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Evaluating Expert Decision Systems for Exchange Rate Insurance

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ABSTRACT

Global trade volumes which set new records yearly indicate growth of commercial operations among an increasing number of companies. This expansion inevitably brings with it the challenge of managing exchange rate risks. As a standard practice, international payments are made within a specified period agreed to in a commercial contract leading to the elevated risks of the exchange rate exposure. To avoid that, many companies decide to use hedging instruments. This paper aims to reduce the extra expenses of hedging by designing an expert decision system. The expert decision system facilitates daily recommendations to a company on the decision of exchange rate hedging. The contribution of this research is twofold. First, it applies the latest machine learning techniques and obtains 79% accuracy in predicting the following day's exchange rate trend. Second, it designs an expert decision system that helps a company reduce its foreign exchange rate exposure managing. The results of backtesting on real data prove the efficiency of the expert decision system.

KEYWORDS

Business Analytics, Foreign Exchange Exposure, Currency Risk, Machine Learning, Random Forest, Feature Selection, Expert Decision System, Decision Support

INTRODUCTION

Financial data trends have been widely investigated in recent years by academics and investors. Specifically, numerous researchers focus on predicting the evolution of currency exchange rates, stock markets and derivatives markets in order to find investment opportunities. Because of limited information, nonlinear trends, and high volatility, financial time series are extremely difficult to predict (Anastasakis & Mort, 2009). One of the first methodologies that tried to predict financial time series was technical analysis. Recent studies have shown the efficiency of technical analysis in obtaining abnormal returns (Scott & Park, 2007). Nevertheless, the results are influenced by market efficiency theory (Hsu et al., 2016).

More recently, looking for higher returns, many researchers started to use big data, artificial intelligence, and machine learning for financial time series prediction. Among the most widely

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used algorithms are neural networks and decision tree algorithms (Alaminos et al., 2019; Hu et al., 2021). There are two points of view on financial data prediction: it can be understood as either a regression or a classification task (Chang et al., 2011; Dingli & Fournier, 2017; Tealab, 2018). With the regression approach, the goal is to predict the exact price in the future, whereas the classification approach attempts to predict future trends. In the financial field, price trend prediction is usually considered to be of greater importance than exact price prediction (Sezer et al., 2020). Among the trend prediction methodologies, some of the best-performing algorithms are ensembles of decision trees and ensembles of different deep learning algorithms including decision trees (Krauss et al., 2017). Specifically, ensemble models such as random forest (RF) and eXtreme Gradient Boosting (XGBoost), along with the long short-term memory (LSTM) neural network, have been shown to yield impressive results in predicting future trends in financial time series data. Basak et al. (2019) demonstrated that these machine learning approaches can effectively capture the complex, nonlinear dynamics present in volatile financial environments, thereby enhancing forecast accuracy. In addition, Ballings et al. (2015) provided evidence that ensemble methods outperform traditional statistical models in stock price direction prediction. Moreover, Kim and Lee (2022) illustrated that both LSTM and XGBoost models excel in capturing time-dependent patterns for stock price predictions, while Li and Wang (2023) extended these findings to foreign exchange rate forecasting, reinforcing the value of these models for accurately predicting financial trends.

Nevertheless, whereas the majority of the research focuses primarily on investment opportunities detection, there are fewer studies related to insurance strategies, in particular on exchange rate insurance. The distinctive feature of an insurance strategy is that it aims to minimize losses, whereas the goal of an investment strategy is to maximize abnormal returns. In order to manage the risk, some companies use the hedging instruments that are offered by banks and other financial institutions. Broadly speaking, hedging is a strategy for limiting risk. In finance, hedging can be achieved by trading particular financial instruments (Smith & Stulz, 1985). Nevertheless, a company should use hedging instruments cautiously; hedging instruments are expensive, and extra costs in terms of fees can significantly impact a company's operational cash flow and cause earnings volatility (Papaioannou, 2006).

Exchange rate risk management has emerged as a critical component of financial strategy amid today's volatile global markets, where rapid currency fluctuations can significantly erode profit margins and destabilize cash flows. Firms employ a range of sophisticated techniques, including hedging with derivatives, diversification of currency exposures, and the use of advanced algorithmic decision systems, to mitigate these risks and enhance forecasting accuracy. (Allayannis, 2001; Jorion, 2007). Such strategies not only safeguard financial stability and reduce uncertainty in operational planning but also strengthen competitive positioning in an interconnected global economy by enabling more agile responses to market shocks (Bartram & Bodnar, 2009). By proactively addressing currency volatility, organizations can capitalize on favorable market conditions while minimizing the adverse impacts of unexpected fluctuations.

This research tries to fill the gap in this field by creating an expert decision system in charge of recommending to its user the most appropriate currency hedging decision. The performance of the expert decision system, as evidenced by real data, shows its advantage in comparison with a benchmark strategy that consists of insuring all the transactions. This paper demonstrates the efficacy of the expert decision system in companies with a considerable number of international transactions. The special challenge faced by these companies consists in the fact that commercial orders are usually paid many days after the commercial contract is signed and the exact date of payment is not known. Considering that highly accurate prediction of exchange rates over such a long period has not yet been achieved, there are various decision making rules introduced into an expert decision system that try to overcome this issue.

The remainder of this paper is organized as follows. The next section reviews related literature on risk management strategies and particularly on foreign currency exposure; the subsequent section