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BIG DATA IN BANKING:

CURRENT APPLICATIONS AND FUTURE POTENTIAL

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INTRODUCTION

After a decade of snowballing development, big data is big everywhere. With financial services –along with manufacturing, retail, healthcare, energy and telecommunications– among the industries[1] in which its use cases abound.

This study looks first at banks' broad use of big data solutions to accommodate and draw meaning from the burgeoning quantities of information with which they are increasingly heavily laden. Subsequently, we run through the broad range of concrete use cases where big data in banking is applied in more specific detail. We then look briefly at how big data in banking may be used in the future.

Finally, we pause to reflect on the importance of not getting too carried away by some of the exuberance that this innovative area can elicit.

1. WHAT IS BIG DATA?

It is important to define what is big data in banking as there is a lot of confusion over this given the myriad of studies that conflate big data, machine learning and artificial intelligence, which are not the same. Big data is a concept and there are many technologies to manage it or improve it.

At its simplest, a widely-recognised definition of big data *per se* encompasses *large, diverse sets of information* that continue to *grow at ever-increasing rates*.[2] Beneath the surface, however, this expanding ocean of data includes both structured data, such as databases and spreadsheets, and also increasing amounts of so-called unstructured data, such as emails, information gleaned from social media, and even signals from the electronic sensors on people's electronic devices.

Merely accumulating such data is only the first step – the point is to analyse and draw commercial advantages from it. Thus, to broach the subject of big data in finance is to refer more broadly to *the rapidly evolving world of data and analytics*,[3] and to the use of artificial intelligence for structuring and mining vast pools of data.

2. WHY BIG DATA SOLUTIONS ARE USEFUL FOR BANKS

Information has always been at the core of the rationale for the existence of financial intermediaries. Banks' customers *generate an astronomical amount of data every day*, notably through millions of transactions.

According to a key study by De Mano and Padilla on *Big Tech Banking*, there are three different important roles for information in banking today: 1) other competitors (BigTech) can do an even better job than banks in managing *soft information* (information about consumer preferences, habits and conduct produced by households and SMEs); 2) information no longer seems to be a barrier to entry in banking; and, 3) information sharing will be key to banking in the future.[4] Yet, managing this information requires *advanced processing techniques in order to be translated into valuable, actionable information*.[5]

Together with the increasingly important role of information in the financial sector, the growing number of cyber threats also influences the need for big data analytics. According to the 2021 *United Kingdom Finance Report,*

criminals stole GBP 754 million (USD 1.03 billion) through bank frauds in the first half of this year, up 30% from the same period in 2020. In addition, the increase in the cyber threats on banks during the pandemic has made it imperative for organizations to adopt big data analytics fraud detection and management.[6]

The increasing relevance of information and growing risk of cyberthreat are among the principal reasons that banks are directing major resources into big data technology and solutions. At present, their data remains bounded in *traditional, product-focused* silos.[7]

As banks become more reliant on big data technologies, they have been pulling in a great deal of outside expertise, and at the same time making big calls on strategy.

In this respect, banks are embracing big data technology in a bid to overhaul systems that simply weren't architected to tackle the scale of data as it exists today. As EY points out, *many traditional financial institutions are dealing with huge quantities of data for which they are ill-equipped to take full advantage*.[8]

Another major quest is simply to be able to search out needles in the vast haystack of data, and then to share and utilise that information effectively. Indeed, *most banks cannot even access, let alone use and analyze, all the data they acquire*.[9]

As BNY Mellon puts it, moreover, *the most common challenge* to the effective management of data that asset managers cited in a survey was *aggregating it across a fragmented infrastructure* in order *to create a single, easily accessible source*.[10]

Once banks have aggregated their data and made it searchable, their next great quest lies *in extracting meaningful insights from it*.[11] This is where high-tech analytics and AI come into their own, but this can be tricky to get right.

Cloud-based data solutions[12, 13] are a popular way to respond to the ensemble of challenges that banks face in managing and harnessing their data. Beyond this, however, banks are increasingly embracing so-called *data lake* and *data mesh* approaches, which confer *the ability to use and process real-time data, and to break down data silos and create a Single Source of Truth for all data necessary for consumption*.[14] This has been the approach of JP Morgan, which has been among the pioneers of big data in the financial sector and has used such an approach to create a vast internal *data marketplace*.[15] That said, broadly speaking the perception is that banks are somehow lagging behind in key areas, such as cloud computing. However, alliances between them and Big Tech companies or collaboration with data integration companies may help improve this situation.

Given the complexity of the challenges that big data poses for banks, both in overcoming the silos of the past and in deploying advanced techniques to translate big data into innovative products and impressive cost savings, specialist consultancies are playing an important role in helping banks to structure and mine the vast pools of data that they accumulate.

Finally, it is worth noting that although it is true that banks are becoming more innovative and advancing in the adoption of "big data" technology, some banks opt to focus first on a so-called *defensive* strategy, whereby they lay solid foundations in order to *achieve security, quality and compliance*.[16] For example, in the presence of new entrants, such as FinTech firms, incumbent banks may often choose to accommodate entry into some market segments although they will try to prevent it in others.[17] For instance, they can then *pivot to a more offensive strategy, in which this foundation can be leveraged*.[18] In the case of incumbents and BigTech platforms, there is more scope for head-to-head competition with banks.[19]

3. CONCRETE USE CASES

In scanning the horizon of the use cases for big data in banking, three broad categories emerge: clients, compliance and markets.

3.1. Clients

Banks are increasingly using big data solutions to unify customer knowledge to optimize marketing, pricing and services.

Customer lifecycle management and delivering in-person services through digital means. One of the most pertinent concrete uses of big data for banks is to interact with customers in a more profitable manner. This is all the more important given the shift of so much business to online channels, as big data offers banks an opportunity to pursue their traditional reputation for delivering in-person services through digital means.[20] As recent academic research has shown, *attracting new customers, and retaining their existing ones*, are among the *most important challenges facing banks today*.[21] The *key* to this is to *personalize all customer interactions and services, which can be achieved by using the latest technological advancements in big data analytics, AI and machine learning*. With *in-depth customer profiles* at their *fingertips* thanks to big data and analytics, it is *easier* for banks *to build stronger, longer-lasting customer relationships*.[22]

Using big data and web semantics to take marketing to the next level. As Funcas recently set out in depth, banks can also use big data to improve their marketing and the image of their brand.[23] This includes trawling through masses of data to ensure the smart monitoring of engagement and impact on social media, and indeed to pinpoint key influencers.[24] It may also include using big data to apply the insights of so-called neuromarketing, analysing data on people's tiniest reactions, such as eye movement.[25] As Funcas also noted, using big data in the service of marketing is also about using the techniques of web semantics to structure data from sources such as social media and customer interactions, and to make them readable, searchable and meaningful.

Know Your Customer. Although it is also used with regard to regulatory compliance, one of the essential concepts when it comes to putting big data to use in serving and increasing profitability from customers is KYC, or know your customer. It allows banks to *tap deep customer intelligence and insights*, in order to achieve improvements in terms of *risk management, the customer experience, and their own ability to service customers, lower costs, and boost revenue*.[26]

360-degree customer view. In this vein, banks are integrating and using big data to *establish a 360-degree view*[27] of their customers, by analysing and cross-referencing variables from demographics, to the offers they've declined in the past, to their relationships with other clients, and of course their transaction histories.[28] It can guide banks towards offering their clients products that they are likely to want, and indeed to maximise the profitability of sales to each client.[29] Big data can also help banks to offer new services to customers, such as assisting them in managing their supply chains by harnessing the *wealth of information* that lies *just waiting in their payments data*.[30]

Next-Best-Action. Another notable customer-oriented application of big data and AI in banking is to figure out what would be the best next product or conversation to propose to a client – the so-called next best action or offer. This involves the collection and analysis of data not just on what customers do, but on *who they are at their core*,[31] including not only information potentially gleaned from their interactions on social media, but also data pertaining to their *awareness of risk*.[32]

Australia's Macquarie Bank has been among the leading firms to push ahead with this approach, notably by leveraging its use of customer relationship management software.[33] Another bank that took advice on making its next best offer initiative work saw its net response rate jump by 15% as a result and was able to launch new marketing campaigns in just one day, rather than a period of months before overhauling its approach.[34]

3.2. Compliance

Complying with regulatory requirements and avoiding fraud is another of the chief over-arching categories in which banks have been deploying big data and analytics, notably in order to mitigate risk, anticipate the changing regulatory landscape, and combat the threat of financial crime.

Turning constraint into opportunity. There is now a perception that, thanks to big data and analytics, banks can turn constraint into opportunity, by viewing increasing *reporting obligations and related data requirements as a launchpad for developing a truly data-driven business model*.[35] One real-world example of investing heavily in big data for compliance is how Credit Suisse has sought to transform compliance *into an intelligence-led, risk-based operation driving significant gains in speed and efficiency*.[36]

Anti money-laundering (AML) and fraud compliance. In today's market, under pressure from increasingly hawkish regulators, *financial services firms are under more pressure than ever before* to comply with new *anti-money laundering laws, and big data analytics can help companies identify potential fraud patterns*.[37]

Transaction monitoring. One of big data's most important applications when it comes to regulatory compliance is transaction monitoring. As Credit Suisse notes, *identifying suspicious transactions in a global bank can be like searching for a needle in a haystack*, and *if performed manually, it is a slow and costly process*.[38] However, the Swiss bank's deployment of an advanced data analytics and technology platform has led to a *45-fold increase in the number of productive alerts from* the *predictive monitoring of transactions*, while also speeding up the resolution of these alerts by 60%, all at a *fraction of the historical cost*.[39]

KYC compliance. Using big data to monitor activity in this way is all part of conforming to ever more stringent Know Your Customer standards and anti-money laundering rules, and indeed of avoiding the *huge fines* that increasingly sanction *non-compliance*.[40] Yet the modern criminal actively seeks out institutions that are not focused on modernization, data science, and the power of machine learning and artificial intelligence.

As in other aspects, big data's ability to map out a 360-degree view of clients is a way to double down on KYC compliance. In this vein, one large data integration company we spoke to highlights one case study in which it helped a financial services firm client to speed up its global compliance efforts and make them more efficient, notably by using *machine learning models to resolve billions of records from around the world into a single client view*.

Another specific way that big data technology can help banks to live up to their KYC obligations is by expanding the application of so-called straight-through processing,[41] automating processes and clarifying all records. This application of big data also helps with things like credit-card fraud.[42]

Cryptocurrency compliance. In addition, big data can help banks to manage compliance *across fiat and cryptocurrencies to detect complex networks with low false positive rates and robust case management*.

Risk management. Moreover, *having high-quality data that's readily available to guide risk measurement and reporting processes* is now of supreme importance for banks.[43] A real-life example of the successful deployment of big data for managing risk can be found at UniCredit's HypoVereinsbank unit, which has deployed *a powerful reporting and analytics solution that helps the company to improve compliance* and at the same time to *reduce risk*.[44] This big data solution also allowed the bank to *increase overall liquidity*. Other concrete results included a 99% acceleration of *ad hoc analysis and reporting*, which cut the process *from four hours to just seconds*.[45]

Non-performing loans. Along these lines, big data heralds the prospect that banks will be able to keep loss provisions to a necessary minimum and indeed to provision more accurately, and that regulators may even require lower levels from banks that use big data to spot NPLs before they become a problem. For a while now, AI has been the great hope for banks grappling with the risk of an explosion in NPLs due to the pandemic and the economic uncertainty that has ensued,[46] and big data can be usefully deployed in the form of *automated analysis features and predictive capabilities* that *can trigger red flags on customer profiles that are at higher risk than others*.[47]

Entity resolution. Another of the many use cases for big data in banks' compliance efforts is so-called entity resolution, which links diverse strands in the vast pile of data in order to ascertain which ones pertain to a single

legal person.[48] A poignant example of this from the US-based consultancy Dun & Bradstreet shows how one large bank's automation of *entity resolution and management across its global business* allowed it to cut costs, streamline its operations, and boost growth.[49]

Using AI to monitor in-house misconduct. Banks can also use big data and AI to look out for warning signs of incipient misconduct among their own employees, as the CEO and founder of Starling Trust, a company specialising in the application of behavioural sciences technology, has noted.[50] It can also be rather more positive, allowing banks to *identify top performers within their teams* or indeed to figure out how to improve the workplace.[51]

One example of using AI in this way comes from Japan Post Bank, which brought in the Japan-based data solutions provider NTTD to help introduce an AI system for its call centre, reducing average handling time for new agents by nearly a third.[52]

3.3. Markets

Aside from marketing and offering new products, banks have also been using big data to pursue a range of markets-related endeavours, from exploring opportunities across global markets to asset management to harnessing efficiency gains and cost cutting, among others.

Capturing new market opportunities. As the large data integration company referenced above shows in one of its case studies of banks it has helped, big data solutions that create a digital twin of a company were of significant assistance to a bank where complex regulatory requirements and cross-jurisdictional operations had been limiting its ability to capture new market opportunities.

Asset management. One of the most emblematic of the market-related use cases for big data so far has been in asset management, a part of the financial services industry in which *the ability to interpret data and convert it into usable, relevant information has become a key differentiator*.[53] Notably, data *can support more robust investment analyses*, and it has been proving popular among asset managers in performance and risk management, the selection and allocation of assets, identifying new client profiles, and driving operational efficiency more generally.[54] As in marketing, big data can give asset managers a 360-degree view of their portfolios.

Client onboarding. Furthermore, and as touched upon already above, banks are also using big data to make it easier to bring on board new clients.[55]

Efficiency and measurement. Further markets-related applications for big data in banking include freeing quants to focus more on markets and less on *engineering data*.[56] They also include measuring trading performance, executing trades, modelling sentiment, and settlement optimisation.[57]

Cutting costs to bolster market position. Another significant strategic deployment of big data and analytics in banks is simply to cut costs. As McKinsey points out, for example, AI can help to *lower costs through efficiencies generated by higher automation, reduced errors*, and *better resource utilization*.[58] Embracing cloud-based data solutions has also been proving its worth when it comes to cutting costs.[59]

Drawing on the benefits of the deployment of big data in markets beyond banking. The use of big data among companies and authorities outside of the banking sector also has the potential to help banks with some of today's significant challenges. This is notably the case when it comes to climate risk, which has become all the more salient for European banks since the ECB published[60] a recent paper assessing banks' resilience to potential stresses borne of a changing climate, and the effects that this could have on banks' credit portfolios and home markets. Indeed, this has particular relevance to banks in Southern European markets, such as Spain, with the ECB insisting that this region is likely, for example, to suffer relatively more from wildfires.[61] Apart from having credit exposure to companies in the regions at higher risk for wildfire, Southern European banks' physical presence in these areas also means that they are themselves potentially within palpable reach of such climate-related catastrophes.

Yet help could be at hand from big data and AI, which can, for example, process information from satellites[62] in order to anticipate fires, or indeed *use data analytics and machine learning software to give firefighters a real-time picture of a wildfire's trajectory*.[63]

4. FUTURE APPLICATIONS AND POTENTIAL RISKS

Big data analytics in the banking market is expected to register a CAGR of 22.97% during the period from 2022-2027.[64] Among the areas for future development of big data and analytics that are already making inroads is the concept of in-the-moment, or dynamic, pricing, which heralds the prospect not just of offering the right product at the right price at the right time as part of personalisation drives,[65] but also as a means to adjust prices to cover changing costs or *balance profits and risk*.[66]

More broadly, it would appear that the deployment of AI is only at the beginning of its rise, which McKinsey thinks will dramatically *improve banks' ability to achieve* what it calls *rapid innovation cycles*.[67] *The AI-first bank of the future*, it says, will *innovate rapidly*, to the extent that it will be capable of *launching new features in days or weeks instead of months*.

There are some who have long warned, however, that *big data does not automatically deliver big value*.[68] One important area for caution, for example, is that human resources and corporate culture are essential to making big data work.[69]

In this connection, McKinsey highlights the example of a bank that had invested in machine learning in the hope of taking its personalisation initiatives *to the next level*, but that two years later *was still managing its personalization program much as it always had: manually and in silos*.[70] This underscores how, *despite billions of dollars spent on change-the-bank technology initiatives each year, few banks have succeeded in diffusing and scaling AI technologies throughout* their organisations.

Finally, buying in pre-trained talent is not always an option, notably given the global shortage of AI talent,[71] and its tendency to coalesce in Silicon Valley. Lastly, as noted by the Brookings Institutions, unsupervised AI models reflect human biases,[72] so human monitoring of AI findings and results will ultimately be crucial to successful application.

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