Chapter 5
Critical Review and Analysis of Air-Travel Demand: Forecasting Models

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ABSTRACT
Demand forecasting may be the most critical factor in the development of airports and airline networks. This chapter reviews various approaches used to forecast air travel and airport demand forecasting. It classifies existing methods according to the modeling approach used to evaluate the available data; then, the forecasting approaches are viewed in relation to data requirements. Finally, a new matrix classification scheme is introduced that combines both the data available and the technique used to evaluate this data in a more concise and manner.

INTRODUCTION AND BACKGROUND
Air transportation is a mode in which demand increases continuously at a significant, yet highly variable rate. It is thus very hard to estimate the magnitude of demand at future points in time, no matter how critical this might be for a number of components of the air transportation industry. One of the most important components of the overall air transportation system is the airports. Airports have developed over the years to become huge and very costly projects that provide the basis for a country’s financial development. It is estimated that the passenger terminal component of an airport can be as expensive as US $200 million, which was the cost of the new International Terminal Building (ITB) for Sydney, amounting to US $25 million per gate. It is obvious that the need for adequate forecasting in such a capital-intensive industry is of critical importance.

Besides the terminal area configuration a planner is required to provide valid forecasts for facilities on the airside of an airport (Figure 1). Such facilities are the gates, the aprons, and the runaways. Forecasts of this type are not based on passenger traffic, but rather on total aircraft movement for the airport. A combination of the previous two types of forecasts and a breakdown of these numbers will
also be required to ensure an effective design of facilities such as the ground access system (rail, transit, highway), and the parking lots.

Forecasting is also very important for the economic development of the airlines, through the fleet development process. Airline fleets have grown significantly in the last few decades, and orders for commercial transport aircraft have reached an all time high, with delivery dates now backed up into the mid-1990’s for some aircraft types. Economic implications and stringent environmental (noise) regulations for the subsonic jet aircraft has led airlines and aircraft manufacturers to search for new ways to develop their fleets in order to make them more competitive. Future fleet development has an important role in the design of terminals, since the aircraft size is critical to some geometric characteristics such as the main deck elevation and the lateral clearance at gates due to aircraft wing span.

Even though the maximum size of aircraft is not expected to grow much beyond 500-seats in the next decade, aircraft of smaller size such as jet aircraft of 50-70 seats are developed to serve some local markets. This down-sizing, combined with the deregulation that provides for a larger number of airlines, will congest the air space more than even before. It is thus critical to be able to forecast the air traffic requirements in order to better plan and develop the new air traffic control system.

It is evident that the forecasting process can be the most critical factor in the development of the airport. Mistakes made in this phase of the process can be very costly and damaging for local economies. Underestimating demand can lead to increased congestion, delay, and lack of storage facilities, as it happened in Venezuela in 1974. The discovery of oil resulted in a dramatic and unforeseen increase of the freight volumes handled by the Caracas airport. The planned storage facilities were insufficient to handle this increased demand, and so the cargo was stored in areas where it was either destroyed or stolen. Overestimating demand could also create significant problems. Forecasts of passenger demand for the Newark airport were so high that the newly constructed airport remained empty for a number of years.

The purpose of this chapter is to review the various approaches used to forecast air travel and airport demand forecasting. The chapter begins