Implementation of Neural Network Autoregression (NNAR) and Double Exponential Smoothing Holt Method in Forecasting PT. Telkom Indonesia Stock Price

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Abbreviated abstract: Stock price is a financial time series that usually formed from non-dynamic linear process that can be used as an indicator that shows management succession in managing a company. The variability in this series is high so linear forecasting methods are not recommended for modeling. The aim of this study is implementing neural network autoregression (NNAR) method that is useful for forecasting non-linear series and Double Exponential Smoothing Holt method that is suitable for trend time series.

Related publications:
– W. Sulandari *et al*, AIP Conference Proceedings 2329 (1),06008 (2021)
– W. Sulandari and H. Utami, International Journal of Advances in Intelligent Informatics 2 (3), 131-139 (2016)

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Problem and Challenge

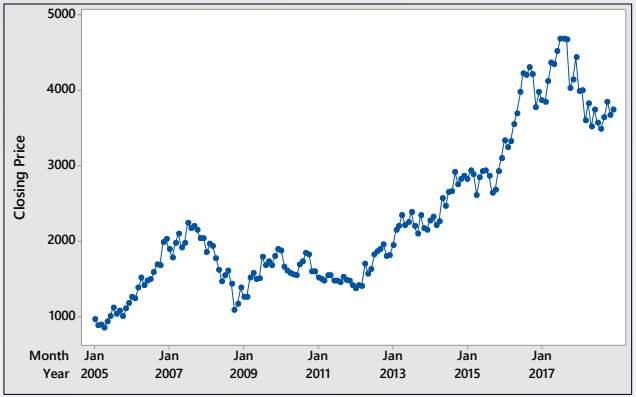
Stock Price

Indicator of **success** in managing a company

formed from **a dynamic non-linear process** with high variability (volatility) dependence

linear forecasting methods are **not recommended**

PT. Telkom Indonesia stock price is one of some popular stocks that have **great demand** from investors in Indonesia



Solution:

Double Exponential Smoothing Holt

- Focuses on exponential weight loss on the oldest observation
- Recent observations will be given a higher weight value than older observations
- Able to smooth trends and gradients by using smoothing constants for levels and trends
- Good for forecasting data with trend

Neural Network Autoregression (NNAR)

- Built based on an artificial neural network model on the performance of the central system neural network
- Good for estimating functions on large training data
- Able to model complex non-linear relationships without any underlying relationship assumptions

The aim of this study are **implementing and comparing** NNAR and Double Exponential Smoothing Holt method

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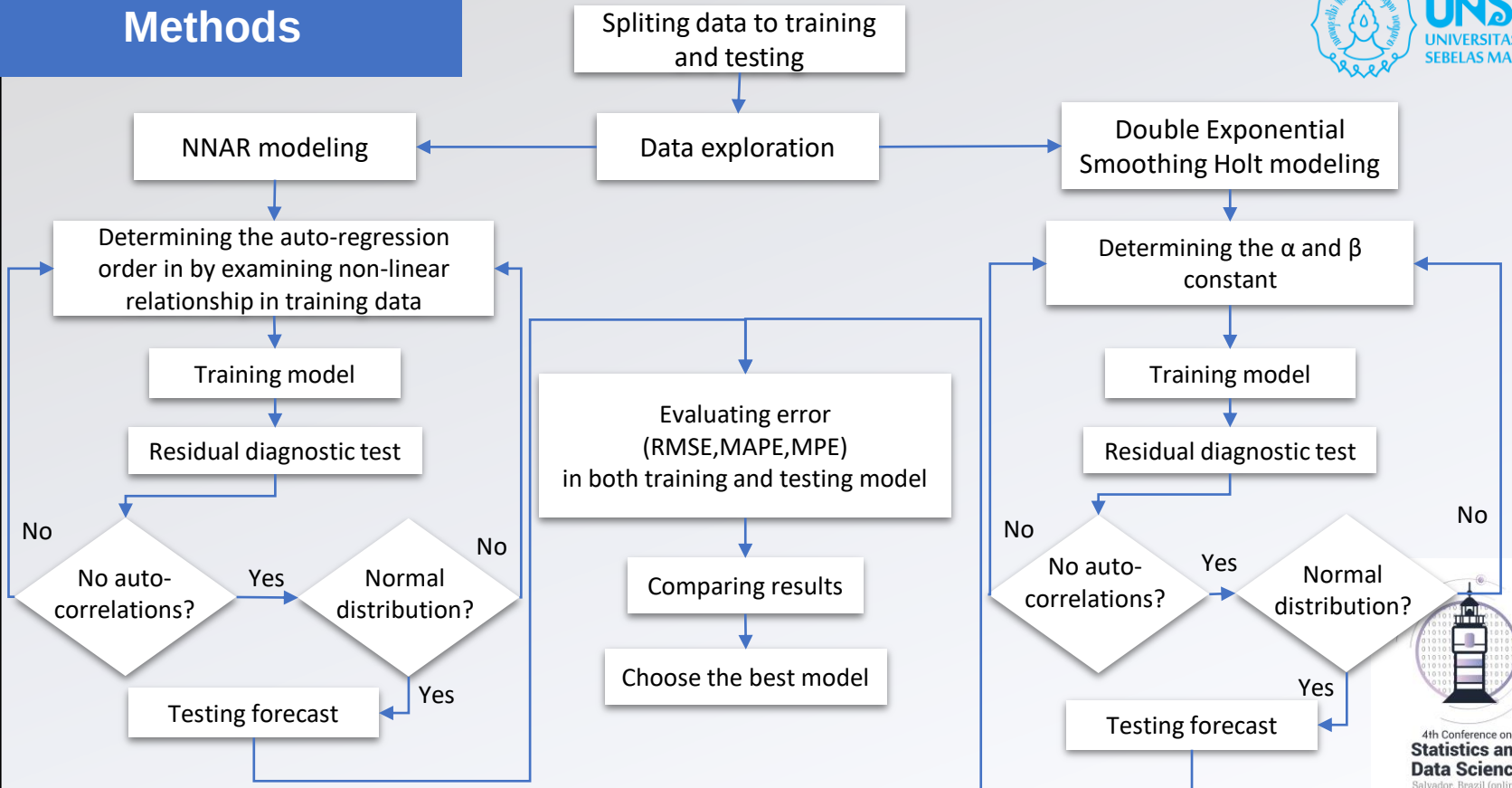
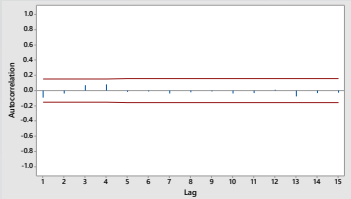
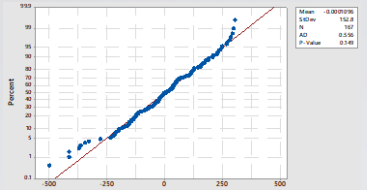
Methods



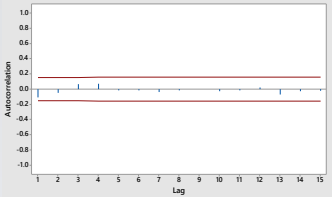
Results and Conclusions

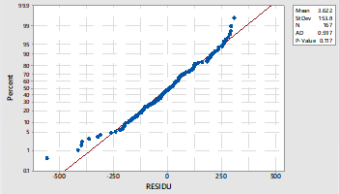
NNAR(1,1)





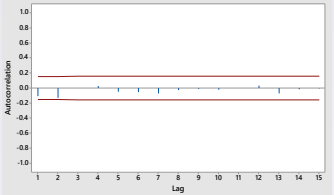
Without Box-Cox transformation

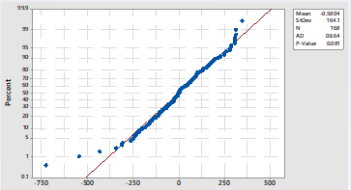




With Box-Cox transformation

Double Exponential Smoothing Holt

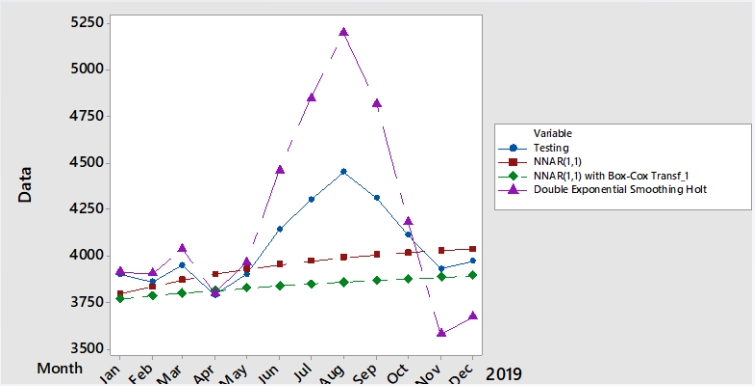




α=0.9 β=0.2

	TRAINING			TESTING		
MODEL	RMSE	MAPE(%)	MPE (%)	RMSE	MAPE(%)	MPE (%)
NNAR(1,1)	**3.119**	**5.420**	**-0.499**	**3.124**	**3.765**	**2.476**
NNAR(1,1) with Box-Cox transform	3.122	5.411	-0.299	4.311	5.168	5.073
Double Exponential Smoothing Holt	3.317	5.669	-0.074	5.304	6.047	-3.291

Conclusion:



NNAR(1,1) offers **better performance** than Double Exponential Smoothing Holt method

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