Todai Finance Innovation Program Lecture 3 Report

Terms such as AI, machine learning, and big data are mentioned frequently in the news in recent times, and there is an ever-growing expectation for the application of such technologies. The 3rd lecture of the program "Finance and Technology" served as an introduction to the technological innovation being implemented in the finance industry at present. It provided participants with an overview of the technologies to be discussed in detail in the latter part of the program. The lecture was given by Dr Tomohiko Taniyama, who is currently Senior Researcher at the Digital Business Development Department of the Consulting Division at Nomura Research Institute.
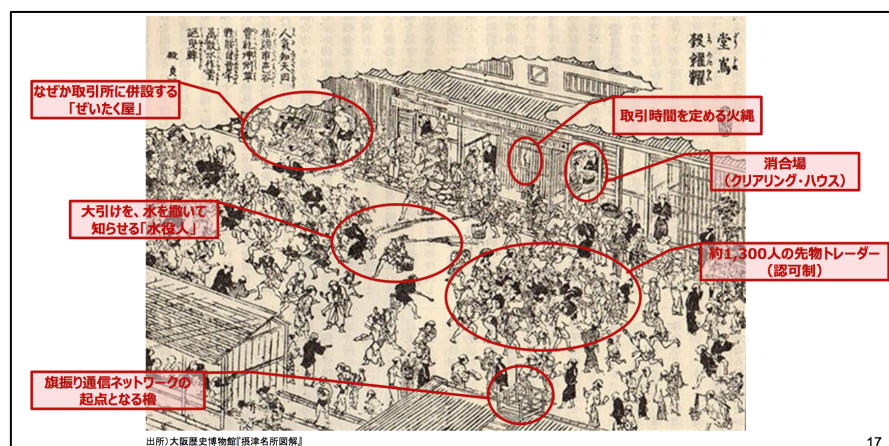

Dr Taniyama obtained his PhD in Economics from Osaka University. Since joining Nomura Research Institute his main work has involved 1) Surveying and Consulting for alternative investments such as real estate and infrastructure covering asset management strategy, securitization, and financial product development 2) Data Science business involving the development of asset pricing models, price index estimation models, macroeconomic models related to finance / economy / real estate.

We are heading into Society 5.0, and moving away from the period of cheap mass production of homogenous goods. We are instead moving towards the customization of goods and services, aided significantly by technologies such as IoT, Big Data and AI. The growth in these areas over the past 5 years has been exponential and quite remarkable to say the least. To give a sense of the tremendous speed of growth, up until five years ago although AI research existed, it was considerably more accurate to use statistics and surveys to obtain information, whereas now technology has far surpassed such methods. It should be noted that such technologies are applicable

not only to the finance industry, but also a range of other industries including insurance, advertisement, real estate etc. (X-Tech). Having said that, the highly digitalized nature of the finance industry has meant the implementation of these technologies has been quicker in comparison to these other industries.

The lecture turned to history to draw upon factors that may shape the financial system of the near future. The particular example used was that of the Dojima Rice Exchange, which was established 60 years before the New York Stock Exchange (NYSE) and is accepted as the oldest derivative market in the world. It became clear from this example that the evolution of the finance industry has largely been driven by the two factors of innovation/technology and regulatory changes.

The Dojima Rice Exchange

Taken from Pg. 17 of Lecture Slides

The picture above depicts the Dojima Rice Exchange where trades of rice futures took place beginning in 1730. It remarkably shows features similar to those of the modern market, with a burning rope showing the trading hours and a clearinghouse for buyers and sellers to formalize trades. Interesting features include shops selling luxury items such as jewelry nearby, in addition to people who would throw cold water onto traders to alert them of the close of the session.

The prices at the Dojima Rice Exchange would affect prices in other areas of Japan. The means by which this information was transferred evolved over time. Initially, messengers were entrusted with relaying the information to other areas. However, the development of flag waving communication provided a faster and more efficient means of information transfer. It was said that flag waving communication could achieve speeds of 720km per hour, and information could be

passed to Kyoto within 4 minutes, Kobe within 5 minutes, and Edo in 8 hours (flag waving could not be use to get over the mountains of Hakone). With time, the development of binoculars meant flag waving towers could be stationed further apart, and in 1783 some people began to use carrier pigeons. Eventually, the development of the telephone would completely revolutionize means of communication. At the core of such developments was the race to obtain information on rice prices first, which would provide a considerable advantage over those who would obtain this information with a delay. In such way, new innovation considerably shaped the evolution of the financial system.

However, the development of a new technology did not necessarily mean that it was permitted to be used. For example, initially the Edo government forbade the use of flag waving communication and stated that messengers must be used to pass on the information. This was in the interests of job protection of the messengers. Furthermore, when carrier pigeons began to be used it is said that the Edo government set out falcons to try and get rid of them. After some time, flag waving was legalized, as it also served useful in alerting when foreign ships were spotted proceeding towards the shore.

The example of the Dojima Rice Market demonstrates the impacts of technological advancements and regulation changes on the market system. One thing that is quite clear from the example is that even with strict regulations in place, it is very hard to stop the advancement of technology. New services emerge that are better than those currently existing (Dojima Case: messengers→flag waving→binoculars→messenger pigeons→telephone). Such technologies provide higher productivity and efficiency, and history suggests that it is difficult to resist such change.

The Financial System of the near future

Unbundling + Rebundling

Until now in the finance industry, big players have aimed to provide the best value chain (providing all services themselves in a complete package), but now startup companies are emerging that have the potential to produce better individual services. Examples of services provided by such startup companies include

Wells Fargo services unbundled by Fintech startups

Taken from lecture slides Pg. 11

household financial trackers, investment advisors (robo-advisors), and money transfer services among others. This process is often referred to as unbundling. However, it is expected that customers will want to be able to select the services that best suit their needs and create their own "customized package" rather than trying to manage all of these services individually. Hence, it may be the case that in the future new big players with advanced API emerge who rebundle the services that are currently in the midst of being unbundled. An important point to note is that when we talk about the value provided by technological advances we tend to focus solely on the cost reduction aspect, however, it must remembered that improving the quality of services is also very important and should not be neglected.
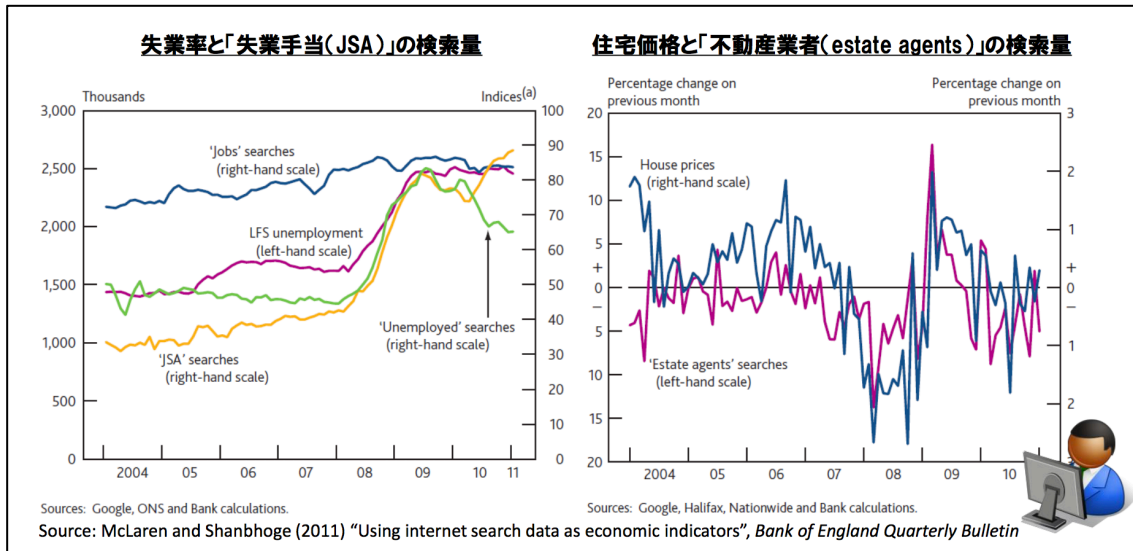
AI and Big data changing finance

When we think about decision making the concept of inequality of information is often raised. It is safe to assume that institutional investors have more abundant knowledge than an individual investor and traditional business has largely focused on this inequality of information. However, the use of open data and big data is changing the balance of such information inequality. Open data and big data are being used to shrink the inequality of information between the providers and recipients of services. Not only this, companies have started to conduct their own research using their own data, with the objective of gaining competitive advantages over rivals.

In this new age, statistics are just not frequent, fast or accurate enough. As an example, the Ministry of Land, Infrastructure, Transport and Tourism releases figures for land prices as at 1st January every year, with an approximate two-month delay in mid March. This is similar to purchasing Toyota shares based on stock prices from two months back, which is absolutely absurd. Until now we have had to make decisions using this information that is lagging behind reality.

So where did people obtain their information from? It had been suspected that people would gather their information instead from sources such as newspaper articles, rumors, and opinions of other investors, although it had been impossible to look into such a hypothesis until recently. Now this has become possible with the advancement of algorithm and text mining capabilities. For example, the text recognition ability of computers for Japanese, which has been very difficult due to the lack of spaces between words, has improved remarkably in recent years and has aided in such developments. Several studies have analyzed text information from social sources such as Twitter, Facebook, and Yahoo bulletin boards, to investigate relationships between content

on these sites and the financial market conditions at the time. One such study titled *"Twitter mood predicts the stock market"* found that when people are calm stock prices rise three to four days later. Investment funds that use such algorithms are steadily increasing.

Taken from lecture slides Pg. 46

Another example of the usefulness of data can be seen from search volume on the Internet. Most people perform a search on things that they are currently interested in and such data on search volume may be utilized to predict people's attitudes toward the market. For example, unemployment is a very important macroeconomic indicator but is released with a time lag. However, with open data it is possible to know how many people are searching for "Unemployed" in real time and if you compare the search volumes to the official statistics released there is a clear correspondence. The same can be seen with "estate agent" and house prices.

The examples discussed in this section show similarities to the case of the Dojima Rice Exchange and the race to obtain information on rice prices first. The utilization of open data and big data is enabling people to obtain information and economic indicators closer and closer to real time, and we should expect such a trend to continue with advances in analytical capabilities.