(IV－18) A Demand and Cost Analysis of Civil Aviation in Bangladesh

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1. Introduction: For the rapid technological advancement in seventies and deregulation act in 1978, air travel demand has experienced dramatic changes in last two decades. The volume of air passenger is expected to increase further with increased industrialization and economic development. Continued traffic growth creates a need for effective longer range advance planning and requires a coordinated approach for design, development and operation of future airports. Air transportation plays a very important role in the development of a country. Its importance in Bangladesh has increased with the privatization of domestic air transportation market. For the planning and management of air transport operators and improvement of the facilities and services, and for assessing the causes of performance breakdowns in existing systems, it is needed to understand the demand and cost structure under present and future conditions. The analysis consists two types of demand models and supply models for different air transport operator.

2. Demand Model: The demand model relates travel demand with a few explanatory variables, which include socio-economic, demographic and transportation system variables. The zone of influence of each airport, identified through inflight passenger survey (Stabaek 1983) has been allocated very carefully and is varied for different airports (maximum radius of the zone of influence is considered to be 50 km). Thc values of the variables are measured on the basis of influence zone. Selected variables' are used by 'City-pair' mode] (Kanafani 1983) and parameters of various variables are estimated by stepwise multiple linear regression which is performed in two sets of variables, one set contains population (P), GDP (G), distance ratio (R) and dummy variable (X) and another set contains employment (E) instead of GDP. This is because GDP and employment arc highly correlated. Two models are developed considering distance ratio in one model and generalized cost ratio (F) in thc other model. These demand model estimates the demand for air travel based on 'city-pair model' by the following equation-

$$T_{ij} = e^{a} (P_{ij})^{b} (E_{ij})^{c} (R_{ij})^{d} (X_{ij})^{e} (G_{ij})^{f} (F_{ij})^{g}$$

Figure 1: Effect of Change of Variables on Air Travel Demand

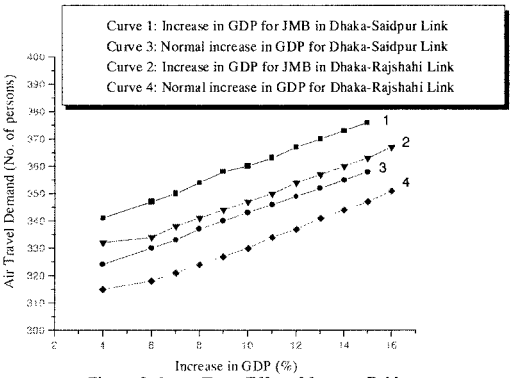


Figure 2: Long Term Effct of Jamuna Bridge

For air transportation in Bangladesh, all the trips are originated from Dhaka and remains constant which can be eliminated from the models. Therefore. socio-economic variables included in the analysis are the property of the destinations only. The models are calibrated using cross sectional and panel data. Statistical results of the analysis are high]y significant and successfully demonstrate the application of the models (Figure 1). In all the models, population is thc most dominant variable (98% confidence level) compare to other variable like employment (95%) and GDP (90%). Thc dummy variable accounting for two special routes are highly significant in all thc models which justifies the inclusion of this variable in thc model. Results also show that inclusion of generalized cost ratio improved the statistical results (confidence level improved 65% to 85%). The demand elasticity of these variables are 1.98% (average), 1.2% and 1.08% with respect to population, employment and GDP respectively. The introduction of employment variable instead of GDP appears to bc slightly less attractive alternative. Predicted demand deviates less than 20% from observed demand. For the application of the models Jamuna Bridge (JB) effect on air travel demand are presented in the analysis. Short term effect of JB in two corridors will reduce the demand by about 10-11% which close to the actual effect (12-15%). Thus the demand models can predict the air travel demand successfully. In long term effect of JB (Figure 2) will compensate this decrease in demand increasing the GDP of these regions due to positive effects of JB.

Model 1(Employment Model)

Parameter	Value	t-value
Y-Intercept	-0.409	-0.458
Population	1.866	3.086
Employment	1.246	2.275
Distance Ratio	0.245	0.927
Dummy	2.634	10.559
G	-0.336	-1.437

R-Square 0.96058 Root-MSE(SD) 0.2453
Adj. R-Square 0.95452 Sample Size 31

Table 1: Statistical Results of Regression Analysis

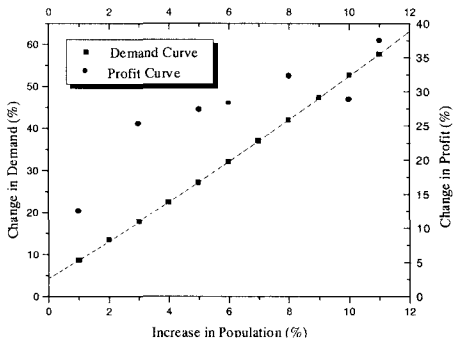
3 Supply Model The supply model highlights the difference of management efficiency between private sector and government sector (Biman) airline companies describing the different aspects of the cost and level of service by which such needs might bc meet; focusing on thc influence by transportation technology, by the operating policies of the system, and by the level and nature of carrier and traffic using the system. Two different supply models are developed for different types of operator. Both fixed and variable cost is incorporated in the models. Load factors are considered in such way that output of the cost functions gives so-called famous stepwise change in profit or revenue. Several cost functions have been

developed to ascertain the relationship between the dependent variable (Fare) and a set of principal cost elements which include operating cost, capital cost, contingency cost etc. Cost functions are based on nine principals cost element along with twenty-two secondary cost elements. Airfare depends directly on the cost recovery scheme used by the airline providing the service and is influenced by regulation and market characteristics.

Corridor Used	Adm. Cost	Main. Cost	Aviation Charges	Run. Cost	Capital Cost	Market. Cost	Contin. Cost	Procure. Cost	Profit
DAC-CHI	1.6	1.37	1.23	1.16	1.04	1.15	1.17	1.23	-3.46
DAC-ZYL	1.58	1.31	1.23	1.19	1.07	1.11	1.22	1.21	+.01
DAC-JSR	1.66	1.39	1.23	1.21	0.98	1.16	1.19	1.14	-2.38
DAC-SPD	1.88	1.56	1.19	1.03	1.14	1.19	1.06	1.09	-1.46
DAC-RJH	1.89	1.57	1.19	1.39	1.28	1.21	1.26	1.25	-1.16
DAC-CXB	1.93	1.44	1.24	1.04	1.11	1.11	1.08	1.09	+0.26
DAC-BZL	1.51	1.14	1.24	1.04	1.03	1.12	1.41	1.23	-1.36
Notes:1) DAC(Dhaka), ZYL(Sylhet), JSR(Jessore), SPD(Saidpur), RJH(Rajshahi),CXB(Cox's-Bazar), BZL(Barisal). 2) All the values are expressed in terms of a ratio (=Biman's cost /Private airlines cost)									

Table 2: Performance Comparison between the Two Types of Operator

Results of the cost functions clearly show that the performance of private airlines is better than Biman both in financial and managerial sector. Expenditure of Biman is 25-30% higher than private airline (Table 2). For both types operator, most important cost elements are running cost (39% of total cost), capital cost (33%) and maintenance cost (19%). Fixed portions of the airline cost elements are relatively high compare to other modes of transport. Biman uses relatively larger



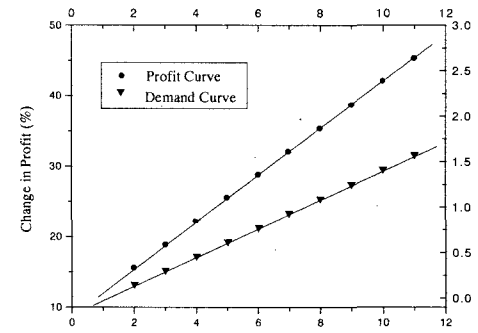


Figure 3 and 4: An Example of Changes in Demand and Profit Due to Change in Socio-economic Parameters and Cost Element

aircraft for small domestic air demand market which is one of main reason for Biman's revenue losses. Biman's fare level are also 10-25% lower than of private airlines. Successful calculation of Biman's revenue loss (deviate only 10-15%) proves the validity of the model. Impacts of various cost elements on demand and profit are presented in the analysis demand (Figure 3 and 4). Elasticity results show that profit changes rapidly with the change in fare level, fuel price and running and maintenance cost compare to travel. Thus the supply model can successfully predicts various effect on profit with corresponding demand.

4. Conclusion: The findings of this study can be used to improve the air transport system with an effective use of limited facilities, to aid the management of various airlines in developing the guidelines for operating in domestic routes and to help the planning and design of future infrastructure development of air transportation system in Bangladesh. Proper development of air transport system will be able to establish new international aviation system (like Hub-Spoke systems) in Bangladesh which will effect the entire South Asian air transport system.

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