How free admittance affects visits to museums:
An analysis of the Italian case

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Abstract: This paper aims to evaluate whether and how the free admittance to museums and monuments affects the charged visits. We take the Italian state museums and monuments as the case study, and we consider the monthly data, aggregate at the national level, from January 1996 to December 2014. Within a multivariate analysis approach, which takes into account the seasonal structure of the time series, we show that a positive influence of the number of free visitors upon the subsequent number of paying visitors exists. We quantify that a 1% increase in free admission today leads to a 0.2% increase of charged admission one year later, ceteris paribus. Our present results can be relevant in the current political debate in Italy, in front of new rules concerning free admission to museums. More in general, we provide evidence that could be informative in the ever-green debate about free attendance to museum and its relations with individual choices and public policies concerning cultural consumption.

Keywords: Museums, Free attendance, Cultural consumption, Seasonal time series.
JEL Classification: Z10, C22.

1. Introduction

The BBC websites, on December 1st 2011, the day marking the 10th anniversary of the government's decision to end charges at England's national museums, reported that: "Government-sponsored museums that have stopped charging since 2001 have seen combined visitor rates more than double in the past decade, figures show. [...] Almost 18 million people visited the 13 attractions in 2010-11, compared with 7 million in 2000-01."

In different recent interviews, the Italian Minister for Culture and Tourism, underlined the spectacular increase in numbers of museum attendance in 2014 and 2015 (complete official data, by the way, are not yet available for 2015), also thanks to the fact that free admission was established for each first Sunday every month in all Italian state museums, starting from July 2014. The official website of the Italian Ministry for Culture and Tourism underlines that free visits have increased by 5%, and charged visits by 7% in the second semester 2014, with respect to the previous year. In

2015, the estimated variation is about +4% for free visits, +6% for charged visits and +14% for revenues (MIBACT, 2016). Such data would suggest, according to the Italian Government, that the policy of promoting free admission has benefitted charged admission too.

The list of reference to specific cases, in which free admission led to positive effect on charged visits (or, more in general on museum revenues) could proceed. On the other hand, cases in which free admission has changed into charged admission have provided evidence that attendance has not declined significantly, nor the sociological composition of visitors seems to have changed (Smithsonian Institute, 2007).

The effect of tickets upon museum attendance has been widely studied by academic scholars too, from different scientific perspectives. In fact, pros and cons of free admission to museums (and monuments) is an ever-green in cultural economics, and also in the debate about the cultural public policy, not to mention the marketing consideration concerning specific cultural attractions (Frey and Steiner, 2006).

Across countries, and across museums in any country, the fee policies differ. Simple observations lead to conclude that all possible combinations of rules concerning entrance to museums are present, in any country: there are cases in which the admission fee is required without exception; museums where charged admission joins with strict or large policy concerning free or reduced admission to certain sub-groups, and museums with free admission for all (sometimes joint with a plea for voluntary contribution). This variety of admission fee rules holds also within a group museums which are similar in nature or managed by the same company. For instance, within the Smithsonian group in the US, some museums are free while others require admission fee.

Available empirical research generally suggest that price is not a serious barrier to visit to museum, and the price elasticity of museum visitors is low (Steiner, 1997; Luksetich and Partridge, 1997; see the review in Kirchberg, 1998, and the conclusion of the same article, showing that price can represent a perceived subjective barrier). On the other hand, the merit good nature of heritage is a theoretical reason supporting the free attendance of public museum (O’Hagan, 1995). The addiction in cultural consumption may also suggest that promoting the free admission of (young, but not only) people will enhance future demand.

Other contributions suggest that free-entry, joint with voluntary contributions, may maximise museum revenues, and charged admission does not hurt museum attendance, and may have positive aggregate effects.

Most part of scientific evidence concerning the effect of tickets on museum attendance is based on individual surveys, or research at specific museums, so that the conclusions are typically based on case-studies (see the comprehensive review in Frateschi et al., 2009; Luksetich and Partridge is the exception, among the previously mentioned studies).

In the present paper we take a different route, and we examine aggregate data on visits to a large set of museums and monuments. Specifically, we examine the attendance at the Italian State museums and monuments, over the period 1996-2014.

We first discuss the statistic properties of the monthly time series at hand; specifically, in Section 2 we show that it is out of any doubt that the series of free and charged visits show seasonal patterns; however, the nature (stochastic or deterministic) of the seasonal time trend can be debated, and the fact that the shape of seasonal components differ between free and charged visit is an aspect which has been overlooked by available analyses, while it can provide some marketing and policy implications. The relation between the dynamics of charged visits, free visits, and tourism flows series is investigated in Section 3. Theoretical underpinnings and policy implications are discussed in Section 4.

2. Data

The data we consider are provided by the Italian Ministry of Culture and Tourism, and they are freely available from the www.statistica.beniculturali.it website. In particular, we consider the monthly series of free and charged visits to all state museums, monuments, historical parks and gardens and archaeological areas. The group of sites is very large (made by more than 400 spots), and heterogeneous: it includes superstar museums (like Uffizi in Firenze), superstar archaeological areas (i.e., Pompei, Foro Romano), superstar monuments (i.e., Colosseo) but also minor heritage attractions, spread over Italy.

It is very informative to take a preliminary look at the series under scrutiny. Figure 1 and 2 provide their patterns over time, while Table 1 gives some statistics. Both the free attendance and the charged attendance show strongly seasonal pattern. The amount of free visitors is clearly larger than the amount of charged visitors, especially due to the attendance at the peak seasons; the seasonal variation of free attendance is clearly larger than the seasonal variation of charged attendance; the peaks occur at different months, for free and charged attendance. These simple pieces of evidence have not yet received due attention from available analyses in literature. However, they tell a very clear story, with valuable elements for reflections and policy implications.

First, the peak months for free visits are the Spring months (April and, in the second place, May). This is due to the visits of school students in organized tours, which typically take place in Springs.

Second, the peak months for charged visits are in Summer (August, and in the second place, July): this clearly suggests that tourist flows (whose peak is in August and July) have an effect on the size of visits to museums and monuments. The fact that tourist arrivals drive visits to museum and monuments is widely documented (see Cellini and Cuccia, 2013, for a specific application to the Italian case).

<Figure 1>
<Figure 2>
<Table 1>

It is also interesting to note that the economic crisis (the so called "Great recession") which has hit Italy starting from 2008, has had similar effects on free and charged visits to museum: in 2008, the percentage annual variation in free and charged visits is equal to 3.8 and 3.9%, respectively; more in general, annual data over the years of the Great recession are plotted in Figure 3, to support our statement about the similar qualitative influence of economic recession on free and charged visits to museums.

<Figure 3>

Descriptive statistics confirm what is already clear from the graphical inspection. It is worth underlining some elements related to the seasonality: if we rely on standard analysis of seasonal components, the usual tests (based on the X12Arima seasonal adjustment programme), as reported in Table 1, confirm that the presence of significant seasonal components cannot be rejected; moreover, seasonality appears to be more limited and more stable over the years for the charged attendance as compared to free attendance; more formally, the appropriate *F*-test on moving seasonality detects moving seasonal factors for free visits (with a tendency to reduction, as shown by the change of seasonal factors), while rejects the presence of moving seasonality for charged visits.

2.1 The nature of seasonality

Seasonality may have a stochastic or a deterministic nature; that is, it can be driven by the presence of seasonal unit roots, or by the presence of deterministic seasonal components. Several test have been proposed to detect the presence of seasonal unit roots. In particular Dickey, Hasza and Fuller (1984), provides an extension of Dickey Fuller test (originally proposed for evaluating the unit root in yearly data) to the case of seasonal series. Hylleberg et al. (1990) and Beaulieu and Miron (1993) provided contributions for additional test procedures, still following a regression-based approach, focussing on quarterly and monthly data, respectively. Tests along these lines have been largely employed to analyse monthly time series in the field of tourism (see, for instance the recent application in Cellini and Cuccia, 2013, referring to Italy).[1]

However, Smith and Taylor (1998) and Taylor (1998) observe that the DHF procedure do not allow for different time trends across the seasons, and they show that the null of the presence of seasonal unit root is easily rejected, if one allows for different trends across seasons (Smith and Taylor, 1998 focus on quarterly data, while Taylor 1998 deals with monthly data). In simpler words, they suggest that seasonal unit roots are likely to disappear from the data generation process, if one accounts for different time trends for seasons across years.

In more formal terms, let Y_t denote a monthly time series.[2] The series possesses a seasonal unit root if the null hypothesis $\rho = 1$ cannot be rejected as applied to the representation $Y_t = a + \rho Y_{t-12} + v_t$; operationally, this amounts to considering the regression equation $\Delta_{12} Y_t = a + \alpha Y_{t-12} + v_t$, and to evaluating the null hypothesis $\alpha = \rho - 1 = 0$ (the symbol Δ_{12} denotes the 12-th difference, that is $\Delta_{12} Y_t \equiv Y_t - Y_{t-12}$). However, the deterministic components of the data generation process of Y_t to take into account may be more complex. Specifically, one can account for 12 different constant terms (one for each season) instead of one constant term; in such a case, a has to be interpreted as a vector, $a = \{a_i\}_{i=1}^{12}$.[3] Second, a number of autoregressive terms of $\Delta_{12} Y_t$ have to be considered in order to have white noise regression residuals (in most cases, the 1st, 2nd and 12th lags of the dependent variable are statistically significant and sufficient to make white noise residuals). Third, and most important, a deterministic trend (T) can be appropriately considered as well, even if it is known that the inclusion of a trend makes the test for seasonal unit roots less powerful. Thus, the procedure requires to evaluate the regression

[1] $$\Delta_{12} Y_t = \sum_{i=1}^{12} a_i + \tau T + \alpha Y_{t-12} + \sum_j \beta_j \Delta_{12} Y_{t-j} + \varepsilon_t$$

[1] Comprehensive reviews of theoretical aspects and applied investigations of seasonal integration and co-integration are offered by Hylleberg (1995), Fransen (1996) and Ghysels and Osborn (2001).

[2] This paragraph is based on Cellini and Cuccia (2013, Section 4)

[3] Operationally, one can evaluate 11 additional seasonal dummy variables beyond the constant term, and evaluate whether the additional seasonal dummy variables are significant (see also Fransen and Kunst, 1999 on this point).

and specifically to evaluate at the significance of the coefficient α, in order to test for the presence of the seasonal unit root. To this end, it is important to consider that the distribution of the Student–*t* statistics are non standard, and specific tabulations of critical values are necessary; such tabulations are provided by Dickey, Hasza and Fuller (1984). If the null of seasonal unit root is not rejected (i.e., $\alpha = 0$), the series is seasonally integrated. Seasonally integrated series possess *s* unit root processes –one for each of the *s* seasons.

Taylor (1998) makes a relevant point concerning the inclusion of deterministic trend: he suggests that the inclusion of 12 different trend terms (one for each season) can be appropriate, and in such a case the null of seasonal unit root may be rejected, whereas is cannot be rejected in the presence of one trend, common to all seasons. He also shows that the evaluation of the presence of a seasonal unit root in the presence of 12 time trends correspond to evaluate the auxiliary regression:

$$[2] \qquad \Delta_{12} Y_t = \sum_{i=1}^{12} a_i + \sum_{i=1}^{12} b_i Y_{t-i} + \sum_{i=1}^{12} c_i T_i + \varepsilon_t ;$$

(where T_i i=1,2,…12 denotes a deterministic trend specific for month *i*) and to test the null $\sum_{i=1}^{12} b_i = 0$

Table 2 reports the results of the two procedures. The presence of different time trends leads to reject the presence of seasonal unit roots for both the series of free attendance and the charged attendance. The same conclusion is reached, by considering only one trend and following the standard HDF procedure.[4] However, both in the case of charged visits and in the case of free visits, some components of the vector $\{c_i\}_{i=1}^{12}$ are statistically significant, while others are not, so that the consideration of different time trends across seasons appear appropriate, and the conclusion is that seasonal unit roots are absent, in the presence of different seasonal trends.

As underlined by Taylor (1998), the interpretation of a time series as a seasonally integrated series (and hence the consideration of seasonally differentiated series for inference analysis and regression specification), whereas the correct DGP representation includes different seasonal deterministic time trends and no seasonal unit root, can results in errors, due to over-differentiation of the series at hand.

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[4] It has to be reported that an available analysis (Cellini and Cuccia, 2013), find the opposite results, that is, the presence seasonal unit root cannot be rejected, with reference to the series of total visits (that is, the sum of free and charged visits), in a shorter time span 1996-2011. Clearly, we cannot say that the results are inconsistent, since the series and the time spans under consideration are different. In other words, the availability of longer time series here leads us to judge the Data Generating Process without seasonal unit roots, but with different trends for different months, as more appropriate, while a different conclusion was reached on the basis of shorter series.

For the above mentioned reasons, we will consider the time series of free and charged attendance to Italian State museums and monuments, as seasonally stationary in the presence of different seasonal constant and time-trend components.

It is important to note that the same conclusion (that is, the presence of a seasonal unit root has to be rejected, in the presence of different seasonal constant and time-trend terms) is reached for the series of tourist arrivals and over-stays. The $F_{1,2....12}$ Taylor tests provide in any case values well above the critical value: the test statistics are 17.799 for arrivals, and 9.444 for overstays.

3. The dynamic effects of free attendance upon charged visits to museums and monuments

In this section we present the core result of the study. Our task is to evaluate the effect of free visits to museums and monuments upon charged visits. Taking into account the seasonal nature of the series at hand, largely discussed in the previous section, we opt for considering the following general specification.

[3] $$Y_t = \sum_{i=1}^{12} a_i + \sum_{i=1}^{12} c_i T_i + \beta X_t + \gamma Z_t + \sum_{i=1}^{12} \lambda_i Y_{t-i} + \sum_{i=1}^{12} \varphi_i X_{t-i} + \varepsilon_t;$$

Variable *Y* stays for the charged visits to museum and monuments; variable *X* denotes the free visits, and variable *Z* is a control variable corresponding to the tourist arrivals. The a_i coefficients correspond to the seasonal dummy variables; the terms $c_i T_i$ represent the seasonal trend terms; polynomial terms $\lambda_i Y_{t-i}$ and $\varphi_i X_{t-i}$, with i=1,2,..12, represent the lags of the dependent variable *Y* and independent variable X, respectively.

Noteworthy, we have proceeded from the general to the particular, and we maintain only the significant terms in the regression specification. More explicitly, only a sub-set of the 12 seasonal dummy variables, and only a subset of seasonal trends are statistically significant, and hence are kept in the final specification, beyond a constant term and a time trend. Similarly, only the significant lags of variables *X* and *Y* are kept in specification (usually, the lags of 1st, 2nd and 12th order). Results are provided in Table 3- Column 1.

<Table 3>

Some comments are in order. First, the amount of tourist arrivals is significant, and thus its inclusion is appropriate. This piece of evidence confirms what is intuitive and already known: the amount of tourist arrivals affects attendance at museum and monuments. As robustness checks, we have substituted arrivals with overstays, but the substantive results remain unchanged. Second, the contemporary free entrance emerge to exert a negative impact on charged visits. So, there is a certain degree of crowding out between free and charged entrance (the coefficient is equal to -0.13, and it is statistically significant); this is comprehensible. Third, the most important piece of evidence, in our reading of results, is the positive and significant effect of the 12th lag of free entrance: the amount of free visits affects charged visits, with a lag of one year. Notice, in particular, that the coefficient is equal to 0.232, which over-weights the coefficient pertaining to the contemporary amount of free flow (-0.139). Verbally, an increase in the number of free visitors may have a negative effect on the contemporary number of charged visits, but it has a larger, positive effect, with a one year lag.

If we consider the effect of the number of free visits, cumulated over the previous twelve months upon the charged visits, we obtain an even clearer result: not only the average number of free visits over the previous twelve months have a positive and significant effect upon the number of current charged visits, but the simultaneous crowding-out effect between free and charged visits disappears, and even the contemporary free visits to museums have positive effect on the charged visits (Table 3- Column (3)). In other words, contemporary free and charged visits appear to be substitute if the relation is conditioned on selected lagged values of free visits, while they appear complement, in the relation conditioned on the cumulated free visits over the twelve past moths; no doubt about the fact that the cumulated past free visits are complement with current charged visits, that is, a positive externality is at work.

It is easy to compute some elasticity coefficients, basing on the provided evidence. The elasticity of the charged visits to the free visits of the twelve months before emerges to be 0.21 (consistently with the results from the specification in Column 1 of Table 3), while the elasticity of charged visits to cumulated free visits over the past twelve months is 0.15 (based on estimates of Column 3). Apart from the specific numerical values, the meaning is that the increase of free visits make a substantial contribution to the increase of subsequent charged visits.

4. Theoretical underpinnings and policy implications

The fact that opportunity cost of cultural consumption is decreasing in the stock of consumed cultural services and commodities, and cultural consumption is characterized by addiction are milestones in cultural economics, since the Becker and Murphy (1988) analysis, not to mention Stigler and Becker (1977) and even the intuition in Chapter 3 of Book 3 by Marshall's *Principles*

(Marshall, 1890). These arguments provide support for the point that enhancing free visit to museums today may increase demand for museum tomorrow.

…

[to be completed]

5. Conclusions

[to be changed] This paper has aimed to evaluate whether and how the free admittance to museums and monuments affects the charged visits. We have taken the Italian state museums and monuments as the case study, and we have considered the monthly data, aggregate at the national level, from January 1996 to December 2014. Within a multivariate analysis approach, which takes into account the seasonal structure of the time series, we have shown that a positive influence of the number of free visitors upon the subsequent number of paying visitors exists. We have quantified that a 1% increase in free admission today leads to a 0.2% increase of charged admission one year later, ceteris paribus. Our present results can be relevant in the current political debate in Italy, in front of new rules concerning free admission to museums. More in general, we have provided evidence that could be informative in the ever-green debate about free attendance to museum and its relations with individual choices and public policies concerning cultural consumption.

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FIGURES AND TABLES

Figure 1 - Patterns over time of free and charged visits to museums and monuments

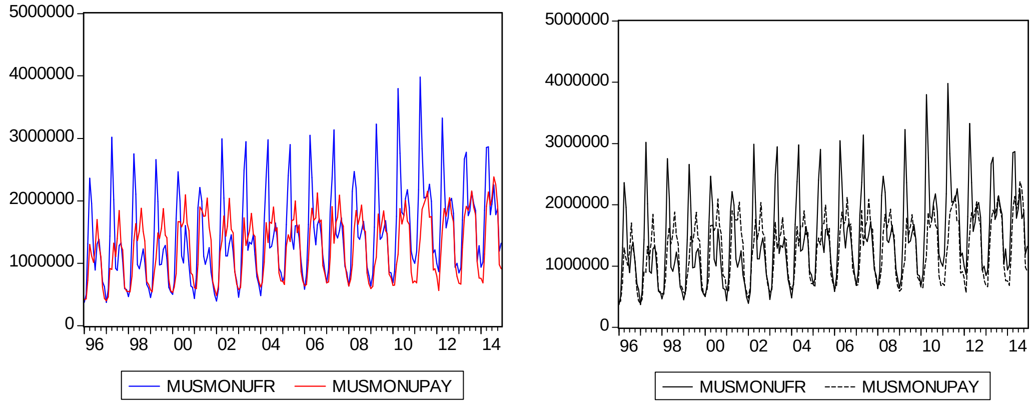

Figure 2 - Patterns over time of free and charged visits to museums and monuments by season

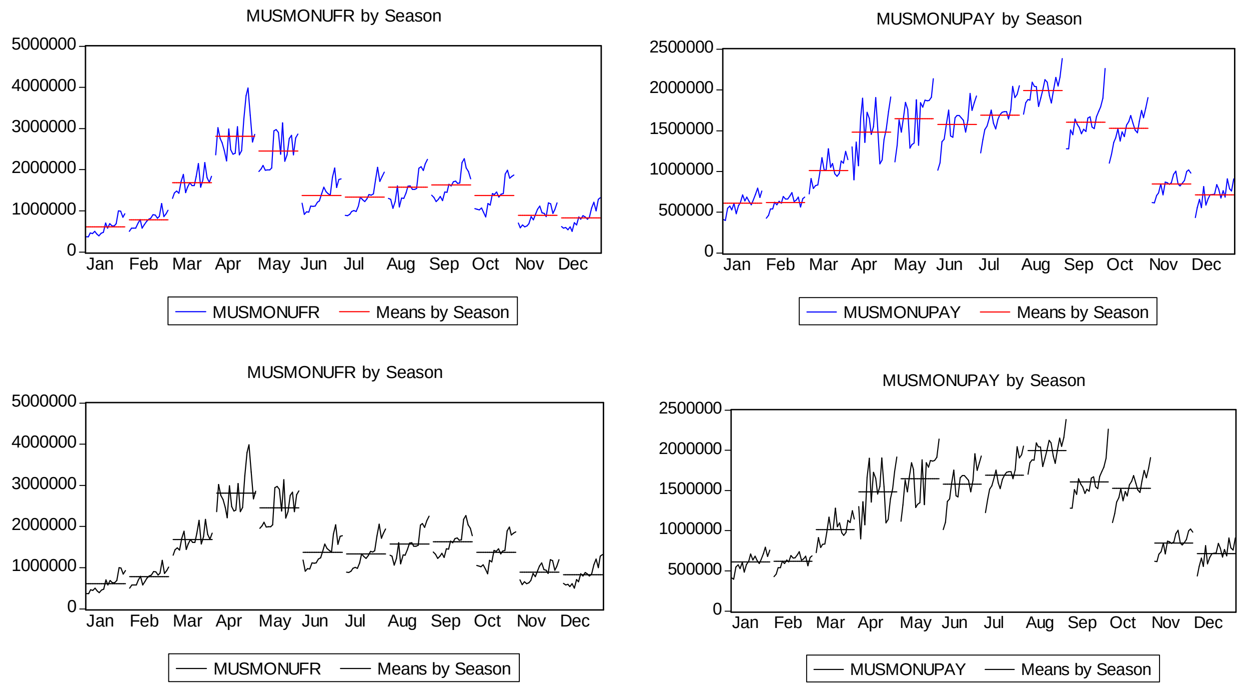

Figure 3 Visits to museums and monument in the years of the Great recession (annual data)

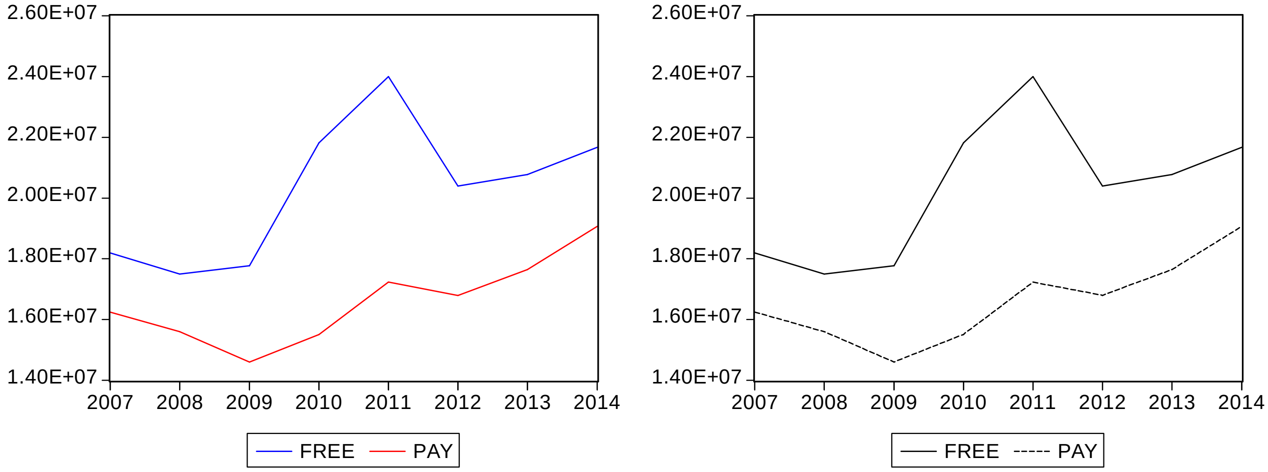

Table 1 – Descriptive statistics on time series

	MUSMONUFR	MUSMONUPAY
Mean	1,447,157	1,277,684
Median	1,324,110	1,357,037
Maximum	3,981,811	2,382,994
Minimum	371,681	398,435
Std. Dev.	709989.1	501996.1
Month with min average	Jan (613,284)	Jan (611,431)
Month with Max average	Apr (2,815,122)	Aug (1,995,734)
F test on seasonality	$F_{11,216}$=208.91***	$F_{11,216}$=348.02***
K test on seasonality	K=211.96***	K=203.90***
F test on moving seasonality	$F_{18,198}$=2.36***	$F_{18,198}$=1.36
SF (min-Max,1996) SF (min-Max,2014)	0.39-2.28 0.51-1.88	0.46-1.73 0.47-1.48
Observations	228	228

Table 2 – Test on seasonal unit roots

	MUSMONUFR	MUSMONUPAY
Hasza-Dickey-Fueller test (critical value Student-t 5%: -6.13)	-0.665 (-9.780)***	-0.68 (-10.13)***
Taylor $F_{1,2,...12}$ test (critical value 5%: 7.240)	10.677 (p=.000)***	8.896 (p=.000)***

Note: Hasza-Dickey-Fuller test report the estimate of the alpha coefficient (and its Student t) in [1]; only significant lag terms of $\Delta_{12}Y_t$ are considered. Taylor $F_{1,2,...12}$ test considers eq. [2] and provides the result of the F test on the null b1=b2=...b12=0. In both cases, the null is the presence of a seasonal unit root.

Table 3 – Regression results – Dependent variable is MUSMONUPAY (Charged visit to museums and monuments)

	(1)	(2)	(3)	
Constant ($\times 1{,}000$)	9014.2 (2.13)***	7160.7 (1.78)**	34515.8 (3.02)***	
Du07 ($\times 1{,}000$)	19819.1 (1.60)*		-81605.9 (-1.92)**	
Du08 ($\times 1{,}000$)	28259.9 (2.24)**	178966.2 (1.81)**		
Du11 ($\times 1{,}000$)	107.9 (-2.23)**			
Trend	-4515.5 (-2.12)**	-3553.8 (-1.76)**	-17464.4 (-3.01)***	
Du07*Trend	-9850.3 (-1.60)*	69.49 (1.79)**		
Du08*Trend	-14039.8 (-2.23)**			
Du11*Trend		-87.89 (-3.64)***	-42.87 (-1.90)**	
Du12*Trend			-50.16 (-2.20)**	
MUSMONUFR	-0.139 (-3.72)***	-0.140 (-3.75)***	0.094 (4.20)***	
Tourist Arrivals	0.040 (3.71)***		0.049 (6.10)***	
Tourist Overstays		0.002 (1.34)*		
MUSMONUFR(-1)	0.111 (3.95)***	0.123 (4.32)***		
MUSMONUFR(-2)	-0.062 (-3.95)***	-0.040 (-1.45)		
MUSMONUFR(-12)	0.232 (2.26)**	0.255 (6.77)***		
CUM_MUSMONUFREE			0.172 (2.01)**	
MUSMONUPAY(-1)	0.138 (2.73)***	0.186 (3.52)***	0.086 (1.69)*	
MUSMONUPAY(-2)	0.085 (2.48)**	0.060 (1.69)*	0.109 (2.46)**	
MUSMONUPAY(-12)	0.398 (7.40)***	0.459 (8.74)***	0.520 (9.06)***	
R2	0.94	0.94	0.93	
F	238.6***	262.7***	260.1***	
DW	1.58	1.62	1.96	
AIC	26.35	26.36	26.56	

Note: t-stat in parenthesis; ***,**,* denote significance at the 1%, 5%,10% level, respectively.

In Column (3), $CUM\_MUSMONUFREE_t = \sum_{i=1}^{12} MUSMONUFREE(t-i)/12$.