Capstone Workshop Program
Columbia University School of International and Public Affairs
Terms of Reference (TOR)
Between
[Quaternion Risk Management Ltd.,] [Project Director –Donal Gallagher]
and
[SIPA Capstone Workshop Faculty Advisor –Sharyn O'Halloran]

Project Title: Measuring Systemic Risk through Open Source Tools to Determine Collateralized Exposure Calculations
Client Organization: Quaternion Risk Management Ltd.,
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Background:

Quaternion Risk Management Ltd is a specialist capital markets software and consulting practice with deep sector specialization in quantitative risk management services, the provision of expertise and the delivery of complex projects in the trading, risk, and finance functions. Quaternion is an Irish headquartered firm, employing 33 professionals, with offices in New York, London, Boston, Dusseldorf and Frankfurt.

About the project:

The purpose of this project is to work with Quaternion Risk Management to run concrete examples of collateralized exposure calculations in ORE (an open source software developed by QRM) with the purpose of putting the power to measure and address systemic risk in the hands of all users—not only regulators—to prevent the kinds of practices of loose oversight that lead to the crisis of 2008.

Objective:

The objective is to investigate the effect of new financial regulation (Initial Margin) on systemic risk in the financial system.

- How much IM is currently posted in total in the world's finance system? What options do we have in principal to estimate this quantity?
- Can we forecast how this total IM is going to change in the future?
- Can we get an overview of the IM posted between the largest banks (bilaterally or through clearing houses)? Can we use this as a metric for systemic risk?
- If we can use this as a metric for systemic risk, can we find a way to reduce the total amount of IM without substantially increasing the risk measured in this metric?
- How would this picture of systemic risk in terms of IM differ from the picture we get by CVA?

Tasks:

The concrete tasks include

- run concrete examples of collateralized exposure calculations in ORE, for instance IR Swaps with/without collateral
- play a bit with the parameters to get a feeling for this
- Calculate sample Initial Margin
- Estimate systemic counter-party risk exposures
- Calculate Systemic Margin
- A small implementation project around dashboard **(optional)**
- Programming languages: Python/Jupyter **(only necessary for previous item)**

Deliverables and timetable:

- Student learns about derivatives, collateral, counterparty exposure
- Student (if interested/capable) develops and adds to open source risk
- Start quantitative investigate of systemic linkages in the financial system

General Timeline:

- Detailed work plan: first week of February, 2017
- Draft report outline: First week of March, 2017
- Draft report: Mid-April, 2017
- Presentation of key findings: End of April, 2017
- Final report: First week of May, 2017

Preferred Qualifications:

Candidates should have a strong analytical background, knowledge of statistics, basic financial concepts, programming in Python or C++ preferred.

Logistics:

Students will communicate with Quaternion Risk Management Ltd regularly throughout the project, including a kick-off meeting at the start of the project, a mid-term briefing, and a final presentation. Travel outside of New York is not expected.