ANALISIS KAUSALITAS DAN PREDIKSI VOLUME LALU LINTAS HARIAN MENGGUNAKAN MODEL *VECTOR AUTOREGRESSIVE WITH EXOGENOUS VARIABLES (VARX)*

(STUDI KASUS: JALAN TOL DESARI DAN CIJAGO)

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INTISARI

Peningkatan mobilitas masyarakat menyebabkan fluktuasi volume lalu lintas pada ruas jalan tol sehingga diperlukan model peramalan yang mampu menangkap dinamika temporal, keterkaitan antar-ruas, serta pengaruh faktor eksternal. Penelitian ini bertujuan membangun model *Vector Autoregressive with Exogenous Variables* (VARX) untuk memprediksi volume lalu lintas harian pada ruas Tol Depok-Antasari dan Tol Cinere-Jagorawi. Variabel endogen berupa volume lalu lintas harian pada kedua ruas tol, sedangkan variabel eksogen terdiri atas variabel *dummy* hari dalam pekan serta hari libur nasional dan cuti bersama. Analisis *Impulse Response Function* (IRF) dan *Forecast Error Variance Decomposition* (FEVD) digunakan untuk mengetahui respons guncangan dan kontribusi masing-masing variabel. Hasil penelitian menunjukkan bahwa model VARX mampu menangkap hubungan antar ruas tol dan menghasilkan kinerja peramalan yang baik, dengan nilai MAPE dan RMSE pada Tol Desari sebesar 7,01% dan 4842,858 serta pada Tol Cijago sebesar 10,08% dan 2824,30. Selain itu, diperoleh temuan bahwa Tol Desari lebih responsif terhadap perubahan yang terjadi di Tol Cijago, sedangkan dinamika Tol Cijago lebih didominasi oleh faktor internal. Secara keseluruhan, model VARX relevan digunakan sebagai pendekatan peramalan volume lalu lintas harian pada jaringan jalan tol yang saling terhubung.

CAUSALITY ANALYSIS AND PREDICTION OF DAILY TRAFFIC VOLUME USING VECTOR AUTOREGRESSIVE WITH EXOGENOUS VARIABLES (VARX) MODEL

(CASE STUDY: DESARI AND CIJAGO TOLL ROADS)

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ABSTRACT

Increased population mobility has led to fluctuations in traffic volume on toll roads, thereby requiring a forecasting model that can capture temporal dynamics, inter-road linkages, and the influence of external factors. This study aims to develop a Vector Autoregressive with Exogenous Variables (VARX) model to predict daily traffic volumes on the Depok-Antasari Toll Road and the Cinere-Jagorawi Toll Road. The endogenous variables consist of daily traffic volumes on both toll roads, while the exogenous variables are categorical dummy variables representing day-of-week effects as well as national holidays and joint leave days. Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) analyses are employed to examine shock responses and the contribution of each variable to forecast errors. The results indicate that the VARX model successfully captures the interdependence between the two toll roads and provides good forecasting performance, with MAPE and RMSE values for the Desari Toll Road of 7,01% and 4842,858, respectively, and for the Cijago Toll Road of 10,08% and 2824,30. Furthermore, the Desari Toll Road is found to be more responsive to changes occurring on the Cijago Toll Road, whereas the dynamics of the Cijago Toll Road are more strongly driven by internal factors. Overall, the VARX model is a relevant and effective approach for forecasting daily traffic volumes in interconnected toll road networks.