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Applications of Big Data Analytics in Asset and Wealth Management

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Abstract:- Organisations across the world are increasingly using Big Data Analytics for various activities and benefits. Although the benefits of data analytics may not be clearly visible inthe day-to-day life of a business, the use of big data analytics techniques and methods has a clear positive impact on the top and bottom lines of the organizations. This study evaluates factors in a customized methodology used by a mid-sized asset and wealth management (AWM) firm that intends to increase the benefits of its offerings by deploying Data Analytics techniques. Evaluating the organizations in the financial stream includes many aspects such as Governance associated with Big Data Analytics in any firm, distinctions in technology like hardware and software of the product, etc.During the course of this study, many challenges were encountered in terms of data collection, validation, necessary approvals etc. However, the results came in line with the said hypothesis under consideration.

Prior to the advent of Big Data, Artificial Intelligence (AI), and Augmented Analytics, AWMsrelied on manual data acquisition and analysis. All the processes from client acquisition, to understanding client metrics based on demographics and net worth were done on the basis of limited data availability and complete human efforts. Today, Big Data Analytics and AI, have democratized the way AWMs operate. AWMs can nowmicro-segment their prospects based on a wider range of data sources like social media, news stories, and other public data sources. Additionally, the service-based offerings have been productized to meet the needs of a variety of customers with diverse risk appetites in the form of model portfolios. This study throws light on similar factors and more.

The findings of the paper will benefit beginners trying to understand the application of Big Data Analytics in the financial sector, especially its deployment in the Asset and Wealth Management stream of finance and its applications thereof.

Keywords:- *Big Data Analytics, AWM, Finance, Portfolio, Returns, Investment, Investors.*

I. INTRODUCTION

In the current age of information technology, big data has gained center stage in almost all industries. Companies across the world use big data for various activities including customer analysis, market analysis, product and distribution analysis, etc. A large set of structured or unstructured data can be processed further to provide solutions for a variety of business challenges across industries. Likewise, the utilization of big data in the finance industry is both crucial and significant. In finance, big data is increasingly used to transform business processes, increase overall efficiency by reducing turnaround times and to reduce cost by eliminating duplication of work or through automation.

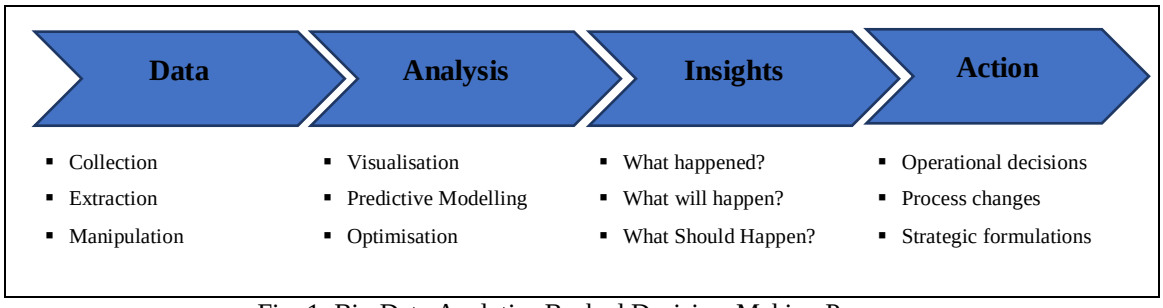

Fig. 1: Big Data Analytics Backed Decision-Making Process

Source: (Tatulici, 2014)

Despite the significance, number of publications on big data in financial sector are limited owing to substantial challenges associated with respect to data collection, data security and compliance issues. To begin with, many large organisations still use old technology and IT infrastructure and use existing tools methods to deal with data. This structure coupled with traditional structures cause a hindrance in implementing big data techniques that is perceived to not create any meaningful value by the top management. Additionally, many financial firms and institutions lack required skillset like data scientists that have financial literacy or vice-versa that can bridge the gap between technical capabilities and financial business understanding and decision making. Finally, the data security and compliance issues discourage management from integrating Big Data Analytics systems in their organisations (Tatulici, 2014).

Nevertheless, the grounds are fast evolving and today big data applications are spread across various sub sectors of finance including stock markets, banking and financial

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institutions, research houses, fraud detection, risk analysis, financial management, credit analysis etc. The financial sector constantly deals with large sets of data that are diverse, unstructured or structured and is also complex. These data sets can be further cleaned, processed analyzed to derive actionable insights or seek a specific investment goal of investors. Big data analysis is also used to transform business processes and investment techniques/processes to and make them accurate and efficient (The Role of Big Data in Investing, n.d.).

	Big Data Investment Approach
Momentum	Use Machine Learning techniques to identify the connections between companies based on industry sentiment, stock movements and correlations in economic factor
Value	Analyze a large universe of industry specific data that extends beyond a company's financial statements to determine its "intrinsic value"
Profitability	Evaluate a company's web traffic patterns to identify businesses that are gaining e-commerce market share in real time

Fig. 2: Big Data Analytics Backed Quantitative Investment Decision-Making Process

Source: (The Role of Big Data in Investing, n.d.)

II. USECASES OF BIG DATAIN FINANCIAL SECTOR

The top used cases of big data in the financial industry are across sub-sectors like customer analytics for Insurance companies, risk management, credit management, customer mapping, fraud management in Banking sector, risk assessment and management in Private Equities, Asset Management, Hedge Funds and Financial Research &Advisory industry. In most of these cases, business decision making is moving away from individuals towards machine learning algorithms. Some specific used cases are:

- Using data science methods and techniques to help the asset managers, financial firms and market traders to make investment decisions. Data science can be used to automate and expedite the entire investment decision making process by using advanced techniques like algorithmic trading or advanced mathematical formulas (quantitative techniques)
- Usage of data science to analyse different data sets on the stock markets from the past and present. Predictive analytics can then be used to‘predict’ the direction in which the market is likely to move base on its performance in the past, under specific economic conditions/events (back testinganalysis). This helps to reduce the level of uncertainty and risk, to a certain extent.
- Financial and stock market analysisto identify which stocks, commodity or other investment products/ asset classes to invest inby automating entire selection process by using scores of structured and unstructured data
- Fraud detection and prevention for financial institutions using machine learning techniques to identify real time spending patterns of the consumers. This helps both the bank and the consumers in tracking unusual activity on credit cards etc.
- Usage of machine learning and pre-built-in data models by the financial planners to assess the risk appetite, identify lending and credit history of individual investors to chalk out their investment plan/portfolio
- In banking and retail segment big data analytics techniques are used to do costumer segmentation on the basis of data related to demographics, likes and dislikes, socio-economic status, credit worthiness, mortgage and repayment histories etc.
- On the basis of target market segmentation, banking institutions can categorically target specific set of customers for their products and services. For instance, big data has helped banking sector in forecasting and planning for events that are uncertain, identify customers with alarming non-performing asset (NPA) rate an avoid lending to them, automated (algorithmic) triggers to check if business assets are in line with the regulatory requirements

The usage of big data techniques has direct impact on financial products and/or services offered by market participants. Off lately, it’s all thanks to data science that financial services industry has been able to provide innovative solutions for areas like predictive analysis, risk-based modelling, customer engagement, fraud detections, cost reductions by removing redundancy.

III. USECASES IN FINANCIAL FIRMS (BY TYPE)

In the financial services domain, big data and various operational functions go hand in hand. The following section discusses the impact of Big Data on each financial sector. Every sector process large set of structured and unstructured data to derive meaningful and actionable insights that have tangible impact on their costs and/or profitability.

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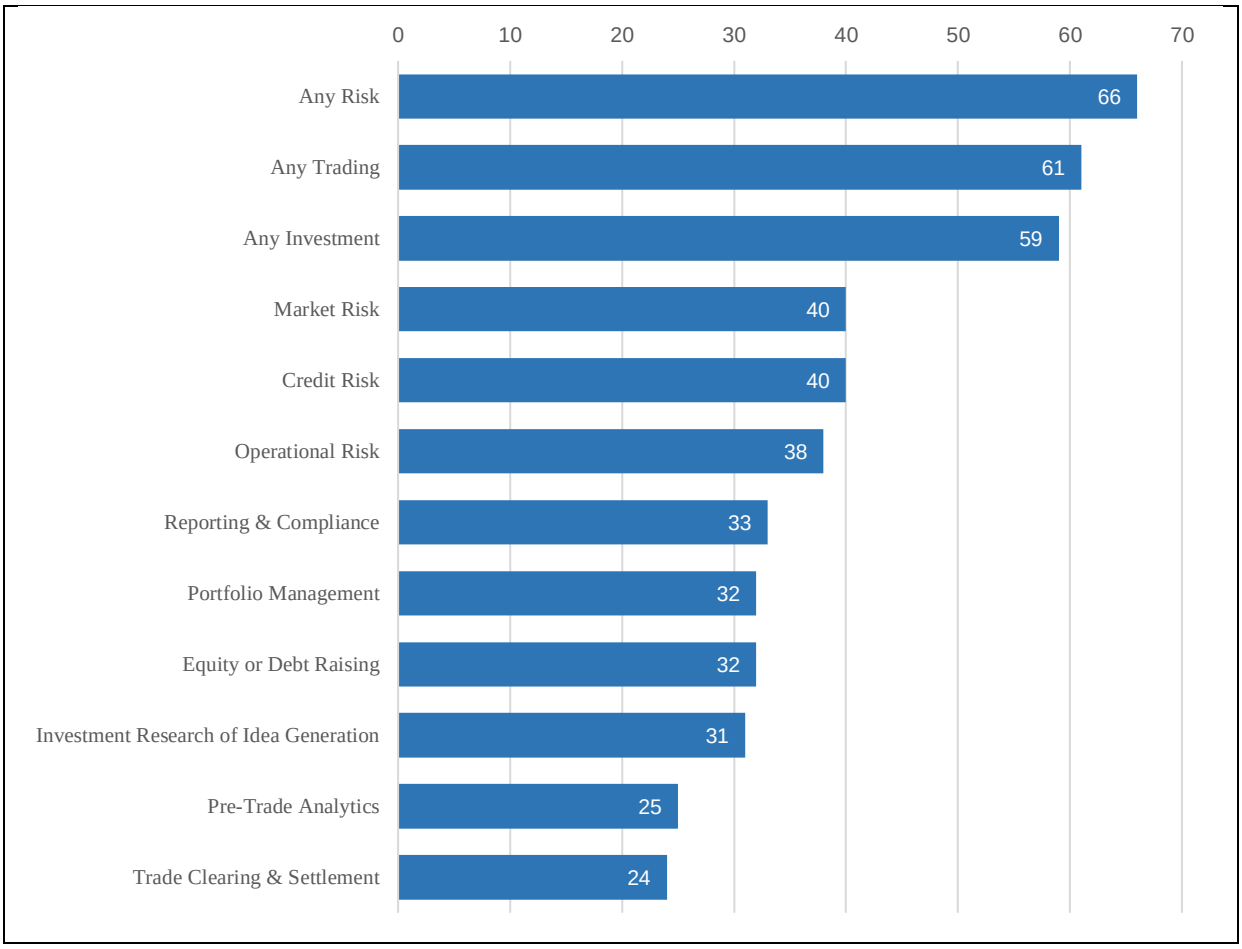

Fig. 3: Big Data Analytics – Key Areas of AI/ML Deployment, in %

Source: (Using AI and Big Data in Asset Management | Refinitiv Perspectives, 2021)

- Securities Trading Institutions – During the course of study, it was observed that there is adequate literature to support positive impact of usage of big data techniques in securities trading institutions. Trading institutions typically use descriptive/predictive analytics to monitor the regulatory thresholds in the trades. The trading institutions incorporate internal trade data and data from government sources to identify problematic trades with the help of algorithms.
- Investment Banking Firms – Use predictive techniques of data analytics in order to help their portfolio managers to identify how any new customer service is impacting their business. Here, large proportion of internal and external, structured and/or unstructured data is processed in a way that helps the managers to understand the metrics of services that may be profitable to their customers. Finally, this helps them to improve their top-lines and margins.
- Hedge Funds – Both large and small sized hedge funds use predictive, prescriptive and in a few cases descriptive data analytics system to identify and understand optimal speeds of securities transactions. The key objective in such cases is to improve the speed of trading.
- Consumer lending/ Banking sector– Manylarge and small consumer lending institutions use descriptive and prescriptive big data analytics to study the credit standing of customers before granting consumer loans. The key objective here is to consider both, the demographic data available from public sources with the internal databases of the firmto assist loan disbursement officers to identify any risks associated with loans that are at risk. This predictive analytical interpretation of structured data is increasingly helping the companies to decrease exposure to risky loans and/or make additional provisions for potential NPA's.
- Key Focus of the study –Asset andWealth Management and Big Data Analytics –Many AWM firms use predictive and prescriptive big data analytics systems to optimize returns on their customers portfolios. The big data systems introduce variety of product models and services for varied portfolios for the investor. These kinds of firmsare able to generate optimal return on investment through marketable models of structured and unstructured data(7 Big Data Use Cases in Financial Services and Benefits of Data Science, n.d.).
- The following chart throws light on the size of global Asset Under Management Growth in USD trillion that in turn depicts the significance of deployment of big data analytics in this stream

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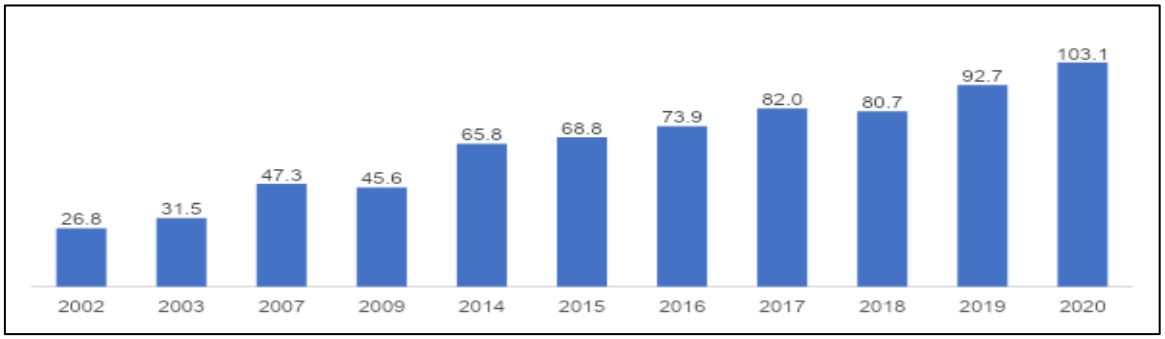

Fig. 4: Global Value of AUM (USD trillions): 2002 – 2020

As per market sources, Big Data and AI are expected to help AWM's optimize workflow efficiencyand also drive more revenues. A sizable portion of wealth managers are already deploying client as well as advisory facing AI backed technologies

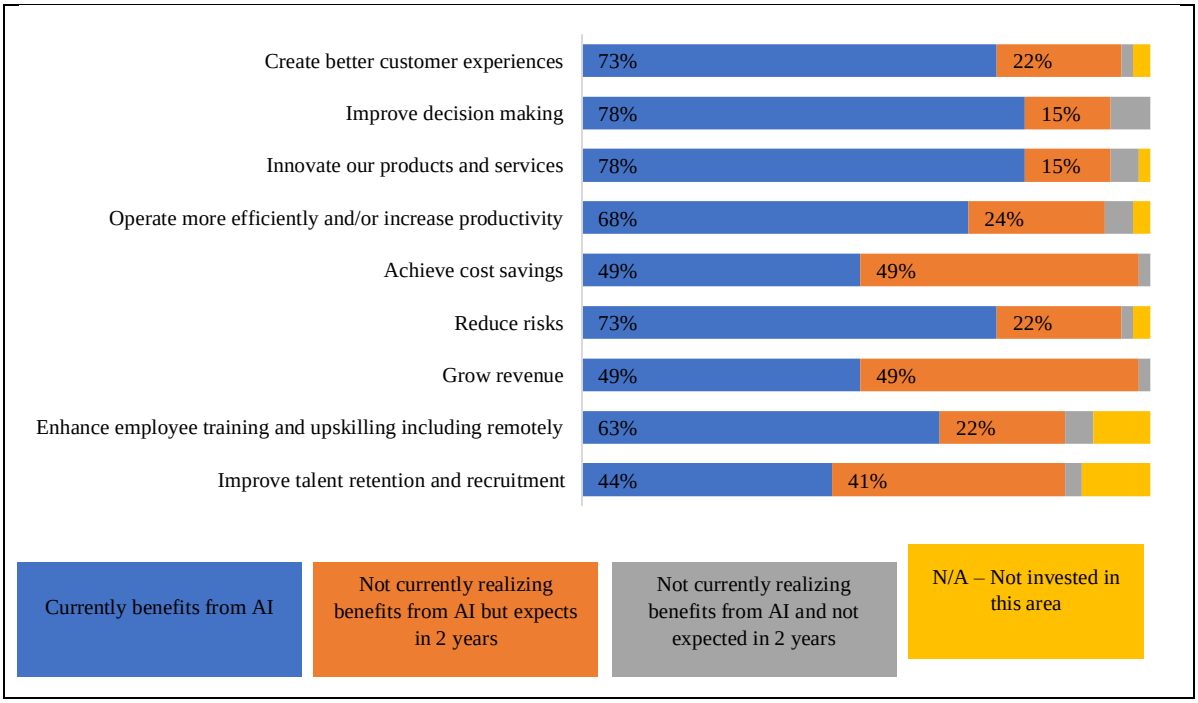

Fig. 5: How AI is gaining traction amongst Asset and wealth Management firms

Prior to the advent of big data, AI and Augmented analytics, wealth managers largely relied on manual data acquisition and analysis(AI in Wealth Management: 6 Use Cases & Real-Life Examples, n.d.).

IV. OBJECTIVES

Markowitz developed a classic research allocation framework suggests that returns on portfolio can be substantially improved by diversifying the holdings. The purpose of this study is to discuss application of Big Data and other languages to create a model portfolio of stocks. While, research portfolio construction still requires human intervention, expert judgement and practitioner experience, big data analytics helps in consolidating vast amount of data to take informed decisions and allows to empirically test our investment hypothesis. This study discusses, a Mid-Sized AWM's process of collecting, processing and cleaning vast scores of publicly available data on all the publicly listed Indian companies on two key exchanges – Bombay Stock Exchange (BSE) and National Stock exchange (NSE) to create attractive model stock portfolios that are most likely to generate an alpha for the investor, under different economic conditions. The study undertakes observation of step-by-step process deployed by a mid-sized wealth management firm that uses the above data to generate model portfolio for diverse set of investors using big data analytics techniques.

Some clearly defined objectives of the study include:

- Identification and discussion of Big Data analytics deployment and application in finance, especially wealth management stream
- Areas where big data techniques are applied by asset and wealth management firms
- How the deployment is spelling out clear benefits for both Asset and Wealth management (AWM) firms as well as their clients in terms of expansion in both top- and bottom-lines
- Clear benefits of deployment of big data and analytics for the firms (in terms of higher efficiency, elimination of work duplication) as well as outcomes for the investors (to meet their expected return goals)

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V. RESEARCH METHODOLOGY

For the purpose of this research, a mid-sized wealth management firm that uses big data analytics system for portfolio creation was studied. The portfolio managers use data driven investment models to evaluate publicly listed companies through fundamental and economically motivated investment themes. To create these models, large sets of publicly available data like financial statements, investor presentations, corporate actions, news, earnings call transcripts and market data like daily stock prices, volumes, returns are used. This helps the asset managers and portfolio managers to identify strong business with attractive valuations and are in sync with the positive themes trending in the market. Additionally, data science and machine learning techniques help in processing and analysing scores of unstructured data that cannot be easily quantified.

A systematic data collection and analysis process includes collection of data from various sources, cleaning the data, processing the data using machine learning techniques and analysing the data to generate a curated portfolio of stocks. The portfoliosare back tested for various past events and triggers to check its effectiveness vs. other investment returns generated over the same period. Key steps involved in the portfolio creation process included.

A. Step 1: Data Collection

The data was collected through various secondary data sources including:

- Web scrapping – to collect data from company website and stock exchanges using python and stored in CSV format. The key data points collected from these sites include

✓ Company Website– to collect financial data from reported financial statements (both yearly and quarterly), investor presentations, sustainability reports/CSR reports (if any), company news, corporate actions, management interviews

✓ Stock Exchange websites – to collect scores of data for a 10-year period or since the company is listed on various parameters including daily prices, daily volumes, daily moving averages, market capitalization, P/E ratios, P/B ratios (for banks), EV/EBITDA ratios

- Economic data for Indian markets on key parameters like GDP, inflation, policy decisions etc.
- Some of the key words used to conduct the search included – 'Big data in finance', 'big data and investment', 'big data and portfolio management', 'big data and fintech'.

B. Step II: Data Cleaning

The data cleaning process included cleaning and segregating all the data collected from annual reports and other company reports from respective company websites as well as stock price data collected from respective stock exchanges website. The total data pool included all the information points collected for 500 companies these data points were imported using pandas library.The key aspect here was cleaning the data using data frame and elimination of unrequired columns and further converting the remaining data into single format.

C. Step III: Data Processing

The key intent here was to standardize the data for each company based on their year ends (annualized), consistency of currency, filtering out the data that was not required and inconsistent. For example, Companies with stock history of less than 10 years data were eliminated to include only those companies that have adequate history to test any hypothesis. categorizing the data into various buckets like – company management information, stock related data, Company financial performance, Company news and events, Company interviews and coverage by analysts. Next step included applying relevant filters to the data depending on the expected return goals. Key filters here included

- Quarterly filters for revenue, profitability, Return on Equity (RoE), Return on Asset (RoA), net margins, debt to equity ratio to locate the best shares in the list of shares.
- Filter associated with, risk adjusted relative strength, Minimum / Maximum value of each share per month, 12 months relative strength, minimum return in 130 days, etc.
- Percentile ranking (ranking) based on closing price of the share on the end of that day
- Liquidity analysis based on average trading volume for a quarter and year
- Price bands to identify the highest lowest prices for the stock during the past one year, three years and 7-year cycle
- Filtering the stocks by category – defensive stocks (ones that are in demand when the economy slumps) like food staples, high potential stocks (like IT stocks that show exponential growth potential in times of economic boom)
- Creation of model portfolios for three economic conditions – economic boom, economic bust and neutral portfolio.

D. Step IV: Data Analysis and interpretation using Machine learning and Natural Language Processing (NLP)

The processed data is further analysed using Big Data Analytics techniques to generate optimal portfolios for diverse set of investors through

- Use of machine learning techniques to build dynamic models – usage of algorithms for raking companies based on certain pre- identified metrics
- Use of natural language processing (NLP) to read as well as interpret large amounts of text from multiple sources and gauge sentiments for e.g., checking whether research reports publish on a company have positive or negative tone. NLP is also used for topic modelling i.e., summarizing large body text and breaking it down into topics and themes that can be easily used for statistical and machine learning applications for example identifying what the company management focused on in their earnings call in this quarter vs. previous quarter. This helps the investment managers to pick up companies that have extraordinary track record and may go unnoticed.
- Use of machine learning and advanced statistical models to process large amounts of data that is both structured and unstructured. This is both customer and market data that is processed to improve overall accuracy of prediction/forecast, generate more leads and also automate routine tasks at the back office.

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VI. RESULTS AND DISCUSSION

The financial organizations discussed in this reportare deriving benefits of decisions that are based on deployment of big data analytics methods and techniques. The model portfolios created using Big Data systems, statistical models and machine learning techniques and other languages helped in generating return on investments (ROIs) that compare well with the market returns, considering the state of economy at any given point of time. Also, when it comes to emerging markets, the information asymmetry creates opportunity for data driven investors. The lack of availability of data throws light on both mispricing and uncertainty. The diligence of structuring, studying and analysing the available data definitely creates an opportunity to generate alpha. Overall, some of the clear benefits of deploying big data analytics techniques that were observed for both the firm and the investors include

- Improved personalization for investors to create tailor made portfolios – based on economic conditions
- Enhanced automation that helped the wealth management firm to reduce time on routine tasks and freeing up employee time for more cognitive tasks
- Streamlined data analysis and lead generation by analysing and making sense out of huge amount of publicly available data as well as improving chance of winning new clients
- Streamlined compliance related information processing as modern AI systems/algorithms can process information from vast variety of sources and which is everchanging, at great speed and accuracy vs. human intervention that can lead to human errors

The mid-sized wealth management firm under consideration in this report invests in a restricted way on Big Data Analytics. Nevertheless, relationship between use of big data techniques and expected results was clearly set and was in line with the hypothesis. The study clearly indicated that the use of big data analytics techniques, advanced mathematical models and machine learning to process and analyse structured and unstructured data to create model portfolios for diverse set of investors generates return on investments that is well comparable to the market returns vs. portfolios constructed through traditional methods and complete human expertise only.

VII. CONCLUSION

The results derived from the project under consideration threw light on the fact that deployment of big data systems in AWM's generate clear visibilityrelated to portfolio construction as it helps in clearly indicating the associated risks and/or upside/downside potential. Adequate and optimum usage of big data techniques help in corroboration of the data to generate clear indications with respect to risks and rewards. The key discussion points associated with the project revolved around the usability and practical deployment of techniques in the actual world. This project and derived results from it helped us in proving our hypothesis that using big data techniques helps in taking informed decisions based on the insights (both positive and/or negative). The results are more comprehensive and consider various factors that may impact the performance of any portfolio. These factors may be missed in case of a complete manual construction of portfolio that does not involve any technological intervention. Big Data and machine learning techniques also play a significant role in helping us build desired portfolios for investors to meet their respective investment goals. The discussion also helped us in concluding the fact that, big data not only helps in analysing the data accurately but also helps in optimally back testing the data/results to understand the possible outcomes of various business, economic or other critical situations on the portfolio returns. This in turn would help the investors to generate the desired alpha on their investment.

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