

FORECASTING THE NIKKIEI AVERAGE: A COMPARISON BETWEEN A NEURAL NETWORK MODEL AND REGRESSION ANALYSIS

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ABSTRACT

Investors are interested in forecasting stock prices in financial markets. This study extends previous research to investigate the influence of the U.S. stock markets and the exchange rate on the Japanese markets using regression analysis and a neural network model. The current research found that regression models were superior to the neural network model in forecasting stock prices in Japanese markets.

INTRODUCTION

Many investors, including individuals and institutions, are interested in forecasting stock prices in financial markets. Forecasting the stock prices, however, is difficult and complicated. This study examines forecasting methods with two different widely-used forecasting techniques: regression models and neural networks. This research should provide individuals and institutions some insight for how to forecast and analyse stock prices in the Japanese markets. Bahmani-Oskooee and Sohrabian (1992) reported about the effects of the exchange rate on stock prices. Their study showed that S&P 500 index and the effective exchange rate influence each other in the short-term but not in the long-term. Abdalla and Murinde examined the relationship between the exchange rate and stock markets in the developing countries. They found that the exchange rate had a strong effect on stock prices. Their findings were consistent with some earlier research on developed countries. Dheeriyaa studied causality among international stock markets and found that some markets influenced other markets. The results showed positive correlations among the markets. Dheeriyaa also discovered that all individual markets responded to other markets significantly. Huang reported on the relationship among the U.S., Japan, and the South China stock markets. Huang found that the U.S. stock markets had more influence on the markets of South China than the Japanese markets do. McIntyre-Bhatty extended the previous research using neural networks in financial market analysis. Compared to regression analysis, the performance of the neural network system was superior in stable, bearish, and bullish markets. Oh and Han studied the accuracy of the neural networks for interest rate prediction by using change-point detection. They concluded that neural network models are more reliable than other models in forecasting interest rates.

Eakins compared regression models and neural network models by examining the relationship between the institutional ownership percentages in common stock and financial ratios. Eakins found that neural networks were more accurate than the regression model. In contrast to Eakins' work, Below reported that linear regression models are superior to neural network models. He examined the determinants of institutional investment demand and common stock, as well as the relationship between institutional investment decisions and financial ratios.

Data

The data is collected via the Internet. Data for variables were collected for a week that was randomly selected. A total number of 262 observations were included in the data set. The study used one dependent variable (the Nikkei Average) and six independent variables as follows:

1. The Exchange Rate between Japanese Yen and the U.S. Dollars
2. The Short-term Prime Rate in Japan
3. The Federal Fund Rate in the U.S
4. Dow Jones Industrial Index
5. NASDAQ Index
6. SP500 Index

Regression Analysis

Table1-Simple Regression Model Results

	t-Statistic	R2	Adj. R2
Dow Jones	-2.112396	0.016937	0.013141
Exchange Rate	-6.884138	0.154173	0.150920
Federa Fund Rate	14.289890	0.439898	0.437744
NASDAQ	5.894279	0.117874	0.114481
Prime Rate (JP)	4.450973	0.070802	0.067228
SP500	0.875465	0.002950	-0.000899

Table 2-Multiple Regression Model Results







	t-S tatic
Dow Jones	2.141365
Exchange Rate	-2.445457
Federa Fund Rate	6.463640
NASDAQ	7.763430
Prime Rate (JP)	1.060500
SP500	-5.740316

Neural Network Model

The following shows the importance of each independent variable determined by the neural network model.

Untitled 0 cycles.

6 of 6 Input columns in ascending order.

Column	Input Name	Importance	Relative Importance
1	DJIA	1.2137	
6	SP500	1.2180	
3	FRB	1.3614	
4	PrimeR	1.5011	
5	NASDAQ	1.7327	
2	Exchange	1.8933	

CONCLUSION

The t-statistic of the exchange rate showed that the exchange rates and the stock prices have a significant relationship, which confirmed the works of Bahmani-Oskooee and Sohrabian and Abdalla and Murinde. The t-statistics of the U.S. markets indicated that the U.S. stock markets (Dow Jones Industrial index, NASDAQ index, and SP500 index) have a strong relationships with the Japanese stock market, which confirmed that the works of Dheeriya and Huang that stock markets influence other stock markets. The MAPE test indicates that the regression models were superior to the neural network model, which did not support the works of Abdalla and Murinde, Oh and Hanconfirmed, and Eakins. However, the poor performance of the neural network may be the result of MultiLayer Perceptron model used in this study. Other neural network models may yield a better performance.

References Are Available Upon Request