Working Paper 92-33
July 1992

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AN ECONOMETRIC ANALYSIS OF TOURISM IN SPAIN: IMPLICATIONS FOR THE SECTORAL STUDY OF EXPORTS AND SOME ECONOMIC POLICY CONSIDERATIONS

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Abstract

This paper deals with the construction of econometric models to explain the external demand for Spanish tourist services. The models include as explanatory economic variables a tourist income index and two real exchange rate indices, one with respect to client countries and the other with respect to competitor countries.

The results obtained : a) support the hypothesis that the decision to expend on tourism is made in two stages with different price and income elasticities in each of them; b) show that the recent drop in demand is due to a real exchange rate effect.

With the models constructed it is possible to evaluate to what extent the drop in demand is due purely to the effect of prices and to what extent it is determined by exchange rate movements. The latter have had an important effect, so that a policy of appreciating the peseta indeed has different sectoral effects. This different sectoral effect, as well as the importance of distinguishing between client countries and competitors, suggest that economic policy must not be based on just one index of the effective exchange rate of the peseta but on several.

Key words:
Real exchange rates, relative prices, vectorial economic indicators, sectorial economic policy.

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Summary

This paper deals with the construction of econometric models to explain the external demand for Spanish tourist services. The models include as explanatory economic variables a tourist income index and two real exchange rate indices, one with respect to client countries and the other with respect to competitor countries.

Expenditure on tourism can be thought to be made in two stages: first the country to which one is travelling is decided and subsequently the amount of the expenditure. To deal with this question, in the paper econometric models are estimated for two endogenous variables -real revenue from tourism and the number of tourists-. The results obtained: a) support the hypothesis that the decision to expend on tourism is made in two stages with different price and income elasticities in each of them; b) show that the recent drop in demand is due to a real exchange rate effect.

In each model the endogenous variable is not co-integrated with the respective explanatory variables, so the models are formulated on differences. The lack of co-integration could be explained by the absence in the model of a variable which could register changes occurring in the quality of tourism offered in Spain. The drop in recent years of tourism demand in Spain is

explained as a combined effect of both relative prices. This implies that the sector's recovery not only requires moderation in costs and increases in productivity, but also enhanced quality, creation of standards, diversification of supply, etc. With the models constructed it is possible to evaluate to what extent the drop in demand is due purely to the effect of prices and to what extent it is determined by exchange rate movements. The latter have had an important effect, so that a policy of appreciating the peseta indeed has different sectoral effects, which can be alleviated by means of public investment, favouring expenditure on infrastructure which might be of the greatest benefit to the sectors most adversely affected by exchange rate evolution. This different sectoral effect, as well as the importance of distinguishing between client countries and competitors, suggests that economic policy must not be based on just one index of the effective exchange rate of the peseta but on several. What is more, each of the important indicators for economic policy, the effective exchange rate index, consumer price index, efficacy of public expenditure, etc., does not seem to be scalar but vectorial.

1. INTRODUCTION

In this paper, which follows a sequence of studies initiated with the papers of Padilla (1987), Espasa et al. (1990) and Espasa and Scheepens (1992), an analysis of tourism in Spain is carried out on the basis of econometric models. Throughout the paper, tourism in Spain and the concepts related to it are understood in a restricted way, since they merely refer to tourism in this country by non-residents.

On the importance of tourism in the Spanish economy it suffices to say that revenue from this area was 1.9 billion pesetas in 1990, which represented 3.8% of that year's GDP, 18.6% of revenue in the current account balance and 49.1% on the services balance. The study of the evolution of tourism is especially apt at this moment, since revenue from tourism in current pesetas, that is, before correction for the effect of inflation, has fallen 3.1% in 1989 and 2.4% in 1990, which is something unknown in the sample used in this work, which began in 1978. The aim of this study, given this negative nominal growth situation in the sector, is to investigate the causes which may be giving rise to it and to discover what type of diagnosis is possible if it is desired to reactivate the sector so that it once more has sustained real growth rates.

The remainder of the paper is organised as follows. In

section 2 an analysis is made of the main available information to study the evolution of tourism in Spain, by contrasting it with the information required by Theory to formulate a model of demand for tourist services. Thus, two endogenous variables are defined, revenue in constant pesetas from tourism and the number of tourists entering Spain and an econometric model is constructed for each one. It should be noted that the variable "number of tourists" can be associated with a initial expenditure decision on tourism, but the total revenue variable refers to global expenditure decision. In both cases, the variables refer to the total tourism demand without any breakdown into the tourists' country of origin.

In section 3 there is a discussion on the general characteristics of the models estimated, among which the inclusion of two Spanish relative price variables stands out positively, when they are compared with client and competitor countries, both corrected for the exchange rate effect. As a negative aspect we must point out that it has not been possible to include a variable which might register oscillations in quality in Spanish tourist supply, which means that the endogenous variable is not co-integrated with the corresponding explanatory variables. Likewise, tourism demand by quarters is, probably, heterogeneous, but the available information does not permit a separate analysis of each seasonal demand. In the models an attempt is made to limit these problems by allowing a specific quarterly component in the determination of revenue levels or

tourist numbers. In the case of revenue, this specific component is deterministic though a certain evolution is allowed for the component corresponding to winter. In the case of tourists, the seasonal component is stochastic.

In Section 4 there is a description of the econometric model estimated for real revenue from tourism, and there are comments on the problems encountered and a development of the implications which such a model has. From this model several points stand out: 1) the estimated lag structure for explanatory variables is compatible with a two-stage spending decision; 2) the drop in revenue in recent years is explained by a greater price elasticity, in absolute terms, but it is not possible to determine which factors have caused such a change in elasticity.

In Section 5 a model is estimated for explaining the number of tourists. The model confirms the possible two-stage aspect of expenditure on tourism. The seasonal pattern of the endogenous variable in this case has differentiated traits with regard to the seasonal behaviour of revenue, which leaves a very important question hanging in the air: to what extent does the uneven seasonal evolution between both variables over the years have as its cause a price policy on the part of the Spanish suppliers and, if so, in which way is it affecting policy towards the sector. Unfortunately the available information on prices does not enable an answer to be given to these questions.

The main conclusions of the previous models are recorded in section 6. There the most remarkable fact is that the income and price elasticities are different in each stage of expenditure. Price elasticity compared to competitors is important and acts prior to elasticity compared to prices from the tourists' country of origin. Oscillations in demand correspond more to oscillations in prices than to tourist income.

Section 7 is devoted to recording a group of comments on the tourism sector which is suggested by the previous econometric analysis. Thus, the estimated effects of different prices indicate that the recovery of the sector needs both moderation in production costs and increased productivity, as well as an improvement in quality, differentiated supply, etc. In fact, it does not seem possible that Spain can compete with a massive low-quality tourist supply. The effect of the appreciation of the peseta on the evolution of the sector is important. Finally, a higher number of tourists, does not seem to be possible without seriously compromising future demand. In any case, this econometric study of tourism has been seriously hampered by the lack of available information and, in this sense, the best recommendation that can be given as a result of it is to undertake a wide-ranging and regular survey on tourism.

The econometric analysis carried out in this paper hinges on two indices of relative prices compared to third countries and corrected for the exchange rate effect. Thus, both prices are

merely two indices of the real effective exchange rate for the tourist sector. This duality of exchange rate indices has been shown to be of use in explaining the evolution of tourism in Spain and, also, the estimated models indicate that both indices have different elasticities and dynamic effects, so that their aggregation is not recommended. Thus, in section 8, there arise the implications that these results have when constructing indices which could be useful in the design and control of economic policy. The most outstanding of these implications is that the construction of real effective exchange rate indices compared to competitor countries is also important, especially for those sectors of the Spanish economy where competition largely springs from countries not belonging to the European Economic Community. The reason is that, in a single market situation where specialisation in production is favoured, the sectors with strong outside competition must not rely on a set of tariff barriers to maintain their competitiveness artificially, but must pay close attention to the real evolution shown by this competition and base progress in the sector on production with differentiated quality in comparison with outside competition, as well as on an improvement, wherever possible, in the relative price index. All of the above indicates that, in order to be able to evaluate the sectoral effects of macroeconomic policy, the effective exchange rate indices, consumer prices, etc, which are used in it must not be scalar ones but vectorial, registering differences which it is convenient not to ignore.

2. AVAILABLE INFORMATION FOR THE ANALYSIS OF FOREIGN TOURISM IN THE SPANISH ECONOMY

There are basically two types of information: that for foreign exchange receipts from tourism, which comes from the cash basis of the Banco de España, and that referring to the number of foreign visitors in Spain. The first type of information is designed, fundamentally, to serve balance of payments analysis aims and not to be used for an economic study on the causes behind this revenue. Even from the balance of payments viewpoint the information from the cash basis of the Banco de España also has problems, since revenue from tourism must be accounted for with a downward bias. In fact, this sector is dominated by large real estate companies with foreign links, which may favour undeclared tourist revenue inflows being offset by outflows for other reasons.

At the same time, tourist investment in the purchasing of apartments and property for their own use means that the rents that tourists must pay to themselves are not registered as tourist revenue. To register this economic fact would imply accounting for an outflow of currency for capital revenue (rents) and an inflow of currency, for the same amount, for tourism. It should be noted that if the owner of a flat is a foreigner and he rents it to another foreigner then there should be an outflow of real estate income and an inflow of the tourist revenue mentioned.

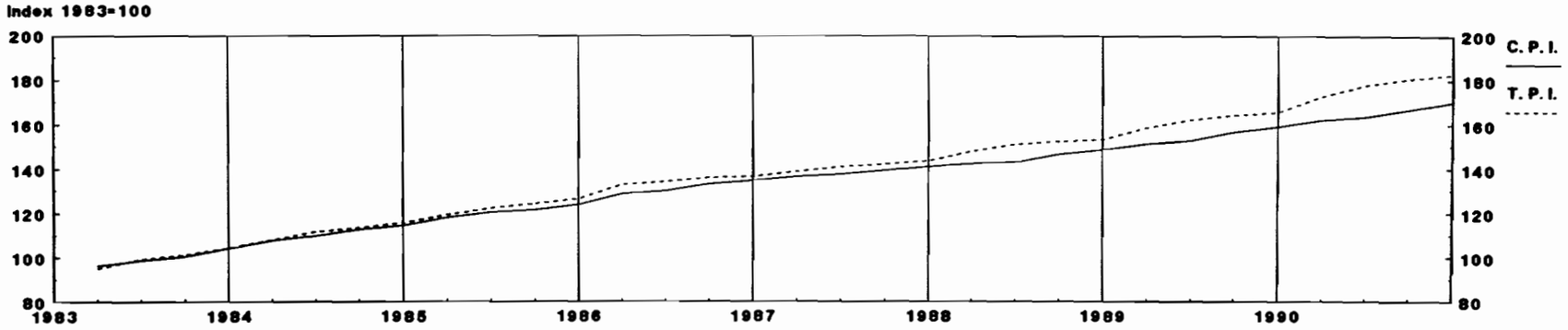
To make use of this information on nominal revenue in an econometric model it is necessary to construct an index of tourist service prices with which such revenue can be deflated. For this, use has been made of an index of prices for tourism, TPI, drawn up by the Economic Research Department of the Banco de España, on the lines of the methodology provided by the Subdirección General de Planificación y Prospectivas Turísticas. This index is shown, along with the consumer price index, CPI, in graph 1A, where it is noted that, since 1983, the index of prices for tourism has been showing increases higher than the CPI. For example, in 1990, compared to an accumulated CPI increase of 6.5%, the index of prices for tourism grew by 10%. In the evolution of the index of prices for tourism it has special importance "hotel and boarding" prices and those for "all-inclusive tourist trips" which have a weighting of 17.84% and 13.80%, respectively. The evolution of these components is reflected in graphs 1B and 1C where the strong growth of both variables in recent years can be noted.

The TPI indicator has several drawbacks. It is constructed from information with which the Instituto Nacional de Estadística prepares the consumer price index by using weightings stemming from input-output tables for tourism . This means that for entries such as "hotels" and "all-inclusive tourist trips" prices with an upward bias are being included. In fact, the prices used in these entries to construct the CPI come from catalogues and refer to the prices that are applied in cases of individual

PRICE INDICES

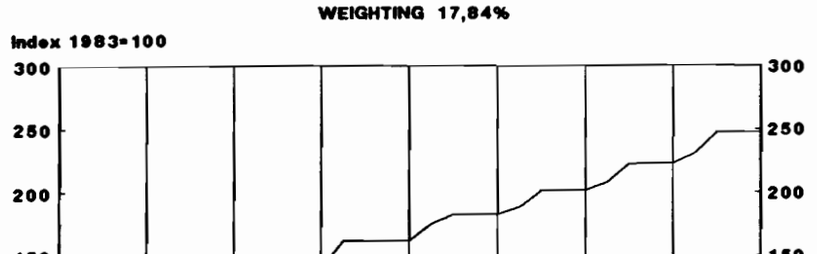
Graph 1

A. Consumer Price Index (CPI)
Tourist Price Index (TPI)

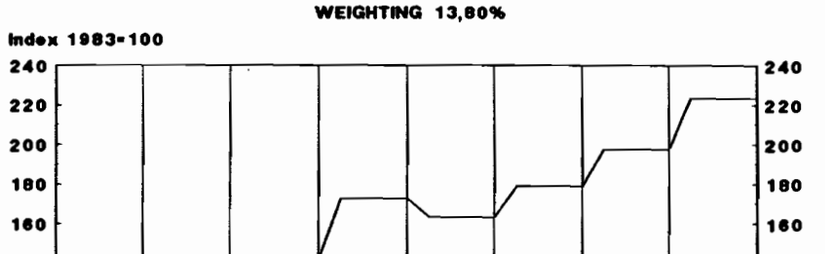


COMPONENTS OF TOURIST PRICE INDEX

B. Indices of prices of hotels and lodging



C. Index of prices of "all-inclusive tourists trips"



demand, while a large number of tourists come with "tour operators", who negotiate much lower prices. Furthermore, the above-mentioned catalogues are usually revised once a year so that prices of the entries quoted move in a step manner, without this reflecting a real fact. With this way of collecting information, the seasonal pattern of tourist prices is completely ignored. All of this suggests that for the study of tourism it would be highly advisable for the Instituto Nacional de Estadística to draw up a periodical tourist survey from which, among other things, a good price index for tourist services could be prepared. Despite the above-mentioned drawbacks, and given that there is no other alternative, in this work the index of tourist prices described is used.

The study of tourism would require an approach broken down by countries of origin, since the elasticities of income and relative prices may be different for tourists originating in different countries. From the cash basis information series of receipts from tourism according to countries of origin are obtained, but their reliability with regard to the country of origin is very relative, so that the use of this information on revenue does not enable an analytical study of tourism to be carried out, and the user is compelled to work with aggregate models. Finally, it must be mentioned that information on revenue has a lead and lag problem with regard to the real fact that it has to reflect, due to expectations of the appreciation or depreciation of the peseta giving rise to displacements in the

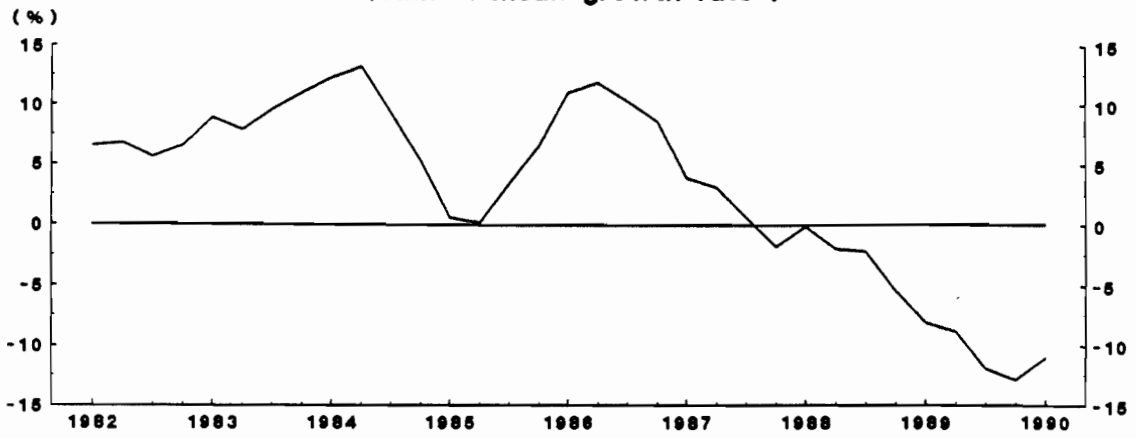
time of the payments, especially those concerning "tour operators". Nevertheless, these displacements of payments can be made only within certain time limits, which enables us to trust, bearing in mind that in this work the information is used in an aggregated quarterly form, that the above-mentioned problem of leads and lags will scarcely have any effect upon this study.

The series of foreign visitors has the advantage of being a series in real terms and can be directly used as an endogenous variable of a demand model. The problem arising from the use of this information is that a study of tourism cannot end with the econometric explanation of the number of tourists entering Spain, since real per tourist expenditure is not stable at all, instead it declines systematically, see graph 2. This means that the latter must be explained by another econometric model, and, in that case, we need to use the information on revenue from the cash records with the already-mentioned drawbacks. Nevertheless, approaching the study of tourism through the explanation of two variables, the number of tourists entering and expenditure per tourist, may be very accurate, since in this way one is better able to register the fact that expenditure on tourism represents a decision by stages, firstly - some months before the trip - a decision is taken as to spending or not, and subsequently, the amount is decided. If this is true, it may well happen that the elasticities of income and relative prices will be different in each decision.

Graph 2

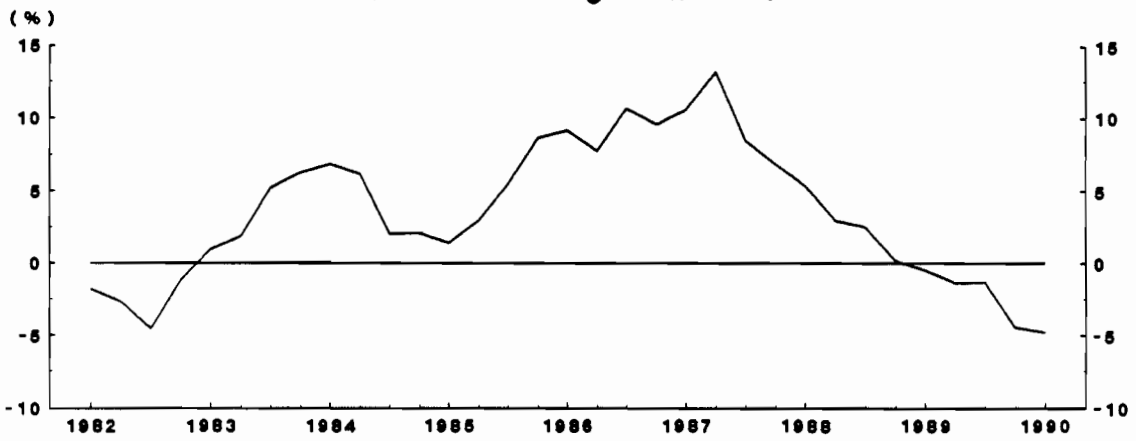
REAL RECEIPTS FROM TOURISM

(Annual mean growth rate)



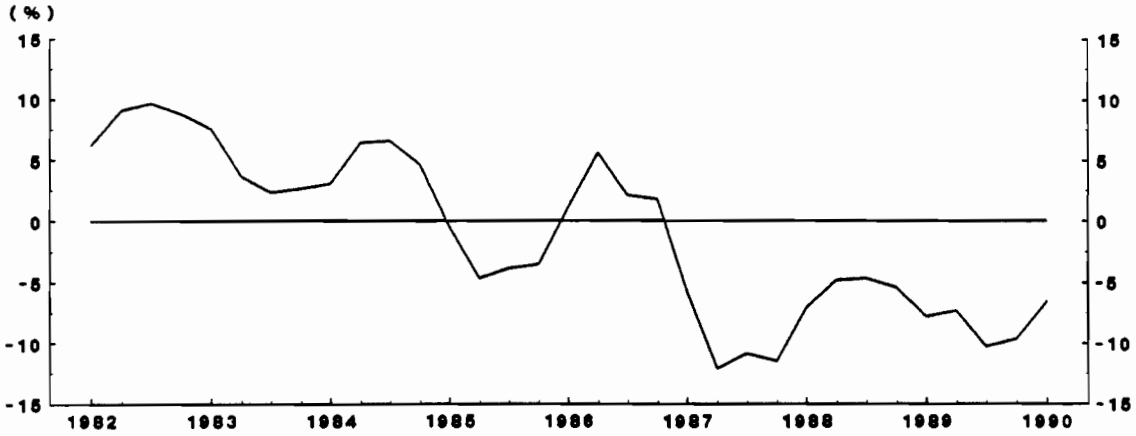
NUMBER OF TOURISTS ENTERING

(Annual mean growth rate)



RECEIPTS / TOURISTS

(Annual mean growth rate)



In this paper it has been found that the variable for real expenditure per tourist is explained much worse than the total real expenditure (revenue) and it has been decided to limit ourselves to econometric models on this latter variable. This result may indicate that measurement errors in revenue and in the number of visitors accumulate when the expenditure per tourist variable is constructed. Nevertheless, given that in order to establish diagnoses and recommendations on the sector it is interesting to know if there are different elasticities in the possible process of expenditure decision by stages, in the paper a model is also constructed on the total number of tourists. With both models real expenditure per tourist can be projected, and this is a very significant variable, since, for example, a drop in its value indicates that the same total revenue can only be achieved with a greater number of tourists, which may mean higher costs.

Moreover, the use of information on tourists entering allows an analytical study by countries of origin which is also of importance for sector planning, if significant differences are seen in the elasticities of income and relative prices according to the tourists' country of origin. Given that data on revenue do not enable an analytical study of demand to be made, in this paper we will refer basically to aggregate demand, although in section 5, with the data of tourists according to country of origin, comments are made on the conclusions of a preliminary exercise on disaggregated demand.

The data on foreign visitors entering Spain records, in the case of foreigners from France and Portugal, both real tourists and mere visitors or people passing through. Therefore, the figures for visitors from these countries must be corrected and, in line with indications from the Subdirección General de Planificación y Prospectivas Turísticas, forty- five per cent of French visitors have been considered as tourists and only ten per cent in the case of Portugal.

The explanatory economic variables included in the econometric models are: tourist income, which we will call INCOME, and the relative prices of tourism in Spain compared to prices in the tourists' countries of origin, which we will call PREF, and compared to tourism prices in the other countries which also provide services for tourists, which we will call PREC. The description of the procedure used in the construction of these variables, which is based on an initial work contained in Padilla (1987), is given in Appendix 1. The relative price variables are corrected for the evolution of the corresponding exchange rates and the income variable is expressed in constant prices.

With regard to the relative price variables, it is worth noting that, as is explained in Appendix 1, each of them can be broken down into a price component (without correcting for the exchange rate) and an exchange rate component in the following way:

$$PREF = PF \cdot TCF \quad \text{and}$$

$$PREC = PC \cdot TCC \quad ,$$

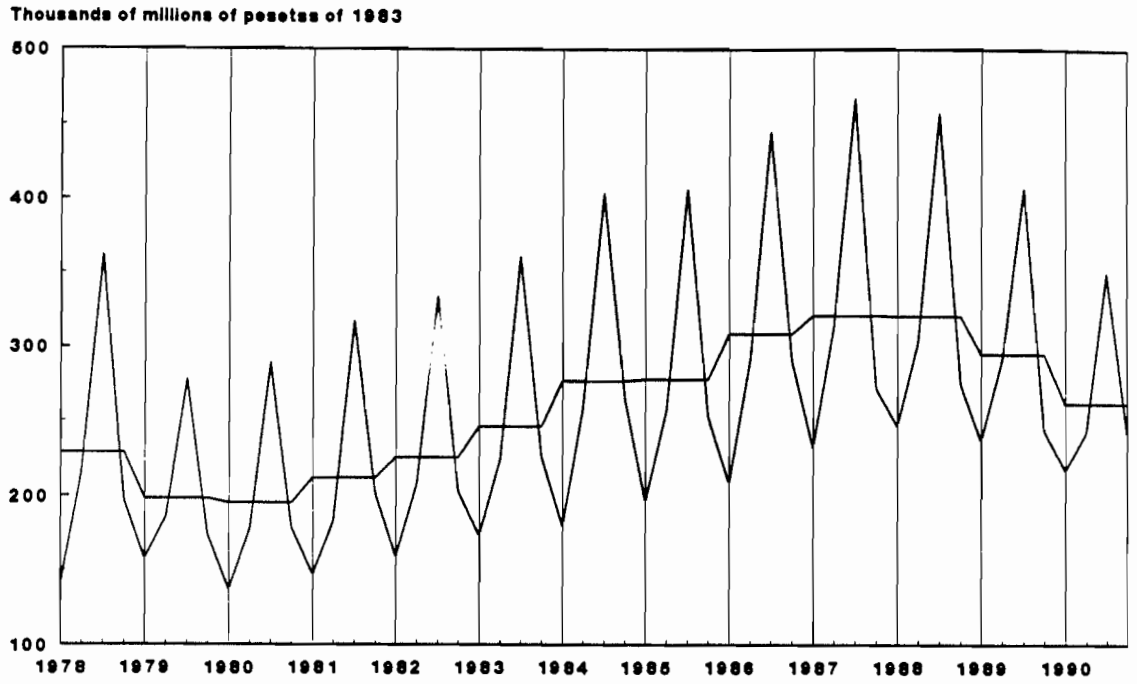
where PF and PC are price components and TCF and TCC are exchange rate components. Graphs 3 to 6 register these variables.

This breakdown of relative price variables (indices of real effective exchange rate) is very illustrative since it enables the contribution of the inflation differential to be separated from the contribution due to the exchange rate.

The PREF and PREC variables have similar evolutions, compare graphs 5 and 6, though this is no longer the case at the end of the sample. Nevertheless, their corresponding price variables, PF and PC, and the exchange rate ones, TCF and TCC, have in each case, very different behaviour. The latter point stresses a very important fact with regard to competitor countries. The Spanish inflation differential compared to these countries has evolved in a very unfavourable way for them, but the exchange rate policies applied have more than compensated for the loss of competitiveness caused by inflation in those countries.

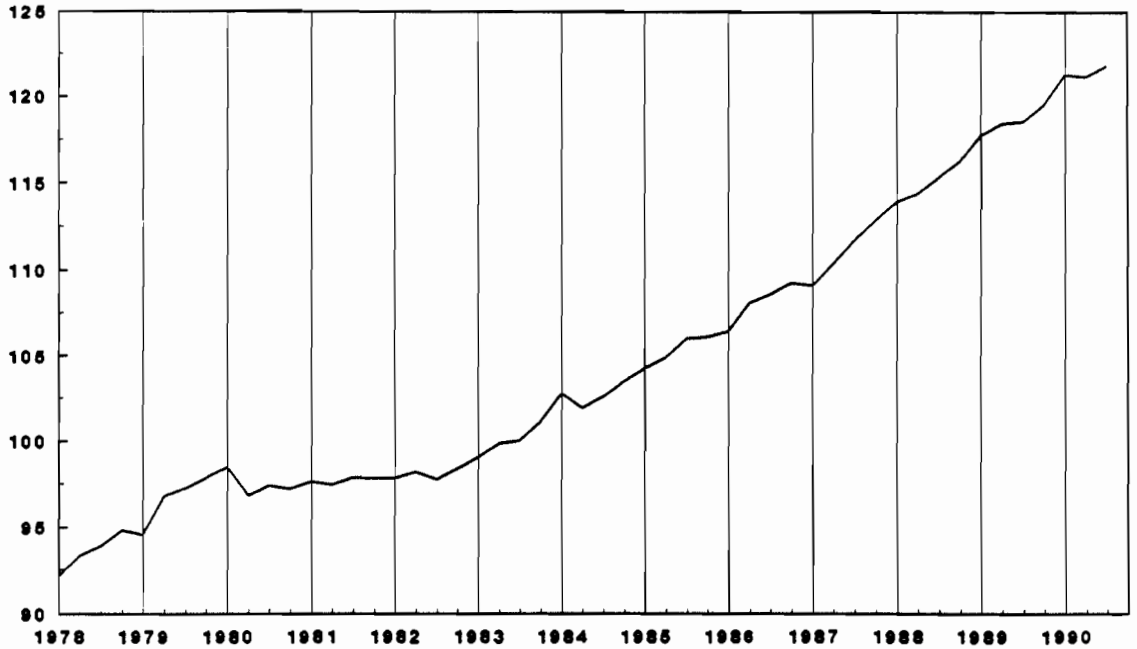
Graph 3

RECEIPTS FROM TOURISM IN REAL TERMS
Quarterly series and annual mean



Graph 4

REAL INCOME OF COUNTRIES OF ORIGIN
Index 1983 = 100

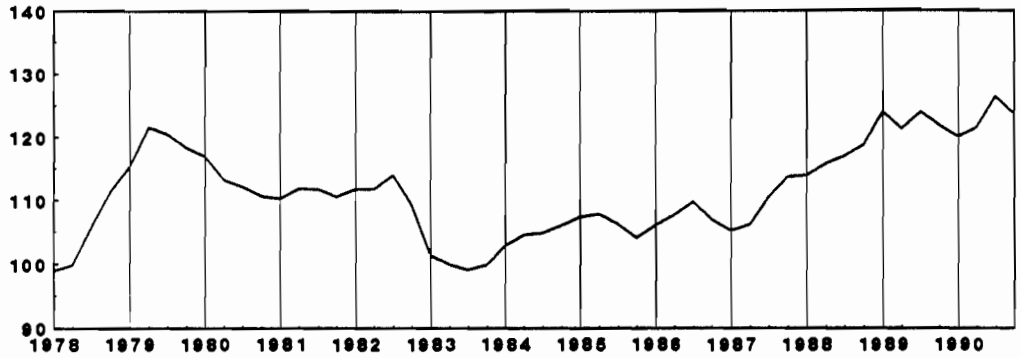


Graph 5

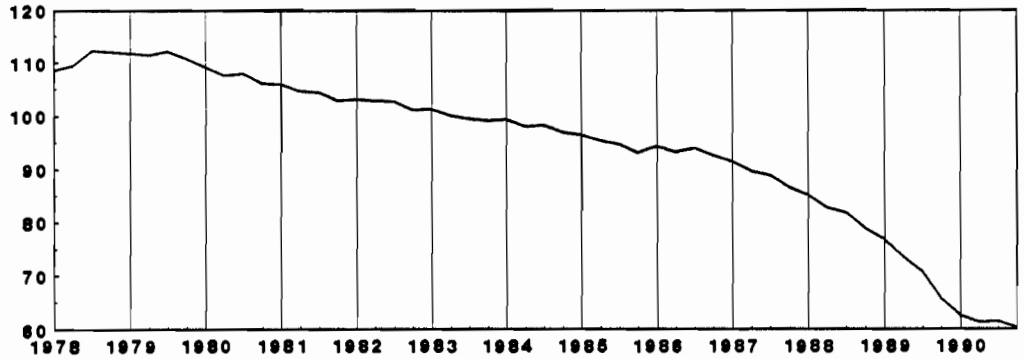
RELATIVE PRICES COMPARED TO COMPETITOR COUNTRIES

Breakdown by prices and exchange rates

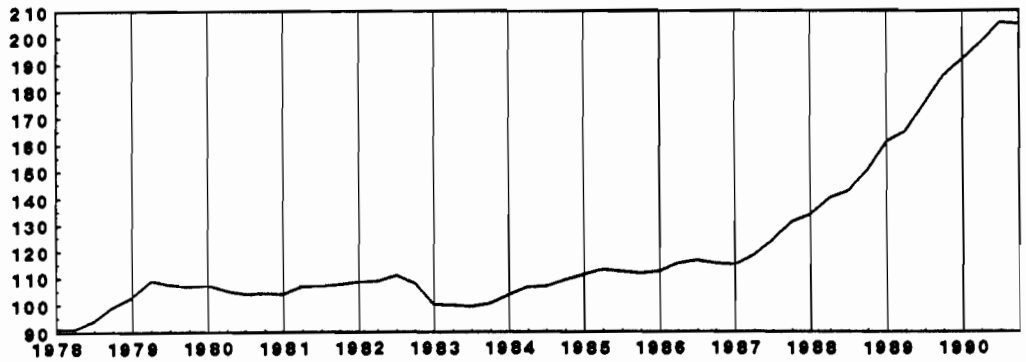
RELATIVE PRICES COMPARED TO COMPETITORS (PREC)



PRICES (PC*)



EXCHANGE RATES (TCC*)



Note: PREC = (PC* x TCC*)/100

The variable PC* and TCC* are the variables PC and TCC explained in the appendix, but on base 1983 = 100

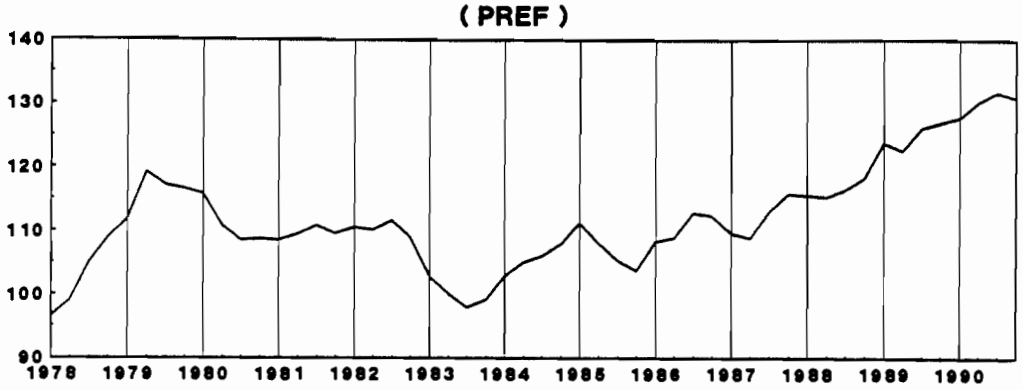
Graph 6

RELATIVE PRICES COMPARED TO COUNTRIES OF ORIGIN

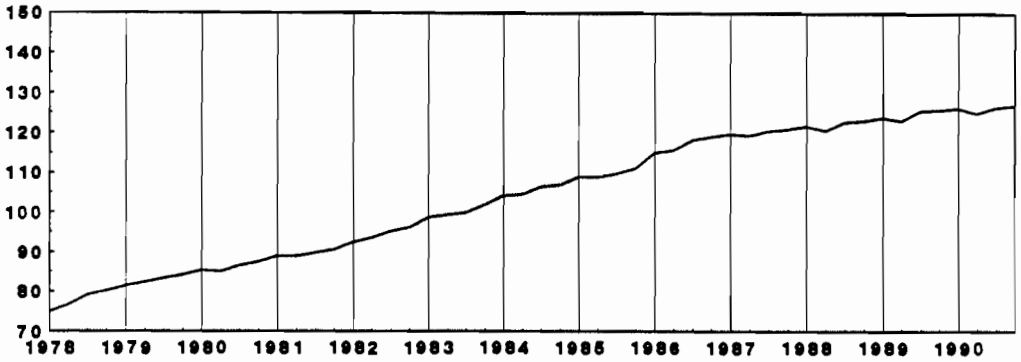
Breakdown by prices and exchange rates

RELATIVE PRICES COMPARED TO COUNTRIES OF ORIGIN

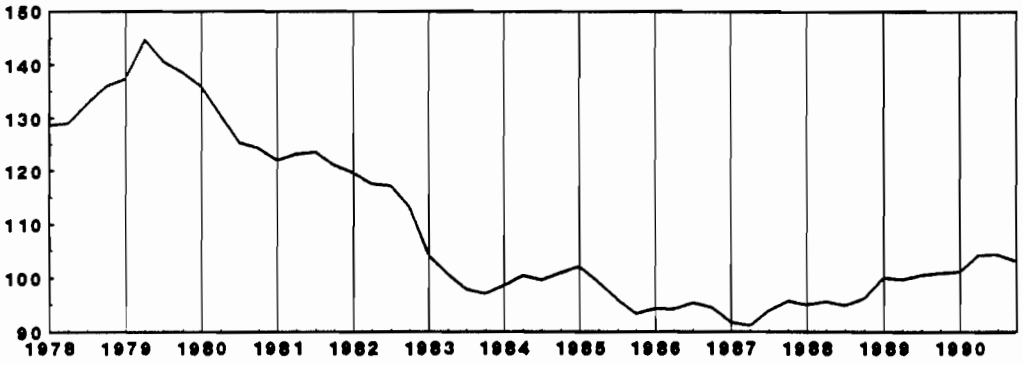
(PREF)



PRICES (PF*)



EXCHANGE RATES (TCF*)



Note: PREF = (PF* x TCF*)/100

The variable PF* and TCF* are the variable PF and TCF explained in the appendix, but on base 1983 = 100

3. DEMAND MODELS FOR TOURIST SERVICES: INITIAL CONSIDERATIONS

In this paper econometric models are constructed for the following variables:

a) total real revenue and

b) total number of tourists entering Spain.

With models a) and b) the aim is to determine if there are signs that expenditure on tourist services is being made in two stages, and if this is the case, if the elasticities in each case are different or not. Also, models have been explored for the number of tourists, distinguishing by countries of origin, in order to clarify if the aggregate analysis can be a suitable approach or if, on the contrary, the elasticities change sufficiently for diagnosis to need to be based upon models broken down according to the tourists' country of origin.

The estimated models are demand models, with a level variable and relative price variables. As has already been said, the level variable used is an index of tourists' income, though it has also been considered an index based on private consumption, with which worse results were obtained. One aspect which has been deemed important in the study of this sector is that of considering, following on the lines of Padilla (1987), that in determining tourism demand there may be more than one really influential relative price. Consequently, two relative

price indices, one for Spain compared to competing countries in the supply of tourist services and the other for Spain compared to the tourists' countries of origin have been used. The evidence in favour of the fact that both indices influence the determination of tourism demand in Spain, will imply that the improvement in Spain's competitiveness compared to the countries of the European Community is not enough to maintain sustained growth in tourist revenue, if it is not also accompanied by an improvement in competitiveness compared to countries traditionally providing tourist services and compared to new countries which might add to the supply of world tourist facilities. We will return to this point in the next section.

As is explained in Appendix 1, the relative price variables, which have had to be constructed from consumer price indices in the different countries, are corrected for variations in exchange rates and are formulated as chained indices the weightings of which change over time. Nevertheless, these indices do not take into account the relative changes in quality in Spanish tourist supply, from the one referring to the transport and communications infrastructure, overcrowding in tourist centres, care of the beaches, etc, to personal attention in hotels. Nor has an indicator been found which might make an acceptable approach to the evolution of this variable which we could call "quality of Spanish tourist supply". Therefore, it has been assumed that this quality variable follows the type of stochastic process called random walk, that is, quality in moment

t equals that of the previous moment, t-1, plus a change which is unpredictable. This implies that tourism demand is not co-integrated with tourists' income and the relative price indices used, but that the possible co-integration relationship should include a variable on tourist quality which is unknown. Given all that, the model cannot be formulated to determine the level of demand but has to be formulated on differenced variables.

As will be seen later on, there are signs that the quality of Spanish tourist supply could have been increasing during a large part of the eighties, but it could have stagnated in the final years of the decade. By accepting this type of information, dummy variables of the ramp-type could be constructed, as was done in Espasa et al. (1990). When this is done, worse adjustments are obtained than those given here or the only significant variables are the dummy ones. Therefore, in this paper, as has been indicated, changes in quality are assumed to be stochastic and the model is formulated with variables in differences.[1]

Tourism demand has a very marked seasonal oscillation. Nevertheless, none of the explanatory economic variables contain

[1] In Espasa et al.(1990) and Espasa and Scheepens (1992), adjustments with ramp-type variables were good and maintained the significant effect of the explanatory economic variables. That was due to errors in the construction of the income and relative price variable compared to competing countries, which have been eliminated from this work.

seasonal movements[2], so the seasonal pattern of the dependent variable must be deterministically explained, by means of seasonal dummy variables, or, stochastically, by means of a residual component generated by an autoregressive process with unit roots of seasonal periodicity. The latter, along with the need to differentiate the variables due to the effect of changes in quality, implies that modelmaking of tourism demand with a stochastic seasonal behaviour requires formulating the variables in seasonal differences.

[2] Specifically, the relative price indices do not have a seasonal pattern, since they have been constructed from the consumer price indices of the corresponding countries which hardly show seasonal changes and the income index, for reasons of homogeneity in the availability of data, has been constructed from seasonally adjusted series of real income of different countries.

4. AN ECONOMETRIC MODEL FOR DETERMINING REAL REVENUE FROM FOREIGN TOURISM

The dependent variable - which we shall call IRT -is defined as nominal revenue deflated by the index of tourist prices commented on in section 2. The explanatory economic variables are the ones pointed out in that section, INCOME, PREF and PREC.

In model 1 in table 1 the dependent variable IRT is explained on the basis of the above-mentioned variables and a set of dummy variables. The elasticities have the expected signs, both relative price indices enter, the one corresponding to competitor countries with a four quarterly lag and that for tourists' countries of origin in contemporaneous form, that is with no lags.

In the construction of this model we began by testing whether the endogenous variable and the explanatory ones were co-integrated or not. When the co-integration relationship was rejected, this being justified by the absence in the model of a variable which could record movements in the quality of tourist supply, we went on to construct the model by using the variables in first differences. Initially, a model was formulated with the most dynamic specification that the data allowed and, subsequently, it was simplified until we concluded with the indicated one.

Table 1

ECONOMETRIC MODELS ON EXTERNAL DEMAND FOR TOURIST SERVICES IN SPAIN

Model Number	Dependent Variable	EXPLANATORY VARIABLES						RESIDUAL ELEMENT AND ADJUSTMENT
		INCOME (ln)	PREC (ln)	PREF (ln)	Seasonal dummy variables	Impulse dummy variables	Other variables	
1	(1-L)lnIRT	1.56 L^3 (2.53)	-0.81 L^4 (3.59)	-0.90 (4.10)	Appear with restriction of sum zero	-0.11D812 (4.11) -0.08D841 (2.91)	0.1WINTER (6.12)	White noise. Standard deviation of the innovations 0.034. The Box-Ljung test does not reject the hypothesis of white noise for the innovations. These are shown in graph 7.a. R^2=0.99
2	(1-L)lnIRT	1.75 L^3 (3.05)	-0.77 L^4 (3.69)	-0.69PREF (3.18) -1.69PREF89 (2.78)	Appear with restriction of sum zero	-0.11D812 (4.43) -0.08D841 (3.18)	0.1WINTER (7.07)	White noise. Standard deviation of the innovations 0.0324. The Box-Ljung test does not reject the hypothesis of white noise for the innovations. These are shown in graph 7.b. R^2=0.99

ECONOMETRIC MODELS ON EXTERNAL DEMAND FOR TOURIST SERVICES IN SPAIN

Model Number	Dependent Variable	EXPLANATORY VARIABLES						RESIDUAL ELEMENT AND ADJUSTMENT
		INCOME (ln)	PREC (ln)	PREF (ln)	Seasonal dummy variables	Impulse dummy variables	Other variables	
3	$(1-L^4)$lnTUR	2.3 L^2 (4.3)	$-0.56L^4$PREC (2.91) $-1.06L^4$PREC88 (2.41)				0.06EASTER (3.3)	AR(1) process with coefficient 0.3 (2.1). Standard deviation of the innovations 0.055. The Box-Ljung test does not reject the hypothesis of white noise for the innovations. These are shown in graph 9.a. R^2=0.99
4	$(1-L^4)$lnTUR	2.4 L^2 (4.6)		$-0.56L^4$PREF (3.0) $-1.32L^4$ PREF88 (2.8)			0.06EASTER (3.6)	AR(1) process with coefficient 0.3 (2.1). Standard deviation of the innovations 0.054. The Box-Ljung test does not reject the hipothesis of white noise for the innovations. These are shown in graph 9.b. R^2=0.99

NOTES:

In this model the INCOME variable has a three-term lag. This lag effect, along with that for relative prices with competing countries, is compatible with a two-stage spending decision: in the first, some quarters before the trip, on the basis of income and relative prices in Spain compared to those of competitors, it is decided whether to come to Spain or not, and, subsequently, at a present time, mainly on the basis of relative prices in Spain compared to those of the countries of origin, the extent of the expenditure is decided.

The evolution of the two relative price indices, or indices of the real effective exchange rate, has been quite similar throughout the sample, except in the last two years. Thus, the incorporation of both indices in the model is based fundamentally on a different dynamic structure. In any case, the response distributed in the time of the dependent variable with regard to the real effective exchange rate enables an explanation to be given for tourism demand as expenditure carried out in two stages. Which is the most important real effective exchange rate index at each stage, is rather more debatable, given the similarity of both indices in the sample used. At the same time, this similarity emphasises that both exchange rate indices are important, so that none of them is to be ignored. Compared to the alternative of grouping both indices in just one real effective exchange rate index, which could consider both client and competitor countries, in this paper it was decided to use both separately. With this breakdown of competitiveness into an

indicator with regard to countries with tourism demand and those with supply, it is possible, subsequently, as is done in graphs 5 and 6, to make, in each case, a separation of the effect due to the inflation differential from the effect corresponding to the nominal effective exchange rate. These effects have been radically different in one index and another and it would appear convenient to continue carrying out a detailed pursuit of the differential effects of inflation and the exchange rate with the two groups of countries.

This pursuit of the four components of the sector's competitiveness, two for each group of countries, has an interest that goes beyond the formulation of econometric models. The decline of competitiveness compared to the other countries offering tourist facilities, despite the favourable advantage for Spain with regard to the inflation differential with them, which has been observed since 1984, could have greater subsequent effects, if the peseta appreciates in comparison with client countries' currency, without a reduction of the differential of inflation compared to the latter being achieved. Such an appreciation has been produced from 1988-89 and, as will be discussed below and also in the following section, from these years onwards elasticity of demand compared to relative prices may be considered to have increased. That is to say, the demand registered by the sector may be subject to non-linear structures that might be less difficult to detect and comprehend on the basis of the four components defining the competitiveness of the

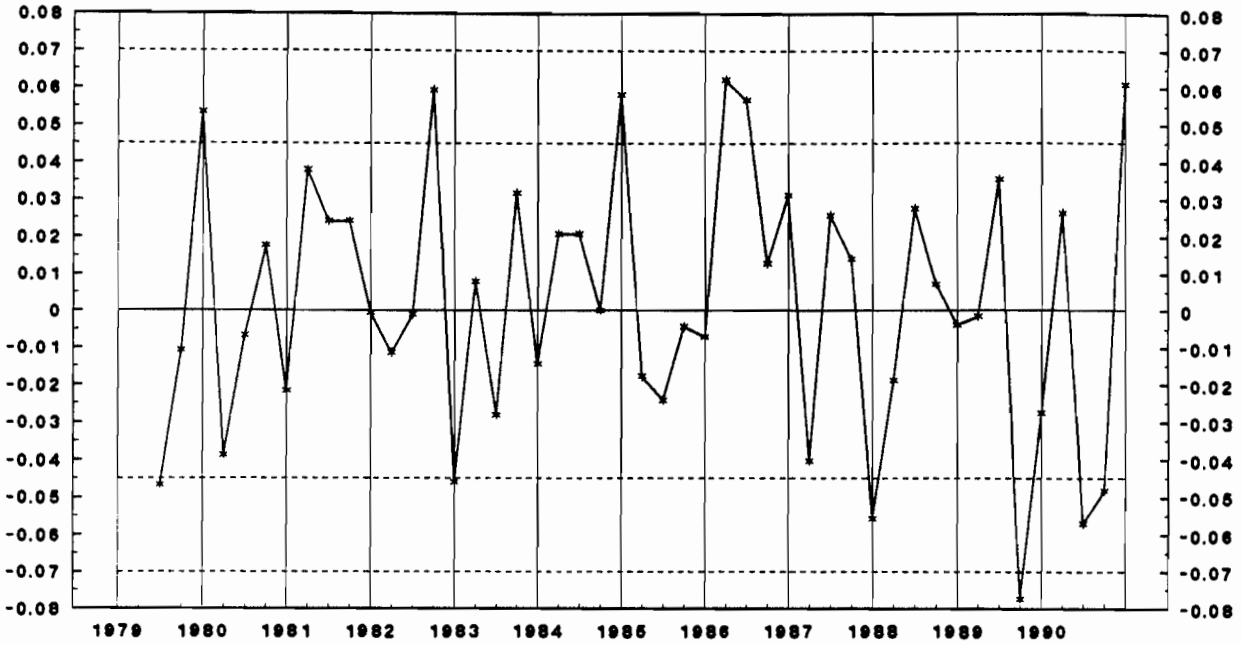
sector.

In graph 7a the residuals of model 1 are recorded. There a concentration of negative residuals, high in absolute value, can be seen in 1989 and 1990; likewise,there is a concentration of positive residuals from 1984 to 1986, except for 1985. The interruption of the sequence of positive residuals during 1985 could be due to the fact that in the summer of that year the international press gave fairly wide coverage to the terrorist attacks which took place in Spanish tourist areas.

A model capable of registering the drop in tourism in 1989 and 1990 is difficult to obtain. One possible solution is that elasticity of relative prices in Spain compared to tourist-supplying countries is not constant, so that, when loss of competitiveness goes beyond certain levels, it has greater effects. Apart from what has been previously indicated on the four components defining competitiveness in graph 6, it is noted that between 1988-89 the PREF variable began to show values above the historical maxima registered at the beginning of the sample. Furthermore, by analysing the exchange rate indices - graphs 5 and 6- it can be seen that it is also from 1988-89 onwards that the peseta began to appreciate both compared to competing countries and those of the tourists' countries of origin, with a huge appreciation compared to the former. To the extent that exchange rate information is more accessible and more widely published, it could occur that this type of appreciation

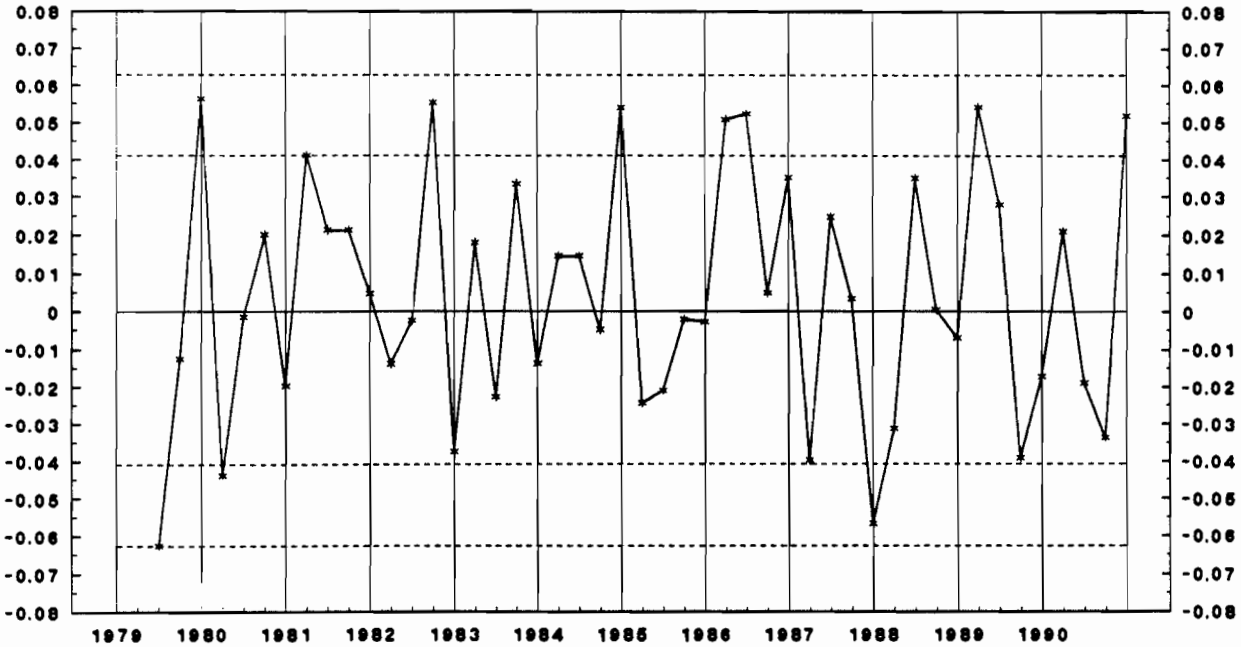
Graph 7a

RESIDUALS OF MODEL 1



Graph 7b

RESIDUALS OF MODEL 2



determines a period when tourists are more sensitive to relative prices, with an increase, in absolute terms, of expenditure elasticity related to these prices. Also, to the extent that tourist summer overcrowding in Spain was historically the highest in 1988 - see graph 8 -, and to the extent that overcrowding means a loss of quality of service, it holds that greater elasticity with regard to prices in the most recent years of the sample can be justified by a loss in quality.

There are, consequently, various reasons for thinking that elasticity with regard to prices may be greater in recent years. This may be built into the model, by introducing the PREFX variable, which takes zero values till the last quarter of the year (X-1) and the value of PREF from the first quarter of year X. This is done in model 2 in table 1, where it is observed that, from an elasticity of -0.69 up to 1988, it moves to another of -2.38 from 1989 onwards. Thus the adjustment is improved and a more acceptable residual behaviour is obtained in the last years (see graph 7b)[3].

We tried putting the extra effect from 1989 onwards on the PREC variable but the best result was the one obtained in model 2: in fact the extra effect is not significant with the PREC variable. Model 2 indicates that the drop in tourism in recent years can be explained by a greater elasticity with regard to

[3] The PREFX variable has been introduced into the model so that, once it has been differentiated, it affects the dependent variable from the first quarter of 1989 onwards.

prices, although there may be several reasons for that changing elasticity. Unfortunately, the sample is excessively limited for discriminating as to which factors and to what extent determine that change in elasticity.

If we add to model 2 a ramp-type dummy variable beginning in 1980 or 1984 and ending in 1986, or a doubly ramp to take into account the large drop in 1985, the adjustment is improved, all the economic variables maintaining their significance, though there are certain changes in the coefficients. Thus, income elasticity may fall to 1.3 and that of PREF be of -0.25 until 1987, with the elasticities and coefficients of the dummy variables remaining almost the same. This indicates that if the model is omitting one or several important variables, such as, perhaps, improvement in commercialisation and quality in Spanish tourist supply in those years, which might allow an approach through the above-mentioned dummy variables, that omission may be giving an upward bias to income elasticity.

Nevertheless, these ramp-type effects may be considered slightly arbitrary, so the models including them were rejected, and model 2 from table 1 was chosen as the pattern to use in formulating an approach to the behaviour of real revenue from tourism.

All the previous models assume that tourism demand is homogeneous in the different quarters of the year. This is hardly

likely to be the case and, more probably, the tourist sector has to deal with at least two different demands; summer and the rest of the year. Thus, for example, as can be seen in graph 3, revenue in the first quarters has fallen less in recent years than revenue from the third quarters. This fact is not explained by movements in income and relative prices, so it may be a question of different demands, that is, with different elasticities[4]. Unfortunately, the number of observations available does not enable a reliable estimate of models with different elasticities of income and prices according to the quarters of the year. To alleviate this imperfection, a WINTER variable has been built into the model which takes value one in the first quarters of 1988 and successive years and zeros at other times. This variable appears as very significant and thus records the fact that winter tourism has different characteristics and, specifically, has shown less of a drop in the last few years.

The model includes two impulse dummy variables to correct outliers: those corresponding to the second quarter of 1981 and the first quarter of 1984.

The specification of the model also contains highly significant seasonal dummy variables. The seasonal pattern in the variable (1-L)ln IRT which is derived from them is:

[4] Relative prices have been constructed by using the consumer price index of the corresponding countries and these indices do not register possible seasonal changes in tourist prices.

First quarter : -0.22

Second quarter : 0.27

Third quarter : 0.43

Fourth quarter : -0.48.

Nevertheless, seasonality is a cyclical oscillation which has its main interest when calculated on the level of an economic phenomenon. Therefore, it is important to calculate the corresponding seasonal coefficients for tourist revenue in real terms, which is derived from the seasonal coefficients estimated in the econometric model on (1-L)lnIRT. Pierce (1978) calculates the relationship between the seasonal coefficients[5] of a variable on levels and first differences. For quarterly series this relationship is:

$$\beta_j = \sum_{i=1}^{j} \delta_i + \frac{1}{4} \sum_{h=1}^{4} h \quad \delta_h \ , \qquad j = 1,\ldots,4$$

where β and δ are seasonal coefficients corresponding to the level and first differences, respectively. By applying such a relationship to revenue from tourism we find that in the third quarter there was a seasonal increase of 40.25%, while in the first, second and fourth quarters there were cyclical falls of 29.75, 2.75 and 7.75%, respectively.

[5] An application to Spanish data is found in Espasa (1989), pages 408 and 409, where on an ARIMA model for the monthly industrial production index, January 1965 - December 1982, the magnitude of the seasonal change is calculated from January 1975 onwards, a time when there was a confluence on the data of this brought about by change in the survey used for calculating it and the effects of the energy crisis.

These quarterly seasonal coefficients do not, in any way, reflect, except in the first quarters, a homogeneous seasonal behaviour in the months of each quarter. In fact, in Espasa and Scheepens (1992) a monthly seasonal IRT profile is calculated and it is observed that the seasonal factors increased from April to August and fell from September to December, rising once more, almost to the April level, in the first three months of the year. Over the years the seasonal factors of each month in real tourist revenue has remained fairly constant, with a simple noteworthy feature being a certain growth of the seasonal coefficient for the month of May.

5. AN ECONOMETRIC MODEL FOR DETERMINING THE NUMBER OF TOURISTS ENTERING SPAIN

In graph 8 the quarterly series of tourists entering Spain from abroad, TUR, is shown. In the graph it can be seen that it is a series which is dominated by the seasonal component. One can also detect that, after ten years of continued growth in the figures for tourists arriving in Spain -except for 1982 which, from the present day point of view, can be considered episodic - in 1989 that figure is stuck at 1988 levels and in 1990 began to decline.

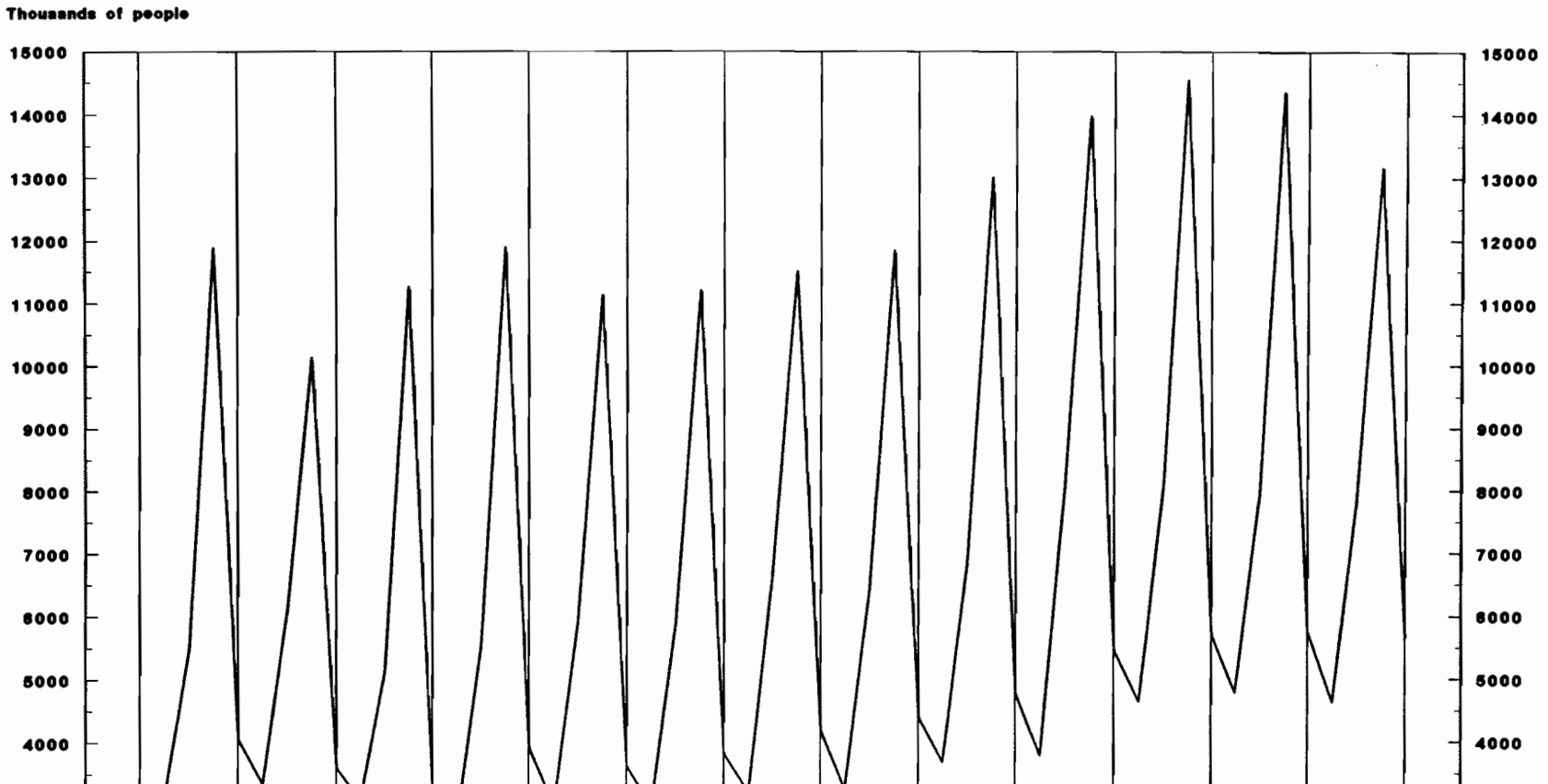
When estimating demand models such as those of the previous section to explain the number of tourists, the following facts are of the greatest significance:

1. The economic variables, number of tourists, tourists' income index, relative price index, compared to client countries and the relative price index compared to competitor countries, are not co-integrated either and the model must be formulated on differences.

2. The seasonal pattern of the dependent variable, as in the previous section, cannot be explained by means of the economic variables considered, but, unlike what occurred with revenue, now this seasonal behaviour is better recorded by means of a stochastic structure.

Graph 8

TOURISTS



Consequently, the model is formulated on annual differences.

3. Only one price effect is recorded, PREF or PREC, but never both together. In any case, the data require prices to appear in the model with a time lag of four quarters.

4. Whatever price variable may be used, its corresponding elasticity is not constant but increases, in absolute value, at the end of the sample.

5. The global adjustment is practically the same, regardless of the price variable used. Likewise the elasticities obtained are almost identical in both cases, the biggest difference being in the elasticity compared to prices in the final part of the sample, which with PREF is -1.3 and with PREC -1.1. The differences in adjustments are given in the last three years, and the adjustment with PREF is marginally higher.

6. The number of tourists entering Spain each quarter is sensitive to the fact that the Easter holiday falls in the first or second quarter. Thus, it is necessary to include a dummy variable to evaluate the influence of the Easter holidays in the rise noted in tourist numbers in those quarters when these holidays occur. For this

purpose, it has been considered that the "Easter effect" covers the period running from the Friday prior to Holy Week to Easter Sunday, both inclusive; in this way a dummy variable is constructed, called EASTER, which always takes value zero in the third and fourth quarters every year and a value between zero and one in the first and/or second quarters, depending upon the proportion of days of the period mentioned belonging to those quarters each year, so that the sum of the values this variable takes in the first two quarters is equal to the unit.

7. The residual element follows a first order autoregressive process.

8. Unlike the econometric models on expenditure in the previous section, where the seasonal pattern was modelled in a deterministic, stable manner, in the models on the number of tourists seasonality is of a stochastic type. As a result, its level evolves over the years, though in the absence of future disturbances,the seasonal coefficients would each tend towards a stable level. The stability of the seasonal pattern of expenditure and a relative seasonal evolution in the number of foreign visitors appeared initially in Espasa and Scheepens (1992), where both seasonal profiles are illustrated and quantified. In that paper it is shown that the seasonal peaks for the months of July and

August in the number of tourists have been reduced in the eighties, moving from coefficients slightly above 150% in 1982 to values around 125% in 1989. This slight flattening out of the summer peak for tourism[6] is something which in principle must be considered as positive for permanent supply, that is, areas which do not close outside the summer, of tourist services. Nevertheless, this reduction in the seasonal cycle of visitors is not reflected in real revenue, which apart from leads and lags problems, indicates that the seasonal peak of real expenditure per tourist may be rising in the months of July and August[7]. To what extent this effect is due to a greater increase in relative tourist prices in the summer than in the other months of the year, or to an income effect is, undoubtedly, an interesting subject for subsequent studies.

In table 1 two models are shown for explaining the number of tourists entering Spain each quarter, one using relative prices compared to competitors and the other compared to tourists' countries of origin. As has been indicated before, the data are not able to discriminate between the importance of one

[6] It should be noted that the seasonal cycle is measured as a percentage of an annual level, so the reduction summer peak does not necessarily indicate that the number of summer tourists has been falling in those years. In fact, graph 8 indicates that this number has grown throughout the sample.

[7] Once more, the increase in this seasonal peak is in relative terms on average annual expenditure, so that if the latter is falling, the seasonal rise may not imply an increase in real expenditure per person in the summer months over the years.

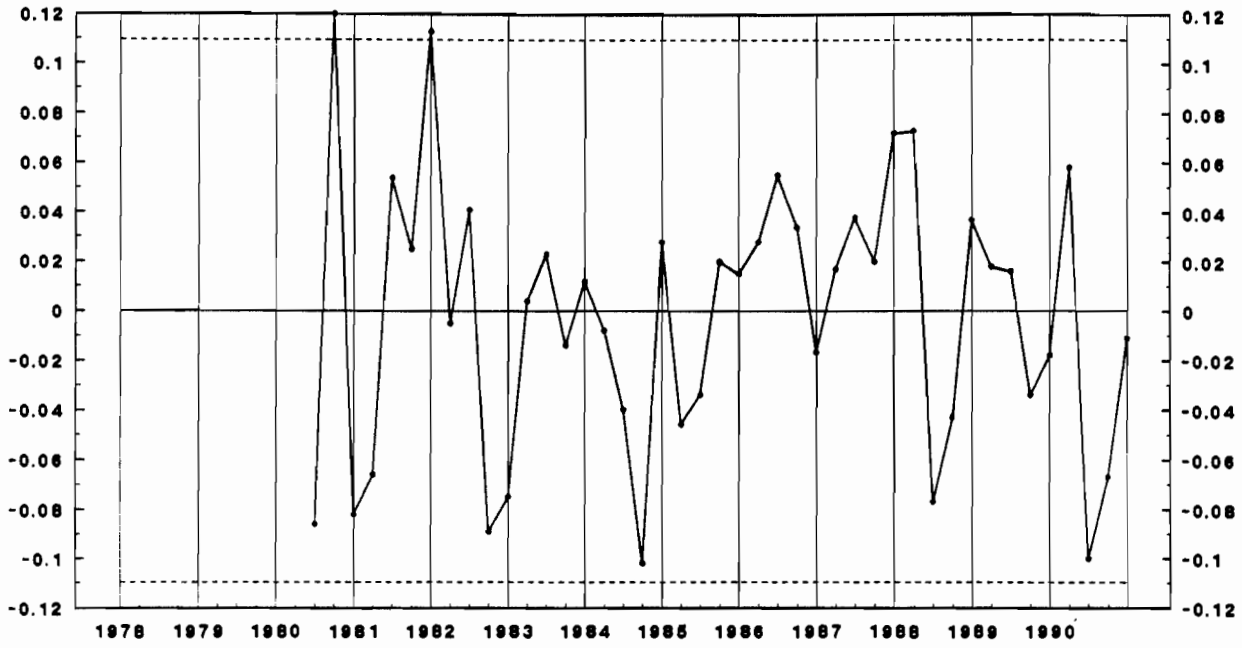
price index or another for this dependent variable. Therefore, given that the only price variable in these models always enters lagged four quarters, and given that in the model on revenue in the previous section the prices showing this lag were the competitors', it is proposed to use the model with relative prices compared to competitors -model 3 in table 1-. The residuals of both models 3 and 4 are recorded in graphs 9a y 9b, respectively.

The model obtained for the number of tourists also favours the explanation that expenditure on tourism takes place in two stages, since all the economic variables which enter into the determination of the number of tourists - a variable which can be considered to correspond to the first stage in the expenditure process- appear with lags.

With the information on the number of tourists an analysis can be made of tourism demand broken down on the basis of countries of origin. In this paper a certain exploratory analysis has been made and from it it is deduced that elasticities and even the lags with which the explanatory variables appear are different according to the countries of origin. This suggests that a recommendation for future works is to carry out an analytical study according to countries of origin.

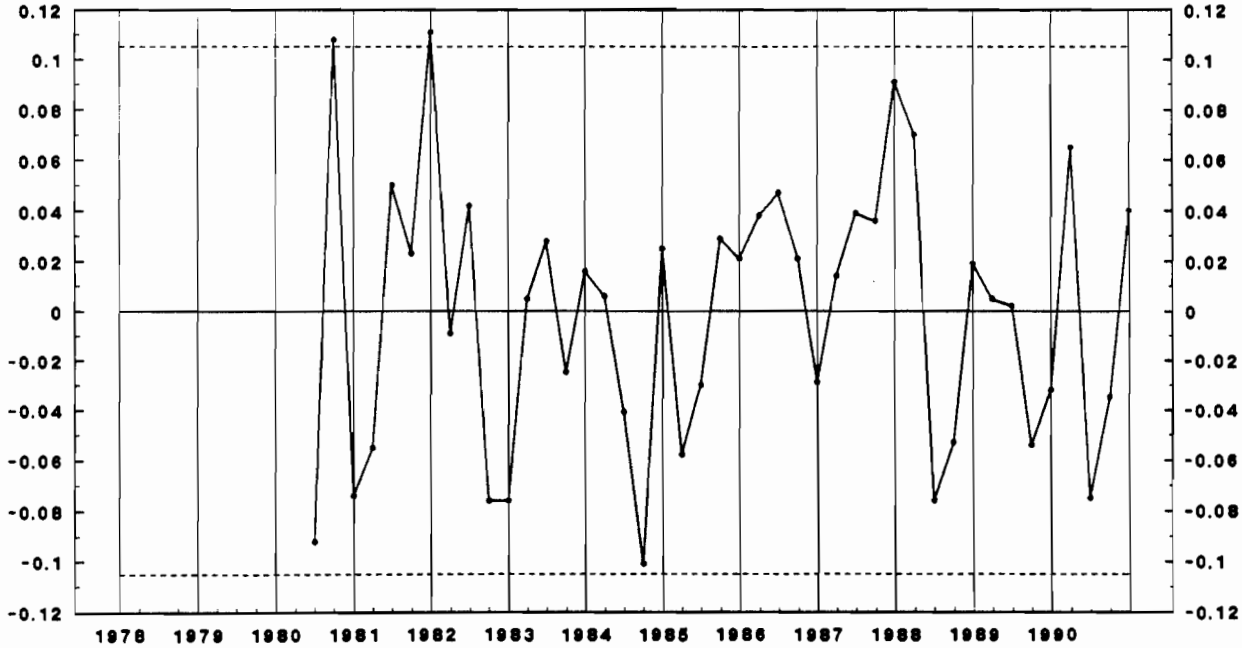
Graph 9a

RESIDUALS OF MODEL 3



Graph 9b

RESIDUALS OF MODEL 4



6. MAIN CONCLUSIONS OF THE ECONOMETRIC MODELLING

1. An econometric analysis of external demand for tourist services in Spain can be made through a series of receipts in foreign currency under this heading or through the series of tourists entering. Both present problems. To base a study on the first series means constructing a price index with which to deflate revenue, but the systematic information on what tourists pay via "tour operators" is not available, so the index of tourist prices used in this work may have upward biases. If the study is made only on the number of tourists, it is found to be incomplete, since expenditure per tourist is not at all constant (see graph 2). From the above, it can be seen that, in order to have a full knowledge of the tourist sector, model-making of both variables is convenient. What is more, the formulation of models both for the number of tourists and for expenditure makes it necessary to be able to explain the demand for tourist services as expenditure decided in two stages.

2. In the demand models estimated, it is found that the corresponding endogenous variable is not co-integrated with explanatory ones: an income variable and two relative prices in Spain compared to competitor countries and compared to tourists' countries of origin.

That is, its long term evolution is not solely determined by the above-mentioned economic variables. Probably there are omitted variables and among them the outstanding ones are the increase in supply and oscillations in its quality. In this paper the absence of co-integration among the variables is dealt with by formulating the model in logarithmic differences.

3. The results obtained are compatible with the explanation that expenditure on tourist services takes place in two stages. In the first, some months before the trip, on the basis of the tourists' income and relative prices in Spain compared to competitors, it is decided whether to come to Spain or not, and, in the second, on the basis of income and relative prices in Spain compared to countries of origin, the magnitude of the expenditure is decided. Income elasticity in the first stage -2.3 (±0.5)-seems higher to that of the second. The global elasticity which is estimated for the two stages is 1.75 (±0.6).

These elasticities could be upwardly biased if in the models the probable quality increases in Spanish tourist supply in the first two thirds of the eighties are not considered. A possibly more accurate value for

the last mentioned elasticity may be 1.3 (±0.6)[8]. As far as elasticity regarding prices is concerned, what is obtained is better, in absolute terms, in the second stage than in the first.

4. Tourist income is highly dominated by a trend evolution, so oscillations in tourist service demand are basically linked to relative prices.

5. The drop in tourism in recent years can be explained with models of changing elasticity regarding prices, so that this has increased, in absolute terms, in recent years. Nevertheless, the causes of this greater elasticity are not easy to identify. Thus, the following can be pointed out:

a) it is a non-linear type economic relationship;
b) given that information on exchange rates is more widely and quickly made available, the huge appreciation of the peseta compared to competitor countries along with an appreciation compared to the tourists' countries of origin, which took place in recent years, has increased price sensibility.
c) the quality of the Spanish tourist supply has not increased at the previous rate or has even fallen in

[8] This is the value which is obtained in models which include ramp-type dummy variables in the middle of the sample.

recent years, and, in the absence of a suitable explanatory variable, this model records it as a greater elasticity towards prices. If greater tourist overcrowding is an indicator of lower quality of tourist services, we would have that this quality must have fallen from 1988 onwards, a time when the highest number of foreign tourists was recorded.

In any case, all these explanations coincide in assigning the recent fall in demand for Spanish tourist services to the negative evolution of relative prices.

6. Demand shows a very strong seasonal behaviour, while the explanatory economic variables do not contain seasonal oscillations. The seasonal pattern of demand possibly means different elasticities of income and prices in the summer compared to the rest of the year. Nevertheless, there is not enough information to estimate all those elasticities and the model approaches them by means of dummy variables and/or seasonal autoregressive processes.

Specifically, the result is obtained that winter tourism (first quarters) has been less negatively affected in recent years than tourism in the other quarters.

7. The exploratory study, which has been made of demand models broken down into countries of origin, indicates that dynamic effects and income and price elasticities may be quite different according to the tourist's country of origin. This indicates that a future research analysing tourism in Spain, disaggregated by countries, would be interesting.

7. SUGGESTIONS APPLYING TO THE SPANISH TOURIST SECTOR WHICH CAN BE DERIVED FROM THE ECONOMETRIC ANALYSIS CARRIED OUT

Of the variables determining tourism demand there is one, tourist income, which cannot be influenced by Spanish economic agents and their action, consequently, is limited to relative prices which, furthermore, are the ones that have caused the recent drop in tourism in Spain. In this sense, it is worth making a series of clarifications and suggestions.

Spanish tourism demand depends on two relative prices, so improving only one, with regard to competitor countries, does not completely solve the problem.

The price indices used are, obviously, corrected for variations in the exchange rate and can be broken down into a pure price component and another of corrections due to exchange rate. On seeing this breakdown in the index compared to competitor countries a highly favourable recent evolution (negative) for Spain is observed in the price component - graph 5 -. Nevertheless, this evolution does not so much indicate a policy of price restraint and productivity increases in the Spanish tourist sector, but rather continuing periods of high inflation in several competitor countries. Therefore, on seeing the evolution of the peseta exchange rate index compared to those countries it is noted that they have resorted to devaluation, not just to maintain competitiveness but to increase it. That is, in

several of these countries what has happened is that high inflation has brought about loss of competitiveness, and a bid to recover or even increase it has been made by devaluation, which, sooner or later, has been translated into price increases that lead to this spiral reaction being perpetuated.

It is not easy to determine how long these countries can continue with those policies, but perhaps long enough to cause serious damage to the sector in Spain. What is more, competition for tourism is being joined increasingly by countries with a low degree of development, who are going to be ready to enter the inflation-devaluation spiral. If the above is true, the Spanish tourist sector can do very little in this respect, since all increases in productivity and price restraint which may give it an advantage in the pure price component may vanish if certain competitor countries do not mind devaluing their currency by however much in order to gain competitiveness. In that context, the type of action necessary on the part of the Spanish tourist sector is that leading to differentiating the product, establishing standards, increasing quality, offering a wider, more diversified service, etc. That is, industrial techniques in these areas must be transferred and brought into line to be used in this service sector.

In the breakdown of the price index compared to tourists' countries of origin - graph 6 - it can be noted that the pure price component has been continuously declining throughout the

whole of the sample, although the rate of decline has lessened in recent years. Moreover, until 1987, the peseta has been undergoing devaluation compared to those other countries, so that competitiveness, measured by the global index, has not undergone a systematic decline in that period, but merely oscillating movements. Nevertheless, with the appreciation of the peseta compared to these countries, especialy from the end of 1988 onwards, it holds that the appreciation is added to the decline in prices and the global index is drastically worsened. This means that the sector must make a great effort in productivity increases, and cost limitation if an increase in competitiveness is sought, since a part of that effort is needed simply to neutralise the appreciation of the peseta.

Summing up, it can be argued that the fall in tourism demand in recent years is to a large extent determined by the increase of relative prices in Spain compared to other countries. Thus, compared to the foreign visitors' countries of origin, the Spanish tourist sector finds itself compelled to moderate its costs and increase its productivity to gain in competitiveness. This gain may be spoilt if the macroeconomic policy put into practice leads to a certain revaluation of the peseta. In that case, the negative effect should be offset with increases in public investment leading to quality increases in the tourist sector. The models given in this paper and the relative price variables corrected for exchange rate, with their corresponding breakdown into prices and exchange rate, may serve to quantify

the effort which the sector must make if it does not wish to lose competitiveness and the part of this effort required to offset the losses of competitiveness due to appreciations of the peseta.

Compared to competitor countries, the efforts of the Spanish tourist sector to increase its competitiveness may be cancelled out by continued devaluation policies on the part of certain countries traditionally supplying tourist services or on the part of countries beginning to join the world tourist service supply. Thus, increases in productivity and cost restraint, though necessary, are not enough for the sector to recover. For that a policy of product differentiation is needed, leading to a wide-ranging, diversified and quality supply of tourist services. The evolution shown by relative prices in Spain compared to competitor countries which, due to huge devaluations on the part of some of these countries, has brought about a large loss of competitiveness, leads one to assume that massive, low-quality tourism can hardly be supplied in Spain on a competitive basis.

Furthermore, expenditure per tourist at constant prices has been falling since 1987, graph 2, which indicates that the same total revenue is being obtained with a higher number of visitors which, apart from increasing the production costs that the tourist supply is really incurring, represents a reduction of the quality of service which will increasingly have a negative effect on demand.

The characteristics of demand and the competition of foreign supply show the Spanish tourist sector as a sector in which increases in supply (greater number of visitors) do not seem likely to occur without compromising future demand. Progress in the sector must be based on increases in quality and product diversification including seasonal diversification.

Finally, it must be remembered that this research has been restricted by not having enough data available on the tourist sector, specifically, as to how the quality on offer has evolved and what prices have been charged. Moreover, the exploratory study carried out clearly shows that demand varies according to the tourists' countries of origin and, possibly, depending on whether it is winter tourism or during the rest of the year. All of this implies that, if the evolution of the sector is a cause for concern, a very necessary investment, in order to be able to make more accurate suggestions on what type of measures to adopt, consists of initiating and carrying out from time to time a tourist survey on expenditure of different types of tourists, their degree of satisfaction with the services received, the evolution of the prices applied, etc.

8. SUGGESTIONS FOR FORMULATING QUANTITATIVE STUDIES ON EXPORTS AND SOME CONSIDERATIONS FOR ECONOMIC POLICY

Some of the results of this study on tourism (service exports) enable a series of suggestions to be made when formulating quantitative studies on exports, and we will comment on these below.

1. Initially, it is worth pointing out that such studies must begin by establishing a minimum disaggregation level with which to work. The breakdown which is frequently used for exports of goods, tourism and others, is highly imperfect. In fact, each of these three components incorporates different sets of goods whose demand functions may have sufficiently different income and price elasticities, so with their aggregation a type of behaviour is obtained that is so heterogeneous that an adequate diagnosis cannot be made on it when based on economic principles. That is, aggregation will be concealing important differences which must be taken into consideration in order to understand the corresponding sector.

2. In the study of tourism it has been useful to construct two relative price indices: one compared to client countries and the other compared to competitor countries. This result can be extrapolated to the study of all types of exports where the groups of client and competitor countries are fairly different. It is to be noted that with the introduction of both prices there

is a better recording of the behaviour of those demanding services when they make their two-stage spending decisions: a) the choice of the supplying country and b) the determination of the level of expenditure. In such cases the differentiation of both prices is important because its elasticities and/or dynamic effects on demand will be, in general, different.

From this we can deduce that, in dealing with situations where sales are made to a group of countries but competition is with another different group of countries, at least to a substantial extent two relative price indices and, consequently two exchange rate indices are needed. It should be noted that, for many economic sectors of the most developed countries of the European Economic Community, their customers and competitors are two groups which coincide to a considerable degree and, therefore, just one exchange rate may be informative enough. In the case of the Spanish economy and, particularly in the tourist sector, the situation seems different. Therefore, in dealing with a single market situation in which each country tends to specialise in that in which it has comparative advantage compared to the other members, a country or a sector of a country, competing with countries not belonging to the single market, must not rely on, at best, a set of tariff barriers artificially to maintain its competitiveness against third parties. On the contrary, it must take measures to maintain this competitiveness and, if devaluation policies in competitor countries prevent competitiveness being maintained, it must establish the

development of the sector on product differentiation and diversification, based on increases in the quality of the service being offered, which must be backed by investment, private and public, and an adaptation of the infrastructure.

One can conclude from the above that the use of just one exchange rate index is not enough to design and follow up an economic policy. In fact, the effective exchange rate indices are, in general, different for the diverse exporting sectors and in several of them it will be important to calculate an index with regard to customers and another with regard to competitors. The conclusion is that for economic policy a small matrix of effective exchange rates is necessary, in which the elements are differentiated by the exporting sector and by the nature of the customers or competitors of the countries included in the index. This matrix is necessary to be able to evaluate the sectoral implications of any exchange rate policy.

The above implies that it is not advisable to use scalar indices, such as effective exchange rate ones, as reference parameters in formulating economic policies. Adequate formulation and the following of these policies it need vectorial or matrix indices. In Espasa et al. (1987) and Espasa and Matea (1989) the importance is highlighted of substituting the scalar, consumer price index (CPI) by a vector in which the two basic components of the inflationary nucleus are differentiated from the rest, the index of consumer prices of non-energy finished goods and the

index of consumer prices for services. In this paper the importance has been stressed of formulating indices of the effective exchange rate of the peseta by distinguishing between competitor and client countries. In Maicas (1988) this concern is found but he does not consider that competition for Spanish sales in a particular country can come from third countries and, in any case, he ends by aggregating the component of clientele and competition.

In the construction of vectorial indices the statistical-econometric analysis may be useful for determining the minimum dimension of the vector. So, we have that both advances in Economic Theory and those in Econometrics allow economic policy increasingly to be based on vectorial indices. Scalar restriction is undoubtedly dangerous and the econometric methods make it unnecessary.

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APPENDIX 1

VARIABLES USED IN THE ECONOMETRIC MODELS

The models prepared to explain the determining factors of external demand for tourism in Spain relate the following variables, all constructed with a quarterly periodicity:

1. Dependent variable in the real revenue model

The series of quarterly receipts from tourism in real terms (IRT), which is obtained by deflating the corresponding nominal receipts. The latter are a result of aggregating quarterly, as a sum, the monthly series of receipts from tourism and trips, in millions of pesetas, fom the cash basis of Banco de España. As a deflator the quarterly geometric mean of an index of tourist prices has been used, and in preparing it weightings from the input-output table for tourism (T.I.O.T.1982) are taken into account in aggregating the components of the relevant consumer price indices, by using a high level of disaggregation.

2. Explanatory variables

The relative price variables have been constructed from the consumer price indices of the corresponding countries, because tourist price indices were not available for the foreign countries considered.

(A) Relative prices in Spain compared to tourists' countries of origin (PREF)

The countries of origin of tourists visiting Spain which have been considered are:

- Germany
- France
- United Kingdom
- Holland (representative of Benelux)
- Sweden (representative of Scandinavian countries)
- U.S.A.
- Portugal
- Italy

Let:

CPI_t = consumer price index in Spain in t

TC_{it} = number of pesetas per unit of currency in country i in t

CPI_{it}= consumer price index of country i in t

w_{it} = indicator of the relative importance of country i in tourism in Spain

i = 1...N countries of origin of tourists indicated

The calculation of the weightings w_{it} has been as follows:

N_{it} = number of tourists accumulated in the twelve months ending in month t (sum of entries in t and in the previous eleven months), coming from country i, except in the cases of Holland and Sweden, for which Benelux and the Scandinavian countries, respectively, are considered. Only 45% of the French entering and 10% of the Portuguese have been considered as tourists.

y_{i89} = Per capita GDP for 1989 corresponding to country i, where the unit of measurement is the dollar (the 1989 exchange rate of the different currencies against the dollar are applied).

n_{it} = normalised number of tourists coming from country i, who have entered Spain in month t and the previous eleven months, that is,

$$n_{it} = \frac{N_{it}\ y_{i89}}{\sum_{i=1}^{N} y_{i89}} \quad .$$

Thus, the weightings w_{it} are calculated as follows:

$$w_{it} = \frac{n_{it}}{\sum_{i=1}^{N} n_{it}} \quad .$$

A chained index has been constructed, base 1983=100, as follows:

$$PREF_t = \frac{I_1}{I'_0} \times \frac{I_2}{I'_1} \times \frac{I_3}{I'_2} \times \ldots \times \frac{I_t}{I'_{t-1}}$$

where:

$$\frac{I_t}{I'_{t-1}} = \prod_{i=1}^{N} \left[\frac{\frac{1}{TCi_t} \left[\frac{CPI}{CPIi} \right]_t}{\frac{1}{TCi_{t-1}} \left[\frac{CPI}{CPIi} \right]_{t-1}} \right]^{\frac{w_{it} + w_{it-1}}{2}} .$$

The index has been constructed monthly, base 1983=100, and subsequently it has been aggregated into quarters by applying geometric means.

This indicator ($PREF_t$) can be broken down into a price evolution indicator (PF_t) and another exchange rate one (TCF_t) so that:

$$PREF_t = PF_t \times TCF_t \quad . \qquad (1)$$

Let

$$PF_t = \frac{E_1}{E'_0} \times \frac{E_2}{E'_1} \times \frac{E_3}{E'_2} \times \ldots \times \frac{E_t}{E'_{t-1}}$$

where:

$$\frac{E_t}{E'_{t-1}} = \prod_{i=1}^{N} \left[\frac{\left[\frac{CPI}{CPIi}\right]_t}{\left[\frac{CPI}{CPIi}\right]_{t-1}} \right]^{\frac{w_{it} + w_{it-1}}{2}}$$

and

$$TCF_t = \frac{T_1}{T'_0} \times \frac{T_2}{T'_1} \times \frac{T_3}{T'_2} \times \ldots \times \frac{T_t}{T'_{t-1}}$$

where:

$$\frac{T_t}{T'_{t-1}} = \prod_{i=1}^{N} \left[\frac{\frac{1}{TCi_t}}{\frac{1}{TCi_{t-1}}} \right]^{\frac{w_{it} + w_{it-1}}{2}}$$

It can be seen inmediately that

$$\frac{I_t}{I'_{t-1}} = \frac{E_t}{E'_{t-1}} \times \frac{T_t}{T'_{t-1}}$$

and that, consequently, relationship (1) is fulfilled.

This breakdown is interesting not only for analysing the historical evolution of the price component and the exchange rate one, and its application to the evolution of relative prices in Spain compared to tourist-supplying countries, but also for studying to what extent one component and the other have influenced the evolution of revenue from tourism and the number of tourists.

(B) Relative prices in Spain compared to competitor countries from the Mediterranean area (PREC).

The countries providing tourist services, in competition with Spain, which have been considered are:

- France
- Italy
- Greece
- Portugal
- Turkey
- Yugoslavia
- Morocco
- Tunisia
- Egypt

Let;

CPI_t = consumer price index in Spain in t.

TC_{it} = number of pesetas per unit of currency of country i in t.

CPI_{it} = consumer price index of country i in t.

w_{it} = indicator of the relative importance of country i with regard to countries competing with Spain in Mediterranean area tourism.

I_{it} = annual data on revenue from tourism and trips, in millions of dollars, corresponding to country i in the year to which month t belongs.

i=1 ..... N competitor countries indicated

Calculation of the weightings w_{it} has been as follows:

$$w_{it} = \frac{I_{it}}{\sum_{i=1}^{N} I_{it}} \quad .$$

As in the case of $PREF_t$, a chained monthly index has been built in the following manner:

$$PREC_t = \frac{I_1}{I_0} \times \frac{I_2}{I'_1} \times \frac{I_3}{I'_2} \times \ldots \times \frac{I_t}{I'_{t-1}}$$

where:

$$\frac{I_t}{I'_{t-1}} = \prod_{i=1}^{N} \left[\frac{\frac{1}{TCi_t} \left[\frac{CPI}{CPIi}\right]_t}{\frac{1}{TCi_{t-1}} \left[\frac{CPI}{CPIi}\right]_{t-1}} \right]^{\frac{w_{it} + w_{it-1}}{2}} \quad .$$

The breakdown in prices (PC_t) and exchange rates (TCC_t) is analagous to the one explained in above for relative prices compared to source countries.

The index has been constructed monthly, base 1983= 100, and it has been aggregated quarterly by geometric means.

(C) Aggregate income of countries visiting Spain (INCOME)

Since quarterly accounting was not available, the number of countries considered in the construction of INCOME has been reduced, leaving:

- Germany
- France
- United Kingdom
- Holland
- Sweden
- U.S.A.
- Italy

Let:

Y_{it} = indicator of real income of country i in the quarter t, base 1983=100, obtained from the GDP or GNP series (according to availability of information) at constant 1980 prices.

w_{it} = relative importance in tourism in Spain of country i with regard to other countries visiting us. It has been calculated as in the case of PREF, but quarterly.

i = 1... N source countries indicated in this section

The indicator of the evolution of aggregate real income in the countries which traditionally visit us has been:

$$INCOME_t = \prod_{i=1}^{N} (Y_{it})^{w_{it}}$$

This indicator has been constructed with a quarterly periodicity, with base 1983=100.

(D) Observations

All these variables have been constructed for the time period: first quarter of 1978 to fourth quarter of 1990, except for global income for visiting countries, for which the final datum is the third quarter of 1990.

This has required predictions to be made with univariate Arima models, to make up for the lack of availability of information, in the following cases:

- Morocco ... CPI for December 1990
- Holland ... Real income for the second and third quarter of 1990.

The list of resulting variables is given in table A.1. Sources for the data used have been:

- Secretaría General de Turismo en España (Movimiento Turístico)

- Banco de España (Boletín Estadístico)
- World Tourist Organisation
- O.E.C.D. (Main Economic Indicators)
- I.M.F. (Balance of Payments, International Financial Statistics)

Table A.1

DATA USED IN THE ECONOMETRIC MODELS

		IRT	PREF			PREC			IMCOME	TUR
		(1)	PF (2)	TCF (3)	Total (2)x(3)	PC (4)	TCC (5)	Total (4)x(5)	(6)	(7)
1978	I	141.00	9.88	9.77	96.51	9.90	9.99	98.90	92.18	3185.1
	II	216.25	10.10	9.80	99.01	9.98	10.01	99.84	93.32	5471.7
	III	361.69	10.42	10.08	105.03	10.24	10.35	105.93	93.88	11892.6
	IV	197.31	10.55	10.33	108.97	10.22	10.90	111.34	94.84	4055.4
1979	I	157.28	10.72	10.43	111.88	10.20	11.30	115.29	94.56	3337.9
	II	185.80	10.86	10.98	119.26	10.16	11.97	121.57	96.80	6089.8
	III	277.61	10.98	10.67	117.24	10.23	11.79	120.59	97.25	10131.5
	IV	173.57	11.09	10.52	116.66	10.09	11.72	118.33	97.85	3592.3
1980	I	136.70	11.22	10.32	115.82	9.95	11.76	117.04	98.51	3075.9
	II	178.44	11.19	9.91	110.82	9.81	11.55	113.28	96.86	5128.7
	III	288.83	11.40	9.52	108.49	9.84	11.40	112.17	97.43	11271.5
	IV	178.53	11.53	9.44	108.76	9.67	11.44	110.62	97.23	3286.0
1981	I	147.29	11.72	9.26	108.51	9.66	11.41	110.24	97.65	2770.1
	II	182.43	11.71	9.35	109.48	9.54	11.73	111.82	97.46	5509.8
	III	317.22	11.82	9.38	110.86	9.52	11.74	111.74	97.85	11898.0
	IV	201.37	11.92	9.18	109.50	9.37	11.80	110.53	97.84	3915.9
1982	I	159.09	12.18	9.08	110.58	9.39	11.90	111.77	97.84	2989.0
	II	207.72	12.34	8.92	110.10	9.37	11.93	111.75	98.17	5926.6
	III	334.38	12.55	8.89	111.61	9.36	12.17	113.92	97.76	11127.5
	IV	203.23	12.67	8.60	108.88	9.22	11.86	109.35	98.37	3613.3
1983	I	173.31	13.00	7.91	102.83	9.22	10.98	101.30	99.01	2988.5
	II	224.41	13.09	7.65	100.12	9.12	10.95	99.94	99.86	5882.1
	III	360.85	13.16	7.44	97.89	9.07	10.91	98.98	99.98	11201.0
	IV	226.48	13.44	7.38	99.14	9.03	11.05	99.76	101.13	3816.3
1984	I	179.67	13.73	7.49	102.83	9.05	11.36	102.84	102.78	3195.6
	II	258.32	13.77	7.63	105.06	8.94	11.69	104.46	101.89	6636.5
	III	403.46	14.03	7.56	106.05	8.95	11.72	104.85	102.57	11516.7
	IV	264.64	14.08	7.67	107.95	8.84	12.00	106.02	103.48	4181.1
1985	I	196.48	14.34	7.76	111.24	8.80	12.20	107.30	104.26	3240.9
	II	257.03	14.35	7.53	108.03	8.69	12.41	107.83	104.90	6422.0
	III	406.34	14.45	7.29	105.33	8.63	12.32	106.25	106.02	11841.6
	IV	253.05	14.64	7.09	103.73	8.49	12.26	104.05	106.09	4392.2
1986	I	208.91	15.13	7.16	108.33	8.59	12.34	106.05	106.42	3678.0
	II	291.55	15.23	7.15	108.94	8.50	12.66	107.58	108.14	6839.1
	III	445.16	15.58	7.24	112.81	8.56	12.82	109.76	108.62	13006.8
	IV	290.51	15.66	7.18	112.41	8.43	12.68	106.97	109.29	4759.5
1987	I	232.36	15.75	6.96	109.65	8.33	12.62	105.08	109.13	3777.2
	II	312.58	15.73	6.92	108.89	8.17	13.00	106.15	110.40	8074.7
	III	467.62	15.85	7.13	113.02	8.10	13.63	110.39	111.75	13983.8
	IV	271.85	15.93	7.27	115.84	7.90	14.40	113.67	112.90	5445.2
1988	I	246.82	16.04	7.21	115.65	7.76	14.67	113.84	114.00	4629.8
	II	303.50	15.89	7.25	115.30	7.54	15.36	115.77	114.44	8068.0
	III	457.83	16.17	7.21	116.50	7.47	15.66	116.93	115.37	14547.0
	IV	275.07	16.20	7.31	118.37	7.19	16.51	118.75	116.31	5705.5
1989	I	236.82	16.31	7.60	123.92	7.01	17.69	124.00	117.79	4770.9
	II	292.01	16.21	7.57	122.68	6.70	18.10	121.30	118.44	7919.1
	III	406.65	16.53	7.63	126.13	6.45	19.23	124.01	118.57	14356.5
	IV	244.36	16.57	7.66	127.00	5.98	20.39	121.91	119.54	5744.0
1990	I	217.40	16.62	7.68	127.74	5.70	21.06	120.00	121.31	4625.6
	II	243.00	16.46	7.91	130.17	5.59	21.76	121.55	121.18	7778.7
	III	349.83	16.63	7.92	131.76	5.60	22.58	126.40	121.81	13158.6
	IV	239.49	16.71	7.83	130.86	5.49	22.51	123.68	...	5661.8