Leveraging Data Analytics in Investment Banking: Transforming Insights into Strategic Decisions

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ABSTRACT

Data analytics has become extremely important for modern-day businesses, especially banks. Most of the information in banks is stored in computers as big data. Analyzing this data allows the banks to function efficiently and smoothly. There are various data analytics categories in banking, such as descriptive, diagnostic, prescriptive and predictive analytics. Data analytics has various advantages and challenges. So, an organisation may face various challenges like privacy regulations not allowing the organisation to analyse data freely, technical & architectural challenges, etc. For data analytics to be helpful for the company, it needs to be applied effectively; this can be done by asking practical questions to the software while analysing data or by making the data analysis platform easier for less skilled employees. Various tests, such as the T-test and regression model, play a key role in analysing data. Various companies have capitalised on data analysis by developing software and platforms focusing solely on data analysis. These companies use these platforms to other companies as a service they charge for. The biggest data analysis and investment research company is Bloomberg.

Keywords- *Analytics, Big Data, Bloomberg, Regression Analysis*

1. INTRODUCTION

Analytics is a buzzword. It's a domain that has been growing exponentially in the past two decades due to the advancements in technology. There are even many research papers which only aimed at finding the right definition of analytics. One of the appropriate descriptions one could find in the literature regarding analytics is the one provided by CETIS (the Center for Educational Technology and Interoperability Standards) which defines "Analytics [as] the process of developing actionable insights through problem definition and the application of statistical models and analysis against existing and/or simulated future data" (Iraqi et al. 506)

Banking customers generate a large amount of data every second through millions of individual transactions. "We generate around 2.5 million quintillion bytes of data every single day, which is 2500000000 gigabytes." (Hitachi Solutions)

In the last few years, the availability of data has increased massively while the cost of analyzing and further processing this data has decreased. Businesses have opened their minds, freely adapting new analytical techniques that in the past might have been dismissed as too impractical and theoretical for the real world. (Garg et al. 3)

Almost every bank lists advanced analytics among its top five priorities. Most plan to invest further in these techniques. A few banks are already seeing the rewards. These leaders have built substantial foundations by establishing centres of excellence and using machine-learning techniques. Therefore advanced analytics is becoming a reflex action, with commensurate rewards (Garg et al. 5). Data analytics allows the banks to better understand the needs of their clients and take action accordingly. By analyzing information the organization can make concrete point decisions instead of using the method of trial and error which leads to excessive wastage of monetary funds and various other resources. The interest towards data analytics comes therefore naturally as this is where magic happens with the data. Through the different types of analytics possible, the algorithms and techniques developed, there is an opportunity for investment banks to enhance their overall revenues.

Data analytics helps in garnering answers to various questions such as "Is the client satisfied with the quality of service?" or "Will the company be able to reach its revenue goal for the month?" and so on. Attaining the answers to these questions ensures increased efficiency in the organization.

Data analytics is not just about satisfying the customer needs, it is also about protecting the company from various problems by identifying early warning signals and detecting cybersecurity threats as well as frauds by analyzing their credit score and repayment abilities.

This new paradigm in the digital era requires the support of multiple skills and the knowledge of programming techniques and allows for better interpretation, inspection, cleaning and modelling of large amounts of data extracted from various sources (including the web) that are useful in the decision-making process.

2. TYPES OF DATA ANALYTICS IN BANKING
Data analytics includes various types of techniques. This paper will be discussing these types of data analytics briefly. The most commonly known techniques or types are as follows:-

i)Descriptive analytics
It is a branch of data analytics that deals with the examination and interpretation of past data to gain insights into what has happened in a business or organization. It uses various graphs and charts to make the data presentable and easy to understand
This approach can help businesses identify areas of strength and weakness, track progress over time, and make informed decisions based on historical data (Wolniak 700). It helps in answering several questions such as What happened? When did it happen? Where did it happen? Etc.
Descriptive analytics is a valuable tool for businesses and organizations looking to gain insights into their operations, improve decision-making, and identify areas for improvement. (Iraqi et al. 507)

ii)Diagnostic analytics
Diagnostic analytics is a branch of data analytics that focuses on examining historical data and identifying the root causes of various outcomes, events, or trends (Wolniak and Grebski 652). It helps in determining why the particular event took place. It answers questions such as why did it happen? What are the triggering events? What are the preliminary conditions for each context?

iii)Predictive analytics
Predictive analytics, a branch in the domain of advanced analytics, is used to predict future events. It analyzes current and historical data to make about the techniques from statistics and machine learning (Kumar and Garg 31). It helps in answering questions such as what is likely to happen. What happened in similar situations throughout the past? What could be the results of such actions or decisions?

iv)Prescriptive analytics
Prescriptive analytics helps in developing various solutions for the problem faced by the organization and also allows the company to get a first-mover advantage so that it can properly utilize an opportunity. It helps in answering various questions such as What should I do about it? What can I do to prevent it? How can I best exploit it? (Iraqi et al. 507)

All these techniques of data analytics are used in the given order and help in processing data appropriately while preventing any inefficiencies in the operations of the organization. Therefore data analytics starts with identifying a problem and ends with coming up with a solution for it or it starts with identifying an opportunity and ends with effectively utilizing it. Hence in both cases, data analytics proves to be extremely important for the functioning of the organization.

3. ADVANTAGES
Over the years data analytics has proved to be extremely beneficial in the banking sector. Advanced analytics can allow banks to get rid of several problems and ensure that the operations are being carried out smoothly. Some of the known advantages of data analytics are as follows.
i) *Accelerating growth*
Data analytics allows the organization to attain a more detailed profile of their customers, not only this but it also allows the organization to properly analyze the transactions and hence improve the retention and acquisition of clients. For example, le a bank can use the credit card transaction details of its customers to develop offers that give them the incentive to purchase from the bank's merchants. This will boost the bank's commission, increase revenue for its merchants and lead to higher customer satisfaction. (Garg et al. 3)

ii) *Customer SegmentatThe customer* base can be divided into groups of individuals that are similar in particular ways relevant to marketing and business, such as their age, gender, financial conditions, interests and spending habits. This segmentation allows banks to provide or deliver to customers exactly what they're looking for. (More and Moily 2)

iii) *Forecasting The Market*
Combining a large amount of data from multiple markets and countries provides an enhanced view of the market which can generate trade signals, profit or risk exposures etc. Hence data analytics provides early warning signals of a depression about to occur in the market so that the bank can protect itself and its clients. It also allows the organization to spot any incoming opportunities so that it can get the first-mover advantage. (Doko et al. 12)

iv) *Enhancing Productivity*
Every bank Finding new sources of growth process can become faster and more effective.

Among other things, banks can use advanced analytics to provide faster and more accurate responses and give teams analytics-enhanced decision support to prevent wastage of manpower and other resources through trial and error. For example, banks can use various algorithms to predict the cash requirement at each of their ATMs across the world to save money. (Garg et al. 4)

v) *Risk Management*

Banks can lower their risk costs through analytics-aided techniques, such as digital credit assessment and advanced early-warning systems. Big data is located and presented on a single large scale which makes it simpler to reduce the number of risks to a manageable number. (More and Moily 2) This would further reduce the chances of losing data or ignoring fraud within transactions in banks. D'Sibs has saved up to 400 million USD through proper risk management with the help of data analytics (Garg et al. 4). D'Sibs also known as domestic systemically important banks are domestic banks which are so huge and influential that if they failed then the economy of the entire country would collapse.

4. CHALLENGES

Even though data analytics has a lot of advantages it is extremely important to pay attention to the challenges of implementing data analytics so that the organizations can learn from them and better implement it in the future for increased efficiency.

Due to the lack of required skills, technical infrastructure, unsupportive senior executives, and inappropriate organizational culture, around 60% of BDA initiatives fail to be successful.

Further, many BDA projects are not initiated because of high infrastructure costs crucial for supporting daily big data collection. Thus, lots of data, especially data beyond organizations' boundaries, are not recorded or stored and, in the case of being stored, are not used or analyzed appropriately. (Delgosha et al. 2)

Some generalized challenges that should be overcome to have successful Big Data projects are given below

..-Privacy and security. Handling Big Data is more scalable and flexible in the cloud, but the privacy and security regulations often restrict this movement decision, also there are reputation consequences. Big Data has faced criticism for overstepping privacy boundaries. Ensuring Big Data projects retain their integrity and trust is critical to avoiding public embarrassment, mistrust, and liability.

-Technical and architectural challenges. Data is rapidly increasing hence it is very important to use appropriate techniques and technology that can handle such vast amounts of large and variety of complex datasets, which requires new infrastructure components. The banking industry is specifically lagging in this department

-Lack of skilled personnel. Banks need skilled staff data scientists to benefit from Big Data opportunities and overcome governance issues. Because of strict governance rules in banking, banks are missing special working positions for data scientists. (Doko et al. 13)

-Not asking the right questions, so algorithms don't deliver actionable insight. As mentioned in the introduction it is extremely important to ask questions that generate answers of actual value to the organization.

-Investing too much up front in data infrastructure and data quality, without a clear view of the planned use or the expected returns. This may lead to unnecessary wastage of resources

If the banks can overcome these challenges then data analytics can allow this sector to become extremely advanced.

5. HOW TO EFFECTIVELY APPLY DATA ANALYTICS

There are various ways to overcome the challenges mentioned above and effectively use data analytics programmes or applications.

i)Great analytics starts with high-value questions. It is extremely important to ask practical questions so that you can get valuable solutions that help the organization instead of asking questions for the sake of it or impractical questions that create no benefit for the organization.

ii)The smallest edge can make the biggest difference. Advanced analytics is not about solving your biggest problems; it's about solving hundreds of small ones that all add up. Ask small questions to get a definite answer instead of asking the programme one huge problem which is more difficult to comprehend.

iii) The design of the application matters a lot. You want regular employees with less specialized skills to use your new tools. A beautiful algorithm deserves an attractive package that catches the eye of your users. Most of them can't read code or understand the output of a model. To act on these insights, they need easily readied and used dashboards that help them make decisions and test potential scenarios. (Garg et al. 7)

iv)Developing algorithms for data analytics is not enough, they need to be implemented by the workers as well so that an actual change or impact can be seen in the organization. This can be done through effective communication or providing incentives both monetary and non-monetary.

v)Analytics is a team sport. The skills banks need to make analytics work cannot be contained within a single person—at least not yet. Your teams must include true experts in data science, engineering, data architecture, and design. Faking it with people who do a little bit of everything won't work.

vi)Skill development programmes. Even though it is important to ensure that the data analytics programme can be used by every person, proper skill development through on-the-job or off-the-job training will further help in ensuring effective and efficient application of such programmes which would allow the organization to run without any complication.

The scope for analytics is vast. Anywhere a bank uses any rule of thumb or something is done "the way we've always done it," analytics can probably make improvements.

The problem with the method of rule of thumb is that it does not always provide the right direction to the company and the results may vary due to the difference in experience and knowledge of the individual, may it be the CEO or a ground-level employee. Analytics on the other hand provides detailed information about the bank or its projects and further helps in optimum utilization of resources. This allows the bank to meet the standards it had set for revenue generation or client satisfaction.

6. APPLICATIION OF STATISTICAL TESTS

Critical reading of the literature requires the capability to determine whether the conclusions are supported by the data presented. Part of this determination involves deciding whether the results are statistically valid. Although much statistical analysis may be beyond those without advanced statistical training, basic knowledge will significantly enhance the ability to both read and interpret medical literature. Part of this knowledge is determining which statistical test is appropriate for a given data set. (Neideen and Brasel 93). If an incorrect test is used, then invalid results and misleading conclusions may be drawn from the study. (Gardner 38)

There are various types of statistical tests. This paper will focus only on the regression model, T-test, Pearson correlation model and the ANOVA test.

i)*Regression Model*

Regression analysis is a statistical tool for the investigation of relationships between variables. Usually, the investigator seeks to ascertain the causal effect of one variable upon another—the effect of a price increase upon demand, for example, or the effect of changes in the money supply upon the indexation rate. To explore such issues, the investigator assembles data on the underlying variables of interest and employs regression to estimate the quantitative effect of the causal variables upon the variables that they influence. The investigator also typically assesses the "statistical significance" of the estimated relationships, that is, the degree of confidence that the true relationship is close to the estimated relationship. (Sykes 3)

It is important to note that the history of this particular statistical technique can be traced to late 19th century England and the pursuits of a gentleman scientist, Francis Galton. Francis came up with the regression model not by analyzing some corporate entity's data but by analyzing an experiment he carried out about the inheritance of the height gene. (Allen 1-2)

ii) *T Test*

It is one of the most popular statistical techniques used to test whether the mean difference between two groups is statistically significant. The null hypothesis states that both means are statistically equal, whereas the alternative hypothesis states that both means are not statistically equal i.e., they are statistically different to each other.T are three types i.e., one sample t-independent samples *t*-test, and paired samples *t*-test. (Mishra et al.)

One sample T test one sample t-test is a statistical procedure used to determine whether the mean value of a sample is statistically the same or different from the mean value of its parent population from which the sample was drawn.

Independent Samples T-test Independent *t*-test, also called unpaired *t*-test, is an inferential statistical test that determines whether there is a statistically significant difference between the means in two unrelated (independent) groups.

Paired sample T The paired-samples *t*-test, sometimes called the dependent samples *t*-test, is used to determine whether the change in means between two paired observations is statistically significant. In this test, the same subjects are measured at two time points or observed by two different methods. (Mishra et al.)

iii)*ANOVA*

A statistical technique used to compare the means between three or more groups is known as ANOVA or F test. ANOVA must be an omnibus test statistic. Its significant *P* value indicates that there is at least one pair in which the mean difference is statistically significant. To determine the specific pairs *post hoc* tests (multiple comparisons) are used. There are various ANANOVAsts, and their objectives vary from one test to another. There are two main types of ANOVA i.e., one-way ANOVA and one-way repeated measures ANOVA.

One way The one-way ANOVA is an extension of an independent samples *t*-test (In independent samples *t*-test is used to compare the means between two independent groups, whereas, in one-way ANOVA, means are compared among three or more independent groups). A significant *P* value of this test refers to multiple comparisons to identify the significant pair.

Two way ANOVA-The two-way ANOVA ian s extension of one-way ANOVA [In one-way ANOVA, only one independent variable, whereas in two-way ANOVA, two independent variables are used]. The primary purpose of a two-way ANOVA is to understand whether there is any interrelationship between two independent variables on a dependent variable. (Mishra et al.)

iv) *Pearson's correlation model*

The Pearson product-moment coefficient of correlation is a pure number, between the limiting values of + 1.00 and -1.00, which expresses the degree of relationship between two variables. It may be considered as a measure of the amount of change in one variable that is associated, on average, with a change of one unit in the other variable, when both variables are expressed in standard scores. When two such sets of measurements are associated so that the measurements in one set are related to those in the other set, we say that the two sets of measurements are correlated. Thus, there is said to be a positive correlation between the two variables. Suppose that we have the height and weight of each one of a group of 12-year-old girls. We can, of course, compute the mean and standard deviation of height; and we can do the same for weight. But a more important question may well be: Is there a correlation, or relationship, between height and weight? If there is then it is said that there is a positive correlation between the height and weight of the 12 year old girls. There is also a (negative) correlation between the score made on an intelligence test and the length of time required to solve certain puzzles and mazes. Statisticians have derived more than 20 different formulas for measuring the degree of relationship between the pairs of measurements people have on two variables such as height and weight.

But we don't need to consider all 20 of the formulas every time we want a correlation coefficient. For most purposes, a particular one of them is outstandingly superior to all the others.

Hence unless we have very good reasons for preferring some other measure in a particular situation, we should use the Pearson product-moment coefficient of correlation. Its name is long, but its symbol is short-merely r or r with two appropriate subscripts, such as r_{12} or r_{XY}. There is only one main use for r: to state in quantitative terms the extent of the relationship existing between two variables. (Kurtz and Mayo 192-193).

7. FINANCIAL ANALYTICS COMPANIES

We are witnessing a movement that will completely transform any business. The word we have given to this movement is called Big Data, and it will and has already changed everything, from the way businesses operate to the way banks provide loans etc. Hence, various companies have come into existence and their raison d'etre is collecting data and analyzing it so that all the organizations as well as individuals dependent on big data can carry out their operations smoothly and with ease. We will talk about some of these companies below.

i) *Bloomberg*

Bloomberg is a popular subscription-based data service that provides a vast of financial, economic and general information to users. Bloomberg LLP ori offered this service to the investment community and has expanded the service to

individuals and academic institutions. In addition to the breadth of data that the service provides, easy access to this data is also an attraction for many users. The service mimics the services of cable TV providers, providing access through a portal (the

subscriber's television) that, while fixed in its location, offers easy accessibility to content that the subscriber can choose. Bloomberg in fact, does provide its information services to the various media. There is Bloomberg Radio, Bloomberg TV and Bloomberg.com. These basic services draw data from the same sources and provide news and some analysis to a wider audience than that of the subscriber base. The expanded resources that are available to subscribers is the expanded access to Bloomberg Professional Systems. (Coe 49).

The Bloomberg Professional Service is widely used by practitioners and academic institutions. The service is accessed via a computer, commonly referred tas o the Bloomberg Terminal, with associated software and license. The platform is adopted by more than 800 business schools worldwide with more than 300,000 terminals. The Terminal provides access to real-time and historical financial time series data, accounting information, risk

metrics across various markets and securities, economic and government data, and students, to evaluate investment strategies taking into account prices, dividends, technical accounting measures about operations and management, debt and equity statistics, firm and industry level data, and macroeconomic indicators. Investment opportunities can be compared across securities as well as industry and market indices. (Moreale and Zaynutdinova 266)

ii) *Morningstar, Inc*

Morningstar is a well-known company that provides financial services such as investment research and investment management to its clients. It is based in Chicago, Illinois and was founded in 1984 by Joe Mansueto. Morningstar is one of the biggest competitors of Bloomberg. Morningstar uses three different platforms or software to provide its financial services, namely Morningstar Direct, morningstar wealth and morningstar advisor workstation. **Morningstar Direct** "is a comprehensive platform that helps asset and wealth managers build their assets and manage their portfolios by supporting market research, product creation, positioning, marketing, and distribution strategies." It helps mainly in research & analysis, product creation, portfolio management and investment reporting. ("Morningstar Direct | Asset Management Platform")

Morningstar Wealth "takes care of the heavy lifting of administering investments on behalf of the clients." It acts as a consolidated platform that allows users to provide higher quality engagement and modify their services to meet the needs of every client effectively. ("Morningstar Wealth Platform")

Morningstar Advisor Workstation "helps in investment research, proposal creation and portfolio analysis." It helps in building plans rapidly and efficiently, organizing your business, communicating with clients, and staying compliant. ("Advisor Workstation | Financial Advisor Tool")

iii) *Alphasense*

Alphasense is a software company that is known for its market intelligence platform that uses AI to attain information from public and private content. This allows businesses to make critical decisions with higher efficiency and speed. Alphasense is a software research startup backed by Goldman Sachs and founded by Jack Kokko and Raj Neervannan in 2011.

Alphasense market intelligence helps in discovering concealed or overlooked data as it understands various business and financial languages. Not only this but it also notifies the clients in case of any major market updates or changes. Powerful workflow tools, like our Notebook and markup capabilities, provide an efficient and secure way to track, manage, collaborate, and share insights more effectively. It further helps in tracking the market environment and industry trends and also identifying and uncovering various strategies used by the competitors.

Hence alpAlpha Sense is one of the most efficient software for running a business as it not only simplifies the clients' work but also allows them to grow in the market rapidly.

8. CONCLUSION

Data analysis is a necessity for banks in this day and age. Descriptive analytics involves reviewing past data, diagnostic analytics focuses on determining the root causes of various events, predictive analytics uses past data to predict the future and prescriptive analytics provides solutions to various problems.

Data analytics has various advantages such as accelerating growth which is done by allowing the organization to properly analyze the transactions and hence improve the retention and acquisition of clients, customer segmentation wherein the customer base is divided into groups of individuals that are similar in particular ways relevant to marketing and business, such as their age, financial conditions etc., and risk management as banks can lower their risk costs through analytics aided techniques, such as digital credit assessment and advanced early-warning systems. An organization may also face some challenges while analyzing data, the biggest challenge which often goes overlooked is not asking the right questions, so algorithms don't deliver actionable insight. As mentioned in the introduction it is extremely important to ask questions that generate answers of actual value to the organization. Lack of skilled personnel is also a major challenge as banks need skilled staff data scientists to benefit from Big Data opportunities and overcome governance issues. However, because of strict governance rules in banking, banks are missing special working positions for data scientists. There are various tests which focus on analyzing data. T test is one of the most popular statistical techniques used to test whether the mean difference between two groups is statistically significant, Regression analysis is a statistical tool for the investigation of relationships between variables, and AVOVA is a statistical technique used to compare the means between three or more groups and Pearson's model may be considered as a measure of the amount of change in one variable that is associated, on the average, with a change of one unit in the other variable, when both variables are expressed in standard scores. Analyzing data is only helpful if it is done while keeping in mind certain strategies and procedures and ensuring that every employee of the organization can analyze data through the software provided by the company. Some of the best applications for data analysis come from Bloomberg, MorningstaInc.nc and Alphasense.

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