Predicting the Foreign Exchange Rate with the Use of Big Data Analytics -Machine Learning- Based on Gold and Crude Oil (BDAEX) and its Impact on Cost Management

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Abstract

Researchers have conducted numerous research to predict the factors that impact the high and down of foreign currency exchange rates. This research provides an extension of the research and studies that predict the exchange rate and measure its impact on cost management by using one of the artificial intelligence tools, which is big data analysis based on gold and crude oil as metrics, using model machine learning in the period from 2014 to 2023, as it is the beginning of a transitional period in which there was a change in some political events and changes in the Arab Republic of Egypt and the economic changes that followed. The study was applied to Ibn Sina Pharma Pharmaceutical Company, considering that this sector was greatly affected by alterations in the exchange rate. The finds of the research concluded that big data analyses that were used to predict changes in foreign exchange rates EGP /USD affect cost management, as predicting changes in foreign currency rates helps management take preventive measures in pricing operations, tracking costs and expenses, controlling costs, and adjusting the level of stress in the company and the possibility of unexpected costs.

Keywords: Foreign Exchange Rate; Big Data Analysis; BDAEX; Gold and Crude Oil; Machine Learning; Cost Management.

المستخلص

اجرى الباحثون العديد من الدراسات للتنبؤ بالعوامل التى تؤثر على سعر صرف العملات الأجنبية إرتفاعاً وإنخفاضاً ويقدم هذا البحث إمتداد للأبحاث والدراسات التى تتنبأ بسعر الصرف وقياس أثره على إدارة التكلفة وذلك بإستخدام إحدى أدوات الذكاء الإصطناعى وهى تحليلات البيانات الضخمة على أساس الذهب والنفط الخام كمقاييس وذلك باستخدام نماذج تعلم الآلة فى الفترة من عام ٢٠١٤ وحتى عام ٢٠٢٣ باعتبارها بداية فترة انتقالية حدث فيها تغيير فى بعض الأحداث السياسية والتغيرات التى شهدتها جمهورية مصر العربية وما تبعها من تغيرات إقتصادية، وتم تطبيق الدراسة على شركة ابن سينا فارما للأدوية بإعتبار أن هذا القطاع تأثر بشكل كبير من التغيرات الحادثة فى سعر الصرف وتوصلت نتائج الدراسة إلى أن تحليلات البيانات الضخمة التى تم إستخدامها للتنبؤ بالتغيرات فى أسعار صرف العملات الأجنبية (دولار) تؤثر على إدارة التكلفة ، يساعد التنبؤ بالتغيرات فى أسعار العملات الأجنبية إلى إتخاذ الإدارة إجراءات وقائية فى عمليات التسعير وتتبع التكلفة والنفقات والتحكم والسيطرة على التكلفة وضبط مستوى التوتر فى الشركة وإحتمالية حدوث تكاليف غير متوقعة.

1. Introduction

Cost management has advantages that can be realized by using their instruments to ascertain actual costs and by anticipating target costs using economic indicators like the price of crude oil, gold, and foreign exchange. On the other hand, lowering cost via the use of cost management tools is crucial and can be dependent on for cost prediction and price management, thus maintaining their financial position and making up for unanticipated or poorly thought-out losses.

Artificial intelligence has invaded the world and has become a companion to all fields, and accounting was not far from this use, so research continued on the utilization of artificial intelligence in reviewing companies, taxes, and predicting exchange rates Predicting foreign exchange rates is one of the metrics used to assess the state of the economy, as it identifies indicators of economic stability that must be analyzed on an ongoing basis. Companies will benefit from forecasting foreign currency buying and selling if they are aware of the amount, which changes based on shifts in supply and demand. Accurate predictions for foreign exchange rates are an essential component of many firms' success (Kartono et al., 2020). The researchers stressed that because of the volume of transactions that occur on a regular basis, investors and financial institutions can make substantial profits by carefully speculating and alerting them to changes in foreign exchange prices. The stock market is utilizing developments in computation, including artificial intelligence (AI) and the subfields of deep and machine learning. and foreign exchange by giving traders fresh methods for examining market data and looking for potentially lucrative trading opportunities (Bormpotsis et al., 2023). Due to recurring market variations that impact foreign exchange prices, predicting foreign exchange rates is a challenging undertaking. Currency rates fluctuate as a result, and investments result in losses for all participants in the investment plan. It's critical to forecast foreign currency rates in order to manage market volatility. based on historical time series data that is multivariate (Madhulatha, Ghori, 2022). It is complex to predict locomotion in foreign exchange rates because it involves analyzing past foreign exchange rates capitalizing qualitative methods (e.g., pattern recognition), quantitative methods (like moving averages), and macroeconomic factors like supply and demand for financial assets,

buying power and interest rate equivalence circumstances, and balance of payments (Yusoff et al., 2023).

By applying big data analytics to predict exchange rates for foreign currencies, valuable information will be revealed that will help predict decisions related to corporate costs. This will help provide a competitive advantage and reduce the tension over decisions where there is no study that combines the study variables. Therefore, the research raises the **following questions:**

Q1: What role does predicting foreign exchange rates play in cost management?

Q2: What is the impact of big data analytics in predicting foreign exchange rates on cost management?

The study proposes the utilize of big data analytics to predict foreign exchange rates using machine learning models and its impact on cost management, with the aim of meliorating its management. However, the study found a gap in the research on user adoption of artificial intelligent technology in already-existing cost management solutions. Particular aspects of cost management in the pharma sector include the intricacy of the operations, the abundance of cost components, the characteristics of the clients (patients who receive medical).

This study is to assess the use of big data analytics to estimate the foreign exchange rate in cost management created by applying emerging technologies, based on the gaps identified in the literature. The impact of big data analytics in foreign exchange rate prediction in cost management and cost improvement in the pharmaceutical business is highlighted in this study and by using the target costing tool that can be dependable for cost prediction and price management and the Kaizen tool to reduce cost by reviewing the literature. The applied study was carried out on Ibn Sina Pharmaceutical Company by predicting the foreign exchange rate through big data analytics using machine learning, one of the artificial intelligence tools, and its impact on cost management. Because of the research topic (BDAEX of costing management tools) and its applicability to cost department in the pharmaceutical business, the study has an original quality. The majority of cost management tasks can be transferred to a controlled and easily accessible technological setting.

The study proposes the utilize of big data analytics to predict foreign exchange rates using machine learning models and its impact on cost management, with the aim of meliorating its management.

The research is regulated as follows:

1- The theoretical framework for the research.

2-Literature review and hypotheses that explain the expected results of the study.

3- Research Methodology.

4- Findings and recommendations.

2. Theoretical framework

2.1. Big Data Analytics

Big Data Analytics (BDA) is the term for managing, processing, and analyzing data to obtain a competitive edge and better prepare businesses to handle disasters like COVID-19 in the future (Anwar et al., 2024). Big Data analytics is the methodical screening of great, intricate data groups to find correlations, models, and insightful information that may not be immediately apparent (Udeh et al., 2024) and is defined as a massive collection of data that surpasses the capacity of conventional information systems to record, handle, operation, and statement on data instantly (Abdelhalim, 2024). The term "big data analytics" describes the laborious process of going through enormous and complicated databases to find hidden correlations, patterns, and insights that might help with strategic decision-making. It entails the application of cutting-edge analytics technique, like predictive modeling, statistical analysis, and machine learning, to extract useful data from massive and varied data sources. The four pillars of big data, or the 4Vs, capture the special opportunities and problems that come with large-scale data analytics. Big data analytics works with enormous amounts of data that are frequently produced instantly (Shoetan et al., 2024). (Alles, Gray,2024) refers to big data analytics that she is the methodical processing and analysis of and intricate data sets, in order to extract useful knowledge. Big data analytics can be used to check large-scale raw data to Specify directions, samples and connections that support analysts in creating data-driven decisions. This technique helps businesses to derive useful insights from the ever-swelling size of data created by a range of origin, inclusive as social media, financial deals, internet of things (IoT) sensors, and smart devices. It does this by exploit state-of-the-art analytical kits.

From previous definitions, the author defines big data analysis as how to manage and process data by combining statistical analysis and programming, whether that data is quantitative or qualitative, using a reasonable number of resources that helps manage costs and predict rational decisions.

In the digital age, big data analytics (BDA) and artificial intelligence (AI) have been confirmed to be underutilized resources. These skills include data analytics and programming, which are socially difficult resources since they require a group of workers and a select few experts who fully comprehend the entire procedure (Bag et al., 2021) It is worth noting that there is a distinction between big data and big data analytics (Alshawawreh et al., 2024): big data is both the infrastructure and the data itself, while big data analytics focuses on the process of analyzing this data to extract valuable information also, there is a distinction between big data analysis and big data analytics, where big data analysis is part of big data analytics because the latter includes all statistical analysis and programming, while the first is limited to statistical analysis only.

Advantage of big data analytics (Demirbaga et al.,2024): Big data analytics is a subgroup of business intelligence that includes the utilize of sophisticated analytical tools to analyze vast amounts of data from multiple origin, like databases, the web, and social media. Organizations examine the data in depth and so to find patterns and trends within it.

- Risk management: Big data analytics offers vital vision into industry trends and customer behavior that support firms in assessing their standing and advancement. Additionally, it assists businesses in recognizing and anticipating financial risks that could negatively impact their operations. Because cybercrime is so common, big data analytics enables companies to spot trends that can indicate a cybersecurity risk.
- Cost Reduction Complex quality assurance and testing procedures can arise, especially in the biopharmaceutical and nanotechnology industries. Big data analytics can shed light on the interactions between numerous variables in the manufacturing process, enabling firms to optimize their operations and cut costs.
- Advanced Decision-Making Driven by Data: By analyzing historical data, big data analytics facilitates prediction-making. As a result, companies may plan ahead and make better judgments for the present, awarding them

a competitive edge and offering a more flexible scope for risk management and decision-making.

- Enhancing the Creation of New Products: By utilizing big data analytics to analysis past data regarding product launches and client feedback, businesses can introduce more superior products in the future. They are also capable of comprehending real-time market data, shifts in the demand and supply for corporate goods, and modifications in consumer behavior that support customer-focused marketing. Analyzing customer demands, preferences, and purchase behavior can also reinforce the growing desire for customized services.

Barriers to the application of big data (Zhao et al.2024)

Technology barriers:

- Information security impedance include loss of legitimacy.
- data goodness case, scalability defy.
- shortage of data storage facilities.
- shortage of authenticity and accuracy and data credibility.
- agreement between outdated and recent technologies.
- intricacy of data, potential bias in data capturing and display.
- immaturity of big data, inconsistent data mensuration and analysis.
- immature of CPS and IoT development, and legal and ethical issues.

Managerial barriers:

- Lack of preparation for infrastructure.
- significant investment costs**.**
- the absence of information systems and user training
- the challenge of designing large data analytics platforms,
- high expense of employing knowledgeable consultants for big data analytics.

cultural barriers:

- stakeholder and user reluctance to change,
- business culture, internal resistance, and the lack of data-driven decision-making

Organizational barriers:

- shortage employee communion and learning behavior
- unsuitable learning transfer
- shortage of collaboration and data sharing.

Big Data Analytics Techniques

Big data analytics techniques cover a broad domain of intricate methods and tools that are specifically made to navigate the challenging terrain of enormous and intricate datasets these techniques can be presented in the following figure:

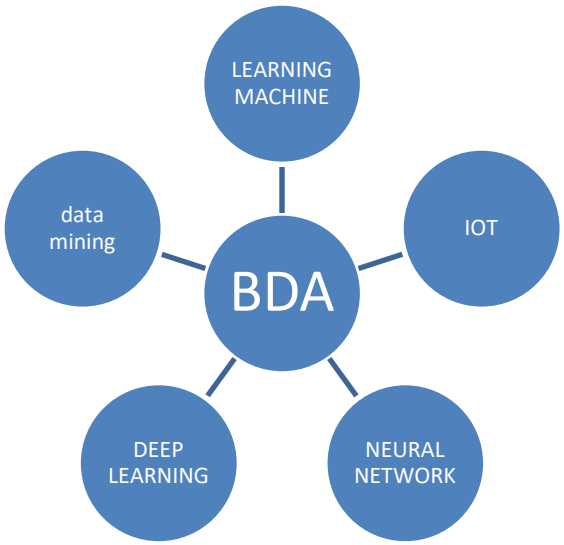

Figure.1 Big Data Analytics Techniques

The research will be limited to explaining machine learning algorithms only.

Machine learning (ML) entails building computer systems that ability comprehend and analyze massive amounts of data, spot trends, and derive valuable insights to improve over time. ML tasks are commonly classified into distinct classes according to factors such as learning models (regression, classification, dimensionality reduction, clustering), learning methodologies (supervised/unsupervised), or the particular algorithms used for a task (Jin et al., 2024).

The author defines machine learning as a subgroup of artificial intelligence (AI), a specialized area that focuses on creating and comprehending technology models and algorithms that can learn, predict, and make decisions on their own without the need for explicit programming that let machines "learn" and become more efficient at certain activities by utilizing data this branch of artificial intelligence focuses on building whose objective is to create a system that mimics human behavior , procedure involves using a set of data to train the system,

after which it automatically learns to calibrate and improve performance without additional explicit programming. yonder are three prime types of machine learning. supervised learning, unsupervised learning, and Reinforcement learning.

Supervised learning: is a kind of machine learning where a labeled dataset (input) is used to train a model (algorithm) to generate predictions or judgments (output) without the need for human interaction (Xue etal.,2024). Supervised models are parameterized using known outputs, such as positive and negative or misstatement and non-misstatement, as independent predictor variables and dependent variables. The models' accuracy is then evaluated using out-of-sample predictors (Booker et al.,2024).

Unsupervised learning: Unlike supervised learning, which produces an output based on the operation of grouping sample data based on similarity, unsupervised learning is a technique that is frequently used for tasks like clustering, anomaly detection, unsupervised learning is given a set of inputs but no associated labels and dimensionality reduction. In unsupervised learning, an artificial intelligence system is trained on an unlabeled dataset in which there is no target variable to predict. The objective is to find the patterns, relationships, and structures in the data. (Ajorloo et al.,2024, Aldoseri et al.,2023)

Reinforcement learning: is a widely recognized and applied learning technique. Unlike supervised learning, which depends on labeled data, training data for reinforcement learning methods only provides a sign of correctness without frank labels. The method of learning "good" behavior is accomplished through repeated interactions with the environment. The learning process in question is similar to supervised learning, but it diverges in that the model must react to its environment in order to receive positive remuneration or negative retribution. This feedback serves to reinforce the behavior of the model and assign it to a nomination (Ajorloo et al.,2024).

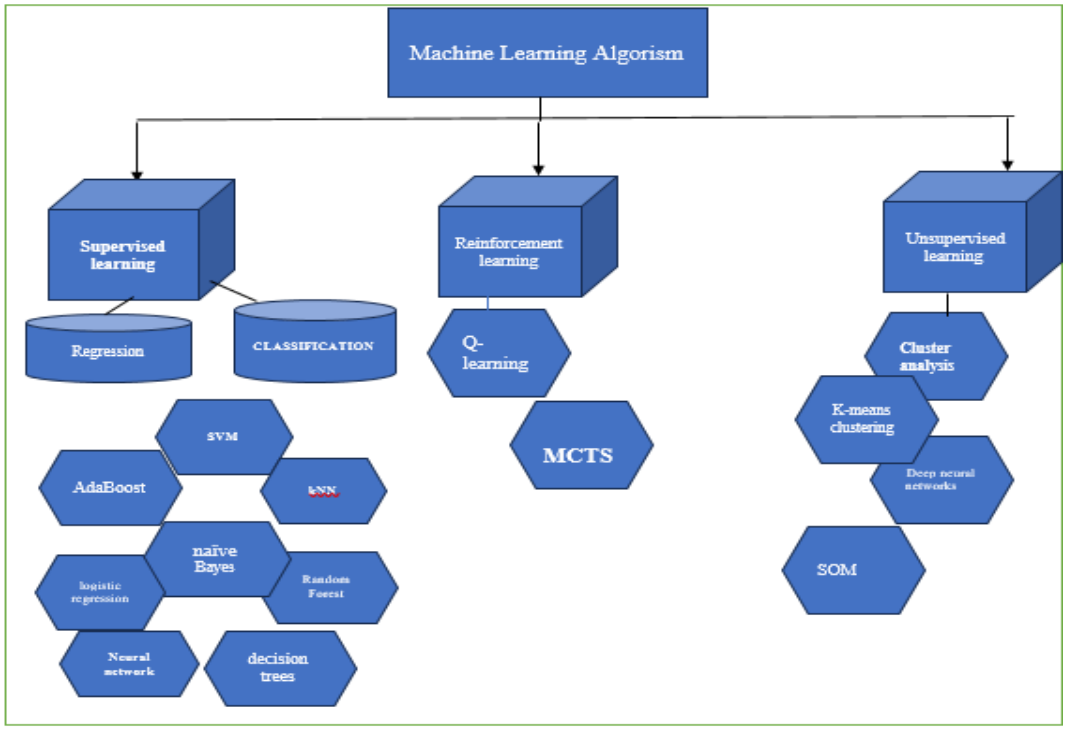

Figure.2 machine learning algorism source: author

Big data comes in a variety of forms, including unstructured data, which includes textual content, written documents, blogs, emails, tweets, text conversations, comments, and information gathered from multiple Internet sites and servers. This includes information from e-commerce, e-auctions, search and browsing activities, as well as images, videos, audio files, and geographic coordinates. Social networks, maps, shares, likes, followers, and structured data: These include sales, inventory, finances, customers, workers, and gold and oil prices, and are kept in designated databases. Administrative choices are made using this data for trend analysis, forecasting, and trend analysis. Tools for machine learning and statistical analysis are utilized to examine this data and extract useful insights.

Foreign exchange rates will be predicted using big data analytics.

2.2. Predicting the foreign exchange rate

The exchange rate is a condensed representation of a state's overall power, encompassing its influence in the world's politics, economy, and military because exchange rate policy affects the profits of import and export traders, many nations exercise extreme caution when it comes to exchange rate adjustment, and some even provide exchange rate forecasts to help government policymakers make decisions (Wang et al., 2019).Both technical and fundamental analysis can be applied to predict the FOREX market. While technical analysis only makes predictions about the FOREX market based on historical time-series data, essential analysis takes into account a vast domain of elements, including firms and the country's economic and manufacturing situation (Islam, Hossain., 2021).

The Central Bank of the Republic of Egypt constantly intervenes in the foreign exchange market. When the market becomes more erratic and volatile than usual, the goal is to stabilize it. When necessary, the local currency will be floated to control the competitive black market and increase the competitiveness of exporting industries. that it is difficult and challenging to make accurate estimates of local currency against large international rivals. Changes in exchange rates have significant effects on the economy as global trade grows. Numerous factors, like the price of gold and oil, inflation, interest rates, and political stability, all have an impact on these changes (Mashayekhi et al., 2013; Tsaih et al., 2018), and a study (Wada, 2023) suggested band spectral regression as a method for out-of-sample exchange rate forecasting. There is some indication that band spectral regression, when employing the Taylor rule essential model, enhances the accuracy of predicting when single-period forecasting is considered. But as the forecast horizon gets longer, the PPP essential model proves to be reliable, and by using the right frequency bands, we can enhance the out-of-sample projection. When we focus on the longer forecast horizon, Bayesian model averaging demonstrates that giving the business cycle's pace a large amount of weight enhances the PPP model's (and the monetary fundamentals model's) out-of-sample forecast accuracy. In many cases—most notably for the PPP essential model—LASSO can produce better forecasts for the exchange rate sample and supply information about the dynamic link between predict variables and exchange rates without requiring the specification of frequency bands

prior to conducting the regression. The frequency domain technique not only boosts the accuracy of exchange rate forecasting, but it also sheds light on why PPP fundamentals continue to be a reliable predictor as the forecast horizon gets longer and the time domain regression prediction may get better and Suggested (Thu, Xuan, 2018) an SVM-based model for predicting foreign exchange. They implemented their models using the EUR/USD currency pair. For their data set, they employed the cross-validation procedure, classifying the outcomes into two groups: positive output and negative output. For performance comparison, they employed macro, micro, positive, and negative averaging as well as accuracy rate. Their findings indicated that the Gaussian RBF approach produced a significant difference (29.5%) between the training and test sets, and this was in order to make a profit.

This study (Datta et al., 2021) uses three machine learning algorithms, including ridge regression, lasso regression, decision trees, and a deep learning algorithm called Bi-directional Long Short-Term Memory (BiLSTM), to predict the foreign currency exchange rate over twenty-two different currencies based on the US dollar. There is also discussion on the technical analysis of foreign currency exchange. The algorithms' performance is measured by the authors using mean absolute percentage error (MAPE), mean absolute error (MAPE), mean square error (MSE), and root mean squared error (RMSE). Based on empirical evidence, all algorithms perform satisfactorily generally, with the exception of Bi-LSTM, which outperforms the others. The stakeholders can set a variety of tactics for the foreign exchange market. study (Xu et al., 2023) used high-frequency data from the COVID-19 epidemic, the spillover index framework, realized volatility, and foreign exchange to analyze the correlation and asymmetry of hazards between oil, gold, and foreign currencies. It was discovered that the total spillover volatility in the system decreased at the start of the epidemic outbreak, which may suggest that the epidemic stopped financial market trading by preventing employee movement. The spread saw a dramatic short-term decline because of panic and predicting the foreign exchange rate and cost management following the outbreak. There was a minimal association between the exchange rate and crude oil locally but a significant risk correlation with gold and global crude oil. These variations in the hazards associated with the spread of epidemics surfaced later than the outbreak,

indicating a considerable lag, and during the sample period, risk transfer resulting from negative news predominated, and the pandemic had a minor impact on the asymmetric risk correlation between oil, gold, and exchange rates. However, gold was less affected by bad news than oil and exchange rates. The creation of Chinese crude oil futures, according to these findings, may help reduce the impact of exchange rate spillovers; the foreign exchange reserve structure needs It has been demonstrated that gold may act as a hedging tool alongside crude oil; thus, its share of foreign exchange reserves should be raised accordingly.

The study (Semiromi et al., 2020) was focused on employing a broad scope of text analysis techniques to extract information from news story events and propose a new sentiment dictionary for the foreign exchange market. It was concerned with estimating exchange rate movements in the foreign exchange (FX) market using machine learning. It demonstrates how news events and the stories that accompany them offer insightful data that improves forecast accuracy and directs trading decisions. The viability of news-based trading is demonstrated by the accuracy of market predictions made shortly after news releases, which is significantly greater than during other times when text data with technical indicators is used as input to different machine learning models previous work on using text data to predict market developments foreign exchange does not take into account economic calendar events, and the results are valuable to traders, risk managers, and other consumers of foreign exchange market predictions and provide guidance on how to design accurate forecasting systems. In addition to predicting the Bitcoin exchange rate, a study (Lin et al., 2022) showed that time series may be used to predict the UDC/CNY exchange rate using machine learning algorithms and the long short-term memory (LSTM) neural network, which perform better in the stock market. This is contrasted with logistic regression and the deep neural network model, and the study proposed Using the Whale optimization algorithm, a new model, WOA-STL-BI-LSTM, was created to predict UCER. It combined the Loess-based seasonal trend analysis procedure (STL) with LSTM, added BI external data, and improved model parameters.

(Breen, Hu, 2021) suggested research on oil price volatility as a novel basis for predicting exchange rates. These fundamentals bridge the gap between macro factors and exchange rates with current theoretical

advances in international finance. By concentrating on tiny open economies that export oil, we can then offer a thorough empirical assessment of the fundamental's forecasting performance across several nations. We find that, particularly when crude oil accounts for a large portion of the nation's exports and there are strong trade linkages between the currency zones, oil price and volatility contain out-of-sample predictive information for the exchange rate at daily frequency. Additionally, we learn that even in the absence of point forecast ability, directional change—that is, appreciation or depreciation—can be predicted for the second SLR on exchange rate prediction using ANN and deep learning methodologies, Panda et al. (2020) offered unique approaches that differed based on their observations from 2000 to 2019. The effects observed through the time within the examined are displayed using newly suggested samples like an auto-regressive (AR) model, an artificial neural network (ANN), a functional link artificial neural network (FLANN), a hidden Markov model (HMM), and support vector regression (SVR). On the other hand, several of the novel neural network models for prediction that have been suggested have adopted a rigorous approach to model creation and theoretical justification. New deep neural network models are consequently sent.

There is little evidence supporting the use of machine learning algorithms and meta-analysis to predict currency pair movements in the forex market. (Junior et al., 2023).

3- cost management

The general steps of cost management, such as cost forecasting, cost decision-making, planning, control, accounting, cost analysis, cost evaluation, and other links, are followed by businesses when they perform cost management. The initial stage of cost management is cost forecasting. Data comparison and thorough analysis are conducted based on the outcomes of enterprise cost management forecast analysis and other industry-related data information. The best solution is ultimately chosen, and cost management decisions are made, setting the groundwork for ongoing cost management in the future. (Li,2022)

The company and its cost components—such as labor, materials, and overhead—as well as strategically managed employee behavior—all benefit from cost management strategies including responsibility accounting, standard costing, and appropriate budgeting. (Mutya,2018)

and target costing makes it possible to plan costs effectively and reach the targeted profit margin. Because the goal is to create a competitive product at acceptable costs, the product's cost therefore comes from the market pricing. (Al-hosban et al.,2021) where that target pricing is the process of determining the most expensive price a new product can have by evaluating a competitive price in the market and adding a company's typical profit margin to that price. Then, working within the predetermined cost constraints, a design team tries to produce a product with the necessary features. (Thapayom, 2024) establishing a competitive pricing for a product by starting at the market price is the fundamental idea. Subtracting the desired profit margin yields the goal cost. Cost components can be predicted based on the target cost in order to ensure that the final cost falls within the target cost. (Vărzaru et al.,2022).

3. Literature review and hypotheses development

3.1. Foreign exchange rate and cost management

study (Dhasmana, 2014) used data on 500 Indian enterprises to investigate the causes and consequences of "operational" exchange rate risk stemming from the companies' mismatch between costs and revenues. Using panel regression techniques, we provided a thorough empirical investigation of the factors influencing firm-level exposure and its effects. To ensure the validity of the results, we run a number of robustness tests. The average business level exposure is significantly influenced by exchange rate volatility, among other factors, and the direction of the relationship suggests that a firm's risk-taking behavior is influenced by "moral hazards." Significantly reduced output growth, profitability, and capital expenditure are linked to further considerable "operational" exposure during periods of significant currency depreciation at the business level.

This study (Moles & Bradley, 2002) looks at how vulnerable non-financial UK enterprises' sales, profit margins, and input prices are to changes in exchange rates. The sample is not restricted to companies that are directly engaged in foreign trade; rather, it represents a cross-section of bigger, publicly-listed companies. Data on the direct and indirect aspects of economic exposure were supplied by the surveyed firms, which discovered a statistically significant correlation between a company's

level of international sales, sourcing, or funding and its susceptibility to exchange rates.

Unlike the idea of economic exposure, there is only one clear-cut major indirect determinant: foreign-based competition models do not account for the other indirect effects, such as the level of product differentiation, the demand elasticity for a firm's output, and common input currencies for rivals. There is no statistical correlation found between the interactive effects proposed by the theory of economic exposure and a firm's exchange rate sensitivity, which explains the lack of strong evidence for competition impacts due to the intricacies of the indirect factors influencing economic exposure at the corporate level.

This is how the second hypothesis can be put forth:

H1: There is a correlation between the foreign exchange rate and cost management.

3.2. BDAEX and cost management

Study **(**Tsaih et al., 2018) It is examined if machine learning modeling and big data analytics can beat the random walk mechanism and the notion of market efficiency by analyzing pertinent public information from new media to predict changes in the USD/TWD exchange rate. The findings of the experimentation indicate that the proposed BDA mechanism, which combines two types of information, can produce more than a 50% chance of correct directional predictions. This suggests that using public information could help traditional trading rules make more money. (Wang et al., 2023) indicate Understanding how exchange rates fluctuate can assist investors in making timely adjustments to their investing strategy in order to increase earnings. As a result, predicting the exchange rate is quite important. The ever-changing financial markets, characterized by intricate relationships between psychological and economic factors and swift information dissemination, have resulted in a growing reliance on machine learning for algorithmic trading. By integrating many methodologies and information sources, including technical and fundamental research, with social media sentiment gleaned from investor interactions, shifts in the values of financial assets can be effectively detected (Kharat, 2023) and added (Baig et al., 2023) that businesses must manufacture sustainable goods without sacrificing their bottom line, where BDA helps adding value through better performance and decision-making and BDA's predictive analytic feature enhances overall

dependability, enhances organizational performance, and increases business agility. It can also facilitate agile manufacturing, which boosts business performance in volatile markets, and BDA plays a part in knowledge management and sharing to obtain an agile competitive edge and recycle, repurpose, remanufacture, and rebuild sustainable elements that utilize a service-driven model and data to optimize the physical process (Mangla et al., 2020). According to Chatterjee et al. (2023), using BDA may improve predicting and decision-making procedures, which will ultimately improve the operational and financial performance of manufacturing firms, and a study by Dubey et al. (2020) demonstrated how BDA and artificial intelligence (AI)-enabled dynamic capability can guarantee improved operational performance to raise service quality, drop expenses, create new items at reduced costs, and lessen market hazards.

Regarding inventory, the fifth-largest tire manufacturer in the world, Pirelli, worked with SAP to leverage real-time big data for effective inventory control. By proactively addressing inventory challenges, Pirelli was able to avoid tire disposal in landfills and lower greenhouse gas emissions. This collaboration is demonstrated in a business report published by 3p Contributors in 2016 (Le, Vu, 2024), and Liu et al. (2024) indicate organizations that want to deploy big data initiatives and unlock the benefits of big data must possess strong technical expertise to boost operational performance, where data specialists who take complete advantage of big data technologies can efficiently coordinate company operations and have better competence and quality of decision-making.

Big data analytics makes it easier for businesses to react quickly and effectively to erratic alterations in the market and in the demands and expectations of their customers. This is significant because it gives businesses the ability to anticipate events accurately and move quickly based on information, giving them a competitive edge in volatile markets and the ability to withstand shocks to their operations. BDA accomplishes this by depending on agility skills to help the company stay ahead of competition and prevent needless reactive actions. It also uses massive amounts of raw data to find untapped opportunities and forecast changes in the market and consumer sentiment.

Furthermore, we discover that big data analytics facilitates the acquisition of important competitive insights, market data regarding competitors' actions, and industry superior practices (Al-Omoush et al.,

2024) Machine learning enhances the product's quality and execution while cutting costs and development time by designing and optimizing the product in tandem with its manufacturing systems (Jiang et al., 2022). added (Khalifelua, Gharehchopogh,2012) A novel strategy to raise cost estimation consistency and accuracy is data mining-based cost estimation. A lot of cost estimation (SCE) software makes use of artificial intelligence (AI) or data mining algorithms. Among the 63 NASA projects, MRE is the most commonly used assessment criterion for assessing the various software cost estimations. WEKA data mining tools are used to train and test these data mining approaches. The outcomes of the datasets used in the LR, ANN, SVR, and KNN with the Intermediate COCOMO method are compared, and AI techniques frequently have a high degree of efficiency when it comes to generating the Intermediate COCOMO method's correct prediction.

Presented (Ding et al.,2018) through a case study, the research demonstrated the validity and accuracy of big data analysis, as well as the feasibility of the prediction model and an estimating approach for remanufacturing costs based on big data and optimized BP neural networks. It will significantly increase prediction accuracy and offer businesses solid assistance when making remanufacturing decisions.

(Gusc et al.,2022) This paper at the difficulties and looks at how blockchain, artificial intelligence, and big data could aid in the True Cost Accounting computation and obliquely support the shift in the European energy sector toward more sustainable energy production. It is carried out in Poland, Germany, and the Netherlands and has relied on qualitative interpretative methodology. The results show that a large data architecture is technically feasible to handle TCA issues.

The researcher will take the target cost tool as one of the cost management tools as an approach to this research.

Therefore, the following hypothesis is put forth:

H2: BDAEX has a significant impact on cost management.

The following figure shows the general framework of the study.

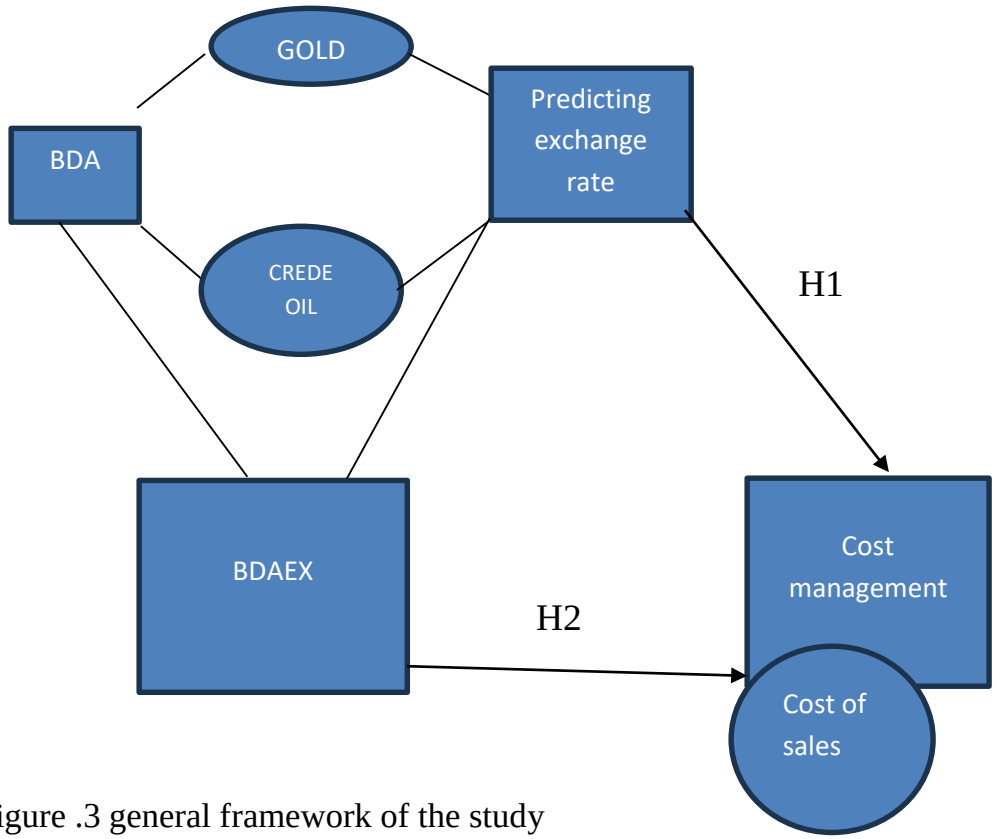

figure .3 general framework of the study

4. Research methodology

The objective of this study is to discuss how BDAEX might improve businesses' cost management with to evaluate hypotheses pertaining to the study objectives, primary data were gathered and analyzed using a quantitative research approach.

It was decided that using a quantitative approach would be suitable because it would enable surveying a huge sample size. Data classification and data prediction research were conducted using the orange program, which was taken from the Python program Orange is an open-source software environment that offers a domain of kits and approaches for database mining and machine learning. It is one of the tools specifically designed for data mining and SPSS V.26 program.

The study population is Ibn Sina Pharma Company. The company was chosen in the pharmaceutical sector due to the effects of alterations in exchange rates on the prices of imported medicines and raw materials for manufacturing medicines and the great difference that this sector has

witnessed in terms of a noticeable increase in the prices of imported medicines. The study covers the period from 2014 to 2023.

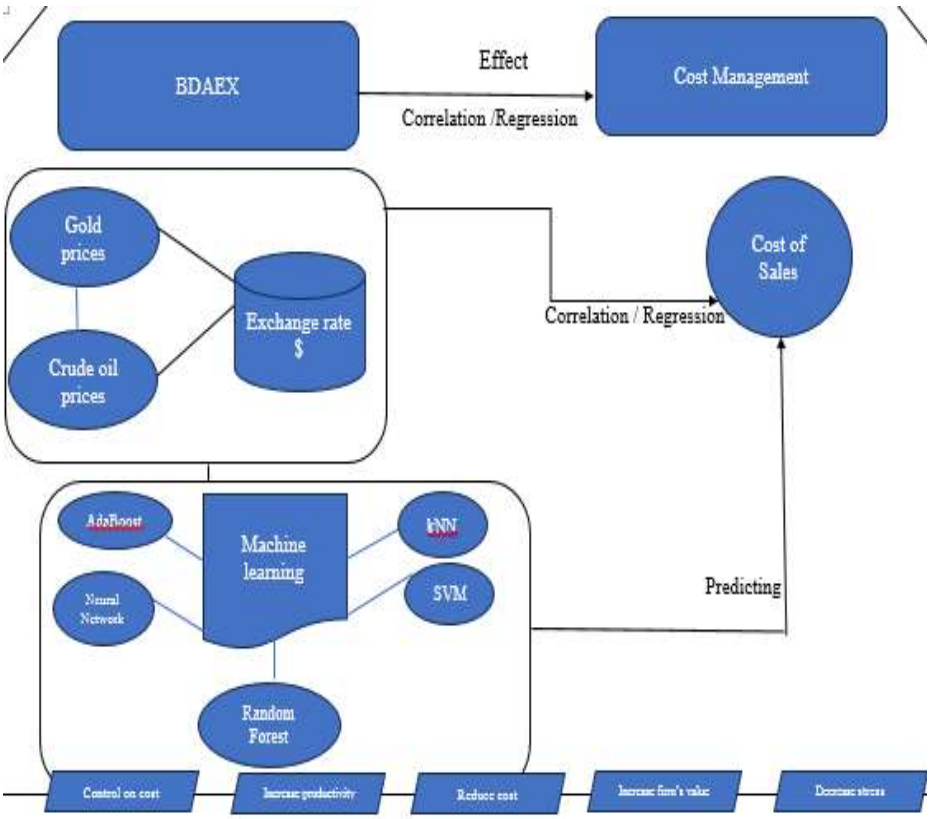

Figure.4 Research model

4.1.Measuring variables:

Independent variable: big data analyses predicting exchange rates: through crude oil prices and gold prices from the beginning of January 2014 until December 2023 on a monthly basis, and the data was gained from the investment website https://sa.investing.com .And exchange rate data were obtained from the Central Bank of Egypt website from January 1, 2014 until December 31, 2023. https://www.cbe.org.eg/ar.

Dependent variable: cost management: It was measured through cost of sales, considering that they include revenues collected from the sale of goods and services and are therefore affected by exchange rates, and the information was gained from the Mubasher website https://www.mubasher.info . It includes all direct costs related to the

production of goods, as well as raw material costs, production costs, labor costs, shipping and storage costs, and overhead expenses. The use of costs of sales (COS) is essential because it shows the profit that the company makes from each commodity, as well as the opportunities available to improve and manage those costs. The cost of sales (COS) is determined by subtracting the total profit from revenues. It helps in identifying profits and helps in Pricing forecasting and cost management Therefore, in this study, the cost of sales is used because it is affected by changes in the exchange rate and therefore affected by profits, which is an important measure that can be relied upon for cost management.

Using a machine learning model and relying on the following:

- **Neural network**: Given their high volatility, noisy nature, and complicated surroundings, neural network approaches were thought to be among the most effective methods for financial time series modeling and prediction. refers to the inability to properly capture the dependence between future and previous prices due to the lack of whole information from the bygone behavior of financial markets. The volatility of foreign exchange rates necessitates the use of well-organized power and risk management tools in order to forecast future exchange rate trends, which could advise investors. Neural networks are universal function approximates, meaning they can indicate any non-linear function without requiring presumptions about the properties of the data. They are also more noise-tolerant and more effective at describing non-stationary time series due to their special non-parametric and adaptive properties. Additionally, they can be applied to learn about networked systems that contain faulty or partial data. They also provide multivariate analysis, which uses predictors that include, but are not limited to, lag-time series of forecasts and other financial market indicators, including technical, fundamental, and inter-makers' indicators (Amelot et al.,2021).
- **Support vector machine** (SVM): is a method of machine learning that draws from statistical ideas to reduce structural risk. Among its many benefits are global optimization and strong generalization performance due to the solution's sparsity. The idea of maximal margin, which states that only data points close to the class border become support vectors and that data points farther away from the boundary have less of an impact on the model, is what allows the solution to be sparse.

Nevertheless, unlabeled data cannot be handled by standard SVM, which is only appropriate for supervised learning. (Lua et al.,2024).

- **Adaboost**: is an algorithm for group learning that uses adaptive boosting. To create a strong classifier with a greater classification accuracy, it integrates several weak classifiers with low classification accuracy in accordance with predetermined rules (Zhi et al.,2023)
- **K-nearest neighbours** (KNN): is an adaptable method that can be applied to regression and classification problems but rather than being well-known for its ability to solve regression problems, KNN is more commonly used in industrial settings to solve classification difficulties. The k-nearest learning samples in the attribute scope input are the input for the KNN technique. It can identify which group a given data point belongs to by looking at all the data points, which makes it an effective tool for classification jobs (Sinhaa e al.,2024).
- **The Random Forest model**: is a very flexible machine learning technique that combines numerous binary decision trees to predict aerosol features. Without the requirement for dimensionality reduction, it efficiently handles a large number of input variables and calculates the relative value of each feature (Bao et al.,2024).

4.2. Application steps and data analysis:

To analyze the impact of BDAEX on cost management, used the machine learning is one of artificial intelligent tools and tool were relied upon to cost management : the target cost tool to try to predict costs, which when predicted in advance can be avoided as an attempt to pursue the rise in the exchange rate, and the Kaizen tool in order to eliminate waste from all stages and activities that do not add value and do not affect the importance and value of the product to the customer. This is done as follows:

- The first stage: Data on gold prices and crude oil prices were collected in order to predict foreign exchange rates in dollars as a first step to analyzing and measuring the independent variable data.

-The second stage is to use the target cost, one of the cost management tools, to predict the cost before it occurs, it done market researches study and determine the expected price where the purchasing department determines the prices of raw materials and components according to the appropriate quantity, quality, price, and timing.

-Determine target profit.

- Determine the target cost by subtracting the expected profit margin from the expected selling price.
- After the step of determining the target cost, the second administration is used the Kaizen tool to eliminate wastage of costs where waste is removed from all stages of product operations in an attempt to reduce the costs that can be predicted to be avoided and managed, which leads to stimulating continuous improvement processes, which leads to a higher profit margin, so the company can reduce the price of the product as a competitive advantage
- The cost of sales was used as an indicator, and the independent variable was measured on the dependent variable for ten years from 2014 to 2023 using a machine learning tool.
- The third stage is to predict the cost for the next three months, study the relationships between the variables, and find out whether BDAEX affects cost management?

The predicting process is done as follows in data analysis:

1- The flow path was built in the orange program as follows:

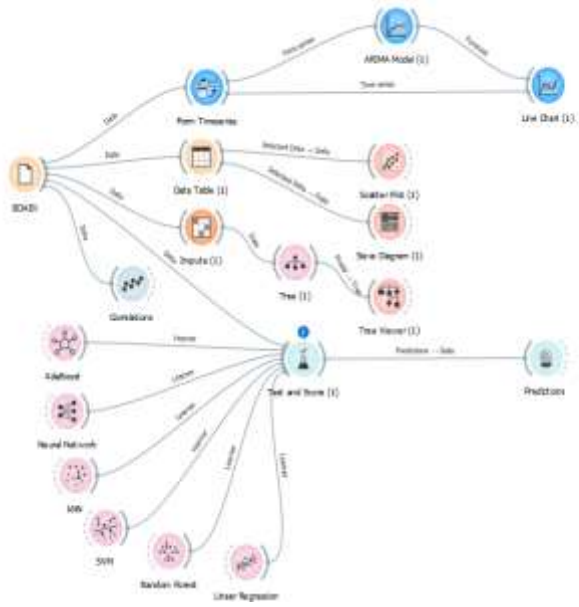

figure.5 The flow path was built in the orange program source: Author

2- Time series of study variables

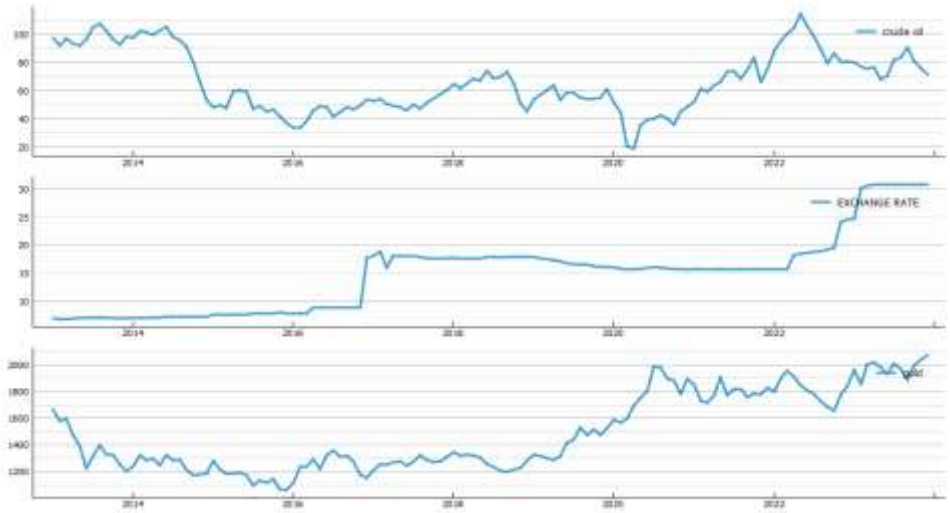

Figure.6 Time series of study variables source: author

It is clear from the time series:

- Crude oil prices: There is fluctuation in the prices of crude oil, as they were high in 2014, then decreased in 2015 and 2016, then returned to rising until 2023.
- Foreign exchange rates EGP/USD: There is noticeable stability in the period from 2014 to 2016, and beginning in 2017, it began to rise and was relatively stable until the year 2022, then the rises continued again.
- Gold prices: There is severe fluctuation in gold prices, but the increase appears from 2019.

3- correlation between the research variables

	EXCANGE RATE	GOLD	CURED OIL	BDAEX	COST MANGEMENT
EXCANGE RATE	١				
GOLD	.702*	١			
CURED OIL	.660*	.699*	١		
BDAEX	.999**	.999**	.720*	1	
COST MANGEMENT	.843**	.939**	.695*	.944**	١

Table.1 correlation between study variables

-There is a positive, significant relationship between gold and crude oil and foreign exchange rate, where reached correlation coefficient to 70.2% and 66% on respectively.

-There is a positive, significant relationship between foreign exchange rate and cost management, where reached correlation coefficient to ٨٤,٣%.

- There is a There is a strong, favorable correlation between big data analytics foreign exchange rate (BDAEX) and cost management, where reached correlation coefficient to 94.4.

4- Test of models

Determine the best machine learning model through testing and scoring. The files are tested, and the test finds are shown.

Table.2 results of model's test

Model	MSE	**RMES**	**MAE**	MAPE	R2
AdaBoost	2.30	4805865540.7	3705374251.5	0.336	0.645
Neural Network	2.65	16286157803.1	141490764.1	0.999	-3.077
kNN	3.24	5694000909.7	3892150546.8	0.407	0.501
SVM	7.33	8562953598.1	6766291103.8	0.749	-0.127
Random Forest	3.08	5552439749.7	4032762061.6	0.407	0.526
Linear Regression	2.99	5471650487.3	4401005425.1	0.332	0.539

It is obvious from the top that the AdaBoost test gives the best results, reaching 64.5%.

5- prediction

Table.3 Prediction model for ten years

Cost of Sales	date	AdaBoost	Neural Network	kNN	SVM	Random Forest	Linear Regression	Fold
20569233006	2022	2.00823e+10	30.0403	1.85057e+10	1.36802e+10	1.76816e+10	2.47311e+10	1
4931514834	2015	7.37247e+09	17.5126	9.47646e+09	1.36802e+10	8.44156e+09	2.17789e+08	1
31313285399	2023	2.00823e+10	40.2047	1.63569e+10	1.19605e+10	1.70995e+10	2.13303e+10	2
12199359376	2018	7.37247e+09	8.57079	8.02289e+09	1.19605e+10	9.57477e+09	7.71261e+09	2
2008316840	2021	2.05692e+10	19.3691	1.86031e+10	1.36802e+10	1.98506e+10	1.4892e+10	3
7372466698	2016	8.75991e+09	9.90107	8.98827e+09	1.36802e+10	8.49974e+09	9.99308e+09	3
15161004836	2019	8.75991e+09	5.30478	1.57646e+10	1.47057e+10	1.01458e+10	1.36103e+10	4
3889571576	2014	7.37247e+09	10.9603	1.06691e+10	1.47057e+10	1.01458e+10	4.16263e+09	4
17212098107	2020	2.00823e+10	13.422	1.9865e+10	1.36802e+10	1.62364e+10	2.73607e+10	5
8759914287	2017	1.21994e+10	9.13772	8.71078e+09	1.36802e+10	1.22453e+10	9.64127e+09	5

It is clear from the previous table that the AdaBoost model measures the real results or their closest estimate and therefore can be relied upon for prediction

Table.4 Prediction model for 3 months

COST	DATE	AdaBoost	Neural Network	SVM	Random Forest	Fold
9.45	2024-03-01 00:0...	9.79	30.0792	9.79	9.79	1
9.79	2024-02-01 00:0...	9.79	30.756	9.79	9.79	1
7.18	2024-01-01 00:0...	7.18	199.021	8.315	8.315	2

It is clear that the prediction is good by comparing the actual values with the AdaBoost prediction values to converge the values, this is for the period from January 2024 to March 2024.

6. Tree decision

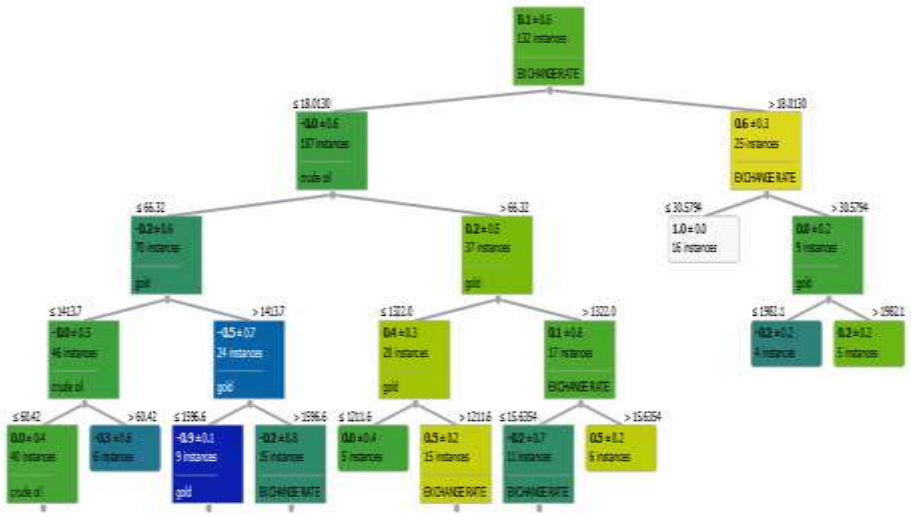

Figure.7 Tree decision for foreign exchange rate and BDA

-The numbers at the top of each box are the range of exchange rate values, and the number below it is the number of views, and the word is the variable gold or crude oil and its effect on the exchange rate. Here we have the exchange rate values (٠,١±٠,٦) which means (0.7,0.5) and the number of views is 132 views. The exchange rates are limited to the range so that the crude oil price affects it. If the price of crude oil is greater than or equal to (18.0130), it affects 107 observations then the scope is limited to finding only 25 observations, then only 9 observations of gold prices will affect the exchange rate and so on for the rest of the tree.

7- The impact of BDAEX on cost management

R^2	Adjusted R^2	F	Sig.	t	Sig.
0.944	0.877	65.182	0.000	8.074	0.000

From the previous table it is clear that

- BDAEX explains approximately 87.7% of the impact on cost management. The regression coefficient is 0.877.
- The F-test value is with a significant level of 0.000 (less than 5%), indicating a good fit.
- The T-test value is 8.074 with a significant level of 0.000 (less than 5%), indicating significant.

5. Findings and recommendations

By completing business evaluations and employing data visualization, BDAEX assists businesses in cost management where large volumes of data can be analyzed for patterns and trends, giving them a competitive edge and allowing them to take advantage of possibilities, get the potential for more acceptable results, and examine a significant amount of costs to improve decision-making and cost prediction. An organization can keep tracking all of its expenses and compare them to the goals that have been established.

Using a machine learning model in the Python language is useful as it helps to choose the best prediction model (AdaBoost) between the independent variable (BDAEX) and the dependent variable (cost management).

The study's findings:

-accepting the first hypothesis that there is a relationship between the use of big data analytics and foreign currency exchange rates.

-Accepting the second hypothesis that there is a correlation between the foreign currency exchange rate and cost management.

-Accepting the third hypothesis, which states that big data analytics used to predict foreign exchange rates (BDAEX) impact on cost management. The author recommends the necessity of conducting more future research on changes in foreign exchange rates for more sectors and in different currencies, as well as studying the impact of forecasts of foreign exchange rates on food commodities such as meat, poultry, and basic commodities and building a platform for collecting and trading data.

Reference

-Abdelhalim, Abeer.M. (2024), "How management accounting practices integrate with big data analytics and its impact on corporate sustainability", Journal of Financial Reporting and Accounting, Vol. 22 No. 2, pp. 416-432. https://doi.org/10.1108/JFRA-01-2023-0053.

-Ajorloo, Sedighe ; Jamarani, Amirhossein ; Kashfi ,Mehdi ; Kashani, Mostafa Haghi ; Najafizadeh, Abbas (2024) A systematic review of machine learning methods in software testing, Applied Soft Computing 162 . 111805, pp1-26

-Aldoseri, Abdulaziz; Al-Khalifa, Khalifa N; Hamouda,Abdel Magid (2023)Re-Thinking Data Strategy and Integration for Artificial Intelligence: Concepts, Opportunities, and Challenges, Appl.Sci, 13, 7082. https://doi.org/10.3390/app13127082.pp1-33.

-Alles, Michael; Gray, Glen L (2024) The marketing on Big 4 websites of Big Data Analytics in the external audit: Evidence and consequences, International Journal of Accounting Information Systems 54.100697.pp.1-17

-Al-Omoush, Khaled Saleh; Garcia-Monleon, Fernando; Iglesias, Jos´e Manuel Mas (2024) Exploring the interaction between big data analytics, frugal innovation, and competitive agility: The mediating role of organizational learning, Technological Forecasting & Social Change 200. 123188, pp.1-10

-Alshawawreh, Ali Ra'Ed; Li´ebana-Cabanillas, Francisco; Blanco-Encomienda, Francisco Javier, (2024) Impact of big data analytics on telecom companies' competitive advantage, Technology in Society 76 .102459, pp.1-10.

-Amelot, Lydie Myriam Marcelle; Agathee,Ushad Subadar ; Sunecher, Yuvraj (2021)Time series modelling, NARX neural network and hybrid KPCA–SVR approach to forecast the foreign exchange market in Mauritius, African Journal of Economic and Management Studies Vol. 12 No. 1,pp. 18-54.

-Anwar, Muhammad Azfar; Zong, Zupan; Mendiratta, Aparna; Yaqub, Muhammad Zafar, (2024) Antecedents of big data analytics adoption and its impact on decision quality and environmental performance of SMEs in recycling sector, Technological Forecasting & Social Change 205. 123468, pp.1-12.

-Bag, Surajit; Pretorius, Jan Ham Christiaan; Gupta, Shivam; Dwivedi, Yogesh K (2021), "Role of institutional pressures and resources in the adoption of big data analytics powered artificial intelligence, sustainable manufacturing practices and circular economy capabilities", Technological Forecasting and Social Change, Vol. 163, p. 120420, pp.1-14.

-Baig, Maria Ijaz Yadegaridehkordi, Elaheh, Nasir, Mohd Hairul Nizam Bin Md., 2023. Influence of Big Data Adoption on Sustainable Marketing and Operation of SMEs: A Hybrid Approach of SEM-ANN. https://doi.org/10.1108/MD-06-2022-0778, pp.2231-2253.

-Bao, Fangwen ;Wu, Shengbiao ; Gao ,Jinhui ; Yuan, Shuyun ; Liu, Yiwen ; Huang, Kai (2024) Continental aerosol properties and absorption retrieval using random forest machine learning method specific to geostationary remote sensing, Remote Sensing of Environment 311 .114275,pp 1-29.

-Booker, Adam; Chiu,Victoria ; Groff ,Nathan; Richardson, Vernon J.,(2024) AIS research opportunities utilizing Machine Learning: From a Meta-Theory of accounting literature, International Journal of Accounting Information Systems 52 .100661,pp.1-17.

-Bormpotsis,Christos ; Sedky ,Mohamed ; Patel, Asma, (2023)Predicting Forex Currency Fluctuations Using a Novel Bio-Inspired Modular Neural Network, k. Big Data Cogn. Comput, 7, 152. https://doi.org/ 10.3390/bdcc7030152, pp.1-27.

-Breen, John David; Hu, Liang (2021) The predictive content of oil price and volatility: New evidence on exchange rate forecasting, Journal of International Financial Markets, Institutions & Money 75.101454, pp.1-27.

-Chatterjee, Sheshadri., Chaudhuri, Ranjan., Gupta, S Shivam., Sivarajah, Uthayasankar., Bag, Surajit., (2023), Assessing the impact of big data analytics on decision-making processes, forecasting, and performance of a firm. Technological Forecasting & Social Change. https://doi.org/10.1016/j. techfore.2023.122824, pp.2-10

-Datta, Rony Kumar; Sajid, Sad Wadi; Moon, Mahmudul Hasan; Abedin, Mohammad Zoynul (2021) Foreign Currency Exchange Rate Prediction Using Bidirectional Long Short-Term Memory In: Musleh Al-Sartawi, A.M.A. (eds) The Big Data-Driven Digital Economy: Artificial and Computational Intelligence. Studies in Computational Intelligence, vol 974. Springer, Cham. https://doi.org/10.1007/978-3-030-73057-4_17pp 213–227.

-Demirbaga, Ü., Aujla, G.S., Jindal, A., Kalyon, O. (2024). Big Data Analytics. In: Big Data Analytics. Springer, Cham. https://doi.org/10.1007/978-3-031-55639-5_3
-Dhasmana,Anubha (2014) Operational Currency Exposure and Firm Level Performance: Evidence from India, International Symposia in Economic Theory and Econometrics, Vol. 23,pp.60-84.
-Dubey, Rameshwar; Gunasekaran, Angappa; Childe, Stephen J; Bryde David J.; Giannakis, Mihalis; Foropon, Cyril; Roubaud, David; Hazen, Benjamin T ;(2020) Big data analytics and artificial intelligence pathway to operational performance under the effects of entrepreneurial orientation and environmental dynamism: a study of manufacturing organisations, Int. J. Prod. Econ. 226, 107599, pp.1-12
-Islam, M.S.; Hossain.E;(2021) Foreign exchange currency rate prediction using a GRU-LSTM hybrid network, Soft Computing Letters 3.100009.pp1-17.
-Jiang, Jingchao; Xiong, Yi; Zhang, Zhiyuan; Rosen, David W (2022) Machine learning integrated design for additive manufacturing, Journal of Intelligent Manufacturing 33:pp.1073–1086 .
-Jin,Liuchao ; Zhai ,Xiaoya ; Wang ,Kang ; Zhang, Kang ; Wu, Dazhong h, Naziri, Aamer; Jiang, Jingchao ; Liao ,Wei-Hsin (2024) Big data, machine learning, and digital twin assisted additive manufacturing: A review, Materials & Design 244. 113086, pp.1-53.
-Junior, Michael Ayitey; Appiahene, Peter; Appiah Obed; Bombie, Christopher Ninfaakang (2023) Forex market forecasting using machine learning: Systematic Literature Review and meta-analysis, Journal of Big Data,10.9, pp.1-40
-Kartono,Agus; Febriyanti, Marina; Wahyudi, Setyanto Tri ; Irmansyah ,Predicting foreign currency exchange rates using the numerical solution of the incompressible Navier–Stokes equations, Physica A: Statistical Mechanics and its Applications Volume 560, 15 December 2020, pp.1-12
-Khalifelua, Zeynab Abbasi; Gharehchopogh, Farhad Soleimanian (2012) Comparison and evaluation of data mining techniques with algorithmic models in software cost estimation / Procedia Technology 1, pp. 65 – 71.
-Kharat, Bhavesh Mahesh (2023) Time Series Forecasting for Forex Trends Using SVM and ARIMA, Bournemouth University, pp.1-5.

-Le, Hai; Vu, Kim-Chi, (2024) Big data analytics and environmental performance: The moderating role of internationalization, Finance Research Letters 64 .105484, pp.1-9.
-Lua, Junqi ; Xie, Xijiong; Xiong, Yujie (2024) Multi-view hypergraph regularized Lp norm least squares twin support vector machines for semi-supervised learning, Pattern Recognition doi: https://doi.org/10.1016/j.patcog.2024.110753.
-Lin, Yong; Wang, Renyu; Gong, Xingyue; Jia, Guozhu (2022) Cross-correlation and forecast impact of public attention on USD/CNY exchange rate: Evidence from Baidu Index, Physica A 604. 127686, pp.1-12.
-Liu, Yan; Qiao Hong; Wang, Junbin; Jiang Yunfei (2024) Influencing mechanism of the intellectual capability of big data analytics on the operational performance of enterprises Heliyon 10. e25032, pp.1-10.
-Madhulatha, T. Soni; Ghori, Md Atheeq Sultan, Foreign Exchange Rates Prediction for Time-series Data using Advanced Q-sensing Model, KGSWC-2022: Second International Workshop on Deep Learning for Question Answering, November 21-23, 2022, Universidad Camilo José Cela, Madrid, Spain, pp.1-9
-Mangla,Sachin K; Raut,Rakesh; Narwane , Vaibhav S; Zhang, Zuopeng(Justin);priyadarshinee, Pragati.(2020) Mediating effect of big data analytics on project performance of small and medium enterprises, Journal of Enterprise Information Management ,Emerald Publishing Limited 1741-0398
-Mashayekhi, Sanctions Bita; Ara, Mehrdad Sadr; Jafari, Ashraf (2013) Gold Price and Exchange Rate Volatility: Effects of Economic, International Journal of Information Technology and Management, Vol.4, No.1, June, pp.121-127.
-Panda Manaswinee Madhumita; Panda Surya Narayan; Pattnaik Prasant Kumar (2020) Exchange rate prediction using ANN and deep learning methodologies: a systematic review .Indo-Taiwan 2nd International Conference on Computing, Analytics and Networks, Indo-Taiwan ICAN 2020—Proceedings,pp.86–90.https://doi.org/10.1109/Indo-TaiwanICAN48429.2020.9181351
-Semiromi,Hamed Naderi ; Lessmann, Stefan;Peters ,Wiebke (2020) News will tell: Forecasting foreign exchange rates based on news story events in the economy calendar, North American Journal of Economics and Finance 52 . 101181, pp.1-12.

-Shoetan, Philip Olaseni; Oyewole, Adedoyin Tolulope; Okoye,Chinwe Chinazo; Ofodile, Onyeka Chrisanctus (2024) reviewing the role of big data analytics in financial fraud detection, Finance & Accounting Research Journal, Volume 6, Issue 3, March,pp384-394.

-Sinha, panel Aaryan ; Rout, Bijayalaxmi ; Mohanty , Sushree ; Mishra , Soumya Ranjan ; Mohapatra, Hitesh ; Dey, Samik (2024)Exploring Sentiments in the Russia-Ukraine Conflict: A Comparative Analysis of KNN, Decision Tree And Logistic Regression Machine Learning Classifiers Procedia Computer Science Volume 235, pp. 1068-1076.

-Thu, Thuy Nguyen Thi; Xuan, Vuong Dang (2018) Using support vector machine in Forex predicting, in: Proceedings of the 2018 International Journal of Engineering & Technology, pp. 400-404, doi:10.1109/ICIRD.2018.8376303.

-Tsaih Rua-Huan; Kuo, Biing-Shen;Lin,Tzu-Hsiang;Hsu, Che-Chuan (2018) "The use of big data analytics to predict the foreign exchange rate based on public media: A machine-learning experiment," in IT Professional, vol. 20, no. 2, pp. 34-41.

-Udeh,Chioma Ann; Orieno, Omamode Henry; Daraojimba ,Obinna Donald ; Ndubuisi Leonard Ndubuisi; Oriekhoe,Osato Itohan (2024) big data analytics: a review of its transformative role in modern business intelligence, Computer Science & IT Research Journal, Volume 5, Issue 1, January,pp.219-236.

-Wada, Tatsuma, (2023) Out-of-sample forecasting of foreign exchange rates: The band spectral regression and LASSO, Journal of International Money and Finance 128 .102719, pp.1-24

-Wang, Keming; Chang, Mengchih; Wang, Wencheng; Wang,Gang., & Pan, Wentsao (2019). Predictions models of Taiwan dollar to US dollar and RMB exchange rate based on modified PSO and GRNN. Cluster Computing, 22(s5), pp.10993–11004. https://doi.org/10.1007/s10586- 017-1280-y.

-Wang,Gang; Ma, Jingling ; Wang, Ying ; Tao ,Tao ; Ren, Gang ; Zhu ,Hegong (2023) SUDF-RS: A new foreign exchange rate prediction method considering the complementarity of supervised and unsupervised deep representation features , Expert Systems With Applications 214 (2023) 119152,pp1-17.

-Xu, Lei, Ma, Xueke, Qu, Fang, Wang, Li (2023) Risk connectedness between crude oil, gold and exchange rates in China: Implications of the COVID-19 pandemic, Resources Policy 83 ,103691, pp.1-12.
-Xue, Jueyi; Alinejad-Rokny, Hamid; Liang, Kang (2024) Navigating micro- and nano-motors/swimmers with machine learning: Challenges and future directions, Chem Phys Mater, m5GeSdc June 24, pp.1-11.
-Yusoff, Iliyas; Chenb, Chen; Lai, Karen; Naiker, Vic; Wange, Jun, (2023), Foreign exchange exposure and analysts' earnings forecasts, Journal of Banking and Finance 146 106715, pp.1-18.
-Zhi, Na; An, Yawei; Zhao, Yan; Qiu, Jilin (2023) Intelligent Island detection method of DC microgrid based on Adaboost algorithm 2022 International Conference on Frontiers of Energy and Environment Engineering, CFEEE 2022, 16–18 December, 2022, Beihai, China, Energy Reports 9, pp. 970–982.
-Zhao, Guoqing; Xie,Xiaotian; Wang ,Yi; Liu ,Shaofeng ; Jones, Paul ; Lopez, Carmen (2024) Barrier analysis to improve big data analytics capability of the maritime industry: A mixed-method approach, Technological Forecasting & Social Change 203.123345,pp.1-27.
-https://www.cbe.org.eg/ar.
-https://sa.investing.com.
-https://www.mubasher.info

Appendix

Correlations

		cost	gold	curde	exchange	BDA
cost	Pearson Correlation	1	.939**	.695*	.843**	.944**
	Sig. (2-tailed)		.000	.026	.002	.000
	N	10	10	10	10	10
gold	Pearson Correlation	.939**	1	.699*	.702*	.999**
	Sig. (2-tailed)	.000		.025	.024	.000
	N	10	10	10	10	10
curde	Pearson Correlation	.695*	.699*	1	.660*	.720*
	Sig. (2-tailed)	.026	.025		.038	.019
	N	10	10	10	10	10
exchange	Pearson Correlation	.843**	.702*	.660*	1	.717*
	Sig. (2-tailed)	.002	.024	.038		.020
	N	10	10	10	10	10
BDA	Pearson Correlation	.944**	.999**	.720*	.717*	1
	Sig. (2-tailed)	.000	.000	.019	.020	
	N	10	10	10	10	10

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.944[a]	.891	.877	2981247007

a. Predictors: (Constant), BDAEX

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.793E+20	1	5.793E+20	65.182	.000[b]
	Residual	7.110E+19	8	8.888E+18		
	Total	6.504E+20	9			

a. Dependent Variable: cost

b. Predictors: (Constant), BDAEX

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.937E+10	4257186475		-4.549-	.002
	BDAEX	21073474.17	2610199.483	.944	8.074	.000

a. Dependent Variable: cost