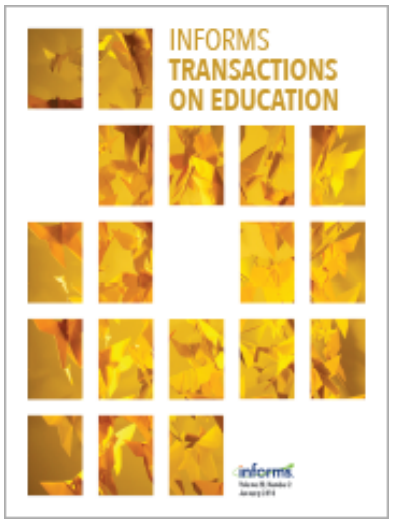

INFORMS Transactions on Education

Publication details, including instructions for authors and subscription information:
http://pubsonline.informs.org

Case—Flight Delays at RegionEx

Amr Farahat, Susan E. Martonosi,

To cite this article:
Amr Farahat, Susan E. Martonosi, (2011) Case—Flight Delays at RegionEx. INFORMS Transactions on Education 11(3):103-105.
https://doi.org/10.1287/ited.1110.0066cs

Vol. 11, No. 3, May 2011, pp. 103–105
ISSN 1532-0545 | 11 | 1103 | 0103
INFORMS Transactions on Education

DOI 10.1287/ited.1110.0066cs

Case

Flight Delays at RegionEx

Amr Farahat
Johnson Graduate School of Management, Cornell University, Ithaca, New York 14853, aaf33@cornell.edu
Susan E. Martonosi
Department of Mathematics, Harvey Mudd College, Claremont, California 91711, martonosi@math.hmc.edu

Key words: exploratory data analysis; Simpson's paradox; airline flight delays; cases; developing analytical skills; teaching decision analysis; teaching statistics
History: Received: June 2010; accepted: November 2010.

1. Introduction

Marion Volero, flight operations manager at RegionEx Airlines, did not know what to tell her Chief Operations Officer (COO) Robert Rohan. The Federal Aviation Administration (FAA) had released to the media the September airline flight delay rankings, which showed RegionEx ranked below their most important client, MississippiDelta Airlines (MDA), despite their best efforts to improve turnaround times at airports. Robert had forwarded to Marion the following e-mail from MDA's COO Jane Lente:

> Robert Rohan
> COO, RegionEx Airlines
> October 3
> Dear Robert:
>
> As you are no doubt aware, the FAA has released its monthly commercial airline flight delay statistics, which show RegionEx ranked worse than MDA in percentage of delayed flights for September. Moreover, RegionEx's average flight delay in minutes is significantly greater than that of MDA. As outlined in your regional carrier service contract with MDA, you are required to maintain on-time performance comparable to, if not exceeding, that of MDA. Flight delays on RegionEx flights translate into delays for MDA customers. If you are unable to demonstrate that your arrival delays are within the limits established by your service contract, then MDA will be forced to re-evaluate its contractual agreements with RegionEx. We trust that you will treat this matter with the utmost urgency to maintain the mutually beneficial relationship MDA and RegionEx have shared over the past decade.
>
> Warm regards,
> Jane Lente
> COO, MississippiDelta Airlines

RegionEx was at risk of losing MDA as a client unless they could figure out what was causing their poor apparent on-time performance.

2. RegionEx and MDA

RegionEx, a small regional airline, is a contracted regional carrier for MDA, a major U.S. airline. In the airline industry, major airlines often contract smaller regional airlines to provide service on short-haul routes. RegionEx provides regional jet service between MDA's hub in New Orleans and smaller airports in the southeastern United States. MDA is RegionEx's largest client, accounting for more than half of RegionEx's revenue.

MDA has been plagued by allegations from the media over the past year that their quality of service and, in particular, their flight delay record, is abominable. Although flight delay data reported by the FAA differentiates between flights operated by the major carrier and flights operated by contracted regional carriers, in the customer's mind, no such distinction is made. A customer flying from Pensacola to San Antonio via New Orleans, who purchases a ticket on MDA, often does not realize that the Pensacola to New Orleans leg is operated by RegionEx and not by MDA itself. A delay on that leg that results in a missed connection in New Orleans gets marked in the customer's mind as a delayed MDA flight, regardless of how it is counted by the FAA. MDA relies heavily on regional carriers over whose flight operations it has only limited oversight. Therefore, MDA has been putting pressure on its regional carriers, including RegionEx to improve their on-time performance or risk losing MDA as a client.

When the September FAA flight delay data showed RegionEx ranked worse than MDA in flight delays, RegionEx knew it had some explaining to do.

3. Airline Performance Measures

One aspect of an airline's quality of service is its on-time performance. Each flight falls into one of four categories: delayed, diverted, cancelled, or on time. The FAA defines a flight to be *delayed* if it arrives at its scheduled destination 15 or more minutes later than its scheduled arrival time. Flights can also be *diverted* to another airport, or *cancelled*. A flight that arrives at its scheduled destination within 15 minutes of its scheduled arrival time (that is, a flight that is not delayed, diverted, or cancelled) is considered *on time*. Two commonly used metrics to assess airline performance are: (1) the percentage of scheduled flights that were delayed and (2) the percentage of scheduled flights that arrived on time. Another metric is the average arrival delay in minutes of an airline's flights.

In addition to these metrics, other factors related to flight delays affect customers' perceptions of an airline. For instance, a delay on the first leg of a two-leg flight is often a more serious problem than a comparable delay on the second leg, because it could result in a missed connection, forcing the customer to wait until the next available flight. Another consideration is that two different airlines might schedule two different durations for the same route, which could affect their apparent on-time performance.

4. RegionEx's Network

To simplify the problem, Marion Volero decided to compare RegionEx's and MDA's performance on the four most important of RegionEx's routes: New Orleans (MSY) to/from Pensacola (PNS), and New Orleans (MSY) to/from Dallas-Fort Worth (DFW). Between New Orleans and DFW, RegionEx operates three flights in each direction daily, while MDA operates only one. Between New Orleans and Pensacola, both carriers operate one flight in each direction daily. Pensacola is a relatively uncongested airport, New Orleans experiences moderate congestion, and DFW is a heavily congested airport.

5. The Data

Marion needed to take a quick look at some data before her afternoon meeting with COO Rohan. She downloaded the publicly available September flight statistics from the FAA website and cleaned the data, focusing only on the four main routes. (This data set is in the Excel file StudentData_RegionEx.xlsx; an excerpt and description is provided in the appendix). For each flight, the scheduled departure and arrival times and the actual arrival times are given. Also given are the delay of each flight, defined as actual arrival time minus scheduled arrival time, and a column of indicator values that equal 1 if the corresponding flight arrived more than 15 minutes late and 0 if it did not. Negative delays correspond to flights that arrived earlier than scheduled. Additional information includes the number of passengers on each flight, a code indicating on which day of the week the flight was scheduled, and a code for the route flown.

Marion is sitting in her office examining the spreadsheet, wondering whether the flight delay rankings as reported in the news tell the whole story.

Supplementary Material

Files that accompany this paper can be found and downloaded from http://ite.pubs.informs.org/.

Appendix. Description of the Data

Figure A.1 shows the first 10 rows of the case data set. Each row corresponds to a flight flown by one of the two airlines in the three-airport four-arc network described above.

Airline: This column contains "RegionEx" if the flight was flown by RegionEx, and "MDA" if it was flown by MDA.

Origin airport: This is the official airport code for the origin of the flight. DFW = Dallas-Fort Worth, MSY = New Orleans, PNS = Pensacola.

Destination airport: This is the official airport code for the destination of the flight.

Departure date: The date on which the flight departed. All flights took place during September.

Figure A.1 The First 10 Records in the Data Set

	A	B	C	D	E	F	G	H	I	J	K	L
1	Airline	Origin airport	Destination airport	Departure date	Scheduled departure time	Scheduled arrival time	Actual arrival time	Arrival delay in minutes	Delay indicator	Day of week	Route code	Number of passengers
2	RegionEX	DFW	MSY	9/1/2008	9:10	10:40	11:00	20	1	2	1	176
3	RegionEX	DFW	MSY	9/1/2008	13:10	14:40	15:00	20	1	2	1	192
4	RegionEX	DFW	MSY	9/1/2008	18:10	19:40	19:58	18	1	2	1	174
5	RegionEX	DFW	MSY	9/2/2008	9:10	10:40	10:50	10	0	3	1	88
6	RegionEX	DFW	MSY	9/2/2008	13:10	14:40	14:51	11	0	3	1	99
7	RegionEX	DFW	MSY	9/2/2008	18:10	19:40	19:50	10	0	3	1	109
8	RegionEX	DFW	MSY	9/3/2008	9:10	10:40	10:49	9	0	4	1	94
9	RegionEX	DFW	MSY	9/3/2008	13:10	14:40	14:49	9	0	4	1	104
10	RegionEX	DFW	MSY	9/3/2008	18:10	19:40	19:49	9	0	4	1	105

Scheduled departure time: This is the time at which the flight was scheduled to depart its origin airport, on a 24-hour clock (e.g., 6:10 = 6:10 A.M., and 18:10 = 6:10 P.M.). All flights in this data set occur in the same time zone. There are no overnight flights in this data set.

Scheduled arrival time: This is the time at which the flight was scheduled to arrive at its destination airport.

Actual arrival time: This is the time at which the flight actually arrived at its destination airport, unless it is marked "Cancelled" or "Diverted" (Note: there are no diverted flights in this data set.)

Arrival delay in minutes: This is the difference between the actual arrival time and scheduled arrival time. Negative delays correspond to flights arriving earlier than scheduled. Cancelled flights are assigned the value "N/A" in this field.

Delay indicator: This assigns a value of 1 to any flight with an arrival delay of at least 15 minutes, and 0 to flights with an arrival delay less than 15 minutes. Cancelled flights are assigned the value "N/A" in this field.

Day of week: This provides the day of the week corresponding to the flight date. 1 = Sunday, 2 = Monday, ..., 7 = Saturday.

Route code: This is a code corresponding to each flight's Origin/Destination pair. 1 = DFW/MSY, 2 = MSY/DFW, 3 = MSY/PNS, 4 = PNS/MSY.

Number of passengers: For RegionEx flights only, the number of passengers on each flight is provided.