Meteorological and Economic Factors Affecting the Number of Tourists Visiting Chiang Mai Province from 2014 to 2023.

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Abstract

This study examines factors influencing Thai and foreign tourist arrivals in Chiang Mai and develops a forecasting model using secondary monthly data from January 2014 to December 2023. Key factors include meteorological (rainfall, temperature, PM10, PM2.5, seasons), economic (exchange rates, crude oil prices), and external influences (COVID-19, road accidents). Three models multiple linear regression, Poisson regression, and negative binomial regression are tested, with the negative binomial model proving most effective.

The results show that the negative binomial regression model is the most effective model for forecasting this dataset. Significant factors for Thai tourists include temperature, PM2.5, exchange rates (USD, CNY), crude oil prices, COVID-19, and seasons, while foreign tourist numbers are influenced by rainfall, temperature, PM10, exchange rates (USD, KRW, CNY), crude oil prices, COVID-19, and road accident fatalities.

Introduction

Tourism is a key industry in Chiang Mai, with a continuous growth trend until the outbreak of COVID-19 in 2020, which significantly reduced the number of tourists. After the situation eased in 2022, international tourists, particularly from China and South Korea, began to return, leading to a recovery in the tourism sector. However, Chiang Mai faces challenges such as air pollution in the summer, flooding in the rainy season, and road accidents affecting travel. Additionally, global economic fluctuations impact travel expenses and the number of visitors.

This study analyzes meteorological and economic factors affecting tourist numbers to develop an accurate forecasting model for managing and improving Chiang Mai's tourism industry.

Objective

- To study the factors affecting the number of Thai and foreign tourists visiting Chiang Mai and to obtain a forecasting model for the number of both Thai and foreign tourists visiting Chiang Mai.

Methodology

1. Collect monthly data on the number of Thai (Y_1) and foreign (Y_2) tourists traveling to Chiang Mai from January 2014 to December 2023 as dependent variables.

2. Collect meteorological factors including rainfall, temperature, PM10 and PM2.5 levels, seasons, and economic factors including exchange rates of the US dollar, South Korean won, and Chinese yuan, global crude oil prices, the occurrence of pandemics like COVID-19, the number of injuries and fatalities from road accidents, and the number of road accidents in Chiang Mai as independent variables.

3. Perform data analysis using Multiple linear regression, Poisson regression, and Negative binomial regression methods.

4. Compare the predictive performance of the models obtained from the three methods using RMSE, MAPE, AIC and BIC.

Conclusion

The results show that:

- The most efficient model for predicting the number of Thai tourists (Y_1) is the negative binomial regression, with the key factors being temperature, US dollar exchange rate, Chinese yuan, crude oil price, and COVID-19 outbreak.
- The most efficient model for predicting the number of foreign tourists (Y_2) is the Poisson regression, with the key factors being accumulated rainfall, temperature, PM10 and PM2.5 dust, currency exchange rates, crude oil price, COVID-19 outbreak, road accidents, and season.

References

- Porrpirun Pun-on. (2021, May - June). Factors Affecting the Number of Tourists in the Upper Northern Region of Thailand. Journal of Modern Learning Development, 6(3): 298 – 311.
- Srisakul Puangthongtip. (2009). Factors Affecting the Number of UK Tourists Traveling to Thailand. Master's Thesis in Economics, Ramkhamhaeng University, Bangkok.

Result from the analysis of Y_1

- The best model is the one from Negative binomial regression, which is:

$$\ln(\hat{y}_1) = 13.135 - 0.068temp + 0.132exrateUSD - 0.604exrateCNY + 0.005crude - 0.254Covid19$$

- The estimated coefficients of the independent variables used in the forecasting model for the dependent variable Y_1 shown as follow.

	Estimate	Std.Error	Z value	p-value
Intercept	13.135	0.876	14.99	$< 2 \times 10^{-16}$
temp	-0.068	0.017	-4.025	5.07×10^{-5}
exrateUSD	0.132	0.336	3.924	8.72×10^{-5}
exrateCNY	-0.605	0.197	-3.075	0.002
crude	0.005	0.002	2.378	0.017
Covid19	-0.254	0.096	-2.621	0.009

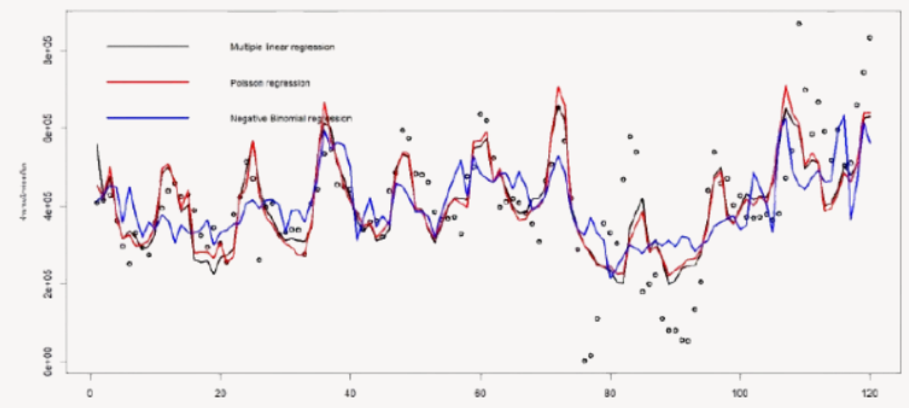

Fig 1: Observed (black dots) and predicted of Y_1 values

Result from the analysis of Y_2

- The best model is the one from Poisson regression, which is:

$$\ln(\hat{y}_2) = 8.854 - (7.263\times10^{-4})precipitation - (1.629\times10^{-2})temp - (2.81\times10^{-2})pm10 + (1.068\times10^{-2})pm2.5 + 0.332exrateUSD - (1.261\times10^{-2})exrateKRW - 0.781exrateCNY + (9.45\times10^{-2})crude - 1.849Covid19 - (5.614\times10^{-3})Numinjured - (4.623\times10^{-3})Numroadacc + (9.927\times10^{-2})season_{winter} + 0.109season_{summer}$$

- The estimated coefficients of the independent variables used in the forecasting model for the dependent variable Y_2 shown as follow.

	Estimate	Std.Error	Z value	p-value
Intercept	8.854	7.954×10^{-3}	1113.15	$< 2 \times 10^{-6}$
precipitation	-7.263×10^{-4}	3.137×10^{-6}	-213.54	$< 2 \times 10^{-6}$
temp	-1.629×10^{-2}	1.311×10^{-4}	-124.7	$< 2 \times 10^{-6}$
pm10	-2.81×10^{-2}	3.942×10^{-5}	-71.3	$< 2 \times 10^{-6}$
pm2.5	1.068×10^{-2}	4.631×10^{-5}	230.64	$< 2 \times 10^{-6}$
exrateUSD	0.332	2.344×10^{-4}	1417.78	$< 2 \times 10^{-6}$
exrateKRW	-1.261×10^{-2}	0.246	-216.46	$< 2 \times 10^{-6}$
exrateCNY	-0.781	1.456×10^{-3}	-536.52	$< 2 \times 10^{-6}$
crude	9.45×10^{-2}	1.725×10^{-5}	547.91	$< 2 \times 10^{-6}$
Covid19	-1.849	1.031×10^{-3}	-1793.21	$< 2 \times 10^{-6}$
Numinjured	-5.614×10^{-3}	4.792×10^{-5}	-117.14	$< 2 \times 10^{-6}$
Numroadacc	-4.623×10^{-3}	8.759×10^{-5}	-52.78	$< 2 \times 10^{-6}$
$season_{winter}$	9.927×10^{-2}	8.642×10^{-4}	114.87	$< 2 \times 10^{-6}$
$season_{summer}$	0.109	8.426×10^{-4}	-536.52	$< 2 \times 10^{-6}$

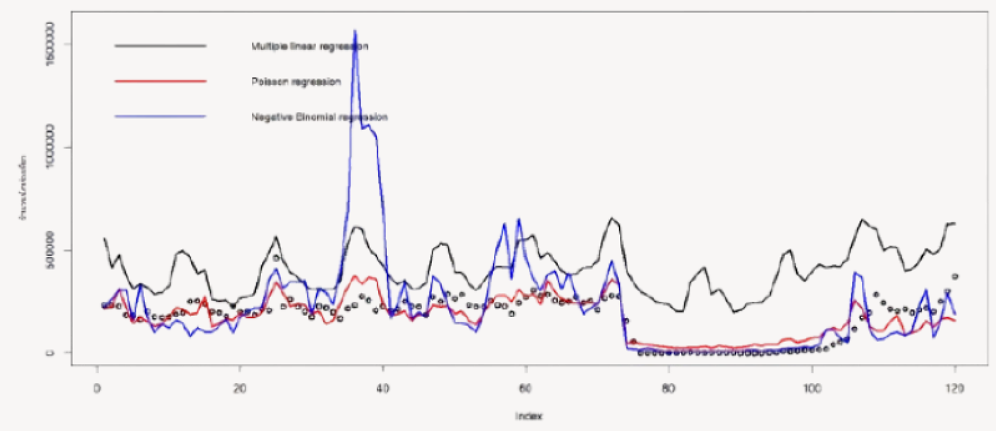

Fig 2: Observed (black dots) and predicted of Y_2 values