

1           **THE IMPACT OF COVID-19 ON THE SPANISH TOURISM SECTOR**

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3                           **Luis Alberiko Gil-Alana**  
4           **University of Navarra, Pamplona, Spain and Universidad Francisco de Vitoria,**  
5                           **Madrid, Spain**

6  
7   **and**

8  
9   **Carlos Poza**  
10           **University Francisco de Vitoria, Madrid, Spain**  
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13   **ABSTRACT**

14   We examine in this note the impact of COVID-19 on the Spanish tourism sector by using  
15   a strong dependence model. Daily data from five equity markets are used and we find that  
16   the Coronavirus crisis has increased the persistence in the data, moving in some of the  
17   series from a mean reverting process to a non-mean reverting one. Thus, shocks that were  
18   expected to be transitory have become permanent, implying the need of strong policy  
19   measures to come the series back to their long-term projections.

20   **Keywords:** COVID-19; tourism; Spain; persistence; long memory.

21   **JEL Classification:** C12; C13; Z30.  
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28   Correspondence author: Prof. Luis A. Gil-Alana, University Francisco de Vitoria,  
29   Madrid, Spain.  
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38 **1. Introduction**

39 In Spain, tourism accounts for 12% of GDP according to the Bank of Spain's (2020) latest  
40 figures (the third major contributor to national accounts), what means that any adverse  
41 shock on this sector may have a dramatic impact on the Spanish economy. The recent  
42 unexpected perturbation, COVID-19, took place in mid-March 2020 and is stagnating the  
43 economic activity in Spain and all over the world. In fact, the most up to date forecast of  
44 GDP growth, carried out by Funcas' Consensus (2020), points out that a technical  
45 recession (two consecutive quarters of GDP decline) is expected in 2020, deepening the  
46 vulnerability of the economic activity. Additionally, The World Tourism Organization  
47 (UNWTO, 2020) states that Spain occupies the second position in the ranking of visited  
48 countries in the world after France and the second highest earning destination behind the  
49 US. Thus, it is important for the scientific community to analyze the impact of COVID  
50 on this sector in Spain. In order to do so, we examine whether COVID-19 will have a  
51 temporary or a permanent effect on the tourist sector in Spain. These results will help  
52 practitioners make decisions in the short and in the long run. If we expect a temporary  
53 impact, companies could put up with Coronavirus taking the appropriate safety measures,  
54 but if we expect a persistent effect, managers should radically modify the strategy and  
55 stronger measures should then have to be adopted.

56 At the same time, getting access to daily data is so difficult in the tourism sector  
57 (mainly because figures are released monthly by the National Statistics Office), that we  
58 have decided to use as proxy variables various measures that look at the evolution of the  
59 Spanish equity markets from macroeconomic, mesoeconomic and microeconomic  
60 perspectives. To investigate the economic consequences of Coronavirus, we analyze the  
61 IBEX35 data; to assess the mesoeconomic impact, we study the Madrid Stock Exchange  
62 Leisure, Tourism and Hotel total index; and to observe the microeconomic impact, we

63 use the Meliá Hotel International and the Amadeus It Group stock market data, that are  
64 the only two tourism companies in the IBEX35 and therefore the most powerful  
65 enterprises in the Spanish tourism sector. Additionally, we have added the NH Hotels  
66 equity data to compare and underpin the results (this company does not belong to IBEX35  
67 but to the Madrid stock market).

68 This note focuses on the properties of the five aforementioned stock market  
69 indices: IBEX35, Madrid SE Leisure, Tourism and Hotel total index (“Madrid SE”),  
70 Meliá Hotel International (“Meliá”), Amadeus It Group (“Amadeus It Group”) and NH  
71 Hotels (“NH Hotel”) stock market; as in many other studies on the persistence of shocks  
72 (e.g., Gil-Alana and Moreno, 2009; Lovcha and Perez-Laborda, 2018) we use fractional  
73 integration methods. The time period considered starts on 14 May 2018 and ends on 14  
74 May 2020, thus making it possible to assess the evolution of the tourism sector prior to  
75 and during the pandemic. The disease was first confirmed in Spain on 31 January 2020,  
76 when a German tourist tested positive for SARS-CoV-2 in the Canary Islands, and the  
77 lockdown was imposed on 14 March 2020.

78

## 79 **2. Data and Methodology**

80 We use daily prices data from five equity markets (IBEX35, Madrid SE Leisure, Tourism  
81 and Hotel total index, Meliá Hotel International, Amadeus It Group and NH Hotels) to  
82 assess tourism activity in Spain before and during COVID-19, from 14 May 2018 to 14  
83 May 2020. The number of observations reaches 512 and the data-source is Refinitiv Eikon  
84 (Thomson Reuters), that is a real-time financial and economic data platform. Meliá Hotel  
85 International and Amadeus It Group belong to IBEX35 as they are the two biggest  
86 touristic companies in Spain. Additionally, we have included the NH Hotels stock market  
87 data to compare and underpin the results with the other two companies. Meliá and

88 Amadeus could be correlated with IBEX35 data, so that the NH variable may clarify the  
 89 final outcomes.

90 As mentioned earlier, we use a strong dependence model based on fractional  
 91 integration (I(d)) to determine the effect of shocks. Thus, if the value of d is below 1, the  
 92 effect of a shock will be transitory, taking longer to disappear the higher the value of d is;  
 93 on the contrary, d equal to or higher than 1 there is no reversion to the mean and  
 94 permanency of shocks. Other articles dealing with fractional integration in tourism data  
 95 include Assaf et al. (2011), Al-Shboul and Anwar (2017) and Gil-Alana et al. (2019).

96

### 97 **3. Results**

98 The model examined is:

$$99 \quad y_t = \beta_0 + \beta_1 t + x_t; \quad (1 - L)^d x_t = u_t, \quad t = 0, 1, \dots, \quad (1)$$

100 where  $y_t$  is the observed time series (in logs);<sup>1</sup>  $\beta_0$  and  $\beta_1$  are unknown parameters  
 101 corresponding to an intercept and a linear time trend, and  $x_t$  is I(d), where d is a real value.

102 Across Tables 1 - 4, the error term  $u_t$  in (1) is white noise; in Tables 5 - 8  
 103 autocorrelation is permitted by using Bloomfield (1973), and in Tables 9 - 12,  $u_t$  is  
 104 described in terms of a seasonal autoregression. First, we display the results with the data  
 105 ending on February 23, 2020 which is the time of the first death by COVID-19 in Spain.  
 106 Then, we enlarge the sample until May 14, 2020, to compare the changes due to the  
 107 coronavirus crisis.

108 **Table 1: Differencing parameter in a sample ending at 23 Feb. 2020: White noise**

Series	No det. terms	An intercept	A linear time trend
Amadeus It Group	0.99 (0.93, 1.07)	<b>0.99 (0.93, 1.06)</b>	0.99 (0.93, 1.06)
IBEX 35	0.98 (0.93, 1.06)	<b>1.00 (0.93, 1.09)</b>	1.00 (0.93, 1.09)
Madrid SE Leisure	0.99 (0.93, 1.06)	0.98 (0.93, 1.04)	<b>0.98 (0.93, 1.04)</b>

<sup>1</sup> We use log prices since the first differences can then be interpreted in terms of the returns series.

Melia Hotel	0.98 (0.92, 1.05)	0.91 (0.85, 0.99)	<b>0.92 (0.85, 0.99)</b>
NH Hotel	0.99 (0.92, 1.06)	<b>1.00 (0.93, 1.06)</b>	1.00 (0.93, 1.06)

109 The selected specifications based on the deterministic terms are marked in bold. The values in parenthesis  
110 correspond to the 95% bands for the values of d.

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112 **Table 2: Selected coefficients across Table 1**

Series	d (95% band)	Intercept (tvalue)	Time trend (tvalue)
Amadeus It Group	0.99 (0.93, 1.06)	4.1560 (295.58)	---
IBEX 35	1.00 (0.93, 1.09)	9.2357 (1125.92)	---
Madrid SE Leisure	0.98 (0.93, 1.04)	6.6781 (644.89)	-0.0007 (-1.66)
Melia Hotel	0.91 (0.85, 0.99)*	2.4869 (156.61)	-0.0010 (-2.29)
NH Hotel	1.00 (0.93, 1.06)	1.8382 (114.35)	---

113 \*: Evidence of mean reversion at the 5% level.

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115 Starting with the results based on white noise errors and looking at the data ending  
116 on February 23, 2020, we notice that the d-estimates are very close to 1 for “Amadeus It  
117 Group”, “IBEX35”, “Madrid SE” and “NH Hotel”, where the hypothesis of a unit root  
118 cannot be rejected. However, for “Meliá”, the value of d is substantially smaller (0.92)  
119 and the I(1) hypothesis is rejected in favor of reversion to the mean. That means that a  
120 shock in the latter series, though persistent, will be a transitory nature, disappearing in the  
121 long term. We also observe negative time trend coefficients for “Madrid SE” and “Meliá”  
122 series.

123 If we extend the sample until May 14, 2020, the results are presented in Tables 3  
124 and 4. The time trends are once more significant for “Madrid SE” and “Meliá”, and the  
125 negative coefficients, as expected, are now higher. Surprisingly, we also observe an  
126 important increase in the order of integration in all series, especially for “Madrid SE” and  
127 “Meliá” and “NH” (1.11, 1.07 and 1.06 respectively), where the unit root is now rejected  
128 in favor of an alternative with d higher than 1. Of particular interest is the case of “Meliá”,  
129 where d was significantly smaller than 1 prior to the crisis but became significantly higher

130 than 1 when including the data during the coronavirus. This indicates that the effect of  
 131 the crisis has been particularly serious in this latter series, since the crisis has produced a  
 132 clear change in the persistence of the series, moving from mean reversion to a lack of it.

133 **Table 3: Differencing parameter using the whole sample: White noise**

Series	No det. Terms	An intercept	A linear time trend
Amadeus It Group	0.98 (0.93, 1.05)	<b>1.00 (0.95, 1.05)</b>	1.00 (0.95, 1.05)
IBEX 35	0.99 (0.93, 1.06)	<b>1.03 (0.98, 1.09)</b>	1.03 (0.98, 1.09)
Madrid SE Leisure	0.99 (0.93, 1.06)	1.11 (1.06, 1.16)	<b>1.11 (1.06, 1.16)</b>
Melia Hotel	0.97 (0.92, 1.04)	1.07 (1.01, 1.13)	<b>1.07 (1.01, 1.13)</b>
NH Hotel	0.99 (0.93, 1.05)	<b>1.06 (1.00, 1.12)</b>	1.06 (1.00, 1.12)

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135 **Table 4: Selected coefficients across Table 3**

Series	d (95% band)	Intercept (tvalue)	Time trend (tvalue)
Amadeus It Group	1.00 (0.95, 1.05)	4.1557 (191.68)	---
IBEX 35	1.03 (0.98, 1.09)	9.2362 (651.12)	---
Madrid SE Leisure	1.11 (1.06, 1.16)	6.6798 (375.03)	-0.0022 (-1.68)
Melia Hotel	1.07 (1.01, 1.13)	2.4908 (95.83)	-0.0026 (-1.75)
NH Hotel	1.06 (1.00, 1.12)	1.8391 (67.59)	---

136

137 As a robustness test of our results, we extend the analysis to other assumptions on  
 138 the error term. To start with, we consider autocorrelation in the errors. First, with data  
 139 ending on February 23, 2020, the results appear in Tables 5 and 6. Here, we observe that  
 140 the I(1) hypothesis cannot be rejected in any of the series, though for “Meliá”, the upper  
 141 value in the interval is precisely 1.00, being therefore close to the mean reversion case.<sup>2</sup>  
 142 The estimated coefficient for the trend is now only significant for “Meliá”. The next two  
 143 tables (7 and 8) refer to the complete data and we observe that, as in the previous case,

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<sup>2</sup> Being more precise, and including an extra decimal value, the upper bound for the interval for Melia is 0.996, therefore supporting the hypothesis of mean reversion.

144 there is a rise in the order of integration in all cases; in fact, the I(1) null is now rejected  
 145 in the five series against  $d > 1$ .

146 **Table 5: Differencing parameter in a sample until 23 Feb. 2020: Bloomfield case**

Series	No regressors	An intercept	A linear time trend
Amadeus It Group	0.98 (0.89, 1.11)	<b>1.01 (0.90, 1.15)</b>	1.01 (0.90, 1.15)
IBEX 35	0.97 (0.88, 1.11)	<b>0.93 (0.81, 1.08)</b>	0.93 (0.82, 1.08)
Madrid SE Leisure	0.98 (0.89, 1.10)	<b>1.08 (1.00, 1.20)</b>	1.08 (1.00, 1.20)
Melia Hotel	0.97 (0.88, 1.10)	0.90 (0.79, 1.00)	<b>0.89 (0.80, 1.00)</b>
NH Hotel	1.01 (0.90, 1.12)	<b>1.08 (0.99, 1.06)</b>	1.08 (0.99, 1.06)

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148 **Table 6: Selected coefficients across Table 5**

Series	d (95% band)	Intercept (tvalue)	Time trend (tvalue)
Amadeus It Group	1.01 (0.90, 1.15)	4.1555 (295.59)	---
IBEX 35	0.93 (0.81, 1.08)	9.2344 (1132.74)	---
Madrid SE Leisure	1.08 (1.00, 1.20)	6.6782 (652.50)	---
Melia Hotel	0.89 (0.80, 1.00)*	2.4862 (157.44)	-0.0010 (-2.71)
NH Hotel	1.08 (0.99, 1.20)	1.8393 (115.43)	---

149 \*: Evidence of mean reversion at the 5% level.

150 **Table 7: Differencing parameter using the whole sample: Bloomfield case**

Series	No regressors	An intercept	A linear time trend
Amadeus It Group	0.97 (0.89, 1.09)	<b>1.13 (1.04, 1.25)</b>	1.14 (1.04, 1.25)
IBEX 35	0.98 (0.89, 1.09)	<b>1.25 (1.12, 1.40)</b>	1.25 (1.12, 1.40)
Madrid SE Leisure	0.98 (0.89, 1.08)	<b>1.29 (1.19, 1.44)</b>	1.29 (1.19, 1.44)
Melia Hotel	0.95 (0.87, 1.06)	<b>1.28 (1.13, 1.46)</b>	1.28 (1.13, 1.46)
NH Hotel	1.02 (0.91, 1.14)	<b>1.21 (1.05, 1.44)</b>	1.21 (1.05, 1.44)

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152 **Table 8: Selected coefficients across Table 7**

Series	d (95% band)	Intercept (tvalue)	Time trend (tvalue)
Amadeus It Group	1.13 (1.04, 1.25)	4.1527 (196.33)	---
IBEX 35	1.25 (1.12, 1.40)	9.2376 (685.84)	---
Madrid SE Leisure	1.29 (1.19, 1.44)	6.6796 (396.44)	---
Melia Hotel	1.28 (1.13, 1.46)	2.4922 (101.25)	---
NH Hotel	1.21 (1.05, 1.44)	1.8414 (69.63)	---

153

154 Finally, and based on the monthly frequency used in the data, an AR(1) seasonal  
 155 model

156 
$$u_t = \rho u_{t-12} + \varepsilon_t, \quad (2)$$

157 is assumed for the errors, and the results are reported in Tables 9 and 10 (with data ending  
 158 at February 23, 2020), and in Tables 11 and 12 with the whole sample.

159 **Table 9: Differencing parameter in a sample until 23 Feb. 2020: Seasonal case**

Series	No regressors	An intercept	A linear time trend
Amadeus It Group	0.99 (0.93, 1.05)	<b>0.99 (0.93, 1.07)</b>	0.99 (0.93, 1.07)
IBEX 35	0.99 (0.91, 1.06)	<b>1.00 (0.93, 1.09)</b>	1.00 (0.93, 1.09)
Madrid SE Leisure	0.99 (0.91, 1.07)	0.98 (0.93, 1.04)	<b>0.98 (0.93, 1.04)</b>
Melia Hotel	0.98 (0.93, 1.05)	0.91 (0.84, 0.99)	<b>0.92 (0.85, 0.99)</b>
NH Hotel	0.93 (0.99, 1.06)	<b>1.00 (0.95, 1.06)</b>	1.00 (0.95, 1.06)

160

161 **Table 10: Selected coefficients across Table 9**

Series	d (95% band)	Intercept (tvalue)	Time trend (tvalue)
Amadeus It Group	0.99 (0.93, 1.07)	4.1560 (295.53)	---
IBEX 35	1.00 (0.93, 1.09)	9.2357 (1125.87)	---
Madrid SE Leisure	0.98 (0.93, 1.04)	6.6781 (642.94)	-0.0007 (-1.65)
Melia Hotel	0.92 (0.85, 0.99)*	2.4869 (155.75)	-0.0011 (-2.28)
NH Hotel	1.00 (0.95, 1.06)	1.8381 (114.35)	---

162 \*: Evidence of mean reversion at the 5% level.

163 The results are similar to those in Tables 1 and 2. Evidence of time trends are  
 164 observed for “Madrid SE” and “Melia”; the unit root hypothesis is unrejected for  
 165 “Amadeus It Group”, “IBEX35”, “Madrid SE”, and “NH”, and this hypothesis is rejected  
 166 in favor of reversion to the mean for “Meliá”. Using the whole sample, there is a rise in  
 167 d, which is especially remarkable in the cases of “Madrid SE”, “Meliá” and “NH”. As in  
 168 the previous cases, including COVID-19 data, there is a change in persistence, and data  
 169 for “Meliá” moves from mean reversion to a lack of it.

170 **Table 11: Differencing parameter using the whole sample: Seasonal case**

Series	No regressors	An intercept	A linear time trend
Amadeus It Group	0.98 (0.92, 1.05)	<b>0.99 (0.94, 1.05)</b>	0.99 (0.94, 1.05)
IBEX 35	0.99 (0.92, 1.06)	<b>1.03 (0.97, 1.09)</b>	1.03 (0.98, 1.09)
Madrid SE Leisure	0.99 (0.92, 1.06)	1.09 (1.04, 1.15)	<b>1.09 (1.04, 1.15)</b>
Melia Hotel	0.97 (0.91, 1.04)	1.07 (1.01, 1.13)	<b>1.07 (1.01, 1.13)</b>
NH Hotel	0.93 (0.99, 1.05)	<b>1.07 (1.01, 1.15)</b>	1.07 (1.01, 1.15)

171

172 **Table 12: Selected coefficients across Table 11**

Series	d (95% band)	Intercept (tvalue)	Time trend (tvalue)
Amadeus It Group	0.99 (0.94, 1.05)	4.1560 (191.33)	---
IBEX 35	1.03 (0.97, 1.09)	9.2362 (650.15)	---
Madrid SE Leisure	1.09 (1.04, 1.15)	6.6794 (372.9)	-0.0022 (-1.65)
Melia Hotel	1.07 (1.01, 1.13)	2.4908 (95.60)	-0.0026 (-1.64)
NH Hotel	1.07 (1.01, 1.15)	1.8392 (67.60)	---

173 Values in parenthesis in the 3rd and 4th columns are t-values.

174

#### 175 **4. Conclusions**

176 The impact of COVID-19 on the Spanish tourism sector has been examined in this work  
 177 by using fractional integration. Our results indicate that this sanitary crisis has been  
 178 particularly serious in the case of companies related to tourism, increasing the level of  
 179 persistence, and moving from mean reversion (and transitory shocks) before the crisis to  
 180 lack of mean reversion (with permanent shocks) during it. Thus, strong policy measures  
 181 should be taken into account by the companies (and authorities) if we want to recover the  
 182 original levels-trends prior to the crisis. Putting in a different way, if there is now another  
 183 exogenous shock affecting the tourism series, stronger actions should be adopted to  
 184 recover the original levels in the series than if that shock would have happened prior to  
 185 the crisis. One example could be observed in the recent package of measures announced

186 by “Meliá” in the 27<sup>th</sup> May Press Release, called Stay Safe with Meliá<sup>1</sup>, in which they  
187 present a transformation strategy based on four pillars: 1) safety for employees and  
188 customers, 2) reduced contact in interactions between customers and employees, 3)  
189 optimization of operational processes, simplifying and digitalizing the service, and 4)  
190 adaptation of the brand to new paradigms and customer needs. The new policies include  
191 extra cleaning and hygiene measures and new personal space: social distance, apart from  
192 a new and more flexible cancellation policy.

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<sup>1</sup> For more details see: <https://n9.cl/meliacovid19>

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