Advance Journal of Econometrics and Finance

Online ISSN

Print ISSN

ame of Publisher: SCHOLAR CRAFT EDUCATION & RESEARCH HUB

Review Type: Double Blind Peer Review

The Role of Artificial Intelligence in Enhancing Financial Forecasting Accuracy

Dr. Shahan Zeb Khan[1*], Dr. Israfil[2], Muhammad Shahzad Gul[3], Fahad Asghar[4]

Dr. Shahan Zeb Khan*
*Assistant Director, Quality Assurance Cell, Higher Education Department, Khyber Pakhtunkhwa, Peshawar. Shahanzebkhan@yahoo.com

Dr. Israfil
Research Scholar, Faculty of Management Science, International Islamic University Islamabad.
bangashpak@gmail.com

Muhammad Shahzad Gul
Dr Hasan Murad School of Management, University of Management & Technology (UMT) Lahore. shahzadgulawan007@gmail.com

Fahad Asghar
Visiting Lecturer, Department of Commerce, Thal University Bhakkar. fahadasghar514@gmail.com

Abstract

This study investigates the role of artificial intelligence (AI) in enhancing the financial forecasting accuracy of listed firms in Pakistan, with a specific focus on the mediating effect of financial performance. Using data collected from 100 firms listed on the Pakistan Stock Exchange, the research examines how AI-driven tools and techniques influence the precision of financial forecasts related to revenues, costs, and profitability. The findings reveal that AI significantly improves forecasting accuracy by enabling firms to process large and complex datasets, detect non-linear patterns, and adjust predictions in response to dynamic market conditions. Furthermore, the study demonstrates that financial performance partially mediates this relationship, as firms with stronger profitability and operational efficiency are more capable of investing in advanced AI technologies, thereby achieving even more accurate forecasts. Sectorial differences indicate that banking and manufacturing firms have higher AI adoption levels compared to service-oriented firms. The study contributes to financial management literature by empirically validating the direct and indirect effects of AI on forecasting accuracy and offers practical insights for corporate managers and policymakers seeking to enhance decision-making, investor confidence, and market competitiveness through technological integration.

.

Keywords: Artificial Intelligence, Financial Forecasting, Machine Learning, Pakistan Stock Market

Advance Journal of Econometrics and Finance
Vol-3, Issue-2, 2025

Introduction

Financial forecasting remains a cornerstone of strategic decision-making for listed firms worldwide. In Pakistan, where the capital market is driven by the Pakistan Stock Exchange (PSX) and regulated by the Securities and Exchange Commission of Pakistan (SECP), unique challenges such as macroeconomic volatility, political instability, and inconsistent data availability make accurate financial predictions difficult. Traditional forecasting methods like ARIMA, GARCH, and linear regression are useful in stable environments but often fail to capture the complex, non-linear behavior that characterizes emerging markets like Pakistan's.

Artificial Intelligence (AI), utilizing machine learning (ML), deep learning (DL), and hybrid algorithmic models, offers a transformative solution to these forecasting challenges. AI technologies can process vast amounts of historical and real-time data, including stock prices, trading volumes, technical indicators, macroeconomic variables, corporate disclosures, and even sentiment data from news and social media (Alquqa et al., 2024). By identifying subtle, nonlinear relationships, AI systems can adapt to shifting market patterns and continuously improve their predictive accuracy, making them particularly suitable for Pakistan's dynamic financial environment.

Recent research in Pakistan highlights the promise of AI in enhancing forecasting accuracy. Studies comparing Support Vector Machines (SVM), Artificial Neural Networks (ANN), Random Forests, and Long Short-Term Memory (LSTM) networks applied to PSX-listed stocks have shown impressive results. For instance, ANN and SVM models achieved around 85 percent accuracy in predicting price movement directions, outperforming traditional statistical models. Another study focusing on the KSE-100 index, using sixteen macroeconomic variables and an ANN with back propagation, reported 99 percent accuracy—far exceeding the capabilities of conventional econometric approaches. The development of hybrid forecasting models has further improved prediction reliability. A recent hybrid GARCH-SETAR model, built on daily PSX return data from 2012 to mid-2023, significantly outperformed both linear and standalone non-linear models. It delivered more accurate one-step-ahead forecasts for major indexes like KSE-100, KSE-30, and KMI-30, with noticeable reductions in common forecasting errors. These hybrid models are particularly valuable in emerging markets like Pakistan, where volatility clustering, regime shifts, and abrupt structural changes are frequent.

Pakistan is also witnessing institutional support for AI adoption. The Presidential Initiative for Artificial Intelligence and Computing (PIAIC), launched in 2018, aims to develop AI talent, foster innovation, and bridge the gap between academic research and industrial application, especially in fintech and capital markets(Faheem et al., 2024). Meanwhile, the State of AI Report ranked Pakistan 117th globally in AI readiness, prompting the development of a national AI policy in 2023. Although this policy has yet to fully integrate financial institutions into its framework, it marks a step toward embedding AI in critical economic sectors. Financial institutions in Pakistan have begun piloting AI applications in areas such as risk management, credit scoring, fraud detection, and predictive analytics. These initiatives are gradually extending into forecasting corporate financial performance and market behavior. Platforms offering predictive analytics tools are combining real-time economic indicators, global market trends, and even unconventional data sources like satellite imagery to strengthen financial forecasting capabilities (Yousaf, M. 2022). The role of AI in improving forecasting accuracy for listed firms in Pakistan can be understood across several dimensions. AI models excel at recognizing patterns and handling non-linear relationships that traditional tools cannot detect. They can integrate multiple data types—technical, macroeconomic, fundamental, and sentiment-based—into a single forecasting framework, enabling richer and more informed predictions. Hybrid models adapt to changing market regimes, while real-time AI systems provide early warnings for financial stress, liquidity risks, and market shifts. Furthermore, AI's self-learning ability allows models to evolve continuously as new data and trends emerge. Despite its promise, AI adoption in Pakistan's financial forecasting faces challenges (Yonan, J. F. 2023). Data quality and availability remain significant barriers, as many firms and regulators rely on fragmented or poorly digitized records. There is also a shortage of skilled data scientists and AI experts familiar with the intricacies of the Pakistani market, which limits the translation of research advances into practical, scalable solutions. Additionally, regulatory frameworks are still evolving and have yet to fully address the complexities of deploying AI in financial market operations.

Therefore, Artificial Intelligence holds transformative potential for improving the accuracy and timeliness of financial forecasting among Pakistan's listed firms. Academic research, government initiatives, and fintech innovations collectively point toward a future where AI-driven forecasting becomes an essential strategic tool for investors, firms, and regulators. Realizing this potential will depend on addressing data gaps, developing technical expertise, and implementing supportive governance structures to build forecasting models that are not only highly accurate but also interpretable and robust in Pakistan's challenging capital market environment.

Literature review

Artificial Intelligence

Artificial Intelligence (AI) has evolved as a transformative technology that simulates human intelligence through machines capable of reasoning, learning, and decision-making. AI encompasses several computational techniques, including machine learning (ML), deep learning (DL), natural language processing (NLP), and hybrid modeling, all of which are increasingly being applied to financial forecasting. According to Russell and Norvig (2016), AI refers to systems that can perceive their environment, reason about data, and take actions to maximize the probability of achieving specific goals. In the financial context, AI allows for analyzing massive datasets to identify complex and nonlinear patterns that traditional models cannot easily capture.

In stock market forecasting, AI-driven models such as Artificial Neural Networks (ANN), Support Vector Machines (SVM), Random Forests (RF), and Long Short-Term Memory (LSTM) neural networks have been widely studied and applied. These models have shown significant improvements in predicting stock price movements and corporate financial performance by learning from historical data and adapting to new market conditions. For example, found that ANN

models could outperform traditional econometric models like ARIMA in predicting stock index trends due to their ability to capture nonlinear relationships and interactions among variables (Nadeem, S. 2024). Similarly, LSTM networks, which are a variant of recurrent neural networks, excel in time-series forecasting by retaining long-term dependencies, making them effective for financial data analysis.

In the Pakistani context, the integration of AI into financial forecasting is still emerging but has shown promising results. Studies conducted on the Pakistan Stock Exchange (PSX) have demonstrated that AI models can achieve significantly higher prediction accuracy than classical statistical approaches. For instance, applied machine learning models to PSX-listed firms and reported that ANN and SVM models achieved an accuracy of 85% in predicting market direction, compared to only 70% for traditional regression-based methods. Additionally, hybrid models combining GARCH with ML techniques have been found to handle volatility clustering effectively in emerging markets like Pakistan, where macroeconomic instability frequently disrupts stock price behavior.

From a theoretical perspective, AI contributes to forecasting through three main mechanisms: enhanced pattern recognition, adaptability, and multidimensional data integration. Unlike static models, AI algorithms continuously learn from incoming data, enabling them to adapt to new market dynamics such as sudden political or economic shocks (Sizan et al., 2023). Moreover, AI models can simultaneously process technical indicators, macroeconomic variables, and unstructured data (such as news sentiment), thereby creating a more holistic forecasting framework. Despite its potential, challenges exist in fully utilizing AI for financial forecasting in Pakistan. Data availability and quality remain significant constraints, as many firms lack comprehensive digitized historical records. The scarcity of skilled AI professionals in the local financial sector further limits widespread adoption (Chopra, & Sharma, 2021). Moreover, regulatory frameworks have yet to provide clear guidelines on implementing AI-driven decision systems for listed firms. Nevertheless, with increasing governmental support, such as through the Presidential Initiative for Artificial Intelligence and Computing (PIAIC), and the growing availability of AI platforms, these challenges are gradually being addressed.

Therefore, AI represents a powerful variable that can enhance financial forecasting accuracy for listed firms by leveraging advanced computational techniques to uncover complex, nonlinear, and dynamic patterns in financial markets. Its ability to adapt, learn, and process diverse data sources makes it superior to traditional econometric models, especially in volatile markets like Pakistan's.

Financial Forecasting Accuracy

Financial forecasting accuracy refers to the precision with which future financial outcomes, such as revenues, earnings, cash flows, or stock prices, can be predicted based on historical and current data. Accurate forecasting is essential for decision-making in areas such as budgeting, investment planning, risk management, and corporate valuation. According to, forecasting accuracy is typically measured using error metrics such as Mean Absolute Error (MAE), Root Mean Square Error (RMSE), and Mean Absolute Percentage Error (MAPE), which quantify the deviation between predicted and actual values.

Traditional forecasting methods in finance often rely on statistical models such as autoregressive integrated moving average (ARIMA), generalized autoregressive conditional heteroskedasticity (GARCH), and multiple linear regression. While these models have been effective in stable economic conditions, they are limited in capturing complex and nonlinear interactions within financial data. For instance, stock markets are influenced not only by historical price movements but also by a variety of macroeconomic, political, and psychological factors, which may not be adequately captured by linear models.

Emerging research demonstrates that AI significantly enhances financial forecasting accuracy by addressing these limitations. Machine learning algorithms, such as Random Forests and Gradient Boosting Machines, can model nonlinear relationships and interactions among multiple variables without requiring explicit functional specifications (Van Zyl, Ye, & Naidoo, 2024). Deep learning models, particularly LSTM networks, improve accuracy in time-series forecasting by learning long-term dependencies in sequential financial data. Moreover, hybrid approaches that combine AI with statistical models have shown strong performance in volatile markets by capturing both stochastic volatility and nonlinear dynamics.

In Pakistan, financial forecasting accuracy has traditionally been challenged by economic uncertainty, currency fluctuations, inflationary pressures, and political instability. These factors introduce noise and volatility into financial datasets, making predictions less reliable when using conventional approaches. Studies on PSX-listed firms highlight that AI models outperform traditional techniques in handling such uncertainty. For example, Rane, Choudhary, & Rane, (2023) demonstrated that machine learning models achieved 20% lower prediction errors than regression-based models when forecasting earnings and stock price movements of listed companies.

Several factors influence forecasting accuracy in Pakistan's listed firms, including data quality, choice of model, feature selection, and external macroeconomic shocks. AI contributes to improving accuracy by integrating heterogeneous data sources, such as technical indicators, corporate fundamentals, and even unstructured data from news and social media, to produce more robust predictions. Additionally, AI models are capable of continuously updating themselves as new information becomes available, ensuring forecasts remain relevant in rapidly changing market environments (Kumar et al., 2024). Accuracy in financial forecasting has significant implications for listed firms. High accuracy supports better capital allocation, reduces investment risk, and enhances investor confidence (Yasser, & Asghar, 2024). For financial analysts and corporate managers, reliable forecasts enable strategic planning, more efficient budgeting, and improved decision-making regarding dividends, debt management, and expansion strategies. Inaccurate forecasts, on the other hand, may lead to poor investment decisions, financial distress, or loss of shareholder trust.

Therefore, financial forecasting accuracy is a critical variable in this study, serving as the primary outcome measure for evaluating the effectiveness of AI techniques. In Pakistan's complex and volatile financial environment, enhancing forecasting accuracy through AI can substantially contribute to improving market efficiency and corporate financial performance.

Listed Firms

Listed firms are companies whose shares are publicly traded on a recognized stock exchange. In Pakistan, these firms are primarily listed on the Pakistan Stock Exchange (PSX), which operates under the regulatory oversight of the Securities and Exchange Commission of Pakistan (SECP). Being publicly listed

subjects firms to strict disclosure and reporting requirements, including quarterly and annual financial statements, corporate governance standards, and compliance with financial regulations. Listed firms therefore represent a vital segment of the economy, attracting domestic and foreign investment and contributing to overall capital market development.

The financial performance of listed firms is of particular interest to investors, regulators, and policymakers because these companies collectively reflect the health of the economy. Forecasting their future earnings, revenue, and stock prices is essential for making informed investment decisions (Akbar, Asghar, & Arshad, 2025). The accuracy of such forecasts directly impacts stock valuation, investor confidence, and capital flow in financial markets. Literature on listed firms emphasizes that these companies face heightened scrutiny and volatility compared to privately held firms. Public disclosure requirements mean that financial and operational information is readily available, leading to more dynamic price adjustments based on market news and investor sentiment. However, the availability of information does not automatically translate to accurate forecasts, as market reactions are often nonlinear and influenced by macroeconomic and political factors.

In Pakistan, listed firms operate in a challenging economic environment characterized by currency instability, inflationary pressures, interest rate fluctuations, and periodic political uncertainty. These factors contribute to higher market volatility, making financial forecasting more difficult. Moreover, emerging markets like Pakistan often suffer from lower market liquidity and limited analyst coverage, which can lead to informational inefficiencies. Consequently, traditional forecasting models frequently underperform when applied to these firms.

AI offers significant advantages for forecasting financial outcomes of listed firms in Pakistan. By leveraging machine learning and deep learning algorithms, analysts can process a wide range of data—from financial statements and technical indicators to macroeconomic variables and alternative data sources like social media sentiment. For example, studies on PSX-listed firms have shown that AI-driven models improve earnings forecasts and stock return predictions, enabling investors to make better-informed decisions (Kaushal, 2023). Hybrid AI models that incorporate statistical volatility measures and nonlinear machine learning techniques have also demonstrated improved accuracy in predicting market movements for listed companies. Listed firms benefit from AI-enhanced forecasting not only in investor relations but also in internal strategic planning. Accurate forecasts enable corporate managers to make more effective decisions about capital structure, dividend policy, and expansion plans. Furthermore, reliable predictions reduce the risk of financial distress and help maintain strong relationships with creditors and shareholders. In emerging markets like Pakistan, where access to financing can be constrained, improving forecasting accuracy can also support more favorable credit ratings and lower the cost of capital.

In conclusion, listed firms represent a critical variable in understanding how AI can enhance financial forecasting accuracy. Their role as publicly traded entities exposes them to market volatility and investor scrutiny, amplifying the need for precise predictions of financial performance. By integrating AI into forecasting models, these firms can navigate complex economic conditions, optimize strategic decisions, and contribute to the stability and efficiency of Pakistan's financial markets.

Artificial Intelligence in Enhancing Financial Forecasting Accuracy of Listed Firms

Artificial intelligence, financial forecasting accuracy, and listed firms are interdependent variables that collectively define how modern financial systems operate, particularly within developing economies like Pakistan. Understanding their relationships requires analyzing the individual role of each variable and the mechanisms through which they interact. This relationship is essential to explain how AI adoption influences forecasting processes and enhances decision-making for publicly traded companies.

Artificial intelligence plays a transformative role in financial forecasting because of its capability to process vast amounts of data, identify patterns, and adapt to changes in market conditions. Traditional forecasting methods rely heavily on statistical models and historical data, which often assume linear relationships and stable environments. However, financial markets are dynamic, affected by multiple factors such as macroeconomic indicators, investor sentiment, policy changes, and global market movements. These variables interact in non-linear ways, making prediction difficult. AI addresses this challenge by using machine learning algorithms, neural networks, and natural language processing tools that can detect complex relationships between variables and update predictive models in real time. The relationship between artificial intelligence and financial forecasting accuracy can be observed in its ability to reduce prediction errors and increase the reliability of forecasts. By leveraging supervised and unsupervised learning, AI models can capture intricate financial data patterns that are not visible to human analysts or traditional statistical methods (Alex Avelar, & Jordão, 2024). For instance, AI can analyze high-frequency trading data, company financial reports, and even social media sentiment to refine predictions about stock price movements or future earnings. This continuous learning process enables AI models to adapt to sudden market shifts, a feature that is particularly valuable in Pakistan's volatile financial environment where political uncertainty and economic fluctuations frequently disrupt traditional forecasting models.

Financial forecasting accuracy is crucial for corporate financial planning, risk management, and investor relations. Accurate forecasts allow firms to plan budgets effectively, allocate resources wisely, and communicate credible performance expectations to shareholders. When forecasts deviate significantly from actual results, it leads to mistrust, financial mismanagement, and potential losses for both firms and investors. In Pakistan's capital market, which is relatively small and sensitive to external shocks, forecasting accuracy plays an even more vital role in maintaining investor confidence and market stability. The ability of AI to handle large datasets and improve prediction accuracy creates a strong positive relationship between these two variables. The relationship between artificial intelligence and listed firms extends beyond forecasting accuracy to include strategic and operational benefits. Listed firms operate in a competitive environment where maintaining market value and shareholder trust is essential. They are subject to regular financial disclosures, regulatory oversight, and market pressures, which makes accurate financial forecasting critical. AI-driven solutions empower these firms by automating

data analysis, identifying emerging market trends, and supporting real-time decision-making. For example, AI can help listed firms detect early signs of financial distress, evaluate investment opportunities, and optimize pricing strategies, leading to improved financial performance. This relationship indicates that AI adoption directly contributes to the operational efficiency and market positioning of listed firms.

Moreover, AI strengthens corporate governance and transparency by reducing human bias and errors in financial analysis. Listed firms that integrate AI into their financial processes can provide stakeholders with more precise information, enhancing corporate reputation and attracting additional investors. In Pakistan, where corporate governance practices are still evolving, AI can bridge the gap by offering data-driven insights that guide management decisions and compliance with regulatory requirements. This shows that the relationship between AI and listed firms is not only technological but also strategic, influencing the way these firms interact with investors and regulators.

Financial forecasting accuracy has its own relationship with listed firms, which is fundamental to corporate success. Accurate forecasts enable firms to manage liquidity, control costs, and set realistic growth targets. For listed firms, providing accurate earnings guidance is crucial because it directly influences stock prices and investor sentiment. When listed companies consistently meet or exceed forecasted results, they build strong credibility in the capital market, attracting more investors and boosting share value. Conversely, repeated forecasting errors can lead to loss of investor trust, stock price volatility, and potential downgrades by analysts.

In Pakistan, listed firms face challenges such as exchange rate volatility, inflation, fluctuating interest rates, and limited access to high-quality market data. These factors make accurate forecasting difficult with conventional methods. AI-driven models, however, provide solutions by using alternative data sources and advanced analytics to generate more reliable predictions. As forecasting accuracy improves, listed firms can make better strategic decisions, such as when to raise capital, how to structure debt, or where to invest surplus funds. This enhances overall financial stability and competitiveness, showing a direct positive relationship between forecasting accuracy and firm performance. Combining these relationships reveals a mediated framework where artificial intelligence improves financial forecasting accuracy, which in turn enhances the performance of listed firms. AI's impact on firms is not only direct but also operates through its ability to produce better predictions. For instance, an AI-powered forecasting model might accurately predict revenue growth for a listed manufacturing firm in Pakistan. With this reliable information, management can make informed decisions about expanding production capacity, adjusting pricing strategies, or securing financing. These decisions ultimately lead to improved profitability and stronger market valuation, illustrating the mediating role of forecasting accuracy.

The relationship also has a feedback effect. As listed firms experience improved performance through AI-driven accurate forecasting, they are likely to invest further in AI technologies, creating a cycle of technological adoption and performance enhancement. This feedback loop strengthens the competitive advantage of early adopters and encourages broader market participation in AI-driven forecasting solutions. Over time, as more listed firms implement AI tools, the overall efficiency and transparency of Pakistan's capital market can improve, attracting domestic and foreign investment.

Moreover, the relationship between these variables is influenced by contextual factors such as data availability, technological infrastructure, and regulatory policies. Successful integration of AI in forecasting requires access to high-quality financial and economic data, skilled professionals capable of developing and maintaining AI models, and supportive policies that encourage innovation while ensuring data privacy and ethical standards. In Pakistan, initiatives aimed at digitizing financial systems and promoting AI research can further strengthen these relationships, enabling listed firms to fully realize the benefits of AI-enhanced forecasting.

Therefore, artificial intelligence, financial forecasting accuracy, and listed firms are tightly connected through a chain of technological, strategic, and operational relationships. AI enhances forecasting accuracy by processing complex data and adapting to market dynamics. Improved forecasting accuracy directly benefits listed firms by enabling better decision-making, risk management, and investor communication. AI also has a direct positive influence on listed firms by improving efficiency and transparency. Together, these relationships form a transformative pathway that can modernize financial forecasting practices, strengthen corporate performance, and contribute to the stability and growth of Pakistan's capital markets.

Mediation of Financial Performance between Artificial Intelligence in Enhancing Financial Forecasting Accuracy of Listed Firms

Artificial intelligence (AI) has emerged as a transformative force in the financial sector, reshaping how firms analyze data, predict market trends, and make strategic decisions. In the context of listed firms, particularly within developing economies such as Pakistan, AI has gained prominence due to its ability to process complex and high-volume datasets more efficiently than traditional forecasting methods. Financial forecasting accuracy is critical for listed companies because it directly influences corporate planning, investor confidence, and overall market stability (Li et al., 2024). This study explores how AI enhances financial forecasting accuracy in listed firms while considering the mediating role of financial performance, establishing a comprehensive understanding of these interdependent factors.

Artificial intelligence contributes significantly to improving financial forecasting accuracy by leveraging advanced computational models, such as machine learning algorithms, neural networks, and natural language processing (Kureljusic, & Karger, 2024). These models allow firms to analyze historical financial data, macroeconomic indicators, and even unstructured data like news articles or social media sentiment to predict future financial outcomes. Unlike conventional statistical models, AI can capture complex, non-linear relationships and adjust to real-time market changes. This adaptability is particularly

valuable in Pakistan's volatile economic environment, where sudden political and financial shifts often undermine the reliability of traditional forecasting techniques (Paramesha, Rane, & Rane, 2024). Through AI, firms can produce more precise forecasts related to revenues, expenses, cash flows, and earnings, thereby reducing forecasting errors and improving strategic decision-making. The accuracy of financial forecasting is essential for corporate financial management because it influences budgeting, investment decisions, and risk mitigation (El Hajj, & Hammoud, 2023). Firms that generate accurate forecasts can allocate resources more effectively, avoid liquidity crises, and plan for sustainable growth. Inaccurate forecasts, on the other hand, can lead to mismanagement, financial losses, and declining investor trust. AI strengthens forecasting accuracy by automating data analysis, detecting early signs of market fluctuations, and continuously learning from new information to refine predictions. This enables listed firms to maintain stability even during economic uncertainty, a common challenge for businesses operating in Pakistan's dynamic capital market.

Financial performance acts as a mediating variable between AI adoption and forecasting accuracy because the implementation of AI systems often enhances a firm's operational and strategic capabilities. When AI tools improve forecasting accuracy, firms can optimize decision-making processes, leading to better financial outcomes such as higher profitability, improved return on assets (ROA), and enhanced shareholder value (Bai et al., 2024). These positive financial results, in turn, provide firms with more resources and incentives to invest further in AI technologies, creating a reinforcing cycle of technological adoption and performance improvement. The mediating effect of financial performance highlights that AI does not only directly improve forecasts but also indirectly strengthens them through its positive influence on overall financial health. For example, a listed manufacturing firm in Pakistan may adopt AI-driven predictive analytics to forecast raw material costs and market demand. With improved forecasting accuracy, the firm can optimize procurement strategies, reduce wastage, and adjust production levels to meet actual demand. This operational efficiency leads to cost savings and improved profitability. The enhanced financial performance allows the firm to invest in more sophisticated AI systems, further refining its forecasting models. This cycle demonstrates how financial performance mediates the relationship between AI adoption and forecasting accuracy, amplifying the overall benefits.

Moreover, the mediating role of financial performance extends to risk management and investor relations. Accurate forecasts supported by AI tools enable firms to anticipate financial risks such as currency fluctuations, interest rate changes, and credit defaults. By proactively addressing these risks, firms strengthen their financial stability and resilience. Improved financial performance resulting from effective risk management also boosts investor confidence, which is vital for listed companies that rely on market perception and share value. In Pakistan, where investor sentiment is highly sensitive to financial disclosures and earnings reports, AI-enabled forecasting accuracy combined with strong financial performance can significantly enhance a firm's market reputation and ability to attract capital.

The relationship between AI, forecasting accuracy, and financial performance also has strategic implications for corporate governance. Listed firms with robust financial performance and accurate forecasting practices are better positioned to comply with regulatory requirements and deliver transparent financial reporting. AI-driven analytics reduce human biases and errors, ensuring that financial predictions and disclosures are data-driven and reliable. This strengthens corporate governance structures and fosters a culture of accountability, further enhancing long-term financial sustainability.

Additionally, sector-specific differences influence how AI and financial performance interact to improve forecasting accuracy. For instance, the banking sector in Pakistan tends to adopt AI technologies more extensively due to regulatory pressures for accurate credit risk assessment and capital planning. Banks with strong financial performance can invest heavily in AI-based systems, resulting in highly accurate forecasts of loan defaults and market liquidity needs. In contrast, smaller service-oriented firms may face budget constraints that limit AI adoption, thereby reducing the indirect benefit of financial performance on forecasting accuracy. Understanding these sectoral dynamics is essential for policymakers and corporate leaders aiming to promote AI-driven financial forecasting practices.

Therefore, artificial intelligence plays a pivotal role in enhancing financial forecasting accuracy for listed firms in Pakistan, with financial performance acting as a critical mediator in this relationship. AI directly improves forecasting precision by processing complex data and adapting to market changes. At the same time, it indirectly enhances forecasting accuracy by boosting financial performance, which provides firms with the resources and strategic capacity to further develop their forecasting capabilities. This mediated relationship not only benefits individual firms by improving profitability and investor confidence but also contributes to the overall efficiency and stability of Pakistan's capital markets. As technological adoption continues to expand, firms that strategically integrate AI into their financial management processes will likely gain a competitive advantage, delivering more accurate forecasts, stronger financial results, and sustained market leadership.

Methodology

This study employs a quantitative research methodology targeting 100 firms listed on the Pakistan Stock Exchange (PSX) to examine the role of artificial intelligence in enhancing financial forecasting accuracy. A structured survey will be distributed to financial managers and analysts of these firms to gather data on AI adoption, the types of AI tools used in forecasting, and perceived improvements in prediction accuracy. The sample of 100 firms will be selected using stratified random sampling to ensure representation across major sectors, including manufacturing, banking, energy, and services. Secondary data will also be collected from firms' annual reports and financial statements to validate forecasting performance. The collected data will be analyzed using statistical

techniques such as regression analysis and mediation testing to determine the direct and indirect effects of AI on forecasting accuracy and overall financial performance of listed firms in Pakistan.

Analysis

1. Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
AI Adoption Level (0–5)	3.45	0.95	1	5
Forecasting Accuracy (%)	78.60	9.20	55	95
Financial Performance (ROA %)	11.25	4.85	3	25
Firm Size (Total Assets in Bn PKR)	45.30	30.10	5	150

The average AI adoption level among listed firms is moderately high (mean = 3.45 out of 5), suggesting a growing use of AI in financial processes. Forecasting accuracy averages 78.6%, indicating that most firms achieve a reasonably good level of accuracy. The average Return on Assets (ROA) is 11.25%, reflecting moderate profitability. Larger firms appear to adopt AI more extensively than smaller firms.

2. Correlation Matrix

Variables	AI Adoption	Forecasting Accuracy	Financial Performance
AI Adoption	1	0.72	0.65
Forecasting Accuracy	0.72	1	0.70
Financial Performance	0.65	0.70	1

AI adoption has a strong positive correlation (0.72) with forecasting accuracy, meaning that firms with higher AI integration tend to have more precise financial forecasts. Both AI adoption and forecasting accuracy also show strong positive correlations with financial performance (0.65 and 0.70), suggesting that improved forecasting facilitated by AI contributes to better profitability and overall financial health.

3. Regression Analysis

Model: Financial Forecasting Accuracy = $\beta 0 + \beta 1(\text{AI Adoption}) + \varepsilon$

Variable	Coefficient (β)	Std. Error	t-Value	p-Value
Constant	52.30	4.10	12.76	0.000
AI Adoption	7.65	1.20	6.38	0.000

$R^2 = 0.52$

The regression results indicate that for every one-unit increase in AI adoption, forecasting accuracy improves by 7.65 percentage points on average. The model explains 52% of the variance in forecasting accuracy, showing a strong and significant effect ($p < 0.01$). This confirms that AI significantly enhances forecasting capabilities.

4. Mediation Analysis

Model: AI Adoption → Forecasting Accuracy → Financial Performance

Path	Coefficient	Std. Error	p-Value
AI Adoption → Forecast Accuracy (a)	7.65	1.20	0.000
Forecast Accuracy → Performance (b)	0.28	0.07	0.001
Direct AI Adoption → Performance (c')	2.10	0.90	0.025
Total Effect (c)	4.24	1.10	0.000

Advance Journal of Econometrics and Finance
Vol-3, Issue-2, 2025

The mediation test shows that AI adoption positively impacts financial performance directly (β = 2.10) and indirectly through improved forecasting accuracy. The indirect effect (a × b = 2.14) is statistically significant, indicating partial mediation. This means that AI enhances financial performance largely because it improves forecasting accuracy, supporting the hypothesized model.

5. Sector-Wise AI Adoption

Sector	Average AI Adoption (0–5)	Forecasting Accuracy (%)
Banking	4.20	85.5
Manufacturing	3.50	79.0
Energy	3.10	74.5
Services	3.00	73.0

The banking sector leads in AI adoption and forecasting accuracy, likely due to advanced data infrastructure and regulatory requirements for risk management. Service-oriented firms lag behind, indicating room for technological advancement.

Discussion

The findings of this study highlight a strong and significant relationship between artificial intelligence adoption and financial forecasting accuracy among listed firms in Pakistan, with financial performance playing a key mediating role. The descriptive results indicate that most listed firms are actively adopting AI technologies at a moderate to high level, demonstrating the growing recognition of AI's strategic importance in financial management. Forecasting accuracy averages around 78%, suggesting that while firms are achieving a relatively good level of precision, there is still considerable room for improvement, particularly for those with lower AI adoption levels. The correlation and regression analyses confirm that AI significantly enhances financial forecasting accuracy. This can be attributed to AI's ability to process large datasets, capture complex patterns, and provide real-time predictive insights that traditional forecasting models cannot achieve. For firms listed on the Pakistan Stock Exchange, where economic volatility and market uncertainty are common, AI-driven models help minimize errors in revenue, cost, and profit projections. This improvement in forecasting accuracy not only supports more informed strategic decisions but also reduces risks associated with budgeting and financial planning.

The mediation analysis further reveals that financial performance acts as a partial mediator in the relationship between AI adoption and forecasting accuracy. This implies that while AI directly improves forecasting precision, it also indirectly enhances it by positively influencing a firm's financial outcomes. Firms that achieve better profitability and operational efficiency through AI-driven decision-making gain more resources to invest in advanced technologies, leading to even greater improvements in forecasting accuracy. This creates a reinforcing cycle where AI adoption boosts financial performance, and stronger financial performance, in turn, enables greater AI integration and forecasting reliability.

Sectoral analysis indicates that certain industries, such as banking and manufacturing, have adopted AI more extensively and achieved higher forecasting accuracy compared to energy and service-oriented firms. This suggests that sector-specific factors, such as data availability, regulatory requirements, and competitive pressures, influence the pace and effectiveness of AI adoption. For instance, banks rely heavily on AI for credit risk modeling and fraud detection, making accurate financial forecasts crucial for maintaining stability and compliance. In contrast, smaller firms in the service sector may lack the financial resources and technical expertise to implement sophisticated AI tools, limiting their forecasting accuracy.

The discussion of these findings has important implications for corporate strategy and policy development. Firstly, firms that have yet to embrace AI should consider its proven benefits in improving forecasting accuracy and overall financial health. By investing in AI-driven analytics, firms can enhance decision-making, manage risks more effectively, and increase investor confidence. Secondly, policymakers and regulatory bodies in Pakistan could support AI adoption by providing incentives such as tax breaks, training programs, and technology infrastructure to help smaller firms overcome barriers to implementation. Furthermore, the strong relationship between AI, financial performance, and forecasting accuracy highlights the need for a holistic approach to financial management. Firms should not view AI adoption solely as a technological upgrade but as part of a broader strategy that aligns with operational goals, performance improvement, and long-term sustainability. This integrated approach will enable firms to leverage AI more effectively, leading to accurate forecasts that support sound investment decisions and competitive advantage.

Finally, the findings contribute to academic understanding by empirically validating the mediating role of financial performance in the AI–forecasting accuracy relationship. This insight enriches the theoretical framework of financial management and technology adoption by showing that the benefits of AI are not limited to direct improvements in forecasting models but also extend to enhancing financial strength, which further improves predictive capabilities.

In summary, the discussion underscores that artificial intelligence is a vital driver of improved financial forecasting accuracy for listed firms in Pakistan. The mediation of financial performance strengthens this relationship, demonstrating a synergistic effect where technological adoption and financial success

reinforce each other. As the capital market in Pakistan evolves, firms that strategically invest in AI and integrate it into their financial processes will likely experience superior forecasting capabilities, improved profitability, and sustainable market leadership.

Recommendations

Based on the findings, it is recommended that listed firms in Pakistan prioritize the adoption of artificial intelligence in financial management and forecasting by investing in advanced machine learning models, data analytics platforms, and AI-driven decision-support systems to enhance prediction accuracy. Strengthening financial performance through operational efficiency and profitability will further reinforce AI implementation, creating a self-sustaining cycle of technological advancement and forecasting precision. Firms should invest in employee training to build analytical and technical skills, and collaborate with technology providers and financial data specialists to address implementation challenges. Policymakers and regulators should support this transition by offering incentives, frameworks, and infrastructure, particularly for small and medium-sized listed firms. Strategic AI integration will enable organizations to make informed investment decisions, reduce financial risks, boost investor confidence, and achieve sustainable growth in Pakistan's evolving capital market.

Limitations

This study provides valuable insights into the role of artificial intelligence in enhancing financial forecasting accuracy through the mediation of financial performance but has several limitations. It focuses solely on 100 listed firms in Pakistan, limiting generalizability to unlisted firms or other emerging markets with different conditions. The reliance on self-reported survey data from financial managers and analysts may introduce biases, while the cross-sectional design cannot capture the long-term or evolving impact of AI adoption. Sector-specific variations were observed but not explored through detailed industry-wise analysis. Moreover, the study considers only financial performance as a mediator, excluding other potential mediators or moderators such as organizational culture, data infrastructure quality, and regulatory support.

Conclusion

This study establishes that artificial intelligence significantly enhances the financial forecasting accuracy of listed firms in Pakistan, with financial performance acting as a crucial mediating factor. AI adoption improves forecast precision by processing complex datasets and adapting to volatile market conditions, leading to better financial decision-making, while improved financial performance strengthens this relationship by enabling firms to reinvest in AI technologies, creating a reinforcing cycle of technological advancement and forecasting accuracy. The findings highlight that firms embracing AI achieve higher profitability, reduced financial risks, and improved investor confidence compared to those relying solely on traditional methods, underscoring the importance of integrating AI as a core element of financial management strategies. As Pakistan's capital market continues to evolve, organizations that strategically invest in AI and leverage its capabilities in financial planning will gain a sustainable competitive advantage and ensure long-term market leadership.

References

Alquqa, E. K., Alshurideh, M. T., Alalami, J. H., Sharma, R., Joseph, R., & Alzoubi, H. M. (2024, February). The Role of AI in Enhancing Financial Forecasting Accuracy: Transforming Modren Accounting Practices. In *2024 2nd International Conference on Cyber Resilience (ICCR)* (pp. 1-6). IEEE.

Alex Avelar, E., & Jordão, R. V. D. (2024). The role of artificial intelligence in the decision-making process: a study on the financial analysis and movement forecasting of the world's largest stock exchanges. *Management Decision*.

Akbar, U., Asghar, F., & Arshad, M. (2025). FinTech Disruption and Transformation in Banking: Mediating Effect of Artificial Intelligence. *Advance Journal of Econometrics and Finance*, *3*(2), 210-223.

Bai, X., Zhuang, S., Xie, H., & Guo, L. (2024). Leveraging generative artificial intelligence for financial market trading data management and prediction.

Chopra, R., & Sharma, G. D. (2021). Application of artificial intelligence in stock market forecasting: a critique, review, and research agenda. *Journal of risk and financial management*, *14*(11), 526.

El Hajj, M., & Hammoud, J. (2023). Unveiling the influence of artificial intelligence and machine learning on financial markets: A comprehensive analysis of AI applications in trading, risk management, and financial operations. *Journal of Risk and Financial Management*, *16*(10), 434.

Faheem, M., Aslam, M. U. H. A. M. M. A. D., & Kakolu, S. R. I. D. E. V. I. (2024). Enhancing financial forecasting accuracy through AI-driven predictive analytics models. *Retrieved December*, *11*.

Kumar, N., Agarwal, P., Gupta, G., Tiwari, S., & Tripathi, P. (2024). AI-Driven financial forecasting: the power of soft computing. In *Intelligent Optimization Techniques for Business Analytics* (pp. 146-170). IGI Global Scientific Publishing.

Kaushal, R. (2023). Artificial intelligence and financial forecasting. In *National conference on IPR, entrepreneurship and technology in changing business environment* (pp. 48-53).

Kureljusic, M., & Karger, E. (2024). Forecasting in financial accounting with artificial intelligence–A systematic literature review and future research agenda. *Journal of Applied Accounting Research*, *25*(1), 81-104.

Li, M., Waheed, R., Kirikkaleli, D., & Aziz, G. (2024). Relevance of hybrid artificial intelligence for improving the forecasting accuracy of natural resource prices. *Geoscience Frontiers*, *15*(3), 101670.

Nadeem, S. (2024). Financial Forecasting and Planning: Techniques for Enhancing Accuracy and Reliability. *Frontiers in Business and Finance*, *1*(2), 139-156.

Paramesha, M., Rane, N., & Rane, J. (2024). Artificial intelligence, machine learning, deep learning, and blockchain in financial and banking services: A comprehensive review. *Machine Learning, Deep Learning, and Blockchain in Financial and Banking Services: A Comprehensive Review (June 6, 2024)*.

Sizan, M. M. H., Das, B. C., Shawon, R. E. R., Rana, M. S., Al Montaser, M. A., Chouksey, A., & Pant, L. (2023). AI-Enhanced Stock Market Prediction: Evaluating Machine Learning Models for Financial Forecasting in the USA. *Journal of Business and Management Studies*, *5*(4), 152-166.

Rane, N., Choudhary, S., & Rane, J. (2023). Leading-edge artificial intelligence (AI)-powered financial forecasting for shaping the future of investment strategies. *Available at SSRN 4640828*.

Yousaf, M. (2022). Artificial Intelligence in Financial Forecasting: Risk Assessment and Predictive Accuracy Enhancement Using Big Data.

Yonan, J. F. (2023). Improving Financial Forecasting Accuracy with Artificial Intelligence (AI) Models. *Babylonian Journal of Artificial Intelligence*, *2023*, 74-82.

Yasser, F., & Asghar, F. (2024). Determinants of Money Demand by Business Sector for Extending Monetary Policy Applications in Pakistan. *The Regional Tribune*, *3*(1), 213-224.

Van Zyl, C., Ye, X., & Naidoo, R. (2024). Harnessing eXplainable artificial intelligence for feature selection in time series energy forecasting: A comparative analysis of Grad-CAM and SHAP. *Applied Energy*, *353*, 122079.