Investigating Flight Delay Delay Patterns on China-Austria International Routes

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# Abstract

Flight delays pose a challenge in the global aviation transportation system, particularly on long-haul international routes, where delays can propagate through airport networks and affect overall operational efficiency. Existing studies mainly focus on identifying static or individual airport delay patterns, but neglecting the complex nonlinear dynamics involved. This study focuses on international flight routes between China and Austria, selecting six major international hub airports: Shanghai Pudong Airport (PVG), Guangzhou Baiyun Airport (CAN), Beijing Capital International Airport (PEK), Vienna International Airport (VIE), Salzburg Airport (SZG), and Munich Airport (MUC). By employing GIS spatial analysis methods, this study investigates the spatial distribution characteristics of flight delays and their influencing factors. Spatial autocorrelation analysis (Moran’s I) is used to assess the clustering effects of flight delays in geographic space, identifying airports with high delay rates and their spatial correlation patterns. Second, spatial regression models, including the Spatial Autoregressive Model (SAR), Spatial Error Model (SEM), and Spatial Durbin Model (SDM), are constructed to analyze the impact of factors such as weather conditions, airport capacity, and airspace control on flight delays. By applying spatial analysis methods, this study uncovers the geographic characteristics of international flight delays, providing valuable insights for airlines in optimizing flight scheduling and for governments in formulating airspace management policies to enhance on-time performance and passenger travel experience with maps.

# Keywords

Flight delay; International airports; GIS spatial analysis; Spatial regression model; Flight network; China-Austria routes