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Title :
Construction and Evaluation of Panel Count Model for Road Accident Data

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This thesis presents the work on modelling road accident count in Malaysia through the development panel count model. This research is motivated by several factors. The first is the alarming phenomenon pertaining to the high rates of road accidents which has generated interest among researchers and policy makers to find ways and means to overcome this global issue. Secondly, the effect of adverse weather condition is known to affect road safety and although various intervention measures have been implemented, significant results have yet to be achieved. Hence, a better understanding of such phenomenon is essential to allow necessary measures to be taken to improve road safety. An extensive literature review was made to gain a better understanding on road accidents phenomenon and evolution of statistical model for count data. Through an extensive literature review, the gap was identified in the development of road accident models in Malaysian which overlooked the panel count models. Additionally, there is also the issue of potential bias in the panel count model estimator particularly with the issues of fixed effects estimator. Thus, the first research objective is to develop panel count model for road accidents data in Malaysia. The second objective is to evaluate the effect of panel size and time dimension on the estimator of panel count model using Monte Carlo simulation. This research involved two phases which are statistical modelling and simulation study. In the first phase of the research, the panel data models based on the fixed and random effects Poisson and Negative Binomial models were developed. Several estimation methods such as conditional and unconditional approaches were used to model road accident data for 12 states in Malaysia. The results revealed that precipitation in the form of rainfall, dry spell and number of rainy days has significant effect on road accidents in Malaysia. The risk of road accident occurrence significantly increases during the rainy months with shorter dry spell period of gap between rain and no-rain. On the other hand the risk is lessening with the rainfall in the months of longer spell period. In the second phase, the Monte Carlo simulation method using SAS programming was used to evaluate the effect of the changes of sample (panel) size as well as number of time periods on the alternative conditional fixed-effects Negative Binomial (FENB) and the Projected Score Method (PSM) estimators. For small sample size and when the number of panel wave/time periods is fixed, the results of the estimation of the unconditional FENB (with correction for standard error) are less satisfactory. This is evidence from the large sampling variability, large SE and RMSE generated. Additionally, the unconditional fixed effects perform better than the PSM method at different level of individual size. The main contribution of this study in the field of road accidents is the fundamental knowledge of new evidence-based research finding of road accident occurrence relating to weather condition. As one of the tropical countries, the considerable amount of precipitation in a form of rainfall and dry spell in Malaysia are found to be a significant contributor to road accidents in the country. This study also provides a framework for Monte-Carlo simulation methodology in evaluating the alternative fixed effects panel model estimator. For future research, the advantage of bootstrapping technique for panel count data involving small sample size and time period can be investigated.