also looked appealing is one of the most fun aspects of creating an app. When using a computer or a mobile device most people take the user interface for granted, however it turns out that creating an elegant experience for the user is one of the most complicated and challenging aspects when creating an app. The design process behind the app is a complicated and challenging process and it requires a lot of thinking and discussion, in addition we also try to use the interfaces other people have designed as inspiration when we are trying to define the look and feel for an app. We have become very passionate about creating a nice experience for the user of our app and it is one of the most exciting parts when building a product.

Could you tell us something about the app your currently working on? We are currently building a dashboard App for a company that allows the user to load financial data from a database in the cloud and display it on an iPad. During this project we have learned about MySQL databases, how to access the data using PHP, applying core data to save the data to the iPad and even a bit of Java. The app has been under development for a couple of months now and we are nearing the testing phase and the completion of version 1.0. We are currently facing the challenge of creating a secure environment for the data on the server and the data transfer to the iPad in order to make sure the sensitive data doesn't fall in the wrong hands. In this article we would also like to formally thank SCOPE | Vectum and in particular the president Jim for setting up the initial meeting with the company.

As mentioned earlier, we also have a graphical calculator under development. We decided to split this project into 2 parts: Dirk did the probability calculator and the function grapher while Florentijn is building both a standard calculator and a matrix calculator. This was our first project and initially we thought this would be an easy project to start off with but it

turned out to be more challenging than we thought. However, the app is slowly but surely advancing and we hope to have it complete within the near future.

Do you have any app-development plans after you have completed this one?

In the near future we wish to specialize in creating dashboard applications for companies, we will start with this after we have finished university. In the more distant future we would like to combine dashboards with business intelligence in order to give companies a deeper understanding of their data and also the company as a whole.

Besides data analytics we would eventually also like to develop Operations Research software on the tablet.

Which skills that you have you learned at university do you use during the development of this app?

We found that certain aspects of our university study helped us in our company. The introduction to basic object oriented programming is the most obvious example. In addition we also found the following university skills to be very useful: algorithm design, statistics, patience, analytical skills, presentation/communication skills, data organization, time management, discipline and thinking critically.
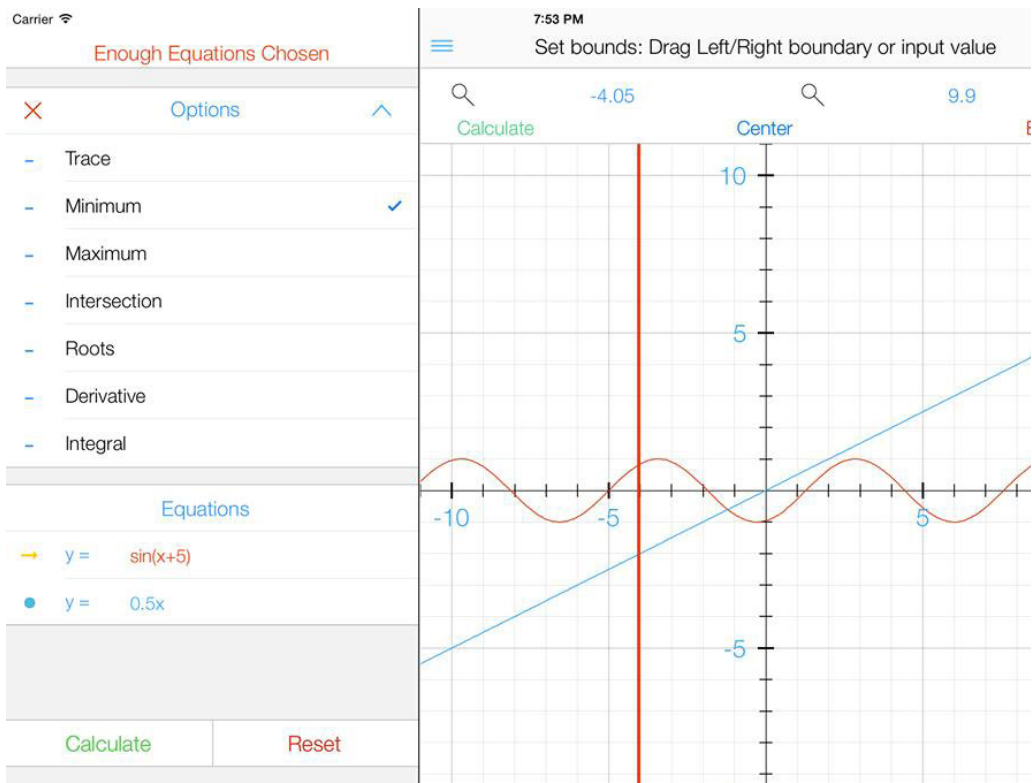
Puzzle

You have 15 cards. They are numbered form 1 untill 15. Each card you can use once. Each card should be the difference of the two cards below it. The first 3 cards are already placed.
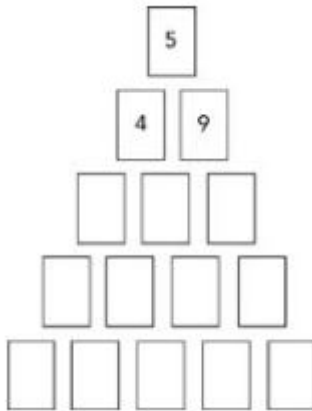

Solution to the Puzzle
PerVectum issue 3, 2013-2014

The numbers were 1, 2 and 3. Then $1 + 2 + 3 = 6 = 1 \times 2 \times 3$. This is the only solution for three positive whole numbers.

With two numbers, the only possibility is $2 + 2 = 4 = 2 \times 2$. With four numbers, the only solution is $1 + 1 + 2 + 4 = 8 = 1 \times 1 \times 2 \times 4$.

With more numbers, there are usually lots of solutions, but in some exceptional cases there is just one solution. If the sum of k positive whole numbers is equal to their product, and only *one* set of k numbers has that property, then k is one of the numbers 2, 3, 4, 6, 24, 114, 174 and 444, or it is at least 13, 587, 782, 064. No examples greater than that are known, but their possible existence remains open.

Impressions from **Bowling**
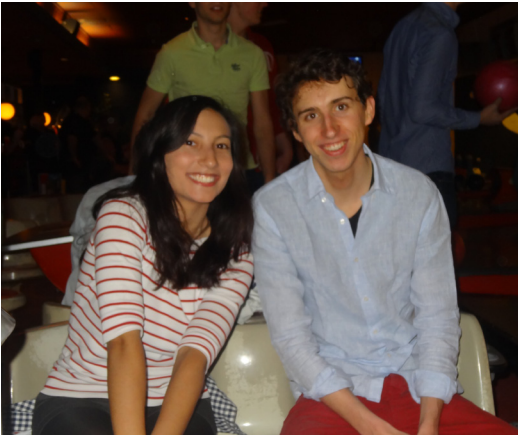
Study Abroad
Exchange Semester in Singapore

by Wim Plender

The academic year is coming to an end. All second-year econometricians are looking forward to their first semester next year: a semester abroad! For me, it is the ideal time to look back at one of the most interesting years of my life so far. Since this is already the fourth article this year about studying abroad, I won't bother you with the process of choosing a destination. Instead, I will directly get to the point and tell something about my (amazing) experiences in Singapore!

As I write this, I realise how difficult it is to keep my own text organised. There is so much that I would love to tell, that I don't know where to start. Since I have limited amount of words, I will stick to the things I most liked, or think that are not so straightforward. Singapore is, to me, an ideal mix between western and Asian culture. The main advantage of the western culture is the organisation. Administration was well organised and structured. Apart from the usual nerves when you are more than 10.000 kilometres away from your friends and family, there was no stress at all. Although, I have to add here that I was really lucky to get allocated to on-campus housing. This

makes life a lot easier. It is a great experience, lots of fun, and really cheap to live on campus. Sadly enough, the UM doesn't have any contract with the NTU, so few Maastricht exchange students get allocated to on-campus housing.

The first few weeks in Singapore I spend getting used to the campus, and meeting lots of new people. It is really easy to meet new people, espe-

cially fellow exchange students, since everyone is new, and is eager to meet other people. Classes did not start yet, so there was plenty of time to walk around. As long as I didn't walk too quickly (Sweaty!), I enjoyed the climate and the views.

After some time, I found out that this whole exchange-community was not really the thing I like most. There were too many new people. Which on itself is not a problem, but after having this "Hi I'm Wim from Maastricht, who are you?" conversation over and over again, I was longing for some more in-depth conversation. Therefore, (and because I'm addicted to sports) I decided to join the NTU dragonboat team (For those that don't know the sports, it's a kind of canoeing/rowing with 20 people in one boat, quite intense). I had a great time with the team. We trained hard in the campus gym, and on the water. I got the chance to meet people who are as sports-minded as I am, but from a completely different culture. It was cool to experience their eagerness to perform. They are a lot more team-focused than we are in the Netherlands. Most Europeans are more individually focussed. Also, most Europeans, especially Dutch people, don't mind someone to be critical towards us, as long as we can learn from it. To most Asians, this is 'not done'. You cannot say anything negative towards them, it's really impolite in their culture.

I talked a lot to the dragonboat coaches and team captains. We talked about coaching, training schedules, people and culture differences. I learned a lot from them, and it was cool to see they were more than willing to learn from the knowledge I gained from rowing and coaching in the Netherlands. and I'm grateful for the opportunities they gave me, since they spend so much time on me despite the fact that I was there for only 4 months.

Besides doing sports every day, there were also some classes to attend. You've probably heard that the academic level is a bit lower abroad, and this was also true for NTU. If you're used to econometrics standards, you won't have a hard time passing your courses. This does not mean, that I didn't do anything. It was great to choose all the courses I liked. My Chinese economics course for instance, was really interesting. It was a combination of history and economics in China. This way, I got to know the history and culture of Asia a lot better. Besides, it was nice to use and test the knowledge gained in all the economic courses of year 1 and 2 on the practice of such a 'different' but important economy as China.

Ok, that was enough academics for this article. One thing that mainly contributes to a great exchange experience is all the spare time you have, and the

lack of obligations. My life in Maastricht is always full with activities. Not things that I complain about –It's mostly things I like- but they are appointments in my agenda, which add up to a busy schedule. It was almost weird to experience such an overwhelming amount of free time. Add to this the absence of the things you would normally do in this time, and you are left with all kinds of new opportunities. I filled this time with all kinds of things. From organising a Halloween party for my campus Hall, to reading books in the sun.

Besides doing all kinds of activities, a tried to meet, and talk to a lot of local Singaporeans. I had interesting conversations about cultural differences. Sometimes they say that it's not a good idea to talk about politics in a foreign county, but I experienced it differently. I spoke to people with different views about things as democracy, equality and human rights. Also, it was hard to understand some of the laws and regulations in Singapore, because I didn't expect them in such a modern city. One (rather funny) example is the absurd incentives the government gives to people to marry and get children. They do this because the birth/death ratio is really low in Singapore. It starts by giving subsidies to schools for organising activities in which girls and boys are mixed, and have to hold hands for instance. It gets more serious in the housing markets. Ordinary people can only afford living in state subsidised housing. One can only apply for this kind of housing when you

are married. The shocking thing about this, is that gay people cannot marry, and thus cannot get state housing; at least not before the age of 35.

Somewhere in October, I read a Facebook advertisement about the Marathon of Singapore. Crazy as I am, I asked my Swedish friend Per, which I met on the Sports centre at the campus, whether he was interested in running with me. Friendly as he is, he said yes, and we could start training. Since running long distances didn't fit in my high intensity dragon boat training schedule, it was an extra challenge. But during the long Sunday runs we did downtown and in the many parks Singapore has, we had a great time. It was a totally new way of getting to know this bustling city. The race itself was even more touristic. We both had our sportive goals, but the main goal was to enjoy the experience. I never ran that far before, but this wasn't running. It was enjoying the city, together with 60.000 other people. The course ran along all major touristic spots, and the weather was ideal for running. I'll never forget this experience. This marathon was again something I would have never done in the Netherlands.

The two days after the marathon (which was on the 1st of December) I had an exam. Since the only thing you want to do after running 42.2km, is sitting, this was no problem at all. After writing my exams, it was already time to start my 6 weeks of backpacking! My first stop was Langkawi, witch my American exchange friend Richard. Langkawi is an touristic island at the west coast of Malaysia. The best thing I did there was canoeing trough a mangrove forest. Those trees are amazing, and it really feels as if you are in a Lord of the Rings movie when you paddle there. The next destination was Penang, which is mainly known for its very tasty food. Food was a big part of the whole exchange experience. You can get the best food, for the best prices. Traveling in South-east Asia is just great.

Traveling became even better when my girlfriend from the Netherlands arrived. Traveling is always fun, but it's even better when you can share the experience with someone. We had a great 3 weeks in Singapore, Lombok, Bali and Java. One of the top experiences was climbing the vulcano Mt. Semeru. The view and experience to reach the top just before sunrise after two days of trekking was amazing. After my girlfriend had left for the Netherlands again, I had two weeks left. I did not waste this time; I met my running buddy Per again in Bali, did some diving and surfing, and spend a week in Cambodja to see the amazing highlights there, in too little time. Which made me realise there is still so much more to see and experience in South east Asia; I'm sure I will go back one time or another!

Upcoming Events

June 13th-15th Members' Weekend

After the resit week, we have an amazing weekend full of fun, drinks, and interesting activities. More information and subscription are available on our website, make sure to sign up soon!

June 24th Annual GMA

On the last Tuesday of the skills period, our annual GMA will take place. The financial statements and this year's progress will be reviewed. After that, the new board will be elected and we will conclude with our last drink of the year at the Preuverij.

Academic Year 2014/2015

September 3th Vectum Welcome Party

The very first activity of the new academic year is of course the Vectum welcome party. Come and join us for a free party, meeting your old fellow econometricians after the summer break and welcoming our new members.

September 18th LEVT

The Landelijke Econometristen Voetbal Toernooi will be your chance to show off your football skills and have a nice day. And who knows, maybe it is Vectum's time again to take the trophy home?

Dates may be subject to changes.
Please check www.scope-vectum.nl for updated information and subscription forms.