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TOURISM IN AZORES ISLANDS: PERSISTENCE IN THE MONTHLY ARRIVALS

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ABSTRACT

This study analyses the persistence in the international monthly arrivals to the Azores Islands using a model based on fractional integration and seasonal autoregressions. The estimated fractional differencing parameter gives an indication of the long run evolution of the series. We use both aggregate data and disaggregate monthly data by location of origin and island destination. The results show that the aggregate series corresponding to the total number of arrivals is a nonstationary I(d) process with d above 1, and the most persistent ones are those travelling to Säo Miguel, especially from Holland, Finland, Norway, Germany, Denmark and the UK.

Keywords: Monthly arrivals; Seasonal fractional integration; Persistence; Azores Islands.

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1. Introduction

This paper deals with the analysis of tourism in the Azores Islands. It examines the degree of persistence of the series corresponding to the number of monthly nights slept in Azores hotels, for the time period from January 2000 to December 2006. Both aggregate and disaggregated data are used according to the different island destination, nationality of the tourists, and crossing all these disaggregated data.

Modelling the degree of persistence in tourism data is important in that it can tell us how loyal tourists are to a particular tourist destination. Thus, in the event of an exogenous shock, different policy measures should be adopted depending on their degree of persistence. If the shock is positive and the series is mean reverting, strong measures must be adopted to maintain the series in a high level. On the other hand, if a shock is negative and the series contains, for instance, a unit root, the effect of that shock will be permanent, and again strong measures should be adopted to bring the series back to its original trend.

The motivation for the present research is, first, to analyse the characteristics of tourism demand for Azores Islands that recently emerged as tourism destination and that is ranked second in the best islands destination by the National Geographic Traveler magazine.

Second, we examine the univariate behavior of the series in terms of fractional integration and seasonal autoregressions to assess whether the series present a persistent pattern over time. Finally, we opt for fractional integration that identifies persistence in a continuous range between zero and one and not in the dichotomic range of zero and one as is the case in the standard time series methods.

The contribution of this paper to the literature lies in that we adopt fractional integration and seasonal autoregressions to analyze persistence in tourism arrivals in the

Azores Islands, which has not been the focus of such research. The seasonal component of each of the tourism series depending on the country of origin will also give us an idea of who are those tourists towards we should direct those policies oriented to reduce the seasonality (such as the creation of new winter products in those areas, etc.).

The outline of the article is as follows: Section 2 presents the contextual setting. Section 3 presents the literature revision. Section 4 briefly describes the main statistical features of the data. Section 5 presents the econometric model employed in the article. Section 6 is devoted to the empirical results, while Section 7 contains some concluding comments.

2. Contextual setting

Azores Islands is an archipelago of small Portuguese Islands in the middle of the Atlantic Ocean. Based on its geographical location and its natural beauty, Azores attracts nature oriented tourism to watch whales and dolphins; to walk around the island; to visit its lagoons and so on. It is considered an unspoiled tourism destination by the National Geographic Traveler magazine.

Tourism has reached Azores recently and is adopted as the main road to its development. As the islands were mainly rural oriented, this change for tourism resulted in hotels construction, a new quay for cruise and other tourism infra-structures. Comparing its tourism arrival with its sister Atlantic Islands of Madeira and Canary, Azores is an emerging tourism destination. Its location does not allow it to compete with the Canary and Madeira tropical beach and sun tourism orientation.

Figure 1: Azores islands

Figure 1 presents the Azores Islands in the middle of the Atlantic in the latitude of Lisbon. The relative position of Madeira and Canary islands also appears in the picture.

3. Persistence in tourism demand

An important feature observed in tourism time series data is the persistence in its behaviour (see, for example, Maloney and Montes Rojas, 2005; Bhattacharya and Narayan, 2005; Narayan, 2005). Maloney and Montes Rojas (2005) documented high levels of persistence on tourist flows from eight origin countries to 29 Caribbean destinations from 1990–2002. Narayan (2005) applied unit root tests to different tourism data and rejected the null hypothesis of unit root in all cases. Other papers also documented the persistence in volatility models of tourism demand (see, for example, Hoti, León and McAleer, 2006; Hoti, McAleer and Shareef, 2006 and Kim and Wong, 2006 among others).

The analysis of the persistence in time series has important policy implications since the effect of a given shock on a series is different depending on its univariate properties. When a series is stationary and mean reverting (i.e., $d < 0.5$), the effect of a given shock on it will have a transitory effect, disappearing its effect fairly rapid; if the series is nonstationary but mean reverting ($0.5 \leq d < 1$) the shock still will be transitory though it takes longer time to disappear completely, while it will be permanent if the series is nonstationary with $d \geq 1$. While the classical approach to study the stationarity of the series only allows for the I(1)/I(0) case, in this paper, tourism series are allowed to be I(d), where d can be any real number. The estimation of the parameter d for each of the tourism series we analyze here give us an idea of the persistence of each of the series, which will be related with the level of loyalty of the tourists. We believe that the disaggregated analysis of tourist arrivals depending on the country of origin may help policy-makers to know who are those potential tourists towards any marketing strategy will be more effective. The analysis of the destination of the tourists will also determine on which islands more promotion efforts should be directed in order to attract more tourists.

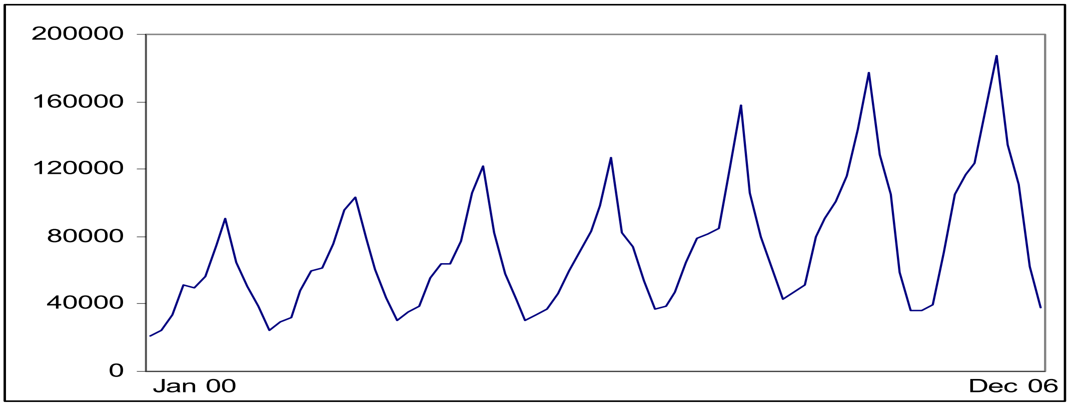
The fractional integration approach allows to identify the level of persistence of a series in a continuous way and therefore overcomes the restrictive view that traditional econometrics identify a series either persistent or non-persistent, but is unable to evaluate the middle term of the persistence level.

4. Descriptive results

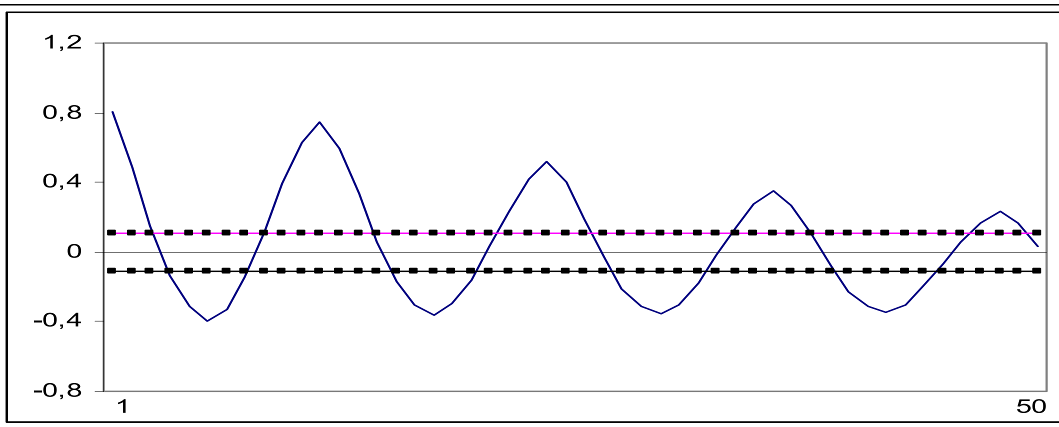
Figure 2 display the time series plot corresponding to the total number of arrivals in the Azores islands, monthly, for the time period January 2000 – December 2006. We clearly see a seasonal pattern and nonstationarity with values increasing with time. The correlogram and the periodogram, displayed in the same figure, exhibits that the seasonal component of the series should also be taken into account whenever analyzing it.

Figure 1: Original time series, correlogram and periodogram

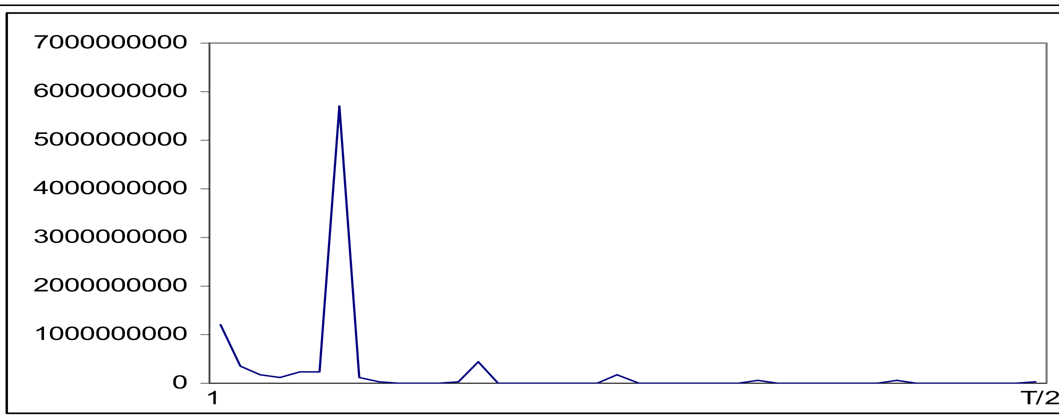
i) Original time series



ii) Correlogram*



iii) Periodogram



*: The large sample standard error under the null hypothesis of no autocorrelation is $1/\sqrt{T}$ or roughly 0.109.

Next we focus on some descriptive results.

Table 1: Percentage of arrivals according to the islands destination

São Miguel	Terceira	Faial	Pico	São Jorge	Santa Maria	Flores	Graciosa
68.92%	12.43%	8.40%	4.44%	1.82%	1.65%	1.22%	1.10%

Table 1 displays the percentage of arrivals depending on the island destination. It is observed that almost 70% of the tourists choose Säo Miguel as the preferred island destination. São Miguel is the Azores capital where the regional government is settled. The following ones are Terceira and Faial with 12.4% and 8.4% respectively. The remaining islands receive less than 5% of the total number of tourists.

Table 2: Percentage of Portuguese/ non-Portuguese arrivals

Portuguese	Non-Portuguese
55.96%	44.04%

Comparing Portuguese with non-Portuguese tourists (in Table 2), Portuguese data represent about 56% of the total number of arrivals. Table 3 disaggregate the data by nation of origin. We see that the highest percentage (31.2%) correspond to Sweden, followed by Germans, Dannishs, Norwegians, US and UK citizens. The remaining countries represent less than 5% of total.

Table 3: Percentage of tourists by nationality

Sweden	31.22%
Germany	12.38%
Denmark	8.98%
Norway	8.62%

U.S.A.	6.74%
United Kingdom	5.90%
France	4.62%
Spain	4.08%
Finland	3.70%
Other countries	2.91%
The Netherlands	2.58%
Canada	2.34%
Italy	2.07%
Switzerland	1.81%
Belgium	0.71%
Brazil	0.68%
Austria	0.57%

Finally, in Table 4, we completely disaggregate the series by island destionation and nationality of origin. As expected, the highest percentage of arrivals correspond to Swedish tourists in Säo Miguel (30.3%) and the closest values (around 8%) correspond to Germany, Denmark and Norway, again arriving at Säo Miguel. Surprisingly, if we focus remaining islands, the highest percentages correspond to the US citizens in Terceira, and to Germans in the rest of the islands.

Table 4: Percentage of arrivals for each island and each nationality of the arrivals

	S.Mig	Terceira	Faial	Pico	S.Jorge	S.Maria	Flores	Graciosa
Sweden	30.308%	0.373%	0.372%	0.080%	0.020%	0.009%	0.052%	0.004%
Germany	8.027%	0.900%	1.330%	1.177%	0.324%	0.216%	0.366%	0.043%
Denmark	8.336%	0.216%	0.270%	0.074%	0.033%	0.009%	0.038%	0.007%
Norway	8.313%	0.168%	0.083%	0.014%	0.009%	0.014%	0.020%	0.002%
U.S.A.	3.311%	1.992%	0.691%	0.209%	0.233%	0.168%	0.092%	0.041%
U.K.	3.057%	0.830%	1.109%	0.446%	0.270%	0.082%	0.105%	0.002%
France	1.958%	0.549%	0.777%	0.915%	0.297%	0.044%	0.068%	0.017%
Spain	2.500%	0.639%	0.562%	0.215%	0.050%	0.053%	0.052%	0.010%

Finland	3.595%	0.032%	0.042%	0.006%	0.018%	0.002%	0.008%	0.002%
Others	1.396%	0.575%	0.456%	0.152%	0.085%	0.139%	0.086%	0.022%
Th Neth	1.497%	0.261%	0.493%	0.183%	0.108%	0.026%	0.015%	0.003%
Canada	1.772%	0.349%	0.105%	0.033%	0.017%	0.053%	0.010%	0.003%
Italy	0.883%	0.431%	0.414%	0.163%	0.058%	0.046%	0.065%	0.012%
Switz.	0.886%	0.208%	0.345%	0.256%	0.028%	0.016%	0.063%	0.009%
Belgium	0.309%	0.096%	0.164%	0.089%	0.035%	0.005%	0.014%	0.002%
Brazil	0.270%	0.249%	0.094%	0.028%	0.013%	0.010%	0.012%	0.002%
Austria	0.290%	0.068%	0.100%	0.061%	0.024%	0.011%	0.015%	0.003%

5. The statistical model

Let us suppose that y_t is the time series we observe, in our case, the number of nights slept in Azores islands. As showed in Figure 2 the data present a clear seasonal pattern. However, when using seasonal monthly dummies, many of the coefficients were found to be insignificantly different from zero, suggesting that the seasonal structure is not deterministic. Moreover, the inclusion of seasonal dummies simply allows for the mean of the series to vary by season (month), so the presence of seasonal dummies raises no interesting statistical issues per se. On the other hand, the data present a clear trend with values increasing across the years. A priori, we do not have any ground to believe that the trend is deterministic, in which case could be modelled in terms of a linear time trend, or stochastic, and modelled as a function of its past history.

Taking into account the above comments a plausible model to be considered is the following:

$$y_t = \beta_0 + \beta_1 t + x_t, \quad t = 1, 2, ..., \tag{1}$$

$$(1 - L)^d x_t = u_t, \tag{2}$$

$$u_t = \alpha u_{t-12} + \varepsilon_t, \tag{3}$$

where ε_t is supposed to be a sequence of i.i.d. observations, and d can be any real value. Then, if d = 0, y_t is described in terms of a linear time trend with seasonal AR disturbances. On the other hand, if d = 1, the series is nonstationary I(1). However, d in (2) can be any value in the real line. In fact, the parameter d plays a crucial role to describe the persistence of the series in the long run, while α is then an indicator of the seasonal (short run) dependence.

The estimate of d along with the other parameters in (1) – (3) are obtained by using a Whittle function in the frequency domain along with a Lagrange Multiplier procedure developed by Robinson (1994). The latter method is the most efficient one in the Pitman sense against local departures from the null, which, in this case is H_o: $d = d_o$, for any real value d_o. Another advantage of Robinson's (1994) approach is that d_o can be any real value, including thus stationary ($d_o < 0.5$) and nonstationary ($d_o \geq 0.5$) hypotheses.

6. The empirical results

We compute the estimated value of d in model (1) – (3) for the three standard cases of no regressors ($\beta_0 = \beta_1 = 0$ a priori in (1)), an intercept (β_0 unknown and $\beta_1 = 0$), and an intercept with a linear trend (both β_0 and β_1 unknown). The results are displayed in Table 5. We present the Whittle estimates of d along with the 95% confidence band corresponding to the non-rejection cases using Robinson's (1994) parametric approach. We also report in the table the seasonal AR coefficient associated to the estimated d for each case.

Table 5: Estimated values of d in the model for the total number of arrivals

Total Aggregate	No regressors	An intercept	A linear time trend
AZORES ISLANDS	**0.78** (0.40, 1.44) α = **0.946**	**1.14** (0.43, 1.49) α = **0.932**	**1.14** (0.70, 1.55) α = **0.932**

The first thing we observe in Table 5 is that the estimated value of d is strictly above 0 for the three cases of no regressors, an intercept, and an intercept with a linear trend. The estimated d is equal to 0.78 in case of no regressors and about 1.14 for the other two cases. Nevertheless, the unit root null hypothesis (i.e. d = 1) cannot be rejected for any of the three cases. Thus, we obtain strong evidence against mean reversion for the aggregate data. We also observe that the AR coefficients are large and close to 1 in the three cases, implying a high degree of dependence in relation with the seasonal pattern.

Table 6: Estimated values of d in the model for the islands destination

Islands	No regressors	An intercept	A linear time trend
SAO MIGUEL	**0.85** (0.44, 1.41) α = **0.893**	**1.09** (0.47, 1.46) α = **0.873**	**1.09** (0.64, 1.50) α = **0.873**
TERCEIRA	**0.61** (0.39, 0.84) α = **0.931**	**0.62** (0.39, 0.91) α = **0.930**	**0.64** (0.40, 0.92) α = **0.927**
FAIAL	**0.61** (0.44, 0.84) α = **0.938**	**0.60** (0.41, 0.91) α = **0.938**	**0.62** (0.43, 0.91) α = **0.935**
PICO	**0.57** (0.44, 0.74) α = **0.910**	**0.46** (0.37, 0.59) α = **0.925**	**0.53** (0.40, 0.72) α = **0.931**
SAO JORGE	**0.48** (0.25, 0.64) α = **0.930**	**0.38** (0.21, 0.49) A = **0.940**	**0.05** (-0.04, 0.31) α = **0.959**
GRACIOSA	**0.47** (0.31, 0.65) α = **0.834**	**0.40** (0.27, 0.56) α = **0.845**	**0.19** (0.04, 0.51) α = **0.863**
FLORES	**0.42** (0.23, 0.60) α = **0.792**	**0.36** (0.21, 0.50) α = **0.810**	**0.23** (0.06, 0.42) α = **0.836**
SANTA MARIA	**0.32** (0.18, 0.73) α = **0.773**	**0.32** (0.18, 0.75) α = **0.772**	**0.31** (0.01, 0.76) α = **0.772**

In what follows we disaggregate the time series firstly according to the different island destination. (Table 6). We observe substantial differences across them. Thus, for four of the islands, namely, Säo Miguel, Terceira, Faial and Pico, the estimated values of d are above 0.5 in the three reported cases, implying nonstationarity with respect to the order of integration. For the remaining four islands (Säo Jorge, Graciosa, Flores and Santa Maria), d is strictly smaller than 0.5, observing lower values if an intercept and/or a time trend is included in the regression model. In general, we only observe two cases where d is strictly above 1 and both correspond to Sao Miguel in the cases of an intercept and with an intercept and a linear trend. Thus, we can conclude by saying that the high level of persistence observed in the aggregate data is mainly due to the contribution of the time series of Säo Miguel.

Thus, according to our results, in the presence of a negative exogenous shock, strong policy measures should only be adopted in the case of the island of Säo Miguel. For the remaining islands there is no need of strong measures since the series will return to their original trends sometime in the future. The same applies to the case of a positive shock, and here stronger measures should be adopted in the mean-reverting (i.e., d < 1) cases to maintain tourism in a high level.

Table 7: Estimated values d in the model for Portuguese/non-Portuguese tourists

Portugal / Abroad	No regressors	An intercept	A linear time trend
PORTUGUESSES	**0.87** (0.73, 1.07) A = **0.879**	**0.90** (0.75, 1.12) α = **0.884**	**0.91** (0.76, 1.12) α = **0.884**
FOREIGNERS	**1.50** (1.33, 1.69) A = **0.606**	**1.50** (1.34, 1.69) α = **0.607**	**1.51** (1.34, 1.70) α = **0.604**

In what follows we disaggregate the data depending on the nationality of tourists. First, we separate the data from Portuguese to non-Portuguese tourists. The results are displayed in Table 7. It is observed a substantial increase in the degree of persistence when the non-Portuguesese data are considered. Thus, the estimated d is about 0.90 for Portuguesse tourism, while it is around 1.50 for non-Portuguesse data.

The same comment as before applies here: thus, in the event of a negative shock, strong actions must be adopted with non-Portuguese tourists, while for positive shocks, the effort should be directed to the Portuguese data to maintain tourism in a high level.

In Table 8 we display the results according to the different nationalities of tourists. We note that values of d above 1 are obtained for the cases of The Netherlands, Finland, Norway, Germany and Denmark, and also for the UK if deterministic terms are included in the regression model. However, for the majority of these countries the null hypothesis of a unit root cannot be rejected at the 5% level; the exceptions are The Netherlands and Norway where d = 1 is excluded from the intervals in the three cases. For Sweden and the U.S., the estimated value of d is smaller than 1 though the unit root cannot be rejected. For the remaining countries (Canada, France, Others, Switzerland, Italy, Spain, Austria, Belgium and Brazil) the estimated values of d are in all cases constrained between 0 and 1, implying thus mean reversion with the effects of the shocks disappearing in the long run.

Table 8: Estimated values of d in the model for the different nationalities.

Country of origin	No regressors	An intercept	A linear time trend
NETHERLANDS	**1.65** (1.42, 1.97) α = **0.437**	**1.65** (1.42, 1.97) α = **0.430**	**1.65** (1.42, 1.97) α = **0.390**
FINLAND	**1.47** (0.87, 2.11) α = **0.384**	**1.51** (0.89, 2.13) α = **0.397**	**1.55** (0.89, 2.13) α = **0.390**
NORWAY	**1.22** (1.00, 1.48) α = **0.226**	**1.22** (1.01, 1.48) α = **0.226**	**1.22** (1.01, 1.48) α = **0.226**
GERMANY	**1.19** (0.91, 1.58) α = **0.580**	**1.20** (0.93, 1.58) α = **0.578**	**1.20** (0.93, 1.59) α = **0.578**
DENMARK	**1.01** (0.77, 1.39) α = **-0.457**	**1.01** (0.76, 1.40) α = **-0.457**	**1.01** (0.75, 1.40) α = **-0.457**
UNITED KINGDOM	**0.98** (0.72, 1.29) α = **0.594**	**1.02** (0.77, 1.30) α = **0.590**	**1.02** (0.78, 1.30) α = **0.590**
SWEDEN	**0.93** (0.80, 1.13) α = **0.090**	**0.98** (0.80, 1.25) α = **0.087**	**0.97** (0.80, 1.25) α = **0.085**
U.S.A.	**0.77** (0.55, 1.11) α = **0.773**	**0.79** (0.56, 1.12) α = **0.774**	**0.79** (0.58, 1.12) α = **0.775**

CANADA	**0.65** (0.51, 0.84) α = **0.636**	**0.66** (0.52, 0.86) α = **0.638**	**0.67** (0.53, 0.86) α = **0.638**
FRANCE	**0.58** (0.43, 0.79) α = **0.844**	**0.57** (0.42, 0.78) α = **0.845**	**0.57** (0.41, 0.78) α = **0.845**
OTHERS	**0.57** (0.44, 0.76) α = **0.309**	**0.57** (0.44, 0.76) α = **0.308**	**0.57** (0.44, 0.77) α = **0.307**
SWITZERLAND	**0.53** (0.37, 0.74) α = **0.809**	**0.52** (0.37, 0.74) α = **0.811**	**0.51** (0.36, 0.74) α = **0.813**
ITALY	**0.48** (0.30, 0.71) α = **0.826**	**0.47** (0.30, 0.71) α = **0.826**	**0.47** (0.30, 0.71) α = **0.827**
SPAIN	**0.44** (0.28, 0.70) α = **0.653**	**0.44** (0.28, 0.71) A = **0.653**	**0.44** (0.25, 0.71) α = **0.653**
AUSTRIA	**0.43** (0.30, 0.62) α = **0.736**	**0.43** (0.29, 0.65) α = **0.738**	**0.46** (0.31, 0.67) α = **0.736**
BELGICA	**0.41** (0.26, 0.62) α = **0.707**	**0.39** (0.24, 0.59) α = **0.710**	**0.35** (0.19, 0.59) α = **0.716**
BRAZIL	**0.38** (0.20, 0.64) α = **-0.110**	**0.39** (0.20, 0.71) α = **-0.109**	**0.46** (0.23, 0.74) α = **-0.102**

In the final part of this work we further disaggregate the data, looking now at the individual series corresponding to the number of arrivals in a particular island for a given nationality.

Table 9: Estimated values of d in a FI model with Seasonal AR(1) disturbances (no regressors)

	S.Mig	Terceira	Faial	Pico	S.Jorge	Graciosa	Flores	S.Maria
Th. Neth	**1.50*****	**1.01***	**1.29***	0.44	0.33	-0.08	0.22	0.06
Finland	**1.33***	0.31	0.02	-0.18	-0.04	0.05	0.31	-0.07
Norway	**1.23*****	0.83*	0.05	-0.02	-0.07	0.05	0.10	0.00
Germany	**1.22***	0.50	0.28	0.23	0.45	-0.15	0.41	0.37
Denmark	**1.02***	0.72*	0.11	-0.10	-0.01	-0.04	0.14	0.11
U.K.	**1.04***	0.08	0.19	-0.09	-0.05	-0.02	0.27	0.48
Sweden	0.92*	0.83*	0.59	0.48	-0.05	-0.19	0.25	0.05
U.S.A.	0.77	0.42	0.44	0.24	0.24	0.18	0.11	0.10
Canada	0.63	0.25	0.26	0.25	0.01	-0.04	0.00	0.00
France	0.63	0.35	0.20	0.16	0.31	-0.04	0.36	0.20

Others	0.45	0.28	0.64	0.40	0.57	0.10	0.10	0.26
Switzerl.	0.64	0.18	0.16	0.27	0.09	-0.15	-0.10	-0.06
Italy	0.48	0.28	0.19	0.25	-0.02	-0.23	0.08	0.13
Spain	0.47	0.29	0.26	0.03	0.19	-0.02	0.05	0.19
Austria	0.61	0.19	0.01	0.25	-0.08	0.13	0.25	0.04
Belgium	0.45	0.29	0.17	0.38	0.10	0.05	0.32	-0.16
Brazil	0.44	0.30	0.34	0.17	0.07	-0.04	0.27	-0.10

***: means that the null hypothesis of d = 1 is rejected in favor of d > 1 at the 5% level.
*: means that the unit root null cannot be rejected.

Tables 9 – 11 display the estimated values of d in the model given by (1) – (3) for the three standard cases of no regressors (Table 9); an intercept (Table 10); and an intercept with a linear time trend (Table 11). We observe that the results are very similar in the three cases. Across the 136 cases presented in each table, we only observe 8 cases where d is above 1. These cases correspond to the time series of Säo Miguel with tourists coming from The Netherlands, Finland, Norway, Germany, Denmark and the U.K., along with those coming from The Netherlands to Terceira and Faial. Though we do not report the confidence bands, it is obtained that only for Duchts and Norwegians in Sao Miguel, the estimated value of d is statistically higher than 1, implying in these two cases strong evidence of no mean reversion. Thus, shocks affecting these two series are supposed to be permanent and strong policy actions must be adopted to recover the original level. Finally, for a few more series (Finish, Norwegians, Germans, Danishs nd Britishs in Säo Miguel, Terceira and Faial), though d is found to be smaller than 1, the unit root null hypothesis cannot be rejected implying also lack of mean reversion in these cases. In all the remaining cases, d is strictly smaller than 1, and thus shocks will tend to disappear in the long run.

Table 10: Estimated values of d in a FI model with Seasonal AR(1) disturbances (with an intercept)

	S.Mig	Terceira	Faial	Pico	S.Jorge	Graciosa	Flores	S.Maria
Th Neth	**1.50*****	**1.01***	**1.29***	0.45	0.33	-0.08	0.21	0.06
Finland	**1.37***	0.31	0.02	-0.18	-0.04	0.05	0.31	-0.08
Norway	**1.23*****	0.83*	0.05	-0.02	-0.07	0.05	0.10	0.00
Germany	**1.22***	0.50	0.28	0.23	0.45	-0.15	0.40	0.37
Denmark	**1.02***	0.72*	0.11	-0.10	-0.01	-0.04	0.14	0.11
U.K.	**1.07***	0.08	0.19	-0.09	-0.05	-0.02	0.27	0.48
Sweden	0.97*	0.83*	0.51	0.45	-0.05	-0.19	0.25	0.05
U.S.A.	0.77	0.42	0.44	0.22	0.24	0.18	0.11	0.10
Canada	0.64	0.25	0.26	0.25	0.01	-0.04	0.00	0.00
France	0.62	0.35	0.20	0.16	0.31	-0.04	0.35	0.20
Others	0.45	0.28	0.65	0.39	0.56	0.10	0.10	0.26
Switzerl.	0.64	0.18	0.16	0.27	0.09	-0.15	-0.10	-0.06
Italy	0.48	0.28	0.20	0.25	-0.02	-0.23	0.08	0.12
Spain	0.47	0.28	0.26	0.03	0.19	-0.02	0.05	0.19
Austria	0.63	0.18	0.01	0.25	-0.08	0.13	0.24	0.04
Belgium	0.43	0.29	0.17	0.37	0.10	0.05	0.31	-0.16
Brazil	0.43	0.30	0.34	0.17	0.07	-0.04	0.27	-0.10

***: means that the null hypothesis of d = 1 is rejected in favor of d > 1 at the 5% level.
*: means that the unit root null cannot be rejected.

Table 11: Estimated values of d in a FI model with Seasonal AR(1) disturbances (with a linear time trend)

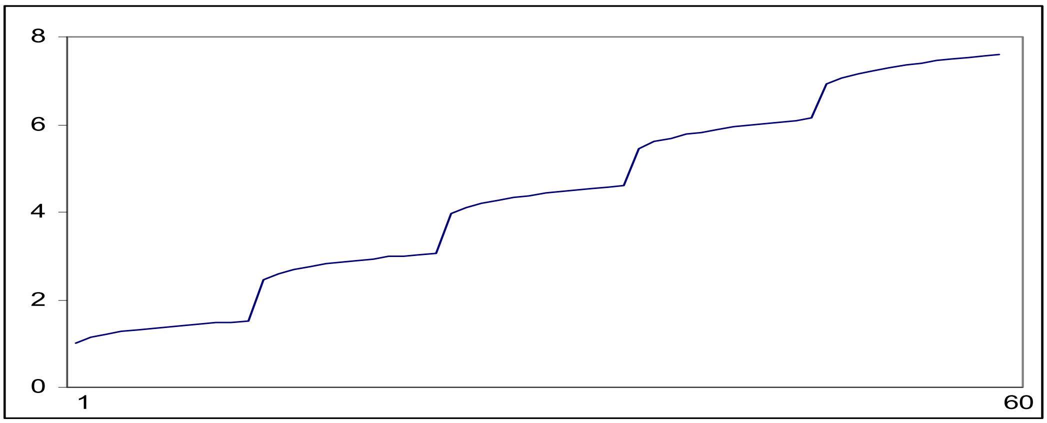
	S.Mig	Terceira	Faial	Pico	S.Jorge	Graciosa	Flores	S.Maria
Th. Neth	**1.50*****	**1.01***	**1.29***	0.45	0.28	-0.11	0.13	0.04
Finland	**1.39***	0.30	0.01	-0.17	-0.08	0.00	0.29	-0.16
Norway	**1.23*****	0.83*	0.05	-0.02	-0.09	0.00	0.10	-0.02
Germany	**1.22***	0.51	0.28	0.23	0.44	-0.15	0.36	0.37
Denmark	**1.02***	0.72*	-0.07	-0.17	-0.08	-0.07	0.06	0.11
U.K.	**1.07***	-0.10	0.14	-0.11	-0.02	-0.02	0.27	0.48
Sweden	0.97*	0.83*	0.27	0.35	-0.04	-0.18	0.25	-0.14
U.S.A.	0.78	0.42	0.45	0.02	0.24	0.18	0.11	0.08
Canada	0.64	0.20	0.23	0.25	-0.04	-0.20	-0.03	-0.03
France	0.62	0.36	0.17	0.15	0.31	-0.09	0.32	0.20
Others	0.45	0.27	0.65	0.36	0.56	0.09	0.04	0.26

Switzerl.	0.64	0.16	0.17	0.25	0.09	-0.15	-0.09	-0.05
Italy	0.48	0.29	0.19	0.24	-0.03	-0.26	0.03	0.05
Spain	0.47	0.16	0.19	0.01	0.18	-0.18	0.01	0.18
Austria	0.64	0.02	-0.01	0.24	-0.16	0.13	0.16	-0.09
Belgium	0.42	0.29	0.16	0.36	0.03	-0.05	0.25	-0.20
Brazil	0.41	0.38	0.34	0.17	0.07	-0.14	0.20	-0.09

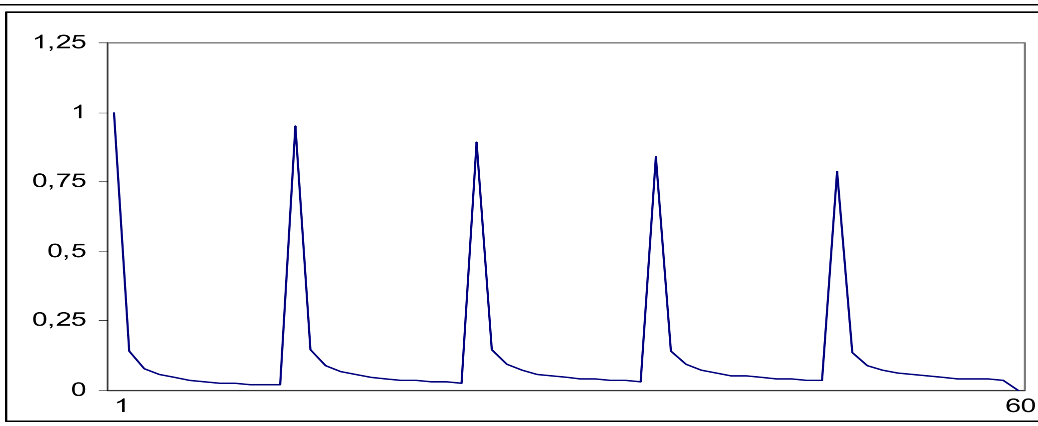
***: means that the null hypothesis of d = 1 is rejected in favor of d > 1 at the 5% level.
*: means that the unit root null cannot be rejected.

Figure 3: Impulse response functions for the Azores Island (aggregate) data

i) Original series



ii) Growth rate series



Coming back now to the aggregate data, we display in Figure 3 the impulse response function for the selected model, which is the one with an intercept. We choose this model given that the time trend coefficient was found to be statistically insignificantly different from zero, while the intercept was significant at the 5% level. As expected, the impulse responses are explosive, which is a consequence of the large value of d (1.14) and the large AR(1) coefficient (0.932). Note, however, that in this case, the large long trend coefficient makes the seasonal effect relatively small. If we look now at the plot of the responses for the growth rate series (lower plot in Figure 2) the seasonal component is evident, being highly persistent though disappearing in the very long run.

7. Concluding comments

In this paper we analyze the persistence in the monthly arrivals to the Azores Islands using a model based on fractional integration and seasonal autoregressions. In doing so we can get estimates of the parameters associated to the long run evolution of the series along with the short run seasonal dynamics. The results based on the aggregate data show that the series corresponding to the total number of arrivals in the Azores Islands is an I(d) process with d slightly above 0.5 if we do not include regressors, and values above 1 if an intercept and/or a linear time trend is included in the model, implying thus a strong degree of association between the observations. Disaggregating the data by the island destination, São Miguel presents the highest degree of dependence. These results suggest that in the event of a negative shock, any tourism policy oriented to recover the number of tourists will be more effective if it is implemented in São Miguel than in the other islands. On the other hand, if the shock is positive, further actions must be implemented in the remaining islands. Furthermore, the arrival of tourists in São Miguel also presents the highest degree of seasonality. Finally, we show that Holland, Finland, Norway, Germany, Denmark and UK are the most loyal tourists in the São Miguel island, while Spanish, Austrian, Belgium and Brazilian present the most random behaviour. Therefore, any tourism policy should take into account that the attraction of tourists from countries such as Holland, Finland, Norway, Germany, Denmark and UK will attract more loyal tourists, so that these policies will have more long lasting effects.

The results suggest the existence of two different groups of tourists according with the level of persistence. In the first group identified with a low level of persistence, Spanish, Austrian, Belgium and Brazilian the local government should implement special tourism programs that will promote tourism between in order to assure they will visit the islands in the near future. In the second group with a higher level of persistence, we find many Nordic countries which present the highest tourist fidelity to the Azores Islands. Tourism for other islands rather than São Miguel, displays persistence on Terceira Island and Faial Island on Dutch tourists.

How do these findings compare with previous research? This paper is directly comparable with Gil Alana (2005) and Chu (2008) who adopted fractional integration. Relative to the first paper this one focuses on a small island and the model is based on fractional integration and seasonal autoregressions allowing for the simultaneous analysis of fractional integration and seasonality. Relative to the second paper, this one paper does not focus on forecasting, but rather on the analysis of persistence.

The limitations of the present research are the following: The data obtained and analyzed in this study is limited in two main respects. First, the data frequency is monthly, from January 2000 to July 2007, rather than daily data. Second, the sample includes the main Azores Islands, but tourism destination is focused on its capital, São Miguel Island. Moreover, since this research is an exploratory study, the intention was not to obtain definitive results for direct use by tourism policy. Rather, the research calls attention to the value of identifying and analyzing persistence among tourists, and developing different business strategies for different segments aimed at attract them. In order to draw more generalized conclusions, a larger data set would be necessary, while other markets, could be included in future research. The limitations of the paper also suggest other directions for new research. Further research is needed to confirm the results of the present study and to determine its wider applicability.

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