

FORECASTING TOURISM DEMAND IN BARBADOS

by

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Introduction

Tourism is the most important economic activity in many Caribbean countries - including Barbados. The forecast of tourism is the key to the forecast of overall macroeconomic performance in these countries. There are already several studies which provide some empirical basis for such forecast. They include: Belchere (1988) for The Bahamas, Metzgen-Quemarez (1990), Carey (1991), IMF (1992), Rosensweig (1988) and Clark, Wood and Worrell (1986). These studies all focus on the demand side of the market. The present study extends their analysis by incorporating supply factors.

Studies of Tourism Demand for the Caribbean

Clarke et al present a disaggregated study of the demand for tourist services in Barbados, broken down by class of accommodation, season (winter, summer) and the origin of tourists. The study covers the years 1956-1983. The factors affecting demand are hotel rates, real income per capita in the source country, airfares, government grants for tourism promotion and hotel rates in Antigua (taken to be Barbados' closest competitor). It concludes that income per capita and airfares are the most important factors. Income per capita matters most for US

visitors in top quality accommodation, for Canadian visitors in apartment hotels and for UK visitors in the summer only. Airfares are important for US visitors in top quality accommodation, Canadian visitors in apartment hotels and UK visitors in the winter.

Rosensweig estimates US and world demand for Caribbean tourism services relative to tourism services in Mexico and Europe. Demand changes in response to changes in relative prices. The Caribbean destinations include the Bahamas, Barbados, the Dominican Republic, Jamaica, the Netherlands Antilles and Puerto Rico and the period examined is 1964-83. Intra-Caribbean relative price elasticities are very high, 1.33 for visitors from the US and 2.45 for visitors from around the world. The relative price elasticity with respect to Mexico is 1.0 worldwide and 1.85 for US visitors. The elasticity of substitution between Europe and the Caribbean is 1.7.

Belchere provides details on the regional breakdown of US overseas tourists and estimates the impact of regional income variations in the US on the demand for tourism in the Bahamas. The Boston/Washington corridor and the Southeast US

are the most influential regions for Bahamas' tourism. Income elasticities are always significant.

Metzgen-Quemarez estimates the effect of US real income, travel prices in selected Western Hemisphere destinations and the prices of other tourist destinations which are included in her sample for the years 1964-84. The tests are for five countries in the Western Hemisphere and six in Europe. The Caribbean countries included are the Bahamas, Jamaica and the Netherlands Antilles. The co-efficient of determination for Caribbean countries is high. Income variations are always influential with elasticities of 1.27 for Jamaica, 1.96 for the Bahamas and 4.04 for the Netherlands Antilles. Own price elasticities and competitors' price elasticities are usually significant but they do not have the expected sign.

Carey estimates the demand for Caribbean tourist services using pooled data on arrivals for Aruba, Bahamas, Dominica, St. Lucia and St. Vincent - 138 observations in all. The principal determinant is income in the tourist's country of origin. Promotional expenditure has significant impact on arrivals as well. Countries further from source are at a disadvantage. The larger the source country

the greater the number of tourists but smaller source countries supply more tourists per capita.

In the IMF study travel receipts in comparable Caribbean destinations (as a percentage of travel receipts in Barbados) are tested for the influence of relative prices in Barbados versus the competition, average GNP per capita of selected industrial countries (France, Germany, the UK, the US and Canada) and the cost of travel (proxied by the price of oil). The relative price elasticities are significant only for the Netherlands Antilles and the Bahamas but they have the wrong sign. That is, an increase in Barbados' relative prices leads to an increase in Barbados' receipts relative to the competition. Higher source country GNP per capita improves Barbados' share of the market vis-a-vis the Bahamas and the Dominican Republic. With respect to the other countries the result is not statistically significant. Travel cost increases Barbados' share relative to the Netherlands Antilles and Trinidad & Tobago, both of which are further away from the North American market and it reduces Barbados' share relative to Jamaica which is closer. However, the effects are small.

In general income in the source country seems to offer a robust explanation of the variation in Caribbean tourism arrivals, with elasticities that vary from destination to destination. There are indicators that the income elasticity of demand may be a little stronger for the Netherlands Antilles and for Barbados than for other countries tested. Evidence about the effects of relative prices are inconclusive. Rosensweig finds some evidence at a very aggregated level for the Caribbean region as a whole but the results at the national level are a mixed bag. Other factors such as the distance from major markets and airfares may have an effect but these results are not particularly robust.

A Model of Tourism Demand and Supply

It is rather strange that most studies estimate demand rather than supply. The Caribbean share of the world tourism market is so small that if tourism were an undifferentiated product the Caribbean would face an infinite demand. In fact, tourism is very highly differentiated and each country - perhaps each resort - may usefully be considered a separate product. This is tantamount to applying to tourism the scheme as suggested for visible goods by Armington (1969) - as has been noted by the IMF and others. The empirical research lends support to this approach. Most analysts find real income in the tourists' home countries an

important factor in explaining arrivals. That would not be so if tourism were a homogeneous product.

However, to get a fuller picture we ought to consider the supply of tourism services. In the short run, supply is fixed; therefore, if one is estimating on annual data it is reasonable to assume there will be no quantity adjustment. However, we would expect prices to change in response to market conditions. If tourism is buoyant and capacity is fully extended prices may be drawn upward but if there is excess capacity we would expect discounting and other evidence of softer prices. Demand studies have taken the price of tourism as given. We should gain extra insight by modelling the price of tourism as responding to supply conditions.

In our model, the demand for tourism falls along the lines of previous studies.

However, the price of tourism reflects the short-run supply schedule.

Demand

The macroeconomic demand function for tourism typically has three arguments: an income variable, the price of tourism relative to the prices of all other goods

and the price of tourism relative to the price of competing tourist services. Foreign travel seems to be an optional consumption good with a high income elasticity of demand in most industrial countries. The first element in the potential tourist's choice is the decision to go abroad which, for many, depends on the level or growth in incomes and the price of an overseas holiday relative to the retail price level or, more typically, the change in relative prices.

The second element is the choice of destination which depends on the characteristics of the tourism destination and the traveller's preferences. Consideration which enter this choice include the relative prices of alternate tourism products, the climate, the convenience of getting there and the infrastructure for tourism. The choice may be affected by tourism promotion, travel writers' opinions and other news (See Morley (1992) for a theoretical approach). Principally because of data limitations we are unable to test for the effects of factors other than the relative prices of competing destinations.

We sidestep issues of travel distance and travel costs by comparing among Caribbean destinations where distances and costs are comparable. A complementary analysis, which we do not attempt, might compare the Caribbean

with other resort areas and other world tourism. Some previous studies, including an earlier effort by this author, include a measure of promotional activities, sometimes found to have a significant effect. The information available, which relates to expenditure by official agencies, is not a tolerable representation of the volume, quality and intensity of promotional activity. It does not include promotion by hotels, airlines and tour companies and not all official expenditure is equally effective. The results are therefore unlikely to be helpful.

Some characteristics of tourism destinations may be reflected in the price of the product, for example, resorts with varied activities and spacious accommodation tend to command higher prices, as do exotic locations off the beaten track. These factors may show up in occupancy rates and in the percentage of high quality accommodation - factors which enter the supply relationship in our model.

The demand relationship to be tested is therefore as follows:

$$\ln \text{ARR}_i = f_1 \{ \ln y_i, \ln [P(\text{tour})/P_i], \ln [P(\text{tour})/P(\text{comp})] \} \quad (1)$$

ARR: arrivals

y: real GDP

P(tour): price index of tourism services

P: CPI

P(comp): price index of competitive tourist product

i: country index (Canada, US, UK, all others)

Arrivals from each source country is the measure of tourism activity. A measure of real tourism expenditure is not available broken down for each source country but it seems plausible that tourists from the same source will spend the same amount on average wherever they choose to have their vacation. The alternatives would be to use aggregate expenditure (receipts) but with loss of information on individual source country demand (Carey, IMF) or to confine the analysis to the US market for which a breakdown of expenditures is available (Metzgen-Quemarez).

The income variable is the constant price GDP. The price of tourism is computed by dividing tourism receipts by the number of bednights defined as the product of arrivals and the average length of stay. For each country the price of the competing tourism product is a weighted average of the tourism prices of the other five countries in the study. The weights are each country's share in Caribbean

tourist arrivals. The consumer price indices in the source countries are chosen to represent the price of all other goods and services.

Supply

In the short run when the capital stock is fixed the supplier of tourism services maximizes profits by keying his prices to marginal costs - principally, unit labour cost and the cost of working capital. However, if he finds that the resulting levels of capacity utilization are below optimum he will lower prices in the hope of attracting greater custom. The main arguments of the supply price function are therefore unit labour cost, interest rates and occupancy rates.

The supply price is also an indicator of the quality of the tourism product. Destinations which boast high quality accommodation, which have exotic appeal or some other exceptional feature, will command higher prices. The movement of prices over time may reflect the changing mix of products in the national tourism offerings. Where data is available, an index of the quality of accommodation is included in the supply relationship.

The supply equation as tested is:

$$\ln P(\text{tour}) = f_2 [\ln \text{ULC}, r, \ln(\text{OCCUP})_{-1}, \ln \text{LUX}] \quad (2)$$

ULC: unit labour cost

r: prime interest rate

OCCUP: hotel room occupancy rate

LUX: percentage of accommodation in the "best" category

The unit labour cost is computed as the wage index divided by an index of output per employed person. We assume, not unreasonably, that changes in unit labour costs are uniform through all sectors of the economy because no data are published separately for tourism. In some countries no productivity data are available. The wage index is used in these cases. Where there are no wage data output per head is used as a proxy. The interest rate variable is the prime rate, the rate to which loans are usually keyed. All destinations publish data on hotel occupancy rates. The quality index is the percentage of first quality accommodation, however that is defined, in the total.

Results

The system of five equations, one supply and four demand equations and four identities is recursive and is therefore estimated by ordinary least squares.

Stationarity

Seasonal correlation is the bane of statisticians. It leads to spurious association and unreliable co-efficients. In the past fifteen years econometricians have developed the helpful technique of cointegration to address this problem. Even though series for comparison may be non-stationary they may be combined to produce stationary series and restore reliability to the estimates. Unfortunately, as in the present case, it is not always possible to obtain such a cointegrating vector. Our stationarity tests indicate that two of the series are stationary but most are non-stationary even after being twice differenced. In these circumstances, academic economists may move onto more tractable problems. Policymakers, however, have to fall back on old-fashioned methods such as making their best judgement about the structure of the serial relationship.

The Price Equation

Unit labour costs are the principal factor affecting prices, with an elasticity of 1.5. The interest rate effects are trivial. Rising occupancy levels seem to depress prices, contrary to expectations. We thought hoteliers would tend to lower prices if occupancy levels in previous years were low and vice versa. However, the effect is very small. The quality variable has no significant effect. Note that although the co-efficient to determination indicates that the equation explains most of the variation, tests of the robustness of the co-efficients are invalidated by the non-stationarity. The fitted line deviates by more than two standard deviations for three of the 19 observations. The fitted line performs poorly in detecting turning points and deflections. Missed deflections or turning points occur in 1978, 1980, 1981, 1982, 1983, 1985 and 1989.

The Demand by Visitors from the US

Arrivals from the US have an irregular cyclical pattern the reason for which we have not yet unearthed. It is not related to the growth in US GDP - the most influential variable in the demand equation - nor to the other variables used. We introduced a first order autoregressive scheme to force the fitted equation to follow the contours of the actual series.

The elasticity of demand with respect to real GDP in the US is the most significant variable (1.4). Relative price elasticities are very small. The fitted values stray outside to standard deviations for 5 of the 27 observations and some cyclical variation seems to remain in spite of the autoregressive scheme.

The Demand by UK Visitors

The elasticity of demand with respect to income changes in the UK is exceptionally high at 4.4. The relative price of tourism appears to have a large effect while the competitive price effect is rather small. The equation strays outside the observed variable for 4 of the 28 periods. Missed turning points and inflections occur in 1968 and 1969, 1974, 1977, 1981 and 1982, 1984 and 1985, 1987 and 1989.

The Demand by Canadian Visitors

Canadian arrivals grew rapidly in the 1960s and 1970s but there has been a persistent decline since 1979. This suggests a structural break in the series which is reflected by the use of a dummy variable to affect the impact of the income of Canadian GDP on arrivals, GDP being the most influential factor.

The real income elasticity of demand remains positive in the 1979-1973 period and it is very high at 3.0. In the earlier period it is only slightly higher than this. Relative prices of tourism have very little effect; on the contrary, the competitor's prices have a strong impact with an elasticity of -1.0. The fitted line strays outside the two standard deviation range for 8 out of 28 observations and again the performance with respect to turning points and inflections is unimpressive with misses in 1967 and 1968, 1971, 1974, 1976, 1983, 1985 and 1991.

The Demand by Other Visitors

Most other visitors come from Europe and we assume that the growth performance of the European source countries converge on German growth. The real GDP of Germany is therefore used as our proxy. The elasticity of demand with respect to this variable is very high at 4.8. Relative prices also have significant effect. The relative price of tourism has an elasticity of -0.6 and the relative prices of competitors' tourism product are slightly less influential at -0.4. The fitted line is badly off target in 7 of 28 observations but it does rather well in tracking turning points with misses only in 1971, 1973 and 1976.

Forecasts

For our baseline forecast we assume that unit labour costs were constant - that is, that increases in productivity would be sufficient to compensate for any rise in wages - and that all other variables would continue on their most recent trends. Interest rates were also kept constant since there was no recent trend evident. Largely because of the dominant effect of the income variable and the fact that real incomes in the source countries have been growing in recent years the demand for tourism in all markets except for Canada is forecast to continue to expand. For the Canadian market the secular decline which has been characteristic since 1979 is expected to continue.

Simulations based on 1% faster growth rate in the GDP of source countries and, as an alternative, a 1% slower growth rate, confirm the significant effect of real GDP on tourist arrivals. In all cases, the pattern of expansion remains the same but the growth of arrivals accelerates or decelerates in line with the changes in real GDP. The price of tourism relative to all other prices also has a noticeable effect and the conclusions are similar. Higher relative prices slow down the growth in arrivals and a more attractive price of tourism accelerates the growth of arrivals. As before there continues to be a decline in arrivals from Canada but a lower

tourism price slows down that decline. In no case is there a noticeable impact of the relative price of the competitive product. The rate of growth of arrivals is indistinguishable whether the relative prices accelerate 5% more quickly or decelerate 5%.

Because we have included the supply equation we are able to detect that unit labour cost changes can have significant impact on the pattern of arrivals. Simulations were undertaken where unit labour costs rose by 5% per year and where they declined by 5% per year. In the former case, as would be expected, the decline in Canadian arrivals was more severe and the growth in other markets was severely inhibited. On the contrary, a decline in unit labour costs accelerates growth in all markets except Canada and slows the decline in Canada to a very small percentage.

Concluding Remarks

The impact of unit labour cost is the most intriguing result of this study. It is to be treated with some caution because of the problem of non-stationarity which means we cannot establish probability bounds on these estimates. Strong income effects confirm earlier findings. The insignificance of interest rates and occupancy

rates is surprising but their impact may evaporate too quickly to be observed in annual data. The insignificance of the quality variable may indicate the need for a better proxy.

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Table 1

THE MODEL

1.	LPTOUR	=	-11.5035 + 1.474779 * LULC - 1.945859D-02*PRIME - .2150552 * LOCCUP(-1) + 4.322617D-03 * LQUAL
2.	lrptrus	=	lptour-lcpius
3.	LAUS	=	.9966395 + 1.3869 * LQUS + 9.112407D-02 * LRPTRUS + 2.670691D-02 * LRPJB + [AR(1) = .7332682]
4.	lrptruk	=	lptour-lcpiuk
5.	LAUK	=	-24.83162 + 4.408078 * LQUK - .6977058 * LRPTRUK - .1692118 * LRPJB
6.	lrptrcn	=	lptour-lcpien
7.	LACN	=	-7.820153 + 2.966383 * LQCN + 8.09917D-02 * DCNLQCN - 8.414691D-02 * LRPTRCN - 1.007093 * LRPJB
8.	lrptrgr	=	lptour-lcpigr
9.	LAO	=	-33.21713 + 4.763373 * LQGR - .6145247 * LRPTRGR - .4156804 * LRPJB

Table 2

THE ORDER OF INTEGRATION OF THE VARIABLES

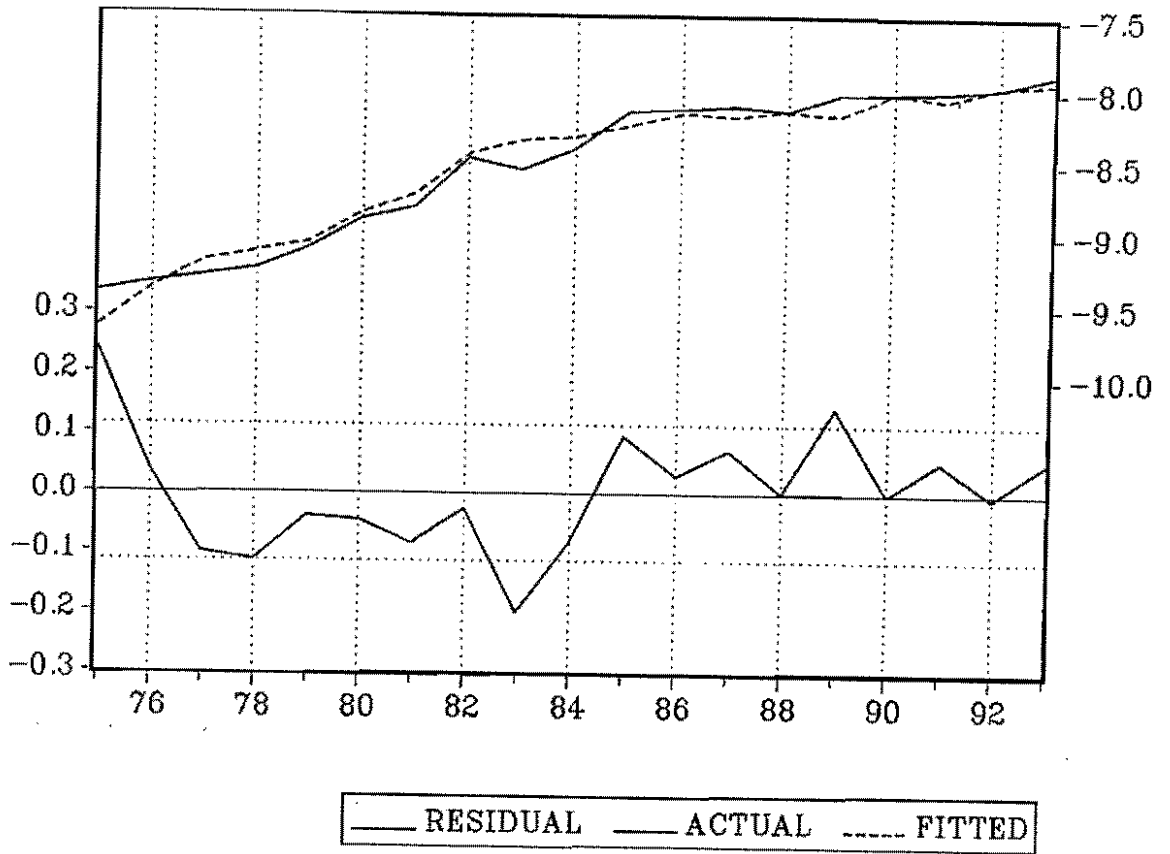
(10% Level or better, using Dickey-Fuller Statistic)

<u>Stationary</u>	<u>I(1)</u>	<u>I(2)</u>	<u>Greater than I(2)</u>
LAUK	LQUS	LAUS	LPTOUR
LQUK	LRPJB	LACN	LULC
	LAO		PRIME
			LOCCUP
			LQUAL
			LRPTRUS
			LRPTRUK
			LQCN
			LRPTRCN
			LQGR
			LRPTRGR

LS // Dependent Variable is LPTOUR
Date: 5-30-1995 / Time: 18:11
SMPL range: 1975 - 1993
Number of observations: 19

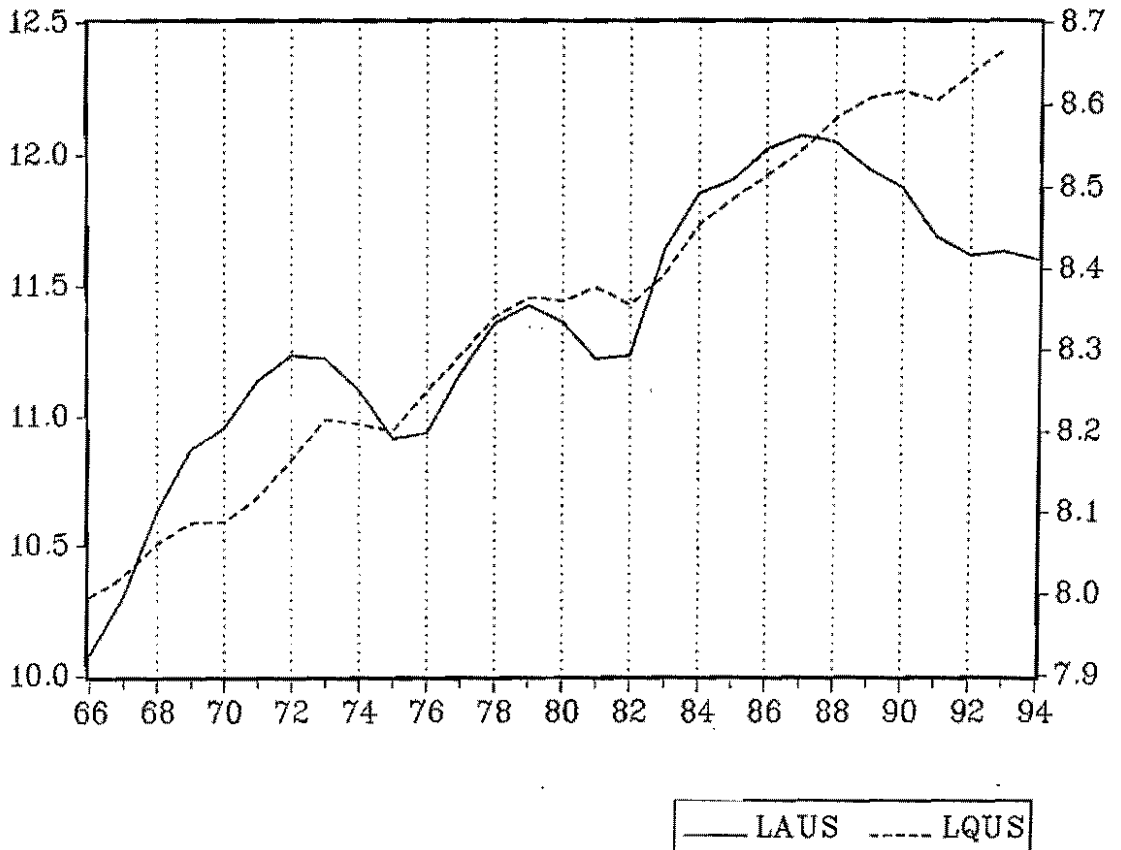
VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-11.503505	2.3207567	-4.9567905	0.0002
LULC	1.4747797	0.1024720	14.392029	0.0000
PRIME	-0.0194586	0.0204498	-0.9515278	0.3575
LOCCUF(-1)	-0.2150553	0.1803501	-1.1924324	0.2529
LQUAL	0.0043226	0.2430003	0.0177885	0.9861
R-squared	0.965224	Mean of dependent var	-8.520574	
Adjusted R-squared	0.955288	S.D. of dependent var	0.541206	
S.E. of regression	0.114439	Sum of squared resid	0.183347	
Log likelihood	17.12791	F-statistic	97.14493	
Durbin-Watson stat	1.155802	Prob(F-statistic)	0.000000	

THE PRICE EQUATION



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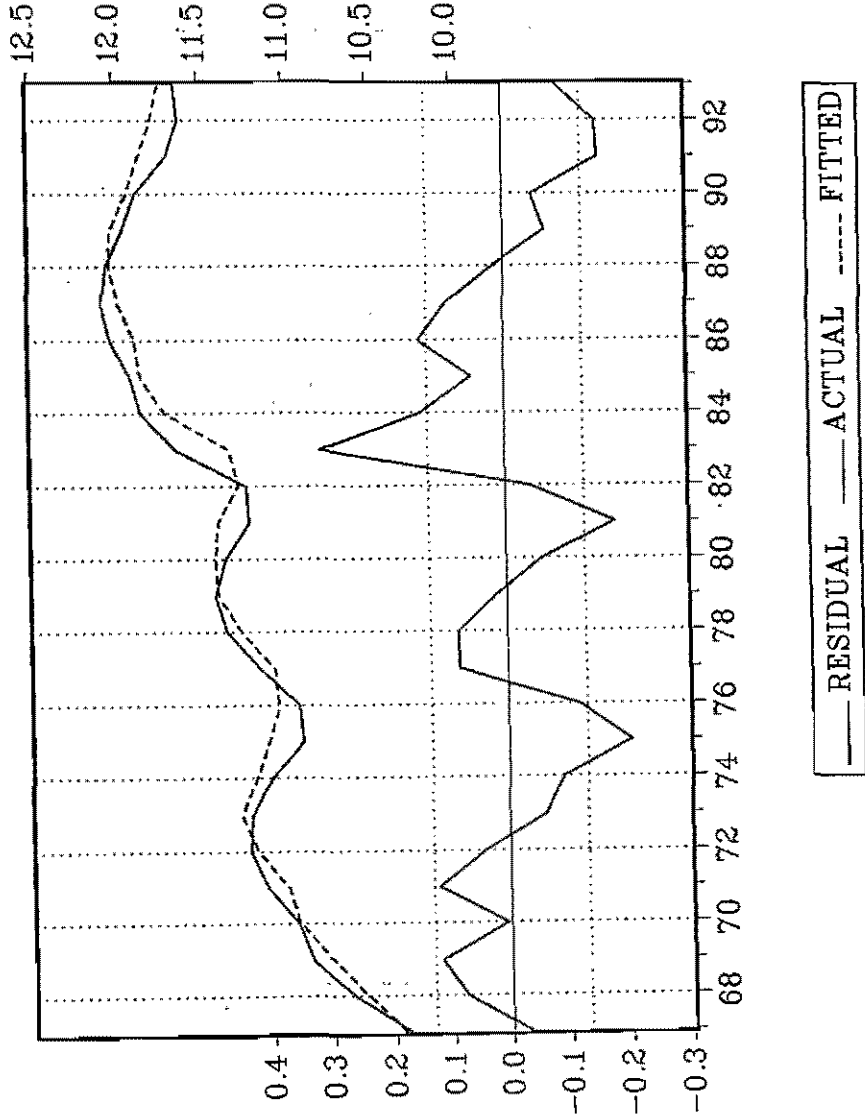
Arrivals from US & US Real GDP



LS // Dependent Variable is LAUS
 Date: 5-30-1995 / Time: 18:12
 SMPL range: 1967 - 1993
 Number of observations: 27
 Convergence not achieved after 20 iterations

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.9966395	6.9837611	0.1427081	0.8878
LQUS	1.3869009	0.7571116	1.8318316	0.0806
LRPTRUS	0.0911241	0.2015513	0.4521135	0.6556
LRPJB	0.0267069	0.2176336	0.1227151	0.9034
AR(1)	0.7332683	0.1172619	6.2532535	0.0000
R-squared	0.931967	Mean of dependent var	11.38302	
Adjusted R-squared	0.919597	S.D. of dependent var	0.461958	
S.E. of regression	0.130990	Sum of squared resid	0.377483	
Log likelihood	19.33455	F-statistic	75.34305	
Durbin-Watson stat	0.973956	Prob(F-statistic)	0.000000	

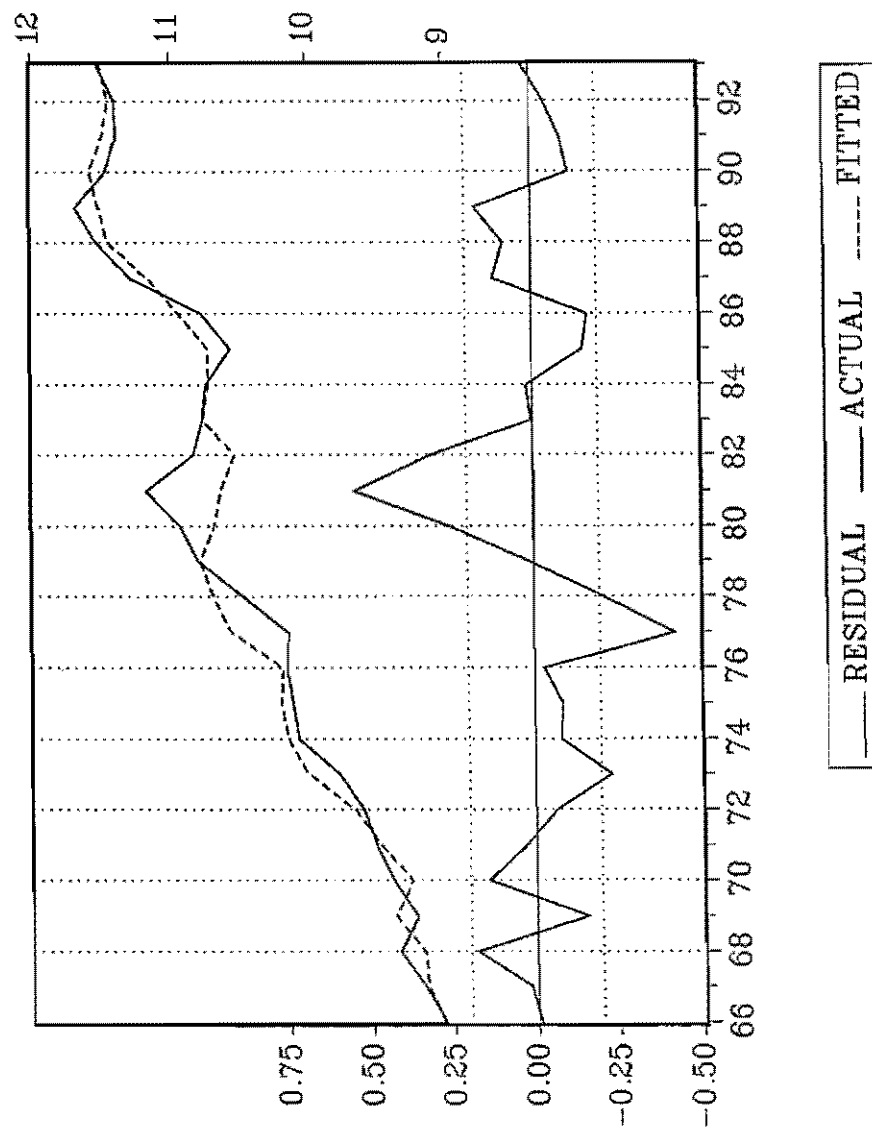
US Demand for Barbados' Tourism



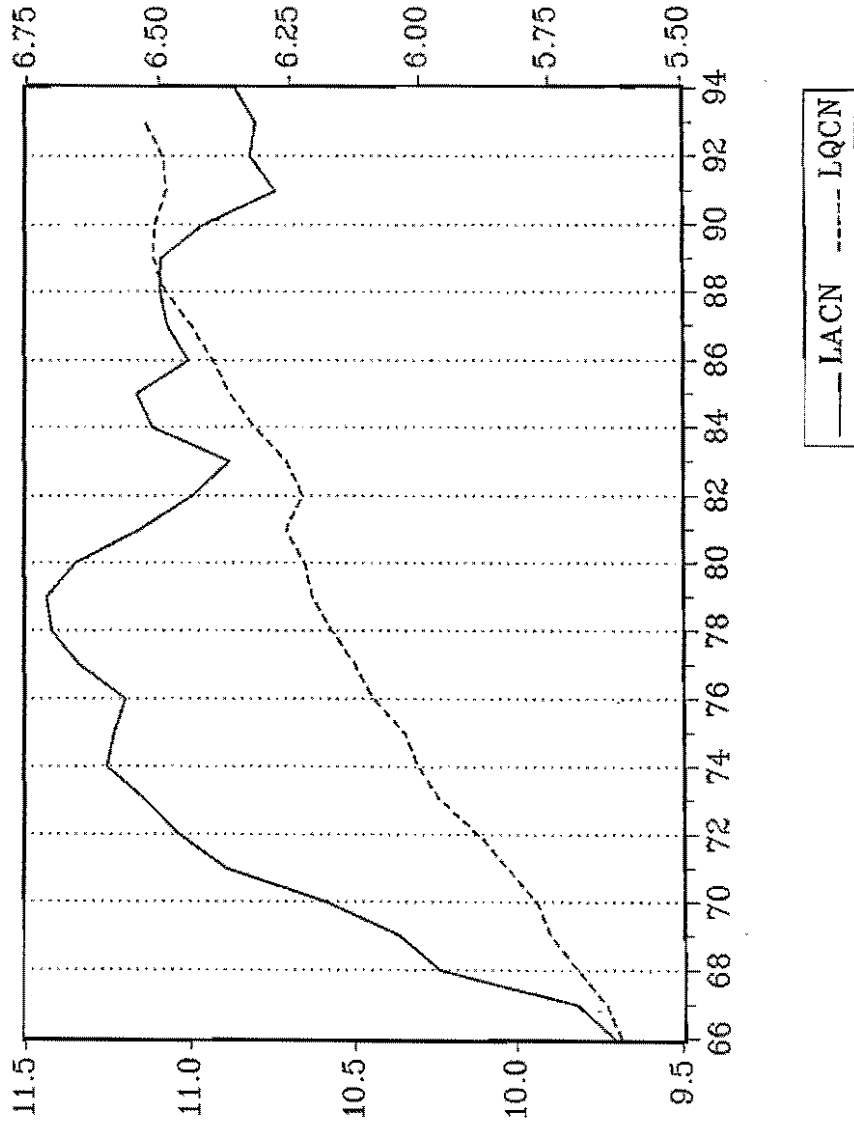
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 SMPL range: 1966 - 1993
 Number of observations: 28

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-24.831626	3.5747267	-6.9464366	0.0000
LQUK	4.4080787	0.6335737	6.9574836	0.0000
LRPTRUK	-0.6977059	0.1599744	-4.3613589	0.0002
LRPJB	-0.1692118	0.2373792	-0.7128334	0.4828
R-squared	0.948571	Mean of dependent var	10.46164	
Adjusted R-squared	0.942143	S.D. of dependent var	0.829280	
S.E. of regression	0.199471	Sum of squared resid	0.954931	
Log likelihood	7.566214	F-statistic	147.5552	
Durbin-Watson stat	1.098112	Prob(F-statistic)	0.000000	

UK Demand for Barbados' Tourism



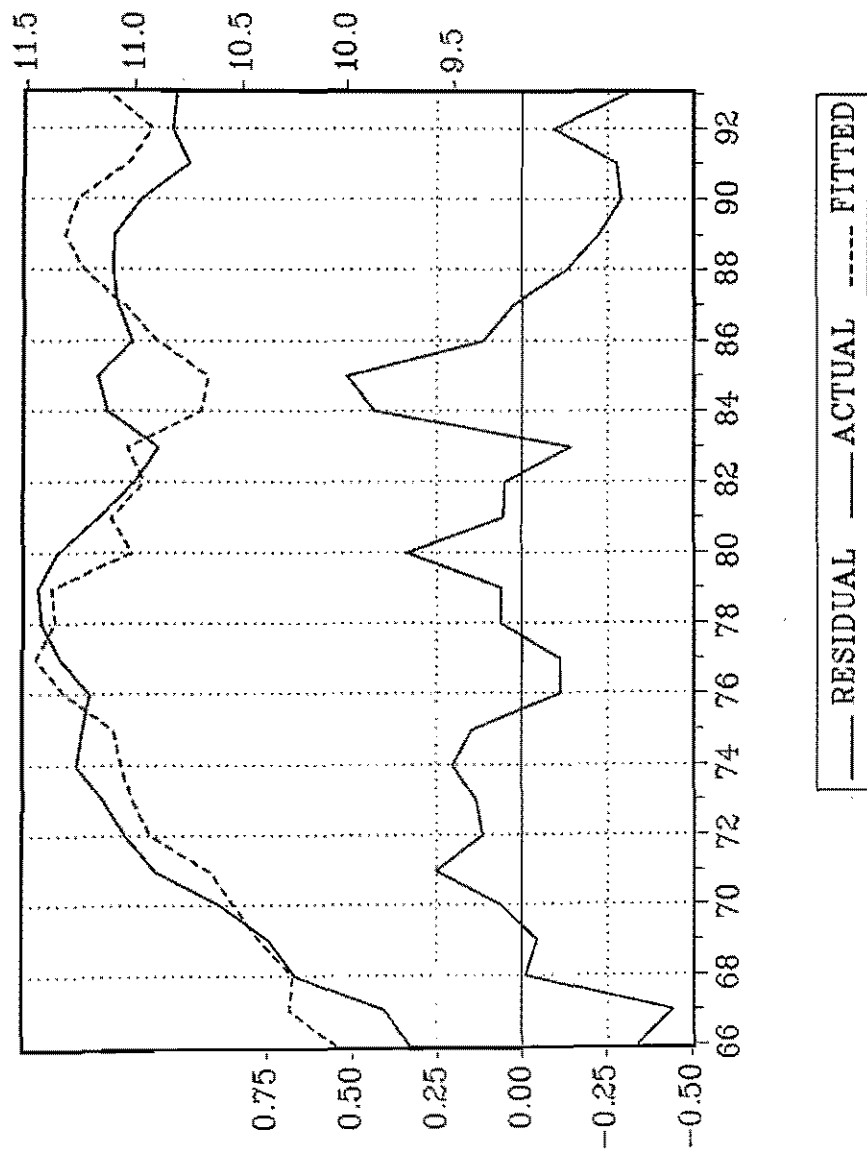
Canadian Arrivals & Canadian Real GDP



LS // Dependent Variable is LACN
 Date: 5-30-1995 / Time: 18:13
 SMPL range: 1966 - 1993
 Number of observations: 28

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-7.8201534	4.0196986	-1.9454576	0.0640
LQCN	2.9663837	0.4891923	6.0638404	0.0000
DCNLQCN	0.0809917	0.0317801	2.5485023	0.0180
LRPTRCN	-0.0841469	0.3437388	-0.2447990	0.8088
LRPJJB	-1.0070933	0.3278209	-3.0720842	0.0054
R-squared	0.712215	Mean of dependent var	10.92494	
Adjusted R-squared	0.662166	S.D. of dependent var	0.435653	
S.E. of regression	0.253223	Sum of squared resid	1.474802	
Log likelihood	1.481256	F-statistic	14.23021	
Durbin-Watson stat	0.819843	Prob(F-statistic)	0.000006	

Canadian Demand for Barbados' Tourism

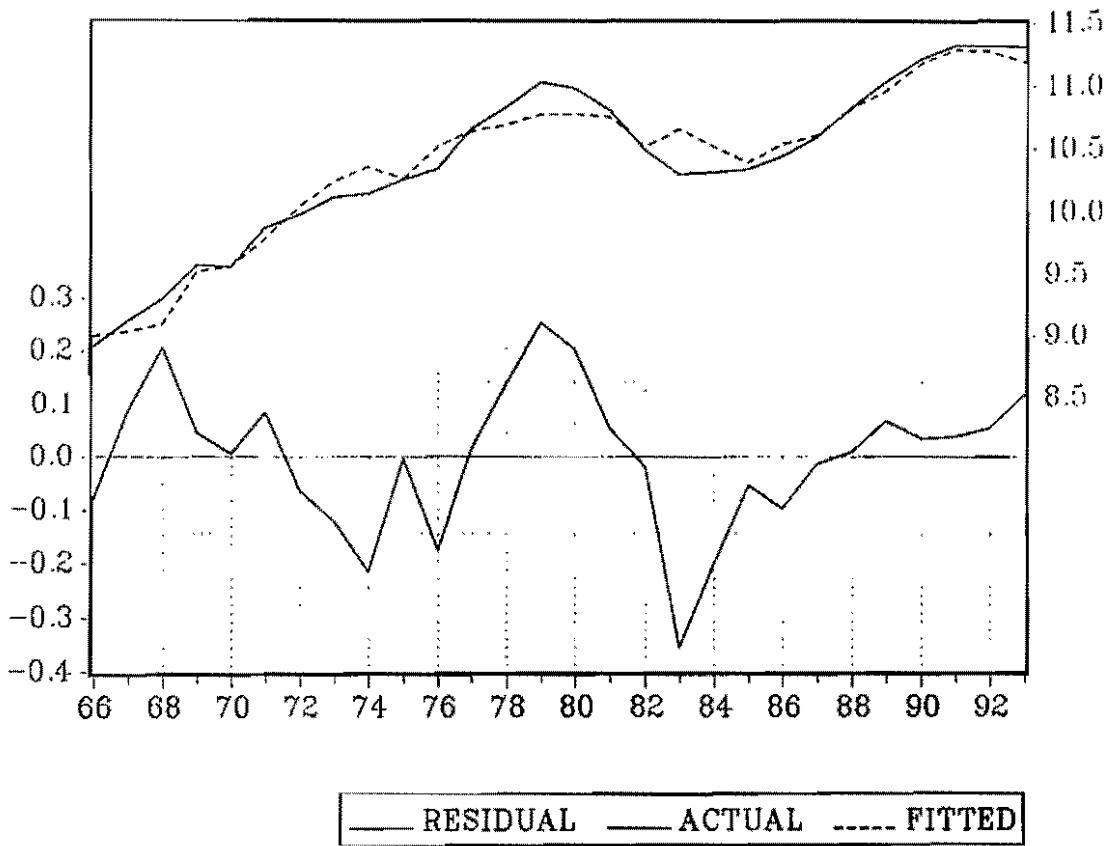


LS // Dependent Variable is LAO
 Date: 5-30-1995 / Time: 18:14
 SMPL range: 1966 - 1993
 Number of observations: 28

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-33.217133	3.1403479	-10.577533	0.0000
LQGR	4.7633736	0.3218606	14.799492	0.0000
LRPTRGR	-0.6145248	0.1549260	-3.9665707	0.0006
LRPJB	-0.4156804	0.1856481	-2.2390766	0.0347

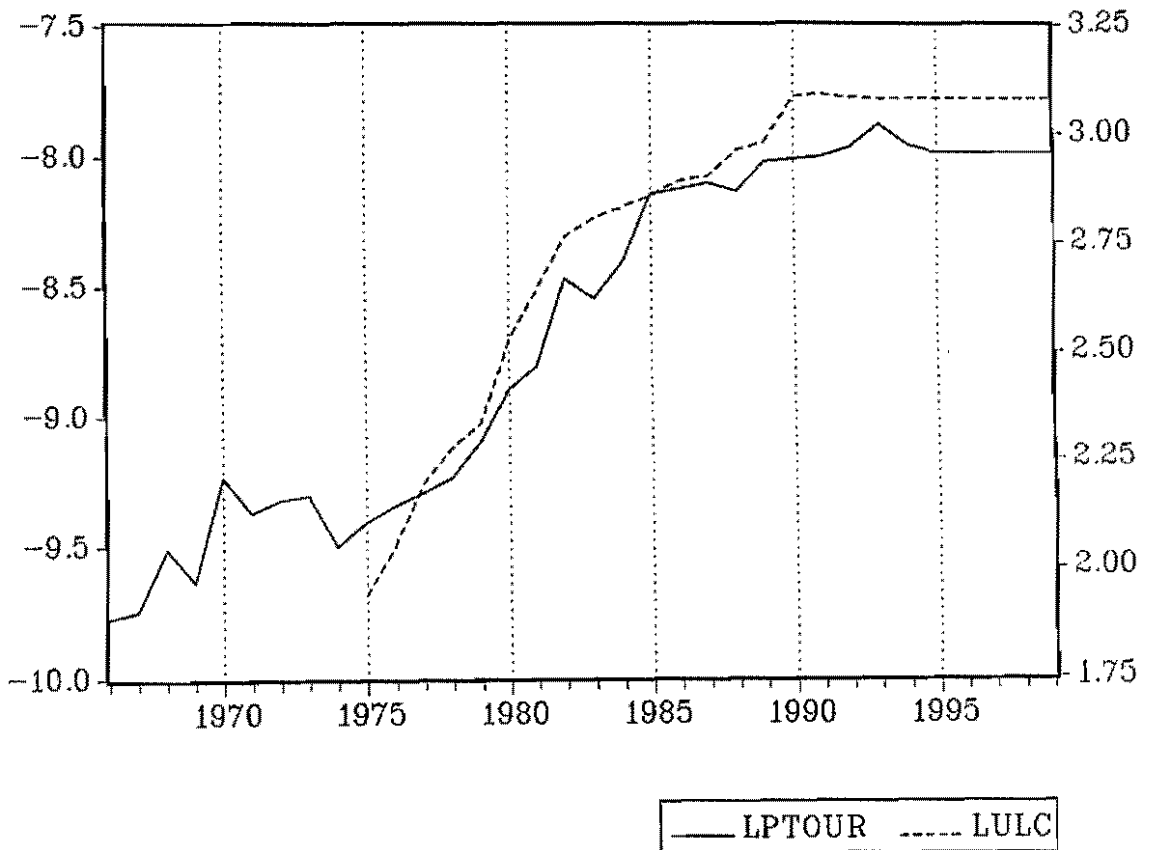
R-squared	0.959060	Mean of dependent var	10.38977
Adjusted R-squared	0.953943	S.D. of dependent var	0.668364
S.E. of regression	0.143437	Sum of squared resid	0.493780
Log likelihood	16.79990	F-statistic	187.4099
Durbin-Watson stat	0.922242	Prob(F-statistic)	0.000000

Demand from Cont. Europe & Other

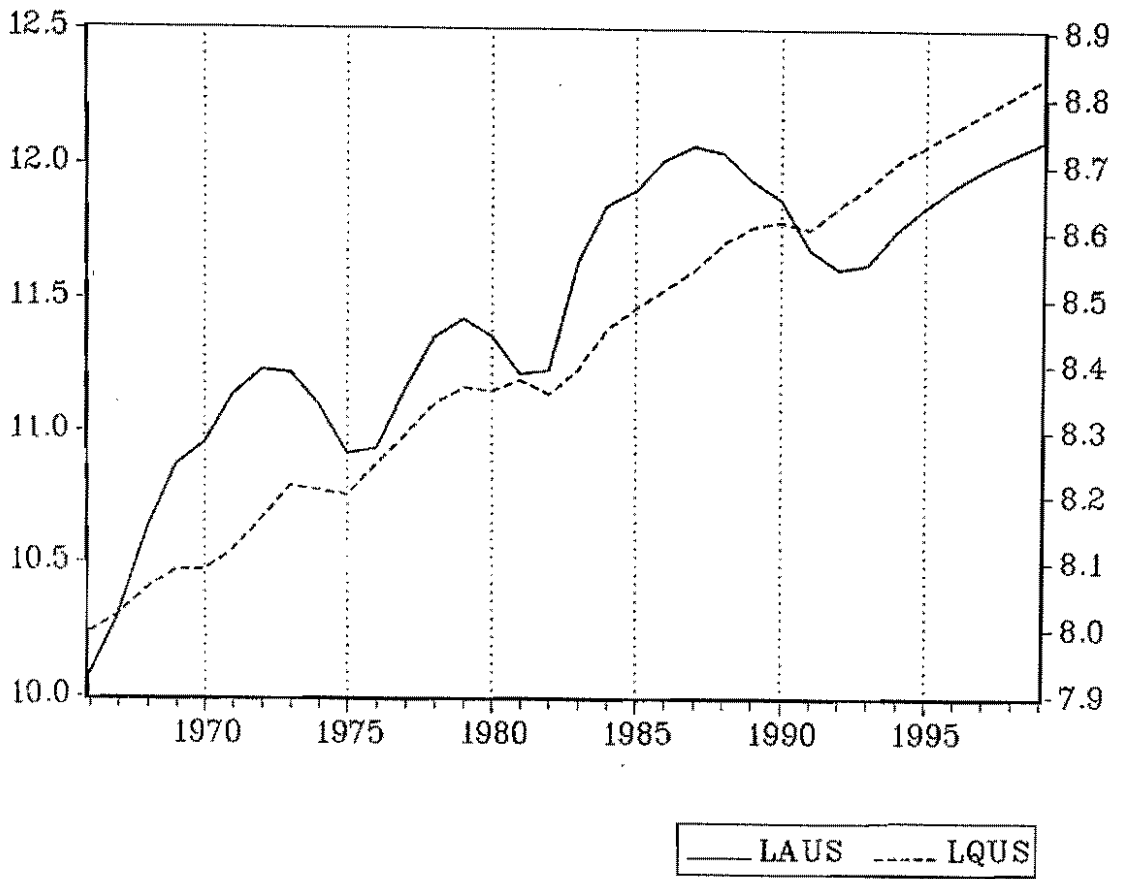


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Tourism Price & Unit Labour Cost

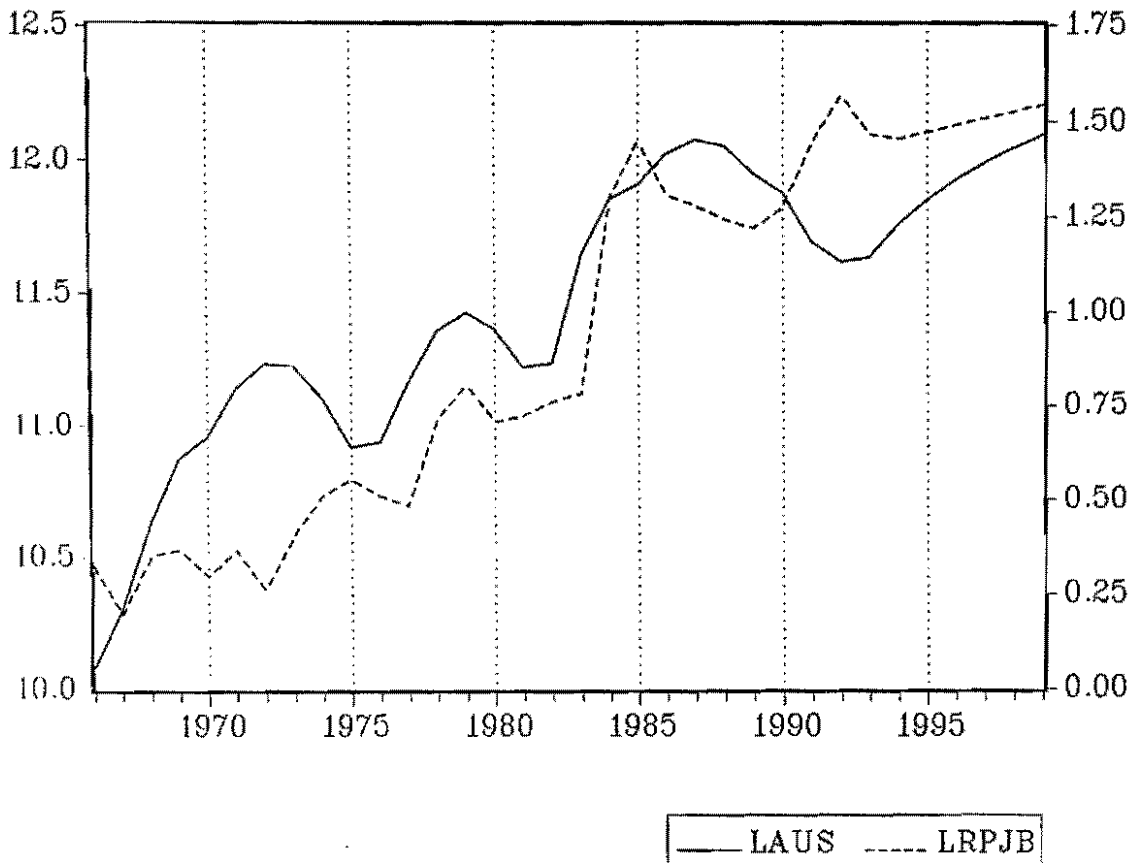


Projection of US GDP & Forecast of Arrivals

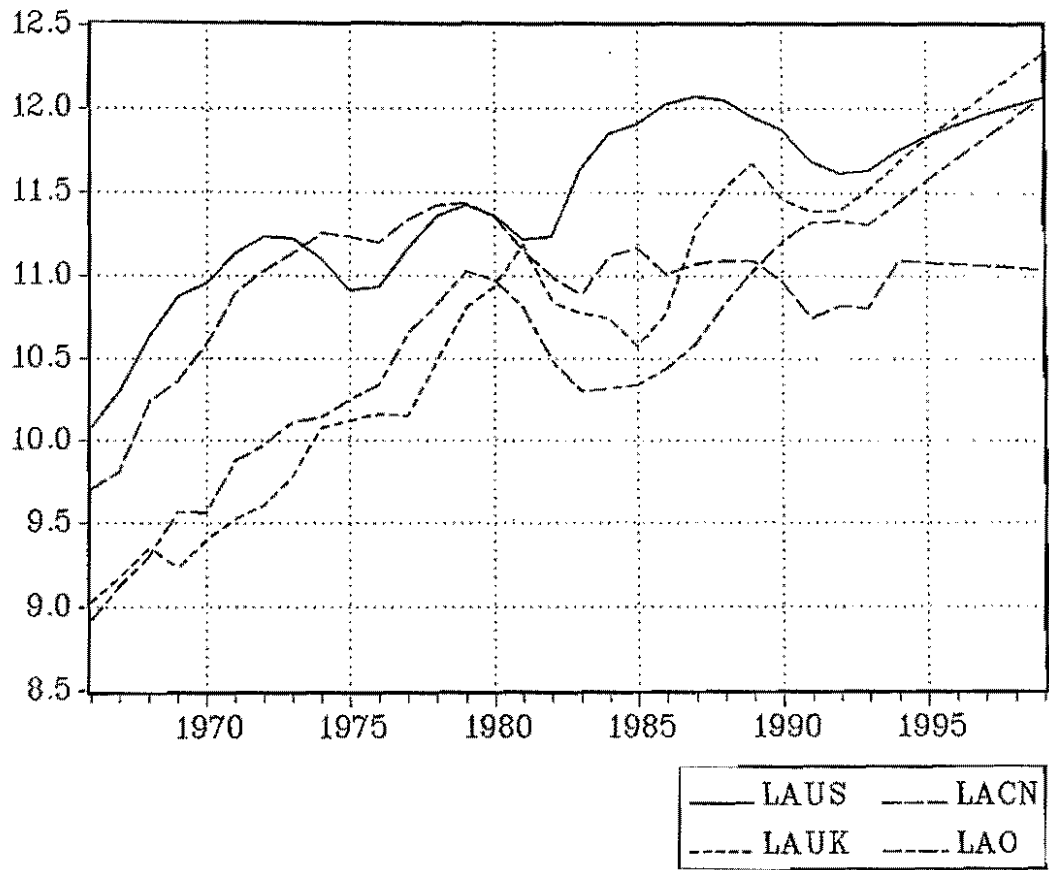


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Projection of Competitive Price & US Mkt Fcst

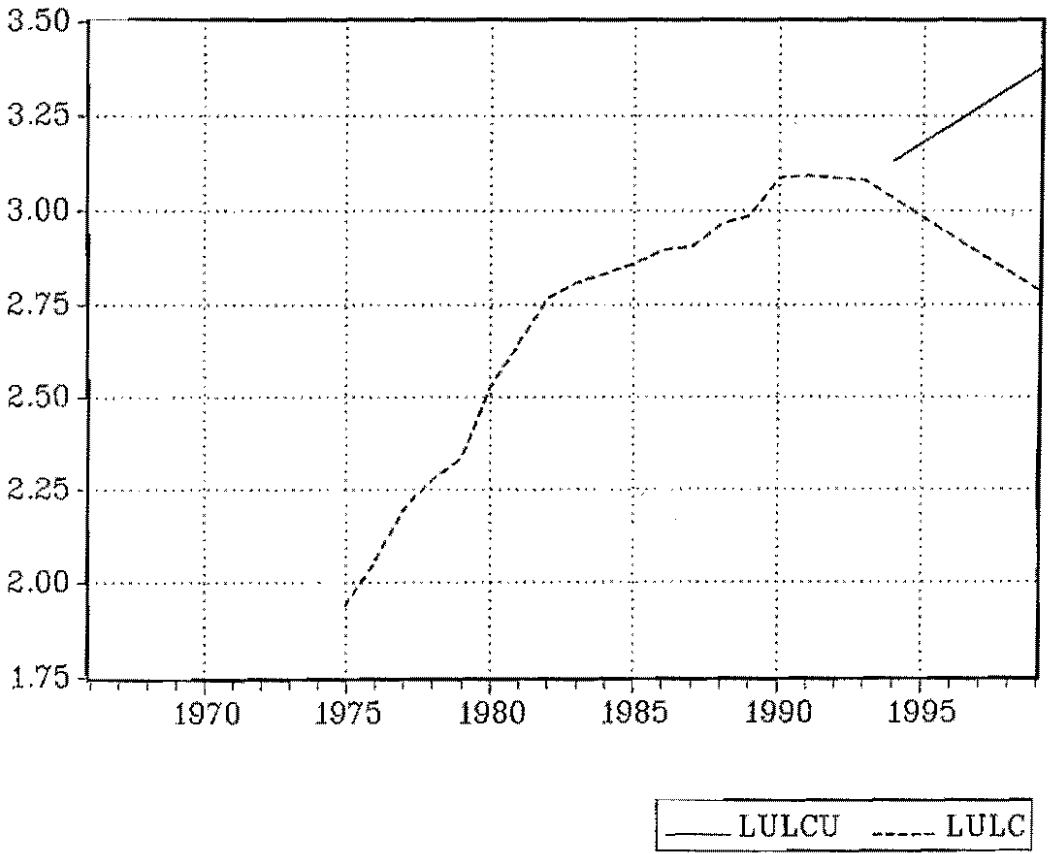


Forecasts of Arrivals by Market

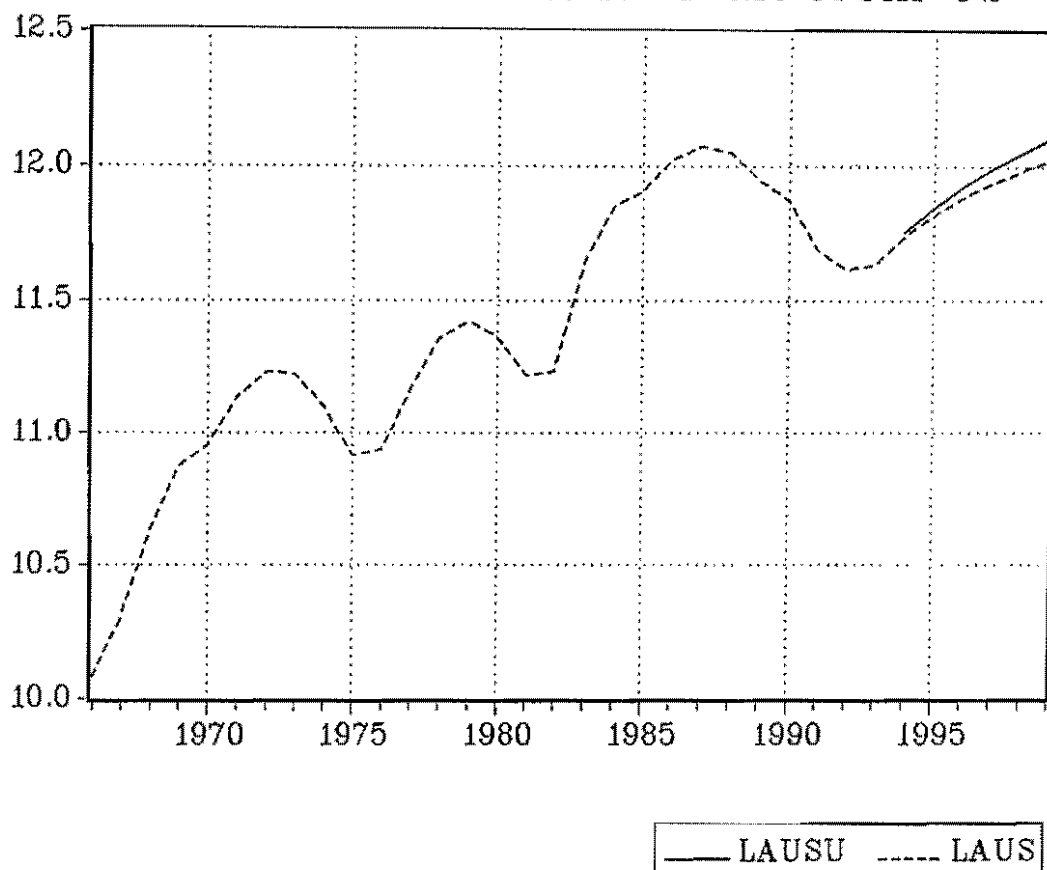


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Alternative Projections for Unit Labour Costs



High & Low Unit Labour Cost Projections: Effect on Forecast of Arrivals from US



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SAMPLE OF ELASTICITY COMPARISONS: TOURISM DEMAND

Dependent Variable	Elast. wrt. Real Income	Elast. wrt. Tourism Price	Elast. wrt. Competit. Price	Comments
<u>This Study</u> Arrivals by market	4.8 1.4	0.1 -0.7	0.0 -1.0	B'dos only, max. & min. 1966-93
<u>Rosensweig</u> Share of US Tourists	Not applicable	Not Applicable	-1.85	Carib. destinations: Bah., B'dos, Dom. Rep., Puerto Rico, J'ca., Neth. Antil., 1964-83
Share of world tourists	Not applicable	Not applicable	-1.0	Competitor: Mexico
<u>Metzger</u> US Tourists (1964-84)				
Bahamas				
Jamaica	1.96	-1.86	-0.38/-1.64 (Mex./Neth. Ant.)	
Neth. Ant.	1.27 4.04	-0.99 3.06	-1.34(Neth. Ant.) 4.88 (Bahamas)	
<u>Carey</u> Arrivals	1.2	0.3	n.a	Pooled data: Aruba, Bah., Dom., St. Lucia, St. Vincent
IMF 1970-91: Bah, B'dos, Dom. Rep., J'ca, Neth. Ant., & Tdad & T'ngo Share of C'bean.	-0.2 ^a	0.4 ^b	1.6	^a Avg. of GNP per cap. for Can., Fm, Germ., UK, US ^b Price of oil (travel cost). Max. & min. in each case
Travel Receipts	-1.7	-0.2	0.2	

