OXFORD MARTIN SCHOOL

REFLECTIVE DIARY

The Ogden Trust

Ogden Trust Internship Program 2016

Institute for New Economic Thinking at the Oxford Martin School

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Introduction

I expected the first day to be as nerve-racking as any first day. I expected the first week to be dropped into the deep end. I expected my six weeks in Oxford would be a lesson in academic research and allow me some insight into a lifestyle I had yet to experience. However, I could never have been prepared for my overall experience in Oxford. I acquired skills I had always been interested in, but had never had to the time or opportunity to learn. I developed an interest in subjects that had always seemed foreign to me and that I had never had a formal education in. I proved to myself that I can jump into the deep end of a subject I have little or no background in, and with the proper support and guidance, learn about the subject and produce meaningful work. Most importantly, my time in Oxford showed me that my work style was ideally suited to that of an academic researcher and convinced me to one day pursue a PhD.

Acclimating to Oxford
August 1st – August 5th

The Institute for New Economic Thinking at the Oxford Martin School is a research think tank that attracts researchers from a variety of academic backgrounds. The institute is divided into multiple teams, including Complexity Economics, Economic Modelling, and Economics of Sustainability. My internship was as a collaborating research student with the Complexity Economics teams working on the forecasting the diffusion of renewable energy. I worked under the guidance of Dr. François Lafond and Dr. Rupert Way, and presented my findings to the head of the Complexity Economics team, Prof. Doyne Farmer.

My research was based on previous work published by Prof. Farmer and Dr. Lafond. In their paper "How predictable is technological progress?", they showed that the mathematical concept of a geometric random walk with drift could be used to model the improvement of technologies. Using this as a framework, I was to investigate if their statistical model could also be used to predict the improvements in renewable energy.

Prior to starting, I had a general understanding of the project at hand and the previous work published upon which this was based. The organization presented me with four academic papers to read prior to starting my work to get me acclimated to what I would be working on. Upon arrival, Dr. Lafond and Dr. Way gave me additional research articles to read and suggested a starting point for how I could begin acquiring data. Furthermore, they recommended that I begin learning a new programming language, either R or Python, which I could use for my data analysis and plotting. Under Dr. Way's advisement, I chose Python as it would teach me skills more transferable to Physics, rather than R which is limited to primarily statistical analysis.

Datasets and Scanned Reports
August 8th – August 12th

Acquiring the data required for the project was tedious work. The data was not centrally located, but rather distributed across four different organizations: The International Energy Agency (IEA), BP, the International Renewable Energy Agency (IRENA), and the U.S. Energy Information Administration (EIA). Some of the data was available in easily accessible tables, while other information was published in old reports of which only scanned copies were available. For these, I had to go through each report and copy each data entry into a spreadsheet which I could use for future analysis.

Such a method of manual data collection was prone to user errors. Typos plagued my datasets, and even weeks after collecting the data, upon analysis, I would discover a column on incorrectly copied values. Even the actual values themselves had caveats. Definitions differed between organizations and a lot of thought and reasonable assumptions were required in order to collect the correct data for analysis.

Programming and Analysis
August 15th – August 19th

Recommended by Dr. Way, I worked through Python tutorials from QuantEcon. This allowed me to simultaneously learn how to program in Python as well as learn some basic statistics and linear regression methods. By the third week I had developed my new Python skills to the point where I could begin reading the data I had collected and start making calculations and analyzing the results. As I collected results, I also began writing a reference glossary in LaTeX with any interesting or noteworthy facts I had learned. This allowed me to also learn LaTeX as an additional skill.

My previous experience with programming had taught me that efficiency and clean code writing was as important as making the program work. However, I found that due to the large scale of the project at hand, it was more convenient to write messy, inefficient code that worked rather than follow my old habits. I quickly learned that with a six-week time limit, the end results mattered most.

Forecasting the Past Future
August 22nd – August 26th

Initially, the complexity of the underlying statistics was surprisingly difficult. After a few weeks of constant work deriving and proving the formulas for myself, I was able to eventually understand and fully appreciate the approach that was to be taken. My goal was to develop a model which I could use to forecast how renewable energies would improve. My main focus was on solar, wind, and hydroelectricity, however I developed my programs in such a way that I could easily expand my model to involve other energy technologies.

Much of the was solitary work and allowed for almost no opportunity to work with others. This suited me and my style of work, as I was able to progress at my own pace and work in my own time. I was not specifically required to be flexible. Rather, as long as I was doing quality research and providing results, I was given free reign of when, where, and how long I would work. I was given 24-hour access to the office and worked there during both regular office hours as well as some weekends and nights.

Preparing to Present
August 30th – September 2nd

By the 5th week, the results of my data analysis started to come to fruition. It was as if all of my weeks of work began to show an answer, and the truth in these large datasets and plethora of numbers began to emerge. Finally, with meaningful results, I began to prepare to present my findings to Prof. Farmer.

I had not anticipated how quickly potential research topics could branch out. Upon completing some a task, the possibilities for what to do next not only included all other tasks that still remained, but the new ones that could be explored as a consequence of the newly completely task. As such, the amount of paths that could be taken or topics or ideas that could be explored would grow exponentially. Therefore, it was extremely important to try and remain focused and anticipate which topics would yield the most worthwhile results. Failing to do this could cause massive amounts of time to be lost on wild goose chases or achieving results that had no real significance in the big picture compared to results from other topics.

Consolidation and Completion
September 5th – September 9th

In the final days of my time in Oxford, I compiled all five previous weeks of my work into a concise but comprehensive presentation of 15 slides. The most difficult part was choosing which bits of information where most important and relevant. I had more than enough data and charts to fill hours of talking, yet I was given 30 minutes in front of Prof. Farmer.

And the 30 minutes doubled to 60. By the end, Prof. Farmer had a solid understanding of the work I had undertaken. Though communication skills have always been a strength of mine, I was assisted by Dr. Lafond in clarifying some of the complex statistics involved in the background. I knew the work had been meaningful and the presentation successful when Prof. Farmer expressed the desire to consolidate my findings, distill a single, impactful result, and publish a paper.

Reflections and Conclusions

Scientific progress is made in incremental steps, not leaps and bounds. This also applies to my particular way of learning, and both manifested themselves during my time at the Institute of New Economic Thinking. Every significant step forward in the project required a process of trial and error until I had figured out the proper method that would achieve the desired, correct results.

The most valuable aspect of the internship was the insight from my supervisors and other colleagues about the lifestyle of a researcher and the environment of academia. Prior to my time in Oxford, I had never had the opportunity to engage with academics of this level on a daily basis. However, this internship was invaluable in showing me what I could expect from a life of academic research and I learned that I would be very well suited for such a life style.

The internship has convinced me, without a doubt, that I one day want to pursue my PhD. The work done by postdocs and research fellows seemed very much my style and nicely complemented my skill set. I definitely want to do research in the future. These six weeks were simultaneous the most productive of my life, while definitely having the most influence on my future career choice.