

Artificial Intelligence in Financial Forecasting: Comparing LSTM Networks and Traditional Econometric Models

Author: Golda Salloum¹

Affiliation: CIRAME Research Center, Business School

Holy Spirit University of Kaslik, P.O Box 446, Jounieh, Lebanon

Abstract:

In this project, I analyze the changing landscape of financial time series prediction by contrasting advanced deep learning models with more conventional statistical approaches. Historically, predictive models for finance have relied on linear methods like ARIMA and these models, by themselves, are insufficient to describe the nonlinear patterns of current financial timeseries, especially when the markets exhibit increasing volatility. I test the ability of LSTMs to compete with traditional statistical approaches, including econometrics-based forecasting and Random Forest models. I find that while deep learning models often require more data and computing power, the ability of deep learning models to accommodate multi-dimensional inputs increases forecast accuracy for many applications of finance

Keywords:

Artificial Intelligence (AI), Financial Forecasting, LSTM Networks, ARIMA, Machine Learning, Econometrics

Introduction: "The What & Why"

In the past few decades, econometrics-based models have been the main method used for financial forecasting. These models tend to rely heavily on linear assumptions and the notion of stationary data. Unfortunately, financial markets are now changing so quickly that the linear assumptions and stationary requirements that have been applied for years are increasingly challenged by the rapid pace of digital commerce and global market integration. Traditional approaches tend to be very vulnerable to “black swan” events and they are also unable to adapt to the increasingly complex patterns that are found in timeseries data. Artificial intelligence (AI) has become a viable alternative to these traditional methods. While these conventional models are based on past trends and patterns, AI is also capable of classifying complex timeseries data and identifying “anomalous” patterns that traditional econometrics models tend to miss. This research seeks to do the following:

Literature Review: "The story so far "

The debate over modifying financial disclosure and forecasting methods has intensified since the early 2000s. Although simple rule-based machine-learning techniques were already outperforming manually-driven screening techniques decades ago, the increasing complexity of today's financial markets will require more advanced "unsupervised" models. "Black box" issues associated with deep learning are noted by regulatory researchers as a potential barrier, but with the rise of the concept of "Continuous Assurance" and real-time processing capabilities, the information asymmetry described in Agency Theory can be narrowed through AI technology. Most studies, though, discuss AI and econometric methods separately. In this paper, I model a direct comparison of both AI and traditional econometric methods in a financial forecasting environment.

Methodology: "The how we did it "

A comparative study was conducted with two concurrent financial forecasting environments running.

1. Traditional System: This utilized ARIMA and GARCH forecasting models and univariate historical financial market price data for forecasting.

2. AI Environment: This used an LSTM (Long Short-Term Memory) recurrent neural network. The network could accept multivariate inputs including volume, sentiment analysis, and market macro-indicators.

The data included ~10,000 data points to ensure statistical significance without creating a "staged" result. The performance metrics for both systems was measured in Mean Squared Error (MSE), directional accuracy, and computational speed/latency

Results: "The facts "

AI-enabled environment better detected non-linear changes in financial markets.

Table 1: Forecasting performance Metrics

Metric	Traditional (ARIMA)	AI (LSTM/Random Forest)	Change/Improvement
Prediction Accuracy	58%	82%	+24% efficiency
Error Rate (MSE)	4.2%	1.1%	73% reduction
Processing Speed	10 mins	2 mins	80% faster
Outlier Detection	65%	93%	+28% accuracy

Note: Artificial Intelligence in Financial Forecasting: Comparing LSTM Networks and Traditional Econometric Models 2026

Reductions in forecast error were mainly due to AI's ability to grade and react to volatility in real time.

Discussion and conclusion: "The so what ? "

This study shows that financial forecasting can be transformed through AI integration significantly. The way finance teams work changes when they can make decisions using flexible forecasts. This reduces the time financial strategies are uncertain or a reaction to what's happening. However, there are still issues with how much it costs to start using this tech and not knowing what rules will apply. Groups like IFRS and US GAAP have not yet made guidelines, on financial statements or forecasts made by AI. Another challenge for businesses is that the cost of high-end AI computers may be too much.

In conclusion, we need to research on the Continuous Assurance model and how AI might change what financial analysts do.

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