



## **Jim Gatheral Travel Scholarship Report 2019-2020**

**Yaofei Xu**

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### **1 About me**

My name is Yaofei Xu. I am a Chinese PhD student in Adam Smith Business School. My supervisors are Dr Yukun Shi and Dr Charalampos Stasinakis. I was awarded the 2019-2020 Jim Gatheral Travel Scholarship of £ 4000 to fund my 7 months visit to Baruch College, CUNY. My visit begins at my third year. My current research focus is on option return for individual stocks and index.

### **2 Why did you apply for the travel scholarship?**

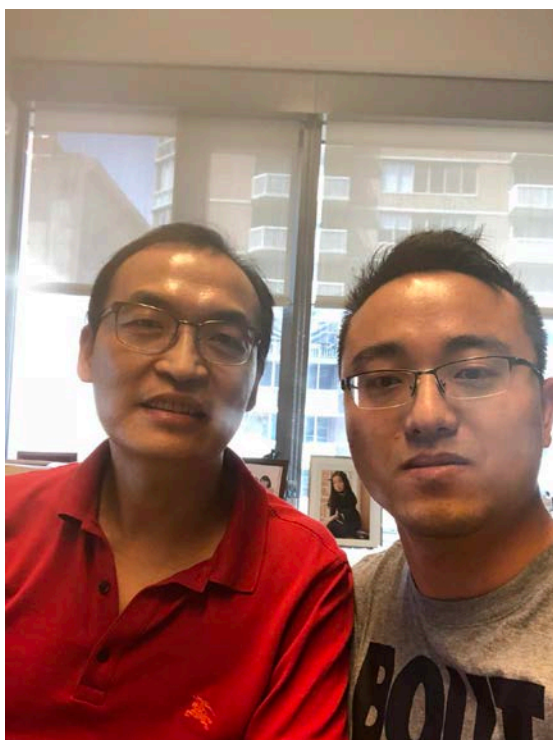
I am working with Dr Yukun Shi to explore the information content between CDS and option markets. We mainly follow the URC theory proposed by Prof. Peter Carr and Prof. Liuren Wu. We are trying to incorporate the mean-reverting features between CDS-inferred volatility and option implied volatility on option and CDS trading. Finally, we find in most cases, the risk premium dominates the return of different assets, and the remaining is from pricing error. In order to separate different contributions on option returns, we tried to figure out the variance risk premium, credit risk premium and mispricing part. Prof. Liuren Wu is specialised in the field of option pricing, credit risk and general asset pricing. Since Prof. Liuren Wu is based in USA, I was only able to know him from his publications. The travel scholarship gave me the opportunity to have a face-to-face communications with him at Baruch College, CUNY. Hence, it is a very good opportunity to solve detailed problems in a quick way.

### **3 Details of your visit**

I have spent all my time at Baruch College, CUNY, New York. I arrived on the 20<sup>th</sup> August 2019 and came back on 10<sup>th</sup> March 2020. Baruch College is located in the middle of

Manhattan, which is near Wall Street. Hence, it is a very good place to do research by incorporating industry experience.

The purpose of my visit is to understand better the behaviour of option return, like straddle, call spread and put spread. During this visit, I also attended some workshops and PhD option pricing training courses, which helps me to understand the option return better. I also got acquainted with researchers who are focused on quantitative finance. Moreover, I had the opportunity to talk with Prof. Jim Gatheral about the predicting the jump size of stock during the earning surprise period. Several puzzles for me were solved during this visit. Firstly, due to the leverage effect of options, the risky capital on the options contract has not obtained serious academic attention, while it is widely observed in industry. Hence, we combined theory to provide a scaling option return, which is directly connected with the variance risk premium and consider the rational risky capital. Secondly, we deconstructed the implied variance into systematic variance, systematic variance risk premium, credit risk part and mispricing part. We explored the magnitude of contribution for each part to the option return. Thirdly, we also began to explore how the risk premium and information parts contribute to the different parts of the volatility smile.



*Figure 1. Selfie with Prof. Liuren Wu*



*Figure 2. Baruch College, CUNY*

#### **4 Impact of travel scholarship**

The Jim Gatheral Travel Scholarship gave me the vital opportunity to work with world-leading option pricing researchers. Firstly, I am now getting familiar with the data structure and details in databases of WRDS. For example, when merging CRSP and Option metrics, ETFs/trusts are still existing in the remaining parts; and after combining Compustat data, ETFs or short-term listed stocks will be eliminated. Moreover, I have started to look deep into the data and see which may result in errors. Secondly, the research of Prof. Liuren Wu also impresses me. For example, previous academics try to incorporate the accounting information, to explain individual CDS spread changes at time-series data. However, the poor performance of explaining CDS spread changes by using accounting information results in little variation at time-series data of each firm, pointed by Prof. Liuren Wu. Then he uses the cross-sectional analysis to explain CDS spread change by using accounting information, which brings a satisfactory result. Hence, I realise that, if we want to explore the relationship between two variables, it is preferable to think which perspective is better. Thirdly, the PhD training courses taught by Prof. Liuren Wu also gives me a broad background of stock, option, bond and CDS, which combines every main element in a company and explores how they are connected. It has opened my mind to do research on individual firms.

#### **5 Acknowledgements**

I would like to thank the University of Glasgow for funding this trip. I appreciate the support from my supervisor Dr Yukun Shi and Prof. George Yuan preparing the application for this scholarship and visit. I also would like to show my gratitude to the Prof. Liuren Wu for his generous efforts on the project during my visit. Rather than the projects, I am very thankful to get training from Prof. Wu on how to do academic research. Last but not least, I would like to thank Mrs Rebekah Derrett, University of Glasgow and Dr. Richard Mitten in Baruch College for assisting with the trip arrangements and administration.