

Investing in Al for Risk Management in Finance:

Exchanging one risk for another?

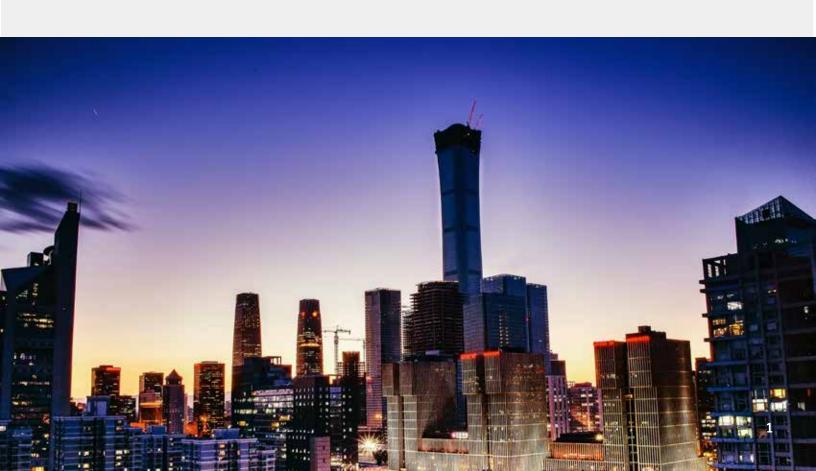
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Finance is a leading industry when it comes to utilising artificial intelligence in its processes. In recent years, there has been a rising trend for Al adoption to support risk management functions in many financial services companies, covering areas such as credit, market and operational risk.

But that's just the tip of the iceberg. There are many hidden risks and challenges associated with the investment of AI that are being overlooked ones which can make or break AI implementation. From its business processes to its people, all aspects of an organisation which are affected will be discussed in detail.

This paper determines that it is worth the risk for financial institutions to invest in Al to improve risk management and presents an Al production programme capable of mitigating a number of the risks associated with the process.





1. The rise of Al adoption in financial services

Artificial intelligence (AI) is no longer a new concept. It has been depicted in books and movies as the next step in human evolution for the last few decades – and for good reason. If it becomes what we have envisioned it to be, the extent to which it will impact our lives is unlimited. Currently, it seems that we are still far from the wonders of this life-changing world, but there has been some meaningful progress in the development of AI.

Many industries have adopted AI to improve their processes, noticeably healthcare, education, marketing, retail and finance (Shah, 2019). Additionally, the ever-growing amount of data available and the decreasing cost of data storage have collectively paved the way for AI to move forward even faster.

Within the financial services industry, AI has become an indispensable tool that directly improves various functions of financial institutions, increasing efficiency, cost-savings and productivity (Deltec Bank & Trust, 2020). A survey conducted by Narrative Science and the National Business Research Institute showed that AI & machine learning (ML) technologies are used by 32% of financial services executives, specifically for predictive analysis, recommendation engines, voice recognition and response. The seven leading commercial banks in America are also on the same path, with JPMorgan Chase having recently launched the "Contract Intelligence" platform, designed to analyse documents and extract data. Instead of going through a long process of analysing data, the platform allows thousands of commercial agreements to be processed in seconds, freeing up time for more valuable decision-making tasks (Cprime Group, 2020).

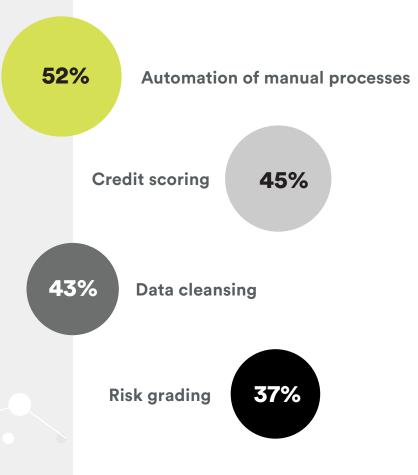
2. Al for Risk Management in Financial services

Risk management is a major function of banks and financial institutions worldwide. Poor management of risk would imply adverse losses for an organisation (Jasnaniyah, 2017), which highlights the importance of identifying, measuring and mitigating risks at financial services institutions.

Financial institutions are now faced with increasing exposure to risk, either through their own growth, increased complexity in the nature of their operations, or the range of products and services they offer. For example, more and more banks are extending credit to low-income borrowers. This creates the issue of how to measure and manage the risks associated with this growth.

To mitigate these risks, financial institutions require more insights into the risk situations, which often means performing more and better data processing and analysis. This is where Al can make a difference, due to its ability to process huge volumes of data at a fast rate, which provides financial institutions with valuable, previously-unknown insights (TCS, 2019). These insights allow financial institutions to facilitate better decision making and better risk management.

In terms of future growth, it is expected that these financial services organisations will continuously and rapidly adopt this technology to assist in their processes within the next three to five years. There are many areas in which AI is being utilised, namely automation of manual processes, credit scoring, data cleansing and risk grading.

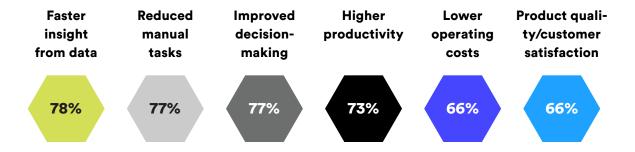


Source: SAS, 2018

Along with these purposes, the use of Al and ML algorithms is now commonplace across many other lines of business within banks, including marketing, customer support, fraud detection and trading, according to the Financial Stability Board.

Additionally, through a survey conducted by the Hong Kong Monetary Authority (HKMA) on Al application in Q3 of 2019, it is expected that the total capital investment of Al will increase by 70% in the next 5 years. Following this change, over 92% of respondents are planning to expand their Al workforce during the same period (HKMA, 2019).

According to a survey conducted by the Global Association of Risk Professionals (GARP) and analytic leader SAS, there are a total of 6 prominent benefits that are expected from the adoption of Al over the next 3 years. The survey received over 2,000 responses from professionals working in the financial services industries:

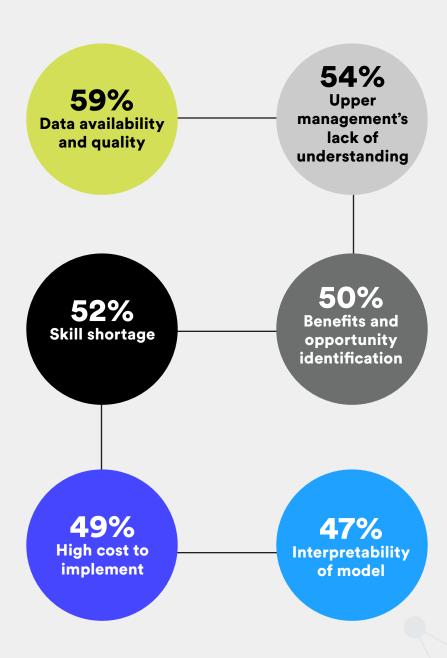


The survey shows that there is widespread interest in AI within the financial services industry. This is perhaps due to the accessibility and improvement of the technology in recent years, as well as the growing demand for digital transformation in the financial world.

However, there are certainly challenges that come with this quick adoption. As mentioned above, these challenges emerge from almost every corner of the process, from opportunity identification and delivery to the preparation of data and suitable infrastructures.



The issue of early and late adopters also needs to be discussed. It is very difficult for firms to strike a balance between these two approaches. If companies decide to adopt AI in the near future, they will find themselves subject to a learning fee to overcome the complexity and uncertainties associated with such new technology. On the other hand, if companies choose to adopt AI at a later date, they will run the risk of losing competitive advantage, as they are left behind in the race of digital transformation (Deloitte, 2020).





The three most common types of risks faced by financial institutions are credit risk, market risk and operational risk. For each of these risks, the benefits of AI and how they can be applied to manage them will be discussed, accompanied by a use case for AI implementation.

1. Credit risk

Credit risk is understood as a risk of loss that may occur from the failure of any party to abide by the terms and conditions of any financial contract. In many cases, this often implies the borrower's failure to make required payments on the loans they received from a bank or financial institution (Corporate Finance Institute, 2020).

Credit risk management techniques are all deployed towards the same purpose: to create the most holistic view possible of the credit risk situation. However, credit risk management has always been a challenging process, given the multiple factors that go into forming an individual's or a business's risk profile. This problem stems mainly from the vast pool of complex and unstructured data, coupled with the high accuracy required to avoid losses (Bajaj, 2020).

This process certainly creates many opportunities for errors, which subsequently create room for improvement. Banks need to adopt new credit risk management technologies to handle this large amount of data in a short period of time. As a result, there has been an increased interest by financial institutions to utilise AI and ML to address all the limitations of traditional techniques have in credit risk management (Credo Lab, 2020), one of which is the application of AI in financial spreading.

USE CASE

Financial Spreading

In simple terms, the financial spreading process is where banks extract information from the borrower's financial statements, and calculate their credit score with that informa-



tion. This credit score is for the bank to assess the borrower's ability to repay the loan, which then determines whether the bank will approve it.

The typical financial spreading process creates various problems. The manual process of extracting and then spreading the required data can be slow, while the case-specific nature of data can cause inaccurate spreading results.

Al can tackle all these problems by automating various processes of financial spreading for credit analysts, from collecting documents, extracting data to transferring data onto the credit scoring model. This reduces the number of steps and people involved in the bank's Financial Spreading workflow while also speeding up the processing time and significantly reducing the risk of errors. Furthermore, with the help of the Expert-in-the-Loop (EITL) concept model, the Al-driven process will look to bring in humans to review spread data when necessary. This will allow the Al model to learn and improve, which gradually reduces the frequency of human intervention.

2. Market risk

Market risk is "the risk that emanates from investing, trading and generally from having exposure to financial markets" (Aziz & Dowling, 2019). Market risk management is then defined as the process of dealing with potential portfolio losses due to adverse changes in the price of financial instruments caused by random and uncertain fluctuations of market variables. These variables include stock prices, equity indices, exchange rates, commodity process, interest rates, etc. (Jastaniyah, 2017).

In the financial world, the market is always in a volatile state, prone to risks and uncertainties (Trehan, 2020). There are many factors that can influence the market, for example, when a financial institution sets out to predict the next financial crisis. There is a plethora of variables that can affect the outcome, leading experts to have conflicting forecasts even when there is sufficient data at their disposal (O'Halloran & Nowaczyk, 2019).

Predicting the future, or in this case, market trends, is and most likely will remain impossible to perform with absolute accuracy. That does not mean that artificial intelligence cannot improve this process, however. By placing data within a context through pattern recognition and iterative learning, Al can have a significant influence over the accuracy of such predictions (O'Halloran & Nowaczyk, 2019).

USE CASE

Alternative data

Alternative data is a primary example of Al implementation in managing market risk. These data sets often come from various sources such as finan-



cial transactions, sensors, mobile devices, satellites, public records and most importantly, the internet. They can provide unique and timely insights into current changes, while helping to predict future changes on the market. This will allow banks and financial institutions to gain a competitive edge and explore more investment opportunities (Bharadwaj, 2020).

However, unlike market data which are provided by stock market indexes, central banks and other industry sources, alternative data are far more difficult to collect and analyse. This is due to its complex and unstructured nature - which is why Al is a fitting solution. With ML and Natural Language Processing (NLP), Al models can extract valuable data points from the web and other sources, addressing the data issue and empowering the decision-makers with insightful information.

3. Operational risk

Operational risk management entails the firm seeking to identify the risk of direct or indirect or financial loss emanating from a host of potential operational breakdowns. These risks can be internal to the institutions (e.g., inadequate or failed internal process, people and systems) or from external events (e.g., frauds, vulnerable computer systems, a failure in controls, operation error, natural disaster, etc.) (ORX, 2019).

The opportunities that machine learning techniques offer – from task optimisations and improving cost-effectiveness to deeper insights into data are especially beneficial to the discipline of operational risk management. The biggest gains from the implementation of machine learning come from the elimination of repetitive, manual and time-consuming tasks. In contrast to popular belief, this efficiency improvement is not to be understood as a trade-off for quality. With massive data volumes to be analysed, Al and ML can provide insightful information to assist with data quality assurance, text-mining, or in our next use case, fraud detection (ORX, 2019).

USE CASE

Fraud detection

Fraud risk is a form of operational risk that arises from inadequate or failed internal processes or adverse external events. In our analysis, financial fraud will be



defined as the intentional use of illegal methods or practices to obtain financial benefits (West, Bhattacharya & Islam, 2015). It is estimated that 72% of business leaders cite fraud as a growing concern over the last 12 months, and the worldwide losses due to fraud will reach \$44 billion by 2025 (IBM, 2020).

Identifying and minimising fraudulent activities has always been a primary focus within the world of finance. It has a direct impact on the smooth running of a financial institution - but it is not an easy task to perform. In the case of a failed execution, it will lead directly to operational failure and substantial economic losses, while a successful execution still creates additional expenses for the organisation. In a way, fraud detection is a necessary evil at financial institutions - a damaging task yet necessary to the effectiveness of their operation.

Once again, Al and ML techniques can be utilised to address this process. By analysing large volumes of accumulated data from different channels and sources, these technologies can predict potential fraudulent activities. For instance, they can be utilised to analyse data from known fraudulent cases to identify similar characteristics among them, and then notifies the organisation of cases that share the same characteristics.



1. Business risk

a. Pursuing the wrong use cases & objectives

It is common for departments to spend months planning for an Al project – a small, first Al solution that acts as the stepping stone for future Al implementation. In the scenario that this project does not proceed, either due to its technical infeasibility or the lack of funding necessary from the organisation, a lot of time will be wasted. Organisations must therefore spend time identifying the right use cases for their Al project from the beginning. However, an effective process of gathering potential use cases for Al and analysing its technical and business effects - all before the development of the product - often takes months.

On the other hand, failing to identify the right objectives can also lead to ineffective AI implementation. Oftentimes business leaders initiate an AI project without a clear vision and strategy, putting their hopes on the hyper-optimistic idea sold by many third-party vendors that the integration of an AI solution will solve all their problems. A strategic approach is therefore paramount to the success of an AI project, which includes setting the right objectives, identifying KPIs, measuring results and tracking ROI.

b. Lack of budget

The size and scope of Al projects can vary considerably but they can represent a sizable investment even for the world's largest and most profitable companies. This upfront investment can prove to be a blocker to the start of any Al project if the benefits are not clearly understood and communicated to stakeholders.

The benefits of AI and ML comes with the added cost of IT infrastructure. Due to their complex nature, intelligent technologies can also be a substantial expense, especially when the costs of future repair and ongoing maintenance are all accounted for (NI Business Info UK, 2020). In addition to the architecture cost, AI projects also come with other costs such as data collection and employee training – which will be discussed in the next sections.

Due to the nature of the project, organisations can face the risk of inaccurately estimating the adequate budget for Al implementation. This lack of funding is one of the reasons why many Al projects never reach its deployment stage.

Overall, the implementation of AI often comes with a high failure risk due to the sizable time and monetary investment. It is therefore important for financial institutions to have a clear plan and objectives in mind when implementing AI. Nexus FrontierTech has developed an AI production programme to help businesses construct AI solutions that can transform theoretical use cases to implementation-ready solutions. This programme will be further discussed in later sections.



2. Infrastructure risk

a. Misunderstanding data

"Data is the new oil" is a quote that has been present throughout this new age of digital transformation. This quote is even more accurate if it is taken within the context of artificial intelligence, as the effectiveness of this technology is very much dependent on the fuel that is data.

But how can organisations prepare data for Al implementation? It is often a misconception that for a machine learning application to function effectively, organsations need to prepare a large volume of data to train them. While this is true in many cases, there are problems that can be addressed by an Al solution trained with a small dataset, mainly due to the problem's degree of complexity. As for more complex issues, providing more data for the model will only serve to increase the investment expenditure, while ineffectively improving its accuracy (Goldfein & Nguyen, 2018).

It is important that organisations understand the problems they are trying to solve as well as the data requirements for the deployment of their Al solutions. Regardless of the data volume, a comprehensive process of collecting, cleaning, preparing and producing data is to take place before the start of an Al project. This data needs to be relevant to the Al application, which is particularly challenging for organisations as they need to collect them from multiple sources and in various formats like text, image, video and audio (FERMA, 2020). As a result, financial institutions often find themselves coping with inconsistent data of variable quality, which directly affects the overall quality of their Al deployment projects.

b. Unsuitable and inadequate infrastructure

The right IT infrastructures have to provide sufficient processing capabilities and high-speed

storage to facilitate effective data handling, computing, storage, scaling and security – all of which are critical to the success of Al deployment. Organisations run the risk of putting in place unsuitable infrastructures, which may cause technical failures whilst functioning, such as latency or throughput issues. For instance, an Al model can stop functioning when the processed data are wrong and malformed. Furthermore, the question of software is also not to be forgotten, as a well-optimised software application that functions in unison with the installed hardware will significantly improve the effect of Al on the organisation.

The integration of such a big systemic change could be more challenging than any previous software or IT project. It is one thing to create a highly-optimised Al model, but another to integrate it with an existing IT and business environment. At this point in time, Al solutions are all customised to the organisation's needs and objectives, as there is no universal out-of-the-box enterprise solution available.

On another note, AI models can face compatibility issues when businesses change or expand. It is critical that AI models are flexible enough to adapt to changes made in the organisations' flows and processes. In the case of business expansion, many problems could arise whilst embedding upgraded AI models. As a result, system reconfiguration and data synchronisation need to happen quickly and smoothly without compromising on efficiency.

A feasible solution to address inadequacies in infrastructures is to have a clear Al roadmap before the first Al deployment project. This roadmap allows financial institutions to plan out their Al development in the future, which gives them the opportunity to install technologies that are flexible and scalable enough to adjust to changes.

3. People risk

In order to effectively implement artificial intelligence and machine learning, all parties involved need to have a clear idea of the problems they are looking to solve. It is imperative that they have an understanding of current AI technologies, their capabilities and limitations as well as the processes and workflows to which they are looking to introduce AI. That is not to say that in-depth knowledge or technical background is required, but not having any knowledge of these domains might adversely affect the investment's success.

Perhaps due to the effect of the entertainment industry, Al is still perceived as a magical tool that can do or provide anything that people desire. This, however, isn't the case. It is therefore required that experts with insights into the capabilities and limitations of Al are present throughout the process of planning, delivery and maintenance of an Al project, as good management of IT stacks and the operational environment can facilitate a better understanding of Al. It's also important to remember that AI works best for narrow goals, hence the importance of defining very specific business problems. However, with AI being such a new territory for many of its practitioners, this has not always been prioritised. Often, business managers lack the technical knowledge of AI, while the data scientists lack the business knowledge of the organisation. Moreover, since the current processes at these organisations do not integrate AI, skills shortage then becomes an issue that can make or break the feasibility of the investment. A survey of the top 1000 firms in the US on Al implementation found that their biggest concern revolves around their staff's current inability to understand and work with these solutions (Wilson et al. 2017).

So how can this problem be addressed? Education. Employees and managers in business departments need to be trained on AI, not just to kick-start an AI project, but also to maintain and expand upon its successes. Technical teams must have a clear understanding of the organisation's current processes, as well as all the problems that need to be addressed.





The most common risk management applications of AI have been discussed, ones which are impactful and most likely will be even more so in the near future. However, the risks associated with AI and ML technologies must be addressed. An investment in time and money of this scale is not to be done without risk, which begs the question:

Is it worth exchanging the risk in financial services for the risk in Al?

Considering the current state and future trends of AI, it is necessary that financial institutions begin their AI endeavor in the near future. With benefits that are too significant to ignore, it is inevitable that AI will grow to become a core aspect of the financial services industry. Coupled with the rising capabilities of cognitive technologies and the availability of data, AI's influence will become more and more impactful in the future. Also, as more organisations are adopting AI, the pressure will be high for those that refuse to do the same. This is no longer just a bandwagon to jump on and off, but the future of finance and many other industries.

But how should they adopt AI? The issues of business, infrastructure and people are still present – of which the available solutions are not completely clear and effective. These problems stem mainly from the lack of AI understanding, which leads to ineffective planning and preparation.

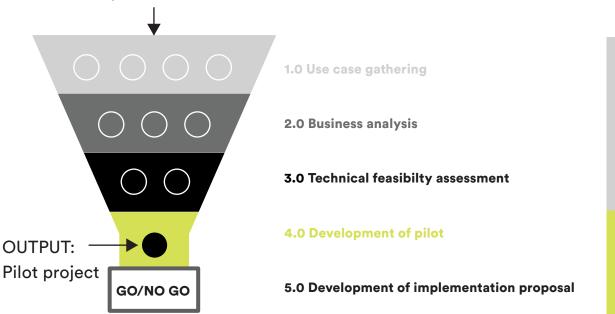
Our team here at Nexus has therefore built a development programme for Al called the "Al Factory", with the sole purpose of delivering Al projects with all the above issues addressed. We've experienced successes with the process, including helping a UK government agency in transforming their operations and providing them with a complete implementation plan for 4 use cases in just 2 months.

Process

The following are the steps we took to help our client achieve their objective:

Birdseye view: How the Al Factory works

INPUT: Unprioritised use cases



This Al development programme is divided into two phases: consulting and development. The consulting phase focuses on gathering use cases and identifying their business impact and technical feasibility. The development phase then focuses on developing a pilot, the results of which were presented and feedback was taken into account until the pilot met the client's success criteria. Lastly, a full development plan will be presented. Not only can this plan facilitate a more successful Al implementation project, but it also establishes a long-term Al implementation roadmap for financial institutions.

We believe that this framework can greatly improve the delivery of Al projects for financial institutions. It was designed to mitigate all the risks identified above and open up financial institutions to the benefits of Al in risk management, all of which can revolutionise the way they operate in the future.

Conclusion

Many industries are now adopting Al-powered technologies to support their practices, and finance is no exception. With a primary focus on risk management, Al is becoming an irreplaceable tool in the financial world. But this change is not without its obstacles, as the technology still presents many risks. However, considering the current applications of Al in risk management processes, as well as its expected growth and maturity, the benefits of Al far outweigh these limitations, and it is in financial institutions's best interest to consider investment in Al.

Consulting

Development

About Nexus FrontierTech

Founded in 2015, Nexus FrontierTech was created with the vision of bridging the gap between developers and business professionals and raising awareness of the benefits of Al in solving common problems in enterprises.

We are a team of 100+ researchers, analysts and business leaders with a strong track record of success across several industries, with a particular focus on highly-regulated activities where the need for quick and valuable impact is greatest.

With teams based in London, Tokyo, Singapore and Hanoi, we focus on developing the most effective, specific Al solutions for each of our unique clients.

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