

# Financial Markets, Accounting and Artificial Intelligence

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## Abstract

Artificial Intelligence (AI) is changing multiple industries recently, financial industry and accounting are latest additions besides robotics and automobiles. The changes within both are drastic with stark implications for investment and accounting professionals due to AI's significant and increasing power. The "AI Brain" can translate the computational power into better returns for investors, while directing markets towards enhanced transparency and efficiency. We can safely assume that AI powered transformation within investment industry may result in elimination of jobs performed by humans in certain sectors. But, AI is also facing technological boundaries due to data and development limitations, as developers are not market professionals. Their algorithms are not designed to cater different market conditions the way humans can. This brings us to AI plus Human Intelligence (HI) model, currently used by many financial institutions. This model eliminate the need to perform repetitive tasks by analysts, so portfolio managers can work with AI assistants to manage their portfolios more efficiently and effectively. But the question is how long it would take AI to replace portfolio managers. This paper is an attempt to explore the multiple dimensions of structural changes within financial markets in near future.

## Keywords

Investment Management, Artificial Intelligence, Machine Learning, Financial Markets, Accounting

## Introduction

The day Google DeepMind's AlphaGo defeated world champion in board game, people around the world were astonished. "Go" is arguably one of the most complicated board game. There are about 200 possible moves for average position in this game; it involves intuitive thinking and decision making to compete and win. AlphaGO is not only studying the game books but actually updating its strategy by analyzing the moves of opponent. That's what frightens the most – "The system that is able to not only think but also act accordingly".

There is no doubt that Artificial intelligence (AI) systems can perform complex and repetitive jobs better than humans. There will be fewer and fewer jobs that robot cannot do better in future. And what are people going to do is the million dollar question, where they fit in future equation. It's about humans and machines or humans verses machines. May be this can ultimately result into self-aware and evolving system that can pursue its

own objectives and goals in future.

Artificial intelligence (AI) and machine learning (ML) are the buzzwords. There are many variations or versions of AI but the concept can be explained broadly as intelligent systems with the ability to think and learn (Russell & Norvig, 2016). Much attention is being paid on future of work, with researchers focusing on employment opportunities and employability of humans in future [Kaplan, 2015; Frey and Osborne, 2017; Arntz et al., 2016; Nedelkoska and Quintini, 2018]. The recent research focuses on just one dimension, the exponential development capabilities and expected changes in market. But results are not based on comprehensive understanding of the issue. What kind of tasks are performed by AI systems at the moment and the system's ability to embrace other difficult aspects of jobs human perform during their work. It's about occupational structures, the chores one needs to perform with few repetitive and similar tasks while other complex ones involving higher level of intuition and decision making.

What is the rational to build something like state of the art AI system, something that can result in mass unemployment rather devastation of our current social system. It can be seen as new take on pushing the frontier of scientific management (Taylor, 1914), to increase economic efficiency and productivity by automated systems and their management.

It's the same old cycle, the pursuit of better performance through automation and management. May be it would result into another industrial revolution, something that can change the way we live, work and interact with each other, just like other inventions and innovations of past. The historical research work by economists before widespread automation and management techniques regarding mass unemployment was quite similar, so is it just the unpredictable nature of future that humans are afraid or there is something different this time.

Multinationals, small businesses, non-profit organizations and other institutions irrespective of type, size and operational boundaries are trying to capitalize this opportunity or waiting for the right moment to incorporate the intelligent systems into their routine operations to achieve efficiency and cost reduction by optimal allocation of time and resources.

## **AI in Finance**

Financial industry was considered strong with respect to automation as it involves complex decision making process compared to other industries. Besides, routine work is not combination of simple or repetitive tasks compared to other major sectors, such as light or heavy manufacturing, etc.

But the financial industry appears to be the foremost battle ground for implementation of intelligent AI systems to achieve better performance and financial results. There are industries with prerequisite regarding structural changes before implementation of automation or advanced techniques, such as manufacturing. A company planning to automate or advance their production system or assembly line needs to change the equipment

and facility and provide enough training for workers to utilize the new equipment to achieve operational efficiency. The whole process can be expensive as well as time consuming. It involves physical movement and installation of machines and understanding their operational capabilities. The process can be cumbersome initially but rewarding in the long run.

The case is entirely different in service industry, there is no actual movement of physical products but the business model is based on availability and utilization of services provided by different companies in particular industry such as financial services. The sector includes banks, investment funds, insurance and consumer finance companies, stock brokerages and individual fund managers among others. The services provided by these companies can be confined into regulatory boundaries or geographical locations, but they can certainly access the resources, instruments and markets beyond those boundaries to build portfolios and diversify their investments.

So an investment fund or its management company can simply look for high grade investment instruments with relatively better returns to optimize their portfolio and offer attractive returns to their clients. These instruments can be part of global financial markets and identifying those can be difficult for fund managers and analysts.

## **AI in Financial Markets**

Financial markets are among currently accessible perfect learning grounds for AI due to availability of up to date and historical market data. It can be used by AI to understand and learn about variety of financial instruments as well as market transactions. The decision making process is certainly complex but few areas can be handled by AI systems perfectly. Such as financial analysis, to perform detailed financial analysis and provide report and recommendations are part of investment firms. The role of "Financial Analyst" is to perform such tasks. This highly paid position involves repetitive tasks besides intuitive touch of final recommendations. Ironically, provided recommendations are not always correct, rather multiple analysts' can give contradictory recommendations for particular firm. The reason can be underlying data used for such analysis. If available data is same then difference in resultant recommendation can point out the different ways to deal with such data.

By now we know that AI is much more effective and efficient to perform such analysis, as it can use all possible analytical techniques to analyze such data and provide results in much less time compared to an individual. So analysts can decide and provide recommendation after using AI analysis, the final task is rather simple and involves intuition. Implications for financial analysts are much severe in nature; such are reduction in total workforce and focus on other areas instead of repetitive tasks.

According to one analyst (W. Hunsaker, personal communication, October 30, 2018) who worked for multiple multinational investment management firms including "ING Baring Securities" and "Daewoo Securities", the whole sector is in process of transition, rather a dying field for humans. Big companies started changing their operations in early

2004-05. The rise of big data and ease of access enabled large firms to use complex financial models with comfort; later the whole process was automated as analytical reports were prepared by such systems and final decisions were based on such analysis.

## **Fintech and Financial Markets**

The rise of AI in financial services sector can eliminate some percentage of jobs for sure, but why we are considering it a dying industry for humans, the answer is in the rise of "Fintech". Fintech is emerging field dealing with mobile banking, investing services and crypto currencies to make financial services more accessible to general public.

Let's try to understand some aspects of Fintech within financial markets. Algo-trading, (automated trading, or simply algorithmic trading) uses computer program to follow defined set of instructions also known as algorithm for trade orders. These orders are placed at a speed and frequency that is impossible for a human trader to attain. On the other hand "Quants" (Quantitative Analyst) are people responsible to design such algorithms, but AI is bound to eliminate their role as well, with rise in personalized portfolio management tools even for small investors, AI can actively manage the given return of particular portfolio by considering almost infinite universe of financial instruments around the world. This can eliminate the market inefficiencies, quants are exploiting at the moment.

Many large financial institutions are implementing Fintech solutions in order to improve and develop their services while striving to sustain their market share. According to Future of Jobs report (Leopold et al., 2018) 56% companies are expecting reduction in their workforce in coming years whereas 67% are in process of relocation around tech-hubs. Majority of financial companies (around 89%) believe that App and Web enabled markets will change the structure of whole industry in near future.

## **AI in Accounting**

Accountants are known by the public as providers of assurance services such as audit and review on their clients' financial statements. However, these services are increasingly considered as low value-added from the perspective of the clients and accountants are constantly striving to expand their portfolio by providing higher value-added service. The use emerging technology such as AI by accountants is still in its early stage and it represents a tremendous opportunity for both the accounting profession and related stakeholders. Oxford University and Deloitte examined the impact of artificial intelligence (AI) in 2015 and the report argued that accountants will be among the first professionals impacted from the introduction of the technology (Head, 2018).

The main objective of accounting profession involves maintaining trust in the financial system. The accounting profession is challenged with facing a trade-off between maintaining stability and change. One of the main responsibilities for accountants includes providing their clients compliance service to certain accounting regulatory standards (such as the Generally Accepted Accounting Principles). In this sense, accountants have

been conditioned to keep pace with regulations changes that are constrained with the relatively slow speed of regulations setting due-process. In order to be able to keep up with the much rapid change in emerging technology such as AI, accounting profession needs to adapt faster. The profession should stay vigilant and anticipate the rapid changes in such technology.

### **Current Application of AI in Accounting**

Modern organizations collect large quantity of data as a result from the decades of automation and computerization. AI can be considered as a technology or a tool to get more insight from data that has high volume, high velocity and diverse. Machine learning as a subset of AI technology could process such data and improving predictive power of the organizations' decision making process. The effectiveness of AI technology depends heavily on the availability of relevant (high quality) data with sufficient quantity and diversity. For example, auditors working in the big firms have been using machine learning to analyze the entire population of transactions and identify high risk financial statements accounts. This approach allows auditors to mitigate audit risk to the extent that is not possible if traditional statistical sampling method is used. Consultants are employing machine learning to assist their clients to produce more accurate revenue forecast. As business processes become more connected and more data is generated through those processes; machine learning could leverage the data and provide managers with an additional set of information for decision making.

Routine tasks commonly performed by the accounting profession are diverse. These tasks can range from mechanical duties such as data entry and financial statements preparation to higher-order judgments skills including interpretation of financial information and evaluation of management's accounting policies and estimates. Thus, we can classify these tasks into two general categories: tasks that can be easily automated (tasks that involve minimal use of judgments and higher mechanical skills such as processing of financial statements into financial ratios) and tasks that are more difficult to automate (tasks that require extensive application of professional judgments such as evaluation of management accounting and control policies).

Outsourcing of accounting services and availability of cloud services have automated the most routine accounting tasks, such as automating accounts payable processes. AI technology could automate accounts payable workflow by analyzes, recognizes, directs, and exports data (Charpentier, 2018). The early stage of AI technology application can be expected to further accelerate the disappearance of structured jobs or tasks that can be automated more easily. From the auditing service, one of the Big 4 audit firms, KPMG has started to leverage IBM's Watson machine learning and AI technology to check and cross foot debit and credit entries for all the clients' transactions (Cooper, 2016).

### **Adaptability of the Profession and the Future of Accounting Education**

Ultimately, AI technology will be able to automate activities or tasks that require

human judgments. For example: automation of driving is becoming a reality with the current development of self-driving cars (Google Car and Tesla). By minimizing human-caused accidents, automated driving technology driven by AI has the potential to start another revolution in the automobile industry. This is where AI will have a significant societal impact. Driver jobs will be lost from AI automated driving vehicles. Should we be worried on this lost job? Economic theory predicts that technology driven unemployment will be replaced by new job opportunities that will lead to an equilibrium state in a long term.

However, the employment pattern of manufacturing jobs pioneered by industry revolution in the last decades has shown that it is not easy to replace manufacturing job once it was gone. This phenomenon can have far-reaching social consequences in a short time horizon such as lack of job opportunities that matches existing labor skills, decreased life satisfaction, concentration of jobs in urban cities, etc. For example, manufacturing jobs in US has been steadily declining since the middle of the 20<sup>th</sup> century. The proportion of manufacturing employment of total US non-agricultural employment has been continually declining from 32 percent in 1948 to 8 percent in 2017 (Fort et al., 2018).

When considering the impact of AI technology application on the accounting profession, there is a precedent that the profession will be able to cope with radical change in technology better than the average working class population. Accounting professionals have always been required to keep up with rapid changes in regulations and business environment. Every member of the profession is required to fulfill a minimum level of Continuing Professional Education (CPE) to maintain his/her license as a public accountant. In response of the emerging challenge raised by the development and application of AI; the CPE requirement mandated by the public accounting profession is particularly suited to rapidly adapt to such rapid technological change.

Accountants working in academia should also be aware on the impact of AI on business education and think about the best way to prepare students for their future career and profession. Students should be more tech savvy. They should have deep understanding on the inner working of applications that used AI technology before students can trust the results produced by such programs. To accommodate such goal, the new set of curriculum should remove out-of-date accounting course subjects (such as the manual recording of journal entry and posting to general ledger) that will have the greatest risk of being replaced by automated programs or algorithm.

## **Conclusion**

The rise of AI systems calls for our understanding of transition and restructuring process multiple industries are facing at the moment. This explains the changes in division of work between machines and humans but ultimately significant reduction in workforce. General expectations of partnerships with AI systems performing mundane tasks, allowing humans to focus on creative work or decision making process is rather too low. Though AI capabilities help humans to overcome complexities by utilizing its superior

analytical approach, the role of human decision makers and intuition in complex situation remains there for sure.

## References

- Arntz, M., Gregory, T., & Zierahn, U. (2016). *The risk of automation for jobs in OECD countries*, OECD Social, Employment and Migration Working Papers, 2 (189): 47-54.
- Charpentier, L. (2018). *From artificial intelligence to accounting intelligence: How AI is optimizing efficiencies in accounting*. Accounting Today.
- Cooper, C. (2016). *5 Ways Accountants Have Mastered AI*. INTHEBLACK.
- Fort, T. C., Pierce J. R., and Schott, P. K. (2018). *New Perspectives on the Decline of US Manufacturing Employment*. Journal of Economic Perspectives 32 (2), 47-72.
- Frey, C. B., & Osborne, M. A. (2017). *The future of employment: how susceptible are jobs to computerisation?*. Technological forecasting and social change, 114, 254-280.
- Head, B. (2018). *Will robots free accountants to be more creative?* INTHEBLACK.
- Kaplan, J. (2015). *Humans need not apply: A guide to wealth and work in the age of artificial intelligence*. Yale University Press.
- Leopold, T. A., Ratcheva, V., & Sahiri, S. (2018). *The future of jobs report*. World Economic Forum, Geneva.
- Nedelkoska, L., & Quintini, G. (2018). *OECD Social, Employment and Migration*, Working Papers No. 38. Technical Report 38.
- Russell, S. J., & Norvig, P. (2016). *Artificial intelligence: a modern approach*. Malaysia; Pearson Education Limited,.
- Taylor, F. W. (1914). *The principles of scientific management*. Harper.