

## **Modeling investments in the dynamic network performance of insurance companies**

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### **ABSTRACT**

This study proposes a dynamic two-stage network data envelopment analysis (DEA) model with and without carry-over variables to evaluate corporate performance. Carry-over variables are those continuously held from one term to another, reflecting dynamic components. Apart from considering dynamic aspects, the DEA model called dynamic slacks-based measure with network structure can address various inputs and outputs at both stages and multiple intermediates that link the two stages. We demonstrate the applicability of the proposed model under the assumption of variable returns to scale to the performance evaluation of 30 insurance companies in Malaysia from 2008 to 2016. Specifically, we gauge resource management and investment efficiencies as the two production stages of insurance companies. While investment asset is considered the carry-over variable, investment income is treated as one of the ultimate outputs. Results indicate that the discriminatory power of the overall performance is high when we consider investments, particularly investment assets, as a carry-over variable. Moreover, we employ a multi-criteria decision analysis to compare all insurance companies in a common setting, including each ratio of liquidity, profitability, and leverage. The decision to include these ratios is made after performing regression analyses. This study entails practical implications for insurers and policy makers in terms of resource management and investment after considering investments and relevant performance ratios.

**Keywords:** Data envelopment analysis; Dynamic network slacks-based measure; Resource-management efficiency; Investment efficiency; Insurance companies