AIR TRAFFIC IN EUROPE

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Summary: Demand in air traffic, which can be described by indicators such as Revenue Passengers Carried or Passenger Load Factor, is variable during a year. This article shows seasonal indexes for different airlines.

Key words: air traffic, Europe, seasonal indexes

INTRODUCTION

People are used to use an air traffic for their travel and the tendency for travel in air is greater and grater every year. Distribution of passengers during a year isn't equal. It is possible to suppose that in summer months there can be higher demand for air traffic due to holidays, which a lot of people want to spend in foreign and for which journeys they use air traffic.

1. AIRLINES AND AEA

European airlines are part of the Association of European Airlines (AEA), where are 36 major airlines. Some of these airlines have much more passengers than others. This is shown on Picture 1, below.

70 % of revenue passenger-kilometres flown (RPK) is given by few airlines. They are:

- Lufthansa (17 % in March 2011)
- Air France (16 %)
- British Airways (14 %)
- KLM (10 %)
- Iberia (7 %)
- Turkish Airlines (6 %)

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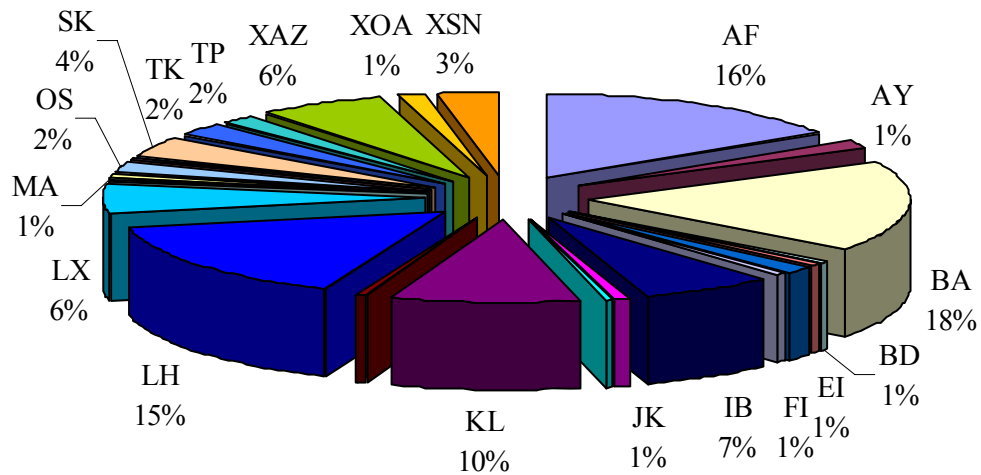
Source: AEA, Author

Fig. 1 – Revenue Passenger-Kilometres Flown - shares of airlines in March 2001
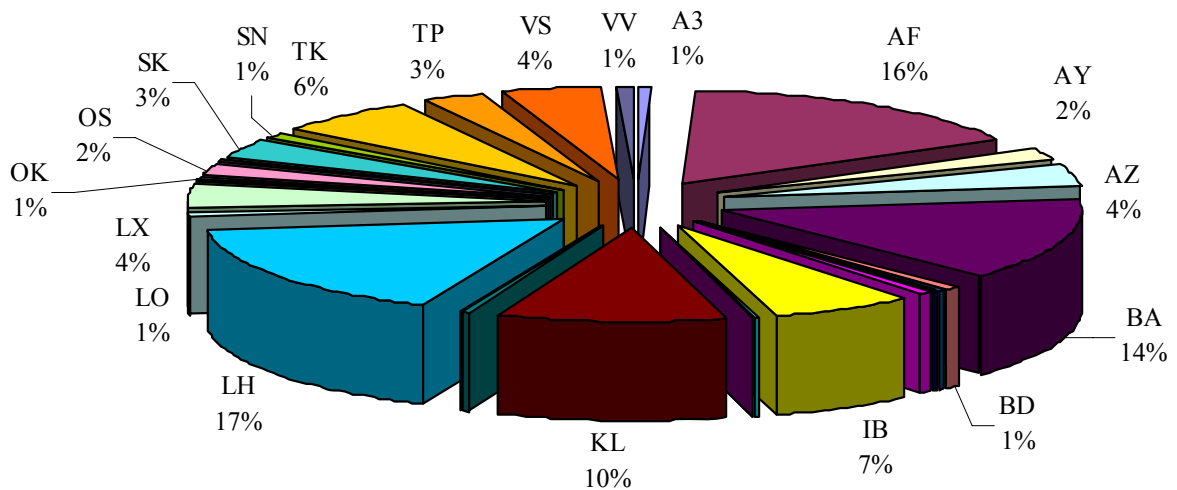
Source: AEA, Author

Fig. 2 – Revenue Passenger-Kilometres Flown - shares of airlines in March 2011

Legend

A3 - Aegean Airlines	LX - SWISS
AF - Air France	OK - Czech Airlines
AY - Finnair	OS - Austrian
AZ - Alitalia	SK - SAS Scandinavian Airline
BA - British Airways	SN - Brussels Airlines
BD - bmi	TK - Turkish Airlines
IB - Iberia	TP - TAP Portugal
KL - KLM	VS - Virgin Atlantic Airways
LH - Lufthansa	VV - Aerosvit
LO - LOT	

(Only airlines with 1% or more are shown on the pictures).

There are not many differences from 2001 to 2011 in these shares, only British Airways lost their leading position from 2001. In this year (2011) the leader is Lufthansa.

2. SEASONABILITY IN AIR TRAFFIC

2.1 Characteristics used for research

For this research I used three characteristics:
- PRK - Revenue Passenger-Kilometres Flown
- LF – Passenger Load Factor
- PAX - Revenue Passengers Carried

Values of these characteristic is given in AEA, monthly, from 1999 to 2010. For research about seasonal indexes, the time series had to be cleansed from variability of the length of month, because months during a year do not have the same amount of days. This could be done by formula

$$y_t^* = y_t \frac{\frac{365}{12}}{k_t} \tag{1}$$

y_t value of a quantity
k_t number of day in the month,
y_t^* cleansed value of a quantity

2.2 Revenue Passenger-Kilometres Flown

F-test, shown below, gives us answer, if there is statistically significant seasonability.

$$F = \frac{\dfrac{m\sum_{j=1}^{r}(\bar{y}_{.j} - \bar{y})^2}{r-1}}{\dfrac{S_R}{(r-1)(m-1)}} \tag{2}$$

$$S_R = \sum_{i=1}^{m}\sum_{j=1}^{r}(y_{ij} - \bar{y})^2 - r\sum_{i=1}^{m}(\bar{y}_{i.} - \bar{y})^2 - m\sum_{j=1}^{r}(\bar{y}_{.j} - \bar{y})^2 \tag{3}$$

m number of years
r number of month in one year
$\bar{y}$ average value
$\bar{y}_{i.}$ average annual value
$\bar{y}_{.j}$ average monthly value

Calculated value is compare with critical value from statistical tables. For this case, the value from tables is 2,978, if we are willing tolerate 5 % mistake. If the calculated number is higher than 2,978, we can say that there is significant seasonability.

In the table below there are calculated values of F-test for chosen airlines, which are the biggest in Europe, and for Czech Airlines.

Tab. 1 – Values of F-test, RPK

Airlines	F test value
Air France	41,49
British Airwayvs	29,86
Czech Airlines	71,19
Iberia	55,03
KLM	44,99
Lufthansa	82,29
SAS	93,83
Turkish Airlines	57,35

Source: Author, AEA

Table 1 shows, that in each of researched airlines there is statistical significant seasonability.

Calculation of seasonal indexes is based on multiplicative model of time series

$$Y_T = T_t \cdot S_T \cdot E_t \tag{4}$$

T_t trend

S_t seasonability

E_t random component

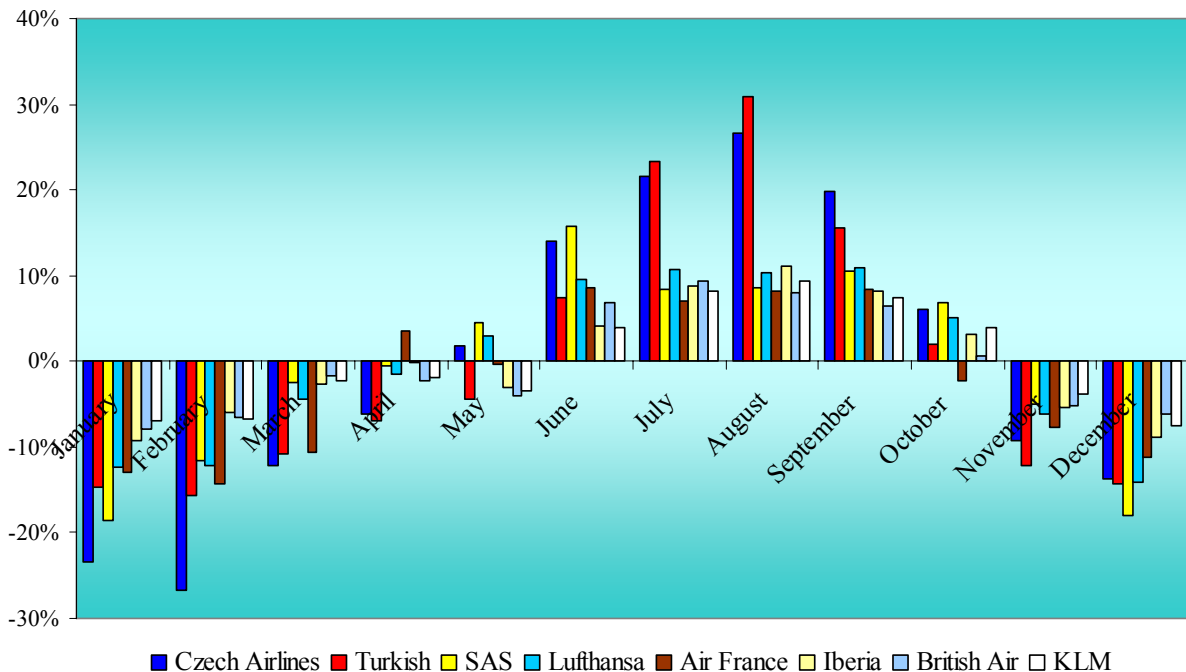Trend was aligned by centred running average. Results are given in table 2.

Tab. 2 – Seasonal (monthly) variation of RPK

	Czech Airlines	Turkish	SAS	Lufthansa	Air France	Iberia	British Air	KLM
January	-23,4%	-14,6%	-18,6%	-12,4%	-13,0%	-9,2%	-7,8%	-6,9%
February	-26,8%	-15,6%	-11,6%	-12,1%	-14,3%	-5,9%	-6,6%	-6,7%
March	-12,2%	-10,9%	-2,4%	-4,5%	-10,7%	-2,7%	-1,7%	-2,3%
April	-6,1%	-7,0%	-0,5%	-1,5%	3,6%	-0,2%	-2,2%	-1,9%
May	1,8%	-4,4%	4,5%	2,9%	-0,4%	-3,1%	-4,0%	-3,4%
June	14,1%	7,4%	15,8%	9,5%	8,6%	4,2%	6,9%	3,9%
July	21,6%	23,3%	8,4%	10,7%	7,1%	8,7%	9,3%	8,2%
August	26,6%	30,9%	8,6%	10,4%	8,2%	11,2%	8,1%	9,4%
September	19,8%	15,5%	10,5%	11,0%	8,4%	8,2%	6,4%	7,4%
October	6,0%	1,9%	6,8%	5,1%	-2,3%	3,1%	0,6%	3,9%
November	-9,2%	-12,1%	-4,9%	-6,2%	-7,7%	-5,3%	-5,2%	-3,8%
December	-13,8%	-14,2%	-18,0%	-14,1%	-11,1%	-8,8%	-6,1%	-7,5%

Source: Author, AEA

The highest variability is in Czech Airlines (difference between maximum and minimum is 53 %) and in Turkish Airlines (46 %).

From November to April in almost every airlines there is decrease of Revenue Passenger-Kilometres Flown, increase is in summer month such as June, July, August and even September.

Fig. 3 – Seasonal (monthly) variation of RPK

Source: AEA, Author

2.3 Passenger Load Factor

The same procedure was used for the other two characteristics.

Tab. 3 – Values of F-test, LF

Airlines	*F* test value
Air France	21,93
British Airwayvs	39,89
Czech Airlines	40,9
Iberia	38,33
KLM	47,3
Lufthansa	37,33
SAS	78,95
Turkish	22,01

Source: Author, AEA

Results of *F*-test (tab. 3) confirm seasonability for load factor in watched airlines.

Tab. 4 – Seasonal (monthly) variation of LF

	SAS	Czech Airlines	Turkish Airlines	British Airways	Iberia	Lufthansa	KLM	Air France
January	-11,8%	-11,1%	-5,7%	-7,1%	-6,5%	-5,3%	-4,0%	-3,4%
February	-8,0%	-9,3%	-6,0%	1,0%	-3,1%	-4,9%	-3,5%	-3,1%
March	-1,3%	-2,4%	-2,7%	-2,0%	-0,4%	0,3%	0,0%	0,6%
April	-1,3%	-3,3%	-2,0%	1,2%	0,1%	-1,5%	-0,7%	0,2%
May	0,5%	-1,0%	-0,3%	-6,2%	-2,7%	0,3%	-3,0%	-2,1%
June	9,2%	4,2%	3,5%	6,5%	2,9%	3,9%	1,8%	2,6%
July	11,9%	8,5%	7,1%	4,9%	5,3%	4,1%	4,6%	4,6%
August	5,2%	12,1%	11,2%	4,2%	6,8%	4,2%	5,4%	3,7%
September	4,4%	9,0%	6,2%	5,8%	4,6%	5,0%	4,6%	1,4%
October	1,3%	2,0%	1,9%	-1,8%	2,0%	1,5%	2,4%	0,3%
November	-5,5%	-4,5%	-5,5%	-2,6%	-3,3%	-2,6%	-3,3%	-2,5%
December	-5,2%	-5,9%	-6,7%	-4,5%	-5,7%	-4,8%	-4,1%	-2,1%

Source: Author, AEA

In this time the variability is highest in SAS (23,7 %) and also in Czech Airlines (23,2) . SAS has highest increase in July (11,9 %), Czech Airlines in August (12,1 %). The lowest number of load factor is for almost every airlines in January, except Turkish Airlines and KLM, where it is in December.

2.4 Revenue Passengers Carried

Table 5 shows that there is also seasonability for revenue passengers carried.

Tab. 5 – Values of F-test, PAX

Airlines	*F* test value
Air France	45,30
British Airwayvs	53,45
Czech Airlines	67,64
Iberia	53,65
KLM	73,56
Lufthansa	52,46
SAS	56,63
Turkish	74,93

Source: Author, AEA

Tab. 6 – Seasonal (monthly) variation of PAX

	Turkish Airlines	Czech Airlines	SAS	Lufthansa	British Airways	KLM	Iberia	Air France
January	-15,5%	-21,5%	-16,8%	-15,3%	-14,1%	-13,0%	-14,4%	-10,5%
February	-15,8%	-20,8%	-7,4%	-10,7%	-8,2%	-9,7%	-5,9%	-8,2%
March	-14,4%	-10,2%	-0,8%	-4,6%	-6,0%	-4,8%	-3,7%	-3,2%
April	-5,3%	-4,7%	-1,1%	-1,5%	-3,0%	-1,4%	1,4%	-1,0%
May	-0,2%	2,5%	6,4%	4,3%	-1,2%	-0,8%	2,2%	-0,5%
June	8,3%	12,6%	14,8%	9,2%	8,7%	7,0%	7,5%	10,3%
July	18,6%	14,3%	-5,0%	7,2%	10,9%	8,9%	8,2%	9,4%
August	26,4%	16,0%	3,3%	3,9%	8,2%	8,6%	7,4%	2,3%
September	16,6%	17,6%	10,7%	13,1%	10,2%	10,4%	8,5%	6,5%
October	4,4%	7,9%	8,9%	7,1%	3,7%	6,9%	4,7%	2,6%
November	-10,5%	-6,1%	0,7%	-1,9%	-5,1%	-3,6%	-4,5%	-5,1%
December	-12,9%	-13,3%	-16,6%	-12,8%	-8,2%	-9,1%	-11,4%	-4,9%

Source: Author, AEA

Turkish Airlines (42 %) and Czech Airlines (39,1 %) has again the highest variation during a year. From November to April (somewhere to May) there is decrease of PAX, the highest increase are in August in Turkish Airlines (26,4 %), Czech Airlines in September (17,6 %) and in SAS in June (14,8 %). The interesting result is decrease in July in SAS, which means that in this month less passengers use SAS for their journeys.

3. CONCLUSION

This article confirms that air traffic is depending on weather and social habits, which are variable during a year. The "winter months" are time, when less passengers use air traffic that in months where people have their holidays (form June to September, sometimes even

Octcober). Airlines, where the variability is highest, are Turkish Airlines, SAS and Czech Airlines.

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