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FINANCIAL MARKET PREDICTIONS WITH DEEP LEARNING

(Ramalan Pasaran Kewangan dengan Pembelajaran Mendalam)

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ABSTRACT

Forecasting the financial market has proven to be a challenging task due to high volatility. However, with the growing involvement of computational methods in econometrics, models built with deep learning neural networks have been more accurate in capturing the dynamics of financial market data compared to the commonly used time series models such as the ARIMA and GARCH models. In this study, four deep learning models were applied to eight separate investments, namely stocks (AAPL, TSLA, ROKU, BAC), currency exchange rates (GBP/USD and USD/SEK) and exchange-traded funds (SQQQ and SPXS) to compare their forecasting abilities. The four deep learning models consists of three recurrent neural networks (RNN) which are the vanilla recurrent network (VRNN), long short-term memory (LSTM) and gated recurrent units (GRU), along with the convolutional neural networks (CNN). The models were tuned to be time efficient and evaluated with RMSE and MAPE. Results show that GRU was the overall best model, with exceptions to the LSTM performing better with the exchange traded funds.

Keywords: CNN; financial market; GRU; LSTM; RNN

ABSTRAK

Meramal pasaran kewangan telah terbukti sebagai tugas yang mencabar disebabkan oleh ketidastabilan yang tinggi. Walau bagaimanapun, dengan penglibatan yang semakin meningkat dalam kaedah pengiraan dalam ekonometrik, model yang dibina dengan rangkaian neural pembelajaran dalam adalah lebih tepat dalam menangkap dinamik data pasaran kewangan berbanding model siri masa yang biasa digunakan seperti model ARIMA dan GARCH. Dalam kajian ini, empat model pembelajaran dalam telah digunakan pada lapan pelaburan berasingan, iaitu saham (AAPL, TSLA, ROKU, BAC), kadar pertukaran mata wang (GBP/USD dan USD/SEK) dan dana yang didagangkan di bursa saham (SQQQ dan SPXS) untuk membandingkan kebolehan ramalan mereka. Empat model pembelajaran dalam terdiri daripada tiga rangkaian neural berulang (RNN) iaitu rangkaian neural biasa (VRNN), long short-term memory (LSTM) dan gated recurrent units (GRU), bersama-sama dengan rangkaian neural konvolusi (CNN). Model-model ini telah diselaraskan untuk menjadi cekap dari segi masa dan dinilai dengan RMSE dan MAPE. Keputusan menunjukkan bahawa GRU adalah model terbaik secara keseluruhan, dengan pengecualian LSTM yang lebih baik dalam dagangan dana yang didagangkan di bursa saham.

Kata kunci: CNN; pasaran kewangan; GRU; LSTM; RNN

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