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- Antigua and Barbuda
- Aruba
- Bahamas
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- Br.Virgin Islands
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- Dominica
- Dominican Republic
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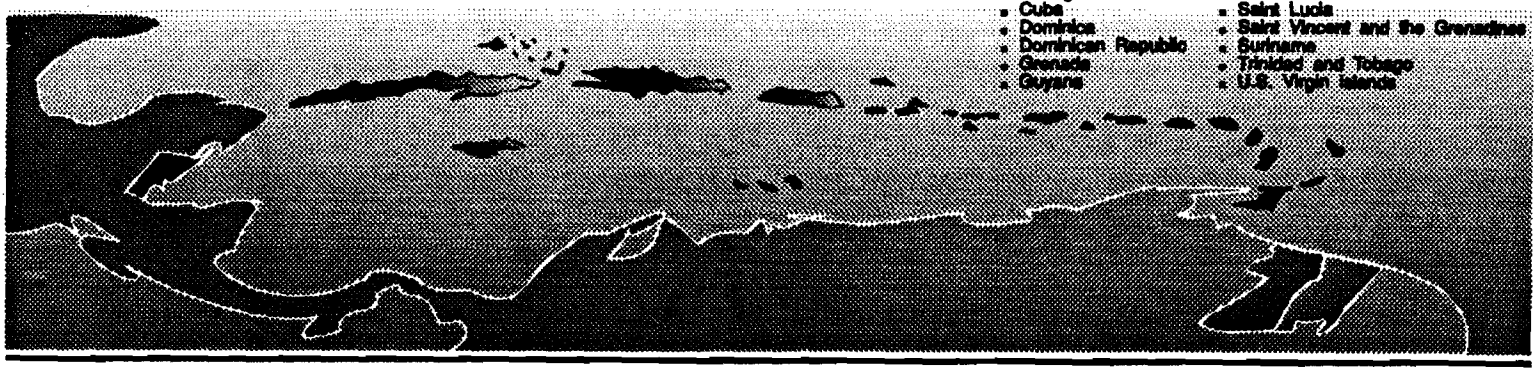
- Haiti
- Jamaica
- Montserrat
- Netherlands Antilles
- Puerto Rico
- Saint Kitts and Nevis
- Saint Lucia
- Saint Vincent and the Grenadines
- Suriname
- Trinidad and Tobago
- U.S. Virgin Islands



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FORECASTING TOURIST ARRIVALS IN THE CARIBBEAN

UNITED NATIONS
ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN
Subregional Headquarters for the Caribbean
CARIBBEAN DEVELOPMENT AND COOPERATION COMMITTEE

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INTRODUCTION

Tourism is a major economic activity that is at or near the top of export earners for most territories in the Caribbean. Despite rapid growth in the 1980s, the subregion receives less than 3 per cent of the world's tourist arrivals; consequently there remains a vast potential for further growth. Tourists require hotel rooms, meals, transportation and entertainment and the industry has strong linkages with construction, agriculture, light manufacturing and handicrafts. Since the necessary infrastructure and facilities must be in place if potential growth is to be realized, government planners and private entrepreneurs alike require timely information on trends in tourist activity. This information is more useful if it includes a reliable forecast of future activity.

Governments collect monthly data on tourist arrivals, and pass this information to the Caribbean Tourist Organization (CTO), which publishes them for the entire subregion on a regular basis. Tourist arrivals are not an ideal measure of tourist activity, for the typical visitor's length of stay, as well as his expenditure, varies by destination and by season; but tourist-days and expenditure figures are usually crude estimates, so tourist arrivals are often the best indicator available.

Tourists are defined as nonresidents who visit a territory for any purpose and remain there for at least 24 hours. Visitors who stay less than 24 hours are classified as excursionists (day-trippers). Cruise passengers are regarded as a special type of excursionist, even if the ship docks for more than 24 hours. Although cruise passenger arrivals are increasing rapidly, the economic impact of a cruise passenger is less than that of a stay-over tourist, so it is misleading to add cruise passengers to tourist arrivals. Forecast of cruise passenger arrivals is best done separately; this task is left for a future paper.

At the present time (April 1992), historical series of monthly tourist arrivals are available for 23 tourist destinations in the Caribbean beginning as early as 1977 and ending in 1991 or the first month of 1992. For the most part, December 1991 is the latest figure available. For three territories (Barbados, Cayman Islands and Trinidad and Tobago), estimates also exist for January

1992. For Anguilla the latest available month is July 1991 and for Saint Vincent and the Grenadines, November 1991. An additional three destinations (Belize, Cuba and Montserrat) have monthly series that end in 1989.

The purpose of the present paper is to examine these 26 data series, then specify and estimate models to forecast tourist arrivals through the end of 1992. The models are not econometric or causal, for time is the only explanatory variable: it is only present and past tourist arrivals that determine tourist arrivals in the future. The objective is to unravel the pattern in tourist arrivals and extrapolate that pattern into the future.

Practitioners may well be sceptical of the usefulness of univariate forecasting, of models based on a single series of data, and feel that nothing can be done without more information. To cite a popular textbook on the subject,

> "Persons unfamiliar with quantitative forecasting methods often think that the past cannot describe the future accurately because everything is constantly changing. After some familiarity with data and forecasting techniques, however, it becomes clear that although nothing remains the same, history does repeat itself in a sense. Application of the right method can often identify the relationship between the factor to be forecasted and time itself ...."[1]

Even the person who disavows the utility of forecasting usually has some naive model in mind, some intuitive "feel" for the direction of tourist activity. If forecasting is both necessary and inevitable, why not make full use of historical data and statistical techniques?

Monthly tourist arrivals typically contain two patterns: seasonal fluctuations and a non-seasonal trend. The trend becomes clear if the seasonality is removed by a 12 month moving average. The moving averages shown in this report are centred moving averages; they consist of the average of the arrivals of a particular month plus the previous five-and-a-half months and the following five-and-a-half months. The moving average for July 1991, for example, is the sum of arrivals for February through December, plus one-half of the arrivals in January 1991 and January 1992, all divided by 12. A centred moving average has an advantage over a simple moving average in that it indicates more precisely

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[1] S. Makridakis, S.C. Wheelwright and V.E. McGee, Forecasting: Methods and Applications (second edition, John Wiley & Sons, New York, 1983), p. 9.

turning points in the trend. Note that the centred moving average is not defined for the first or last six observations of the monthly series.

In all but one case (discussed below), the time series analysis used in this report is that known as Box-Jenkins or ARIMA (autoregressive/integrated/moving average) models.[2] The autoregressive (AR) part of the model relates tourist arrivals in a given month to past values of the same series. Integrated (I) refers to the degree of differencing involved in the model; the term comes from the fact that an original series may be constructed from a differenced series by a process of "integration." The moving average (MA) part of the model is not the moving average referred to in the paragraph above; rather, it relates tourist arrivals in a given month to past error terms of the same series.

The general model is known as ARIMA(p,d,q), where p is the order of the autoregressive process, d is the degree of differencing involved, and q is the order of the moving average process. In practice, d is inevitably 0 or 1, and p or q seldom take values other than 0, 1 or 2. In an ARIMA(1,0,1) model, for example, this month's value of a series depends on last month's value and the error in the model's estimation of last month's value. In an ARIMA(1,1,1) model, this month's change in a series depends on last month's change and the error in the model's estimate of last month's change.

Before coefficients of the autoregressive (AR) or moving average (MA) terms of a model can be estimated, the series must have stationary mean and variance. In other words, the data should exhibit no trend and their fluctuation should be constant, neither increasing nor decreasing over time. First differences are usually sufficient to remove any trend from a series, and a logarithmic transformation normally suffices to obtain a series with a constant variance.

In the same way that consecutive observations may exhibit AR or MA properties, or require differencing, so might observations separated by an entire year. This year's January arrivals may depend on last year's arrivals in January or on the error in estimating last year's January arrivals. The model can thus be referred to more generally as an ARIMA$(p,d,q)(p_k,d_k,q_k)_k$ where the subscript "k" refers to the seasonal portion of the model. An ARIMA$(0,1,2)(1,1,0)_{12}$ model, for example, has first differencing, seasonal differencing, an autoregressive (AR) term with a lag of 12 months, and two moving average (MA) terms with lags of one and two

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[2] The terminology is due to G.E.P. Box and G.M. Jenkins, Time Series Analysis: Forecasting and Control (revised edition, Holden-Day, San Francisco, 1976). The original edition was published in 1970.

months. The taking of seasonal differences to create a new series that is each month's year-to-year change in tourist arrivals is sometimes referred to as "deseasonalization." It should be noted, however, that a seasonal pattern may remain that can be captured by an AR or MA term with a lag of 12 or more months.

Of the 25 ARIMA models specified in this paper, 12 are ARIMA$(0,1,1)(1,1,0)_{12}$, or close variations of that model, seven are ARIMA$(0,1,1)(1,1,0)_{12}((1,0,0)_{24}$, three are ARIMA$(3,1,0)(0,1,1)_{12}$, two are ARIMA$(2,1,0)(0,1,1)_{12}$, and one is an unusual ARIMA$(1,1,1)_{12}$ model. The estimated coefficients are reported for each model along with the autocorrelation of the residuals (errors) for lags of one through 12 months. If all the autocorrelation is captured by the model, the residuals should be random noise, with no significant autocorrelation. Unlike the case of causal models, the coefficients in themselves are of no intrinsic interest in a time series model. If, however, a coefficient has a large standard error, it may be dropped (the model simplified) with no loss in forecast accuracy.

In one case, Saint Vincent and the Grenadines, all attempts to fit an ARIMA model to the data failed. As an alternative, the logarithm of tourist arrivals was regressed on dummy variables, to capture the seasonal pattern, and on a linear time trend. Although the technique is that of ordinary least squares, the model is of the time series rather than the causal variety, for time (including the monthly dummies) is the only explanatory variable. The result is highly successful, for the residuals of the regression are completely random, with no autoregressive or moving average process. It should be noted, however, that the model is much simpler than the others reported in this paper. In the Saint Vincent model, unlike ARIMA models, tourist arrivals depend only on time, not on the past numbers of tourist arrivals.

All the models reported here are exploratory and subject to improvement. Most fit the data well and forecast well. Some are less successful. All will benefit from re-estimation and, perhaps, re-specification when additional data become available. Anyone who wishes to work with the models is advised to consult a suitable text that covers Box-Jenkins methods, such as Makridakis et. al, cited above, or part three of R.S. Pindyk and D.L. Rubinfeld, Econometric Models and Economic Forecasts (McGraw-Hill, New York, 1981). The calculations were done with the PC version of SORITEC, a fourth-generation language for econometric analysis. A "shareware" subset of SORITEC, as well as the models reported in this paper, are available on diskette from the Economic Commission for Latin America and the Caribbean (ECLAC).[3]

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[3] Requests for the computer programmes should be directed to ECLAC, P.O. Box 1113, Port-of-Spain, Trinidad and Tobago.

A true test of a forecasting model is its ability to forecast outside the sample period. When data for 1992 become available, it will be possible to measure the accuracy of the forecasts reported here. In the meantime, we use for each model a subset of the data (all observations except the last 12 months) to forecast the remainder of the known data. For each observation in the 12 month forecast period, a forecast error is calculated, defined as actual tourist arrivals less forecast tourist arrivals. The percentage forecast error is this same figure divided by actual arrivals, multiplied by 100. The mean percentage error (MPE) is the arithmetic average of the percentage errors. Typically, some of the percentage errors are negative and some are positive; these tend to offset each other, lowering the MPE. If one is interested only in total arrivals over the forecast period, and not their monthly distribution, this is a reasonable summary of the model's performance. Otherwise, a better measure of forecast accuracy is the mean absolute percentage error (MAPE), the arithmetic average of the absolute values of the percentage errors.[4]

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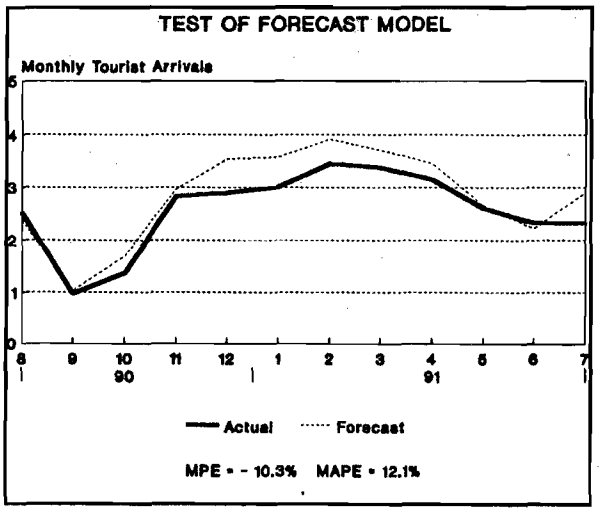
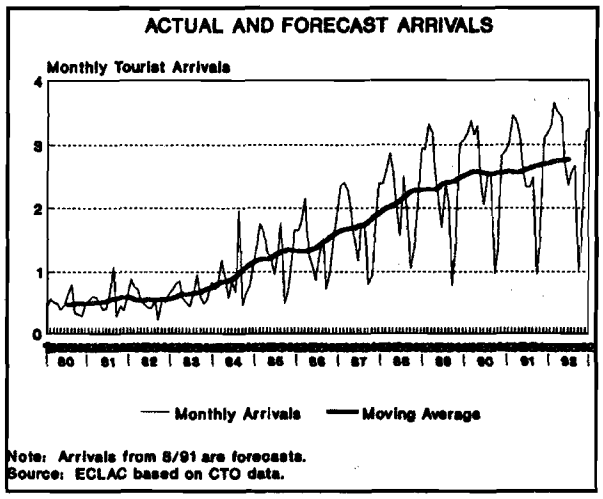
[4] Algebraically, let X_t denote actual tourist arrivals at time "t" and F_t forecast arrivals in the same month. The forecast error is then X_t-F_t, the percentage error (PE) is $100*(X_t-F_t)/X_t$, the mean percentage error (MPE) is $\Sigma PE/12$, and the mean absolute percentage error (MAPE) is $\Sigma|PE|/12$.

ANGUILLA TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		5.7	6.5	6.7	8.0	10.8	15.4	16.7	21.0	25.7	28.7	30.6	31.5	33.3

Data for Anguilla are available for January 1980 through July of 1991. The series does not have a constant variance, so a logarithmic transformation is necessary before specifying and estimating an ARIMA model.

The Anguilla forecasting model is an $ARIMA(0,1,1)(1,1,0)_{12}$ model applied to the logarithms of tourist arrivals. First differences are sufficient to remove the pronounced trend from the series. Seasonal differencing, along with an autoregressive term with a twelve month lag, captures the seasonality of the tourist industry in Anguilla. The high R^2 and t-statistics show that the model fits the data quite well, but the autocorrelation and partial autocorrelation coefficients of the residuals show there is scope for improvement.

A test of the model using data through July 1990 to forecast tourist arrivals from August 1990 through July 1991 was satisfactory. Actual arrivals are well below forecast arrivals from December 1990 to April 1991, a reflection of reduced travel by tourists following the onset of hostilities in the Persian Gulf, and forecasts are very close to actual arrivals in the remaining months. For the forecast period, the mean percentage error (MPE) is -10.3% and the mean absolute percentage error (MAPE) is 12.1%.

The model forecasts an increase in tourist arrivals of 5.7% in 1992, to a record level of 33,300.

ANGUILLA FORECASTING MODEL

Using 1980M1 -1992M12
1-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

126 Observations, 2 Parameters

Parameter Estimates

Dependent Variable is LOGARITHM OF TOURIST ARRIVALS

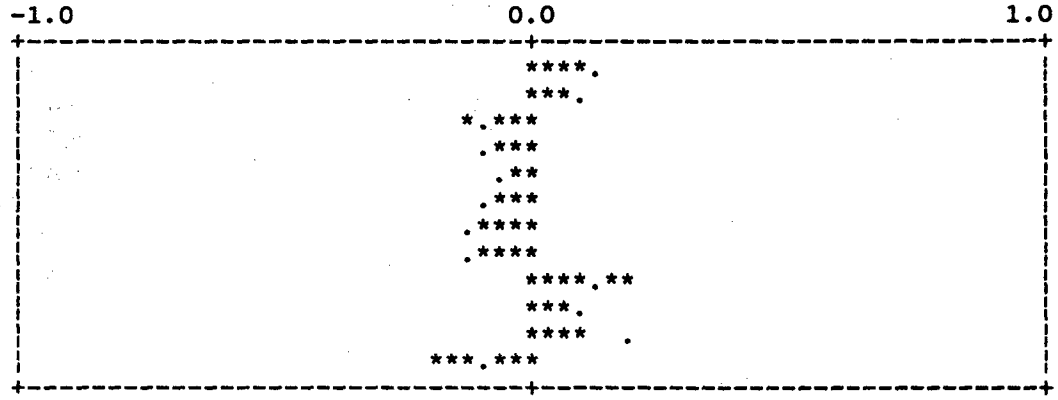
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.423629	.817120E-01	-5.18441
_MA-TERM(-1)	.801156	.533909E-01	15.0055

R-Squared = .9067

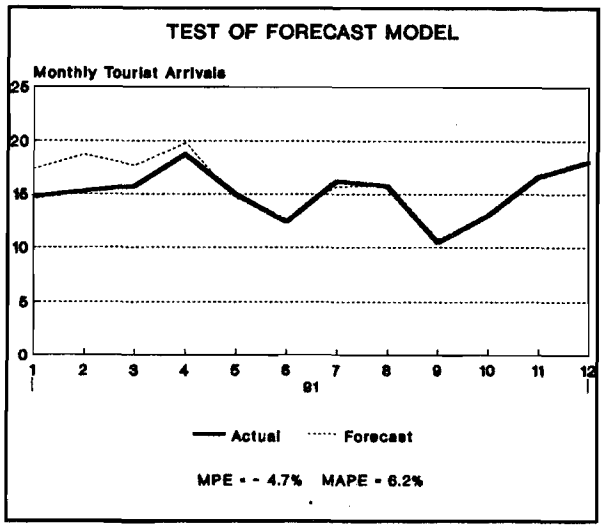
Autocorrelation Structure of ^RES

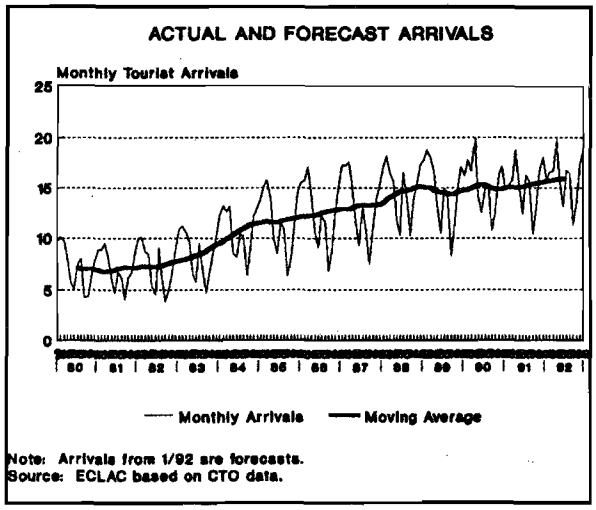
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.434333E-01	1.00000	1.00000	.000000
1	.531792E-02	.122439	.122715	.894427E-01
2	.429230E-02	.988250E-01	.849394E-01	.898027E-01
3	-.395912E-02	-.911540E-01	-.116369	.901670E-01
4	-.453813E-02	-.104485	-.926708E-01	.905357E-01
5	-.325747E-02	-.749994E-01	-.336385E-01	.909091E-01
6	-.368999E-02	-.849575E-01	-.655842E-01	.912871E-01
7	-.553506E-02	-.127438	-.125995	.916698E-01
8	-.605991E-02	-.139522	-.128287	.920575E-01
9	.543424E-02	.125117	.171935	.924500E-01
10	.443220E-02	.102046	.668099E-01	.928477E-01
11	.779669E-02	.179510	.897676E-01	.932505E-01
12	-.434042E-02	-.999329E-01	-.174086	.936586E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



ANTIGUA AND BARBUDA TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		87	85	87	101	129	140	149	159	177	176	184	182	192

Although the tourist industry in Antigua and Barbuda has grown very rapidly in the past decade, its rate of growth has fallen sharply since 1988. Tourist arrivals fell by 1% in 1991, but they remain more than double their level of ten years ago.

The Antigua and Barbuda forecasting model is a simple, yet highly effective, ARIMA$(0,1,1)(1,1,0)_{12}$ model. First differences are necessary because of a trend in the series, and seasonal differences because of a strong seasonal pattern in tourist arrivals. A moving average term is included with a one-month lag, and an autoregressive term with a twelve-month lag.

A test of the model using data from 1980 through 1990 to forecast arrivals in 1991 was exceptionally successful. Because of the Gulf War, actual arrivals are well below forecast arrivals in the first four months of 1991, but actual arrivals are close to forecast arrivals in the remaining eight months of the year. For the forecast period, the mean percentage error (MPE), a measure of bias, is -4.7% and the mean absolute percentage error (MAPE), a measure of accuracy, is 6.2%.

In 1992 tourist arrivals are forecast to increase more than 5% to a record high of 192,000.

ANTIGUA AND BARBUDA FORECASTING MODEL

Using 1980M1 -1992M12
1-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

131 Observations, 2 Parameters

Parameter Estimates

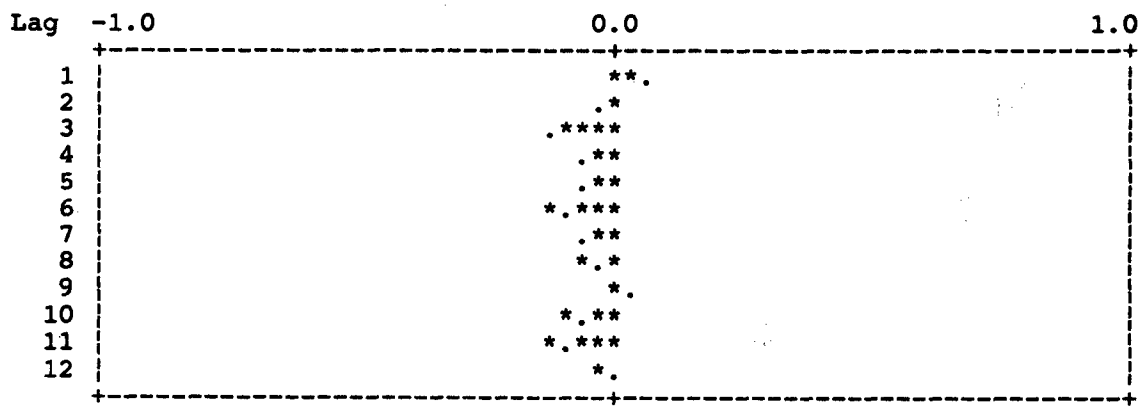
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.205723	.920331E-01	-2.23532
_MA-TERM(-1)	.526009	.759679E-01	6.92409

R-Squared = .9277

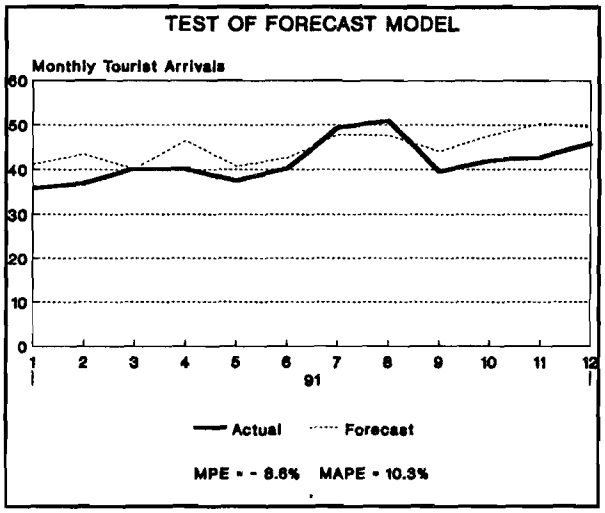
Autocorrelation Structure of ^RES

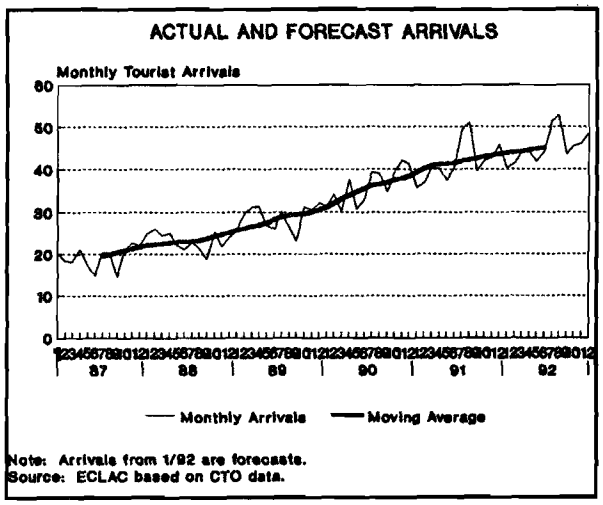
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.114366E+07	1.00000	1.00000	.000000
1	76938.0	.672734E-01	.673456E-01	.877058E-01
2	-35221.2	-.307969E-01	-.357442E-01	.880451E-01
3	-151127.	-.132144	-.129216	.883883E-01
4	-71539.4	-.625530E-01	-.476968E-01	.887357E-01
5	-57406.1	-.501950E-01	-.520030E-01	.890871E-01
6	-111641.	-.976170E-01	-.115259	.894427E-01
7	-78175.4	-.683554E-01	-.776400E-01	.898027E-01
8	-28227.5	-.246817E-01	-.469243E-01	.901670E-01
9	48501.1	.424087E-01	.133752E-02	.905357E-01
10	-63161.6	-.552276E-01	-.107937	.909091E-01
11	-93273.5	-.815569E-01	-.118634	.912871E-01
12	1675.48	.146501E-02	-.218988E-01	.916698E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



ARUBA TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
									232	278	344	433	501	544

Aruba is growing in importance as a tourist destination in the Caribbean. The island received half a million visitors in 1991, more than double the number of arrivals recorded in 1987. Data on tourist arrivals exist for earlier years, but they are not comparable to the new series that began in 1987.

Despite the small number of observations in the series, an ARIMA$(0,1,1)(1,0,0)_{12}$ model does fit the data quite well. Aruba shares with Belize the distinction of not requiring seasonal differencing for the ARIMA model. The seasonal structure of the series is captured solely by an autoregressive term with a twelve-month lag. The standard errors of the estimated coefficients are small, and the residual autocorrelation is satisfactory.

In a test of the forecast accuracy of the Aruba model, its coefficients were estimated with data for 48 months (1987 through 1990) and tourist arrivals were forecast for each of the twelve months of 1991. Actual arrivals in 1991 are less than forecast arrivals, and the mean percentage error (MPE) is -8.6%. The mean absolute percentage error (MAPE) for the forecast period is 10.3%, which compares favourably to models estimated with a much longer series of data.

In 1992 tourist arrivals are expected to increase by 8.6% to reach 544,000. This represents a deceleration of the 15.7% growth registered in 1991.

ARUBA FORECASTING MODEL

Using 1987M1 -1992M12
1-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

59 Observations, 2 Parameters

Parameter Estimates

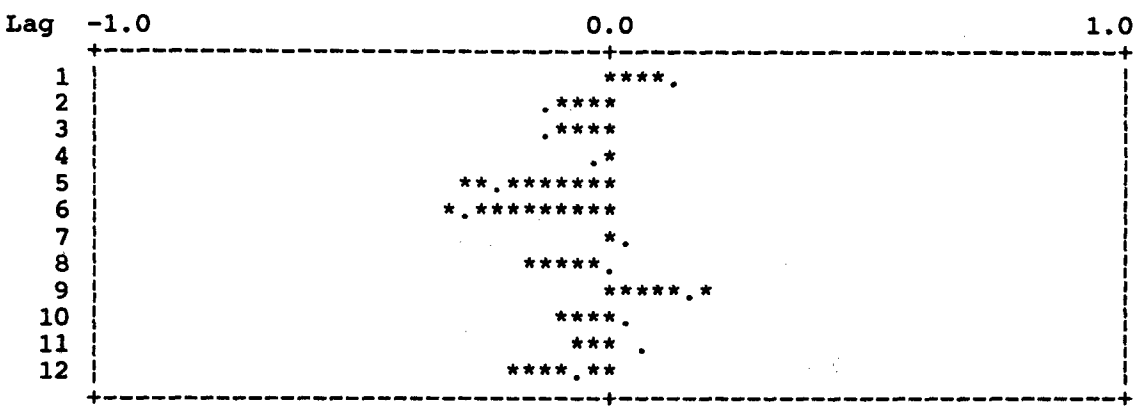
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	.812794	.969735E-01	8.38161
_MA-TERM(-1)	.531686	.113260	4.69437

R-Squared = .9049

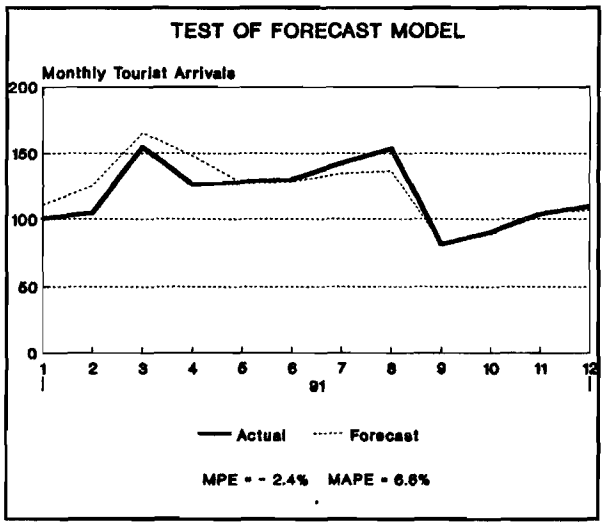
Autocorrelation Structure of ^RES

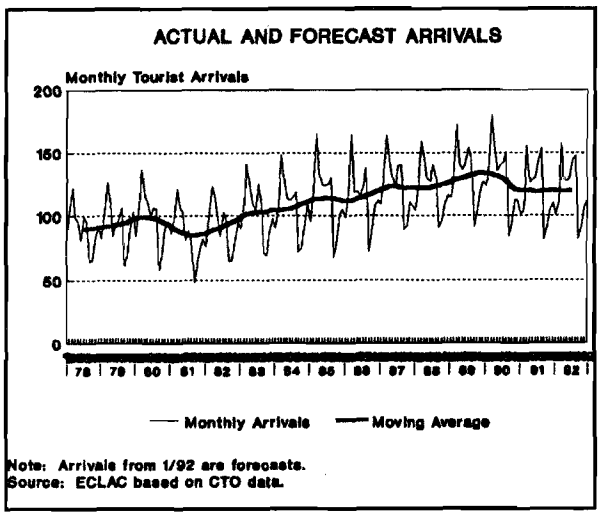
Lag		Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.	.717203E+07	1.00000	1.00000	.000000
1	.	826001.	.115170	.115522	.131306
2	.	-840632.	-.117210	-.137626	.132453
3	.	-958380.	-.133627	-.116051	.133631
4	.	-164417.	-.229248E-01	-.309626E-01	.134840
5	.	-.152636E+07	-.212822	-.271411	.136083
6	.	-.196690E+07	-.274246	-.314601	.137361
7	.	237574.	.331250E-01	.587641E-02	.138675
8	.	48242.3	.672644E-02	-.140704	.140028
9	.	.119996E+07	.167311	.196773	.141421
10	.	285393.	.397925E-01	-.940451E-01	.142857
11	.	488437.	.681031E-01	-.760446E-01	.144338
12	.	-555532.	-.774581E-01	-.188654	.145865

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



BAHAMAS TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1083	1129	1181	1031	1102	1240	1279	1368	1375	1480	1475	1575	1562	1427	1439

Tourism is vital to the economy of the Bahamas: in a typical month the islands receive well in excess of 100,000 tourists. Tourist arrivals grew steadily from 1981 through the end of 1989, then began to decline.

The Bahamas model is an ARIMA$(0,1,1)(1,1,0)_{12}(1,0,0)_{24}$ model that requires first differencing and seasonal differencing before estimating the coefficients of AR(-12), AR(-24) and MA(-1). Each coefficient is highly significant, and the residuals of the model tend to have low coefficients of autocorrelation.

An out-of-sample test of the model using monthly data for 1978 through 1990 to forecast 1991 arrivals proved highly successful. Because of the reduction in air travel that followed the onset of the Gulf War, actual arrivals are somewhat below forecast arrivals in the first four months of 1991. For the remainder of the year, however, actual arrivals reach or surpass forecast arrivals. For the entire year, the mean percentage error (MPE), a measure of bias, is -2.4% and the mean absolute percentage error (MAPE), a measure of accuracy, is 6.6%.

For 1992 the model forecasts a modest increase (0.8%) in tourist arrivals following two consecutive years of negative growth.

BAHAMAS FORECASTING MODEL

Using 1978M1 -1992M12
2-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

155 Observations, 3 Parameters

Parameter Estimates

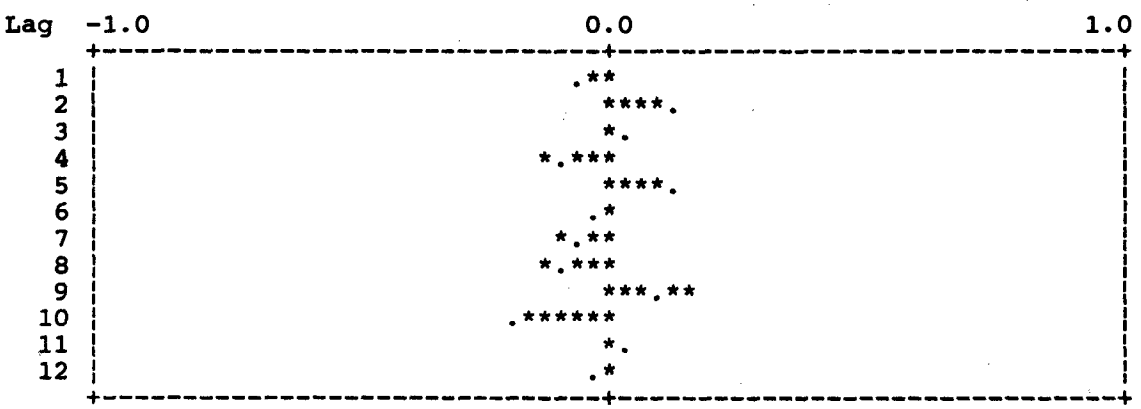
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.356963	.840903E-01	-4.24500
/_AR-TERM(-24)	-.405630	.815948E-01	-4.97127
_MA-TERM(-1)	.548835	.681359E-01	8.05500

R-Squared = .9240

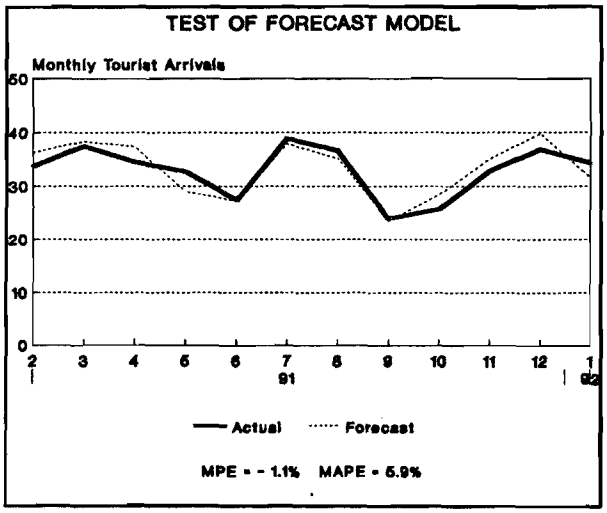
Autocorrelation Structure of ^RES

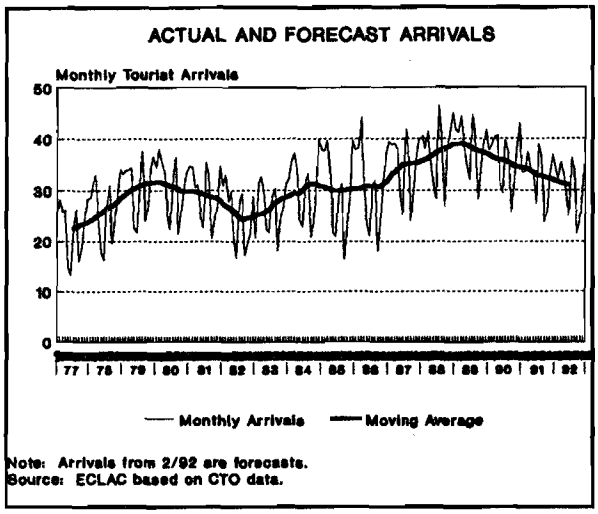
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.496750E+08	1.00000	1.00000	.000000
1	-.369199E+07	-.743229E-01	-.743434E-01	.805823E-01
2	.694198E+07	.139748	.135360	.808452E-01
3	.122470E+07	.246543E-01	.454284E-01	.811107E-01
4	-.469095E+07	-.944329E-01	-.114086	.813788E-01
5	.581827E+07	.117127	.105449	.816497E-01
6	-.145838E+07	-.293584E-01	.110181E-01	.819232E-01
7	-.347385E+07	-.699317E-01	-.102877	.821995E-01
8	-.443362E+07	-.892526E-01	-.131692	.824786E-01
9	.510018E+07	.102671	.161874	.827606E-01
10	-.919727E+07	-.185149	-.188429	.830455E-01
11	.211295E+07	.425355E-01	-.122538E-01	.833333E-01
12	-.173940E+07	-.350157E-01	.122743E-01	.836242E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



BARBADOS TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
317	371	370	353	304	318	368	359	370	422	451	461	432	394	373

The tourist sector in Barbados experienced strong growth until 1980, a decline from 1980 through 1982, and another period of growth from 1983 until 1989, when tourist arrivals again began to decline.

The structure of this lengthy time series is captured quite well by a simple ARIMA$(0,1,1)(1,1,0)_{12}$ model with first differences, seasonal differences, a moving average term with a one-month lag and an autoregressive term with a twelve-month lag. Both coefficients are estimated with low standard errors, and the autocorrelation structure of the residuals is satisfactory.

The model also forecasts very well. The coefficients of the model were estimated with data through January 1991 in order to forecast tourist arrivals in the following twelve months. Forecast arrivals for February 1991 through January 1992 are close to actual arrivals. The mean percentage error (MPE) for this forecast period is - 1.1% and the mean absolute percentage error (MAPE) is 5.9%.

For 1992, tourist arrivals are forecast to decline by 5%, to 373,000, following a fall of nearly 9% in 1991.

BARBADOS FORECASTING MODEL

Using 1977M1 -1992M12
1-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

168 Observations, 2 Parameters

Parameter Estimates

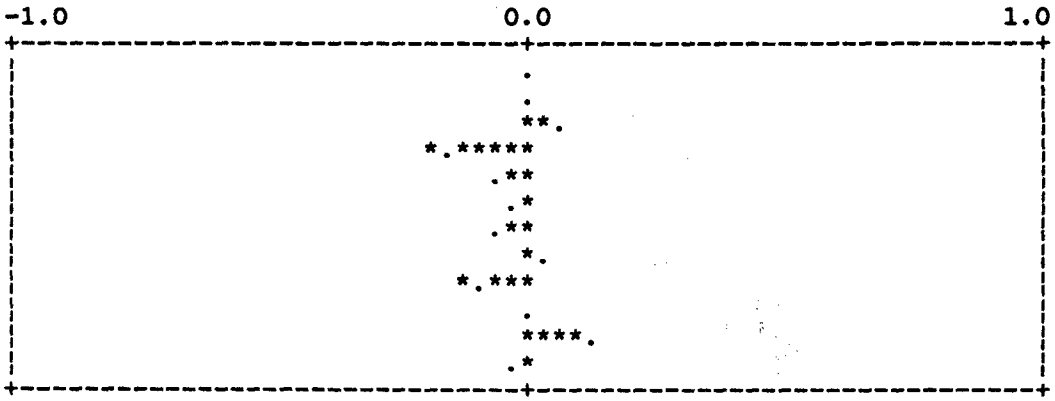
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.287393	.780485E-01	-3.68223
_MA-TERM(-1)	.524781	.670096E-01	7.83143

R-Squared = .8669

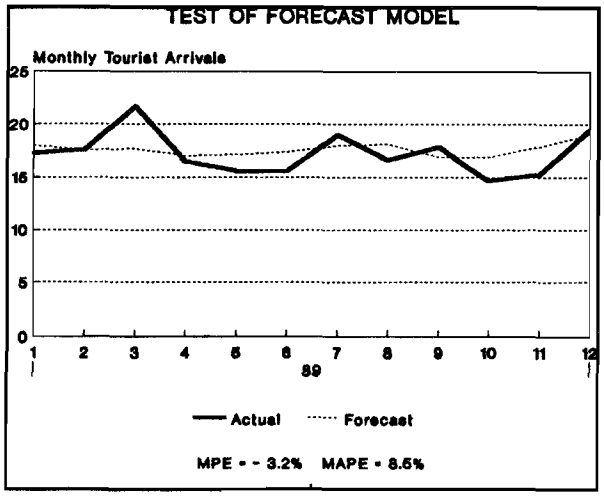
Autocorrelation Structure of ^RES

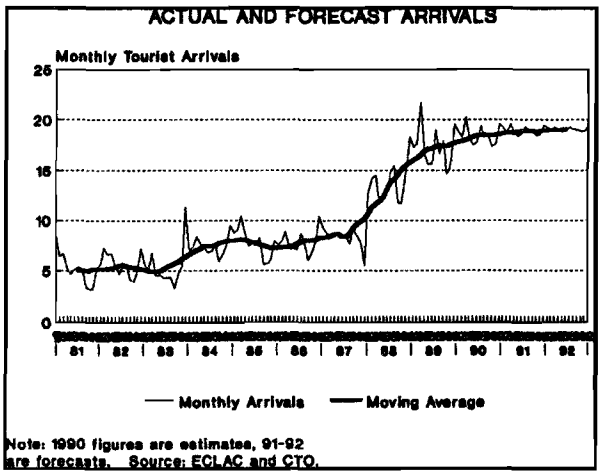
Lag		Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.	.720085E+07	1.00000	1.00000	.000000
1	.	48653.6	.675665E-02	.682465E-02	.773823E-01
2	.	58434.8	.811499E-02	.810017E-02	.776151E-01
3	.	440768.	.612105E-01	.627220E-01	.778499E-01
4	.	-.121013E+07	-.168054	-.177673	.780869E-01
5	.	-522105.	-.725061E-01	-.706180E-01	.783260E-01
6	.	-133358.	-.185197E-01	-.191858E-01	.785674E-01
7	.	-545028.	-.756894E-01	-.508667E-01	.788110E-01
8	.	236512.	.328451E-01	.180740E-01	.790569E-01
9	.	-639274.	-.887776E-01	-.120602	.793052E-01
10	.	21774.6	.302390E-02	.450590E-02	.795557E-01
11	.	.100249E+07	.139218	.129452	.798087E-01
12	.	-262726.	-.364854E-01	-.349617E-01	.800641E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



BELIZE TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
			62	67	64	88	93	94	99	164	208	222	227	229

Monthly tourist arrivals for Belize are available only through the end of 1989. These data show a sharp acceleration in arrivals from September 1987 through the first quarter of 1989. First differences remove this trend from the data. There is a definite seasonal pattern, but it changes over time, so seasonal differences do not improve the model. Introduction of seasonal differencing must await the availability of a longer series at the new, higher level of tourist activity.

The Belize forecasting model is an ARIMA$(0,1,1)(1,0,0)_2(1,0,0)_{12}$ model. Of all the ARIMA models specified in this report, this model and that for Aruba are the only ones to eschew seasonal differencing. Nonetheless, a seasonal element is included in the model in the form of an autoregressive term with a twelve month lag: arrivals in a given month this year depend on the number of arrivals in the the same month last year. An examination of the residuals of the regression show some rather high coefficients of autocorrelation and partial autocorrelation, especially for the eight month lag. Monthly data for the years since 1989 are needed to improve the model.

To test the accuracy of the model, data from 1981 through 1988 were used to estimate the three parameters of the model, in order to forecast tourist arrivals for each of the twelve months of 1989. When the forecasts are compared to actual arrivals in 1989, the result is quite satisfactory: the mean percentage error (MPE) is only -3.2% and the mean absolute percentage error (MAPE) is 8.5%.

Making use of all available data (through 1989), the Belize model forecasts tourist arrivals totalling 215,247 in calendar 1990. Tourist arrivals are known to have numbered 221,800 in 1990, so the monthly forecasts for 1990 were adjusted upwards by 221,800/215,247, the model re-estimated, and forecasts generated through December 1992. This is a very long forecast period for a short-term model, so we cannot expect a high degree of accuracy for 1992.

BELIZE FORECASTING MODEL

Using 1981M1 -1990M12
2-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

107 Observations, 3 Parameters

Parameter Estimates

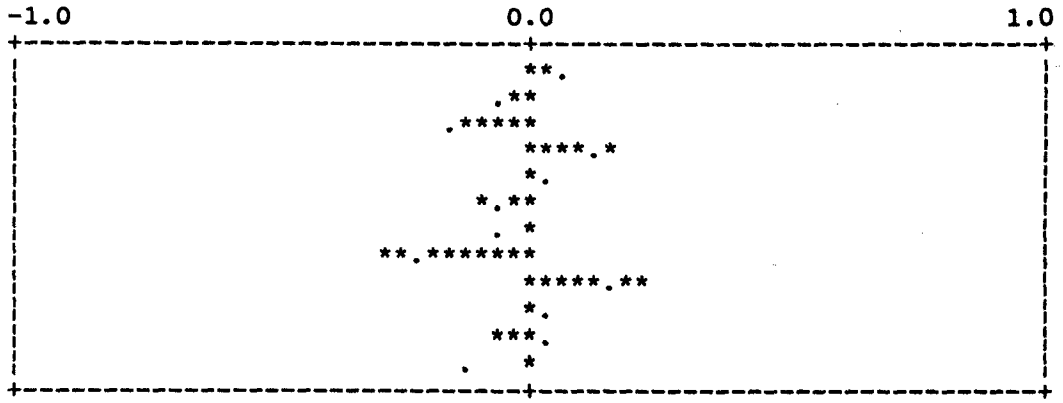
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-2)	-.164178	.108285	-1.51617
/_AR-TERM(-12)	.407618	.995194E-01	4.09586
_MA-TERM(-1)	.493500	.984581E-01	5.01228

R-Squared = .8387

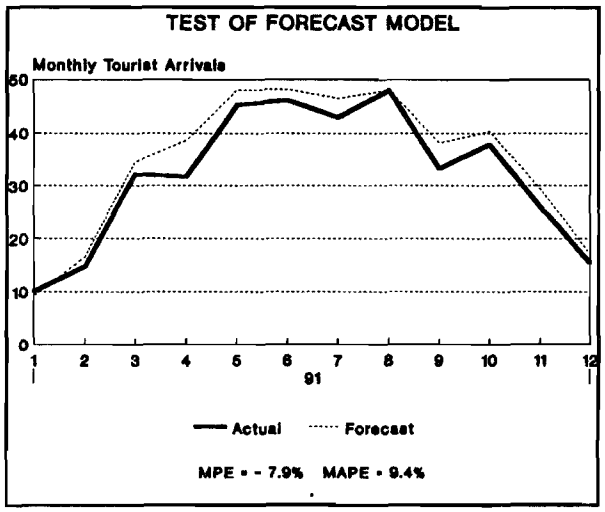
Autocorrelation Structure of ^RES

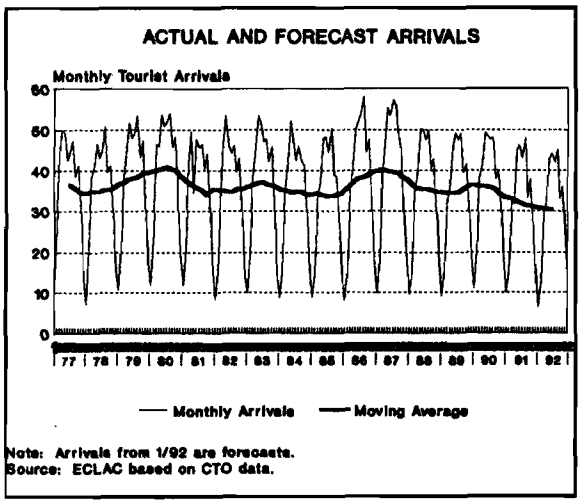
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.259982E+07	1.00000	1.00000	.000000
1	140280.	.539575E-01	.542310E-01	.971286E-01
2	-124489.	-.478835E-01	-.518421E-01	.975900E-01
3	-412194.	-.158547	-.159085	.980581E-01
4	317442.	.122102	.149631	.985329E-01
5	96288.1	.370364E-01	-.118927E-02	.990148E-01
6	-186260.	-.716433E-01	-.993611E-01	.995037E-01
7	-160950.	-.619080E-01	-.743054E-03	.100000
8	-576545.	-.221763	-.285451	.100504
9	435589.	.167546	.205139	.101015
10	68898.4	.265012E-01	-.129674E-01	.101535
11	76841.8	.295566E-01	-.505027E-01	.102062
12	-302776.	-.116460	-.626957E-02	.102598

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



BERMUDA TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
420	459	491	430	417	447	417	406	459	477	426	416	433	384	363

Bermuda has a very large, mature tourist industry that is characterized by sharp seasonal fluctuations, with peaks in the summer and troughs in the winter months. Tourist arrivals have not shown much growth in the past decade and a half, and recently they have begun to decline.

The forecasting model applied to Bermuda's tourist arrivals is an $ARIMA(0,1,1)(1,1,0)_{12}(1,0,0)_{24}$ model. The coefficients of autocorrelation for the residuals are very close to zero, an indication that additional terms will not improve the model.

The ability of the Bermuda model to forecast was tested by estimating its three parameters with data through December 1990, then forecasting tourist arrivals for the months of 1991. Actual arrivals are somewhat below forecast arrivals, and the mean percentage error (MPE) for the year is -7.9%. The mean absolute percentage error (MAPE) is 9.4%.

The model forecasts a decrease of 5.5% in tourist arrivals for 1992, following the 11% drop in 1991.

BERMUDA FORECASTING MODEL

Using 1977M1 -1992M12
2-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

167 Observations, 3 Parameters

Parameter Estimates

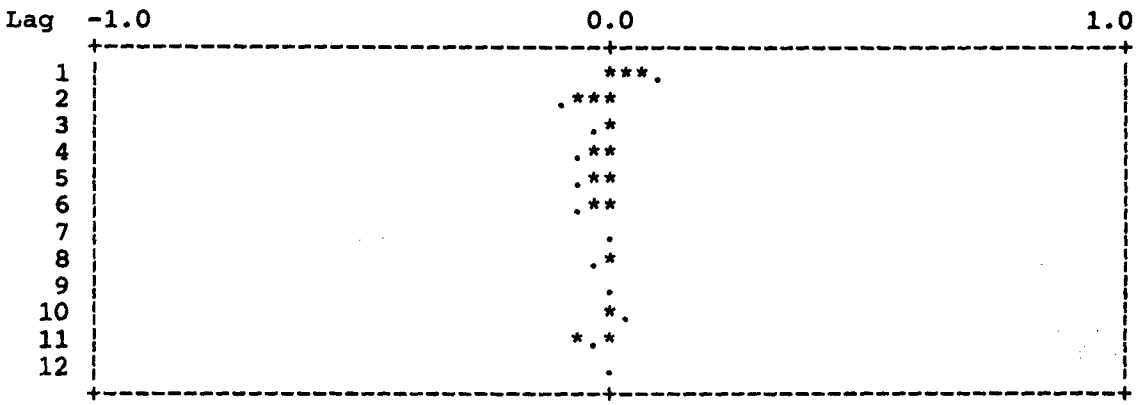
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.567365	.738084E-01	-7.68700
/_AR-TERM(-24)	-.389119	.738796E-01	-5.26694
_MA-TERM(-1)	.640145	.602392E-01	10.6267

R-Squared = .9473

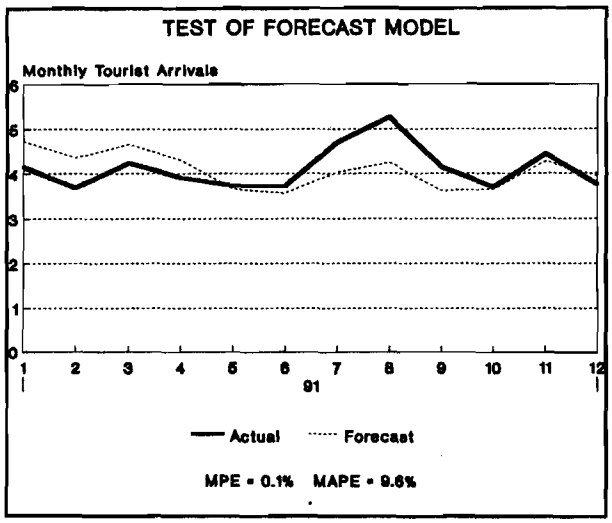
Autocorrelation Structure of ^RES

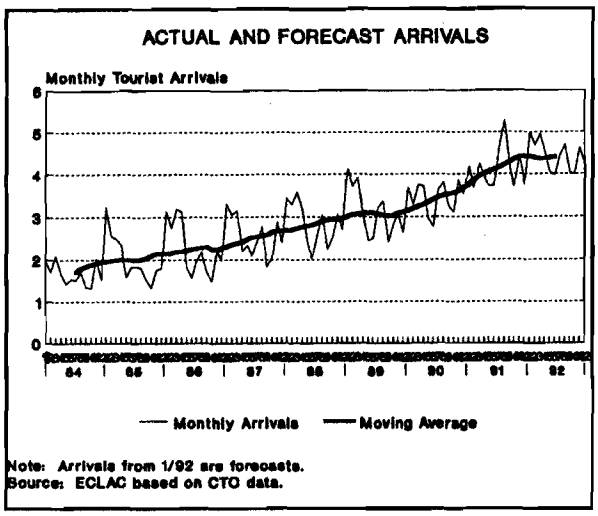
Lag		Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.	.102116E+08	1.00000	1.00000	.000000
1	.	928060.	.908825E-01	.909439E-01	.776151E-01
2	.	-824886.	-.807790E-01	-.899052E-01	.778499E-01
3	.	-166323.	-.162876E-01	-.862667E-04	.780869E-01
4	.	-551226.	-.539801E-01	-.614969E-01	.783260E-01
5	.	-486215.	-.476138E-01	-.380329E-01	.785674E-01
6	.	-661210.	-.647506E-01	-.690723E-01	.788110E-01
7	.	-154701.	-.151495E-01	-.109971E-01	.790569E-01
8	.	-243493.	-.238447E-01	-.392161E-01	.793052E-01
9	.	-69635.6	-.681923E-02	-.982598E-02	.795557E-01
10	.	331488.	.324618E-01	.210333E-01	.798087E-01
11	.	-350437.	-.343174E-01	-.518966E-01	.800641E-01
12	.	-99686.2	-.976201E-02	-.600416E-02	.803219E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



BONAIRE TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
						20	24	27	30	34	37	41	50	53

Bonaire, a small island that is part of the Netherlands Antilles, has a growing tourist industry that received 50,000 visitors in 1991.

The Bonaire forecasting model is an ARIMA$(2,1,0)(0,1,1)_{12}$ model with first differences, seasonal differences, two autoregressive terms with lags of one and two months, respectively, and a moving-average term with a twelve-month lag. The autocorrelation of the residuals is acceptable, although the correlation coefficients for lags 4, 6 and 7 are far from the ideal of zero.

As a test of the model, forecasts were generated for the twelve months of 1991 using only data for 1984 through 1990. Actual arrivals are below forecast arrivals in the first four months of 1991, an effect of the Gulf War, but actual arrivals are well above forecast arrivals in July, August and September. As a result, the mean percentage error (MPE) for the forecast period is only 0.1% while the mean absolute percentage error (MAPE) is 9.6%.

For 1992, the forecast growth in tourist arrivals is 7%. This is much less than the 20% growth recorded in 1991.

BONAIRE FORECASTING MODEL

Using 1984M1 -1992M12
2-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

83 Observations, 3 Parameters

Parameter Estimates

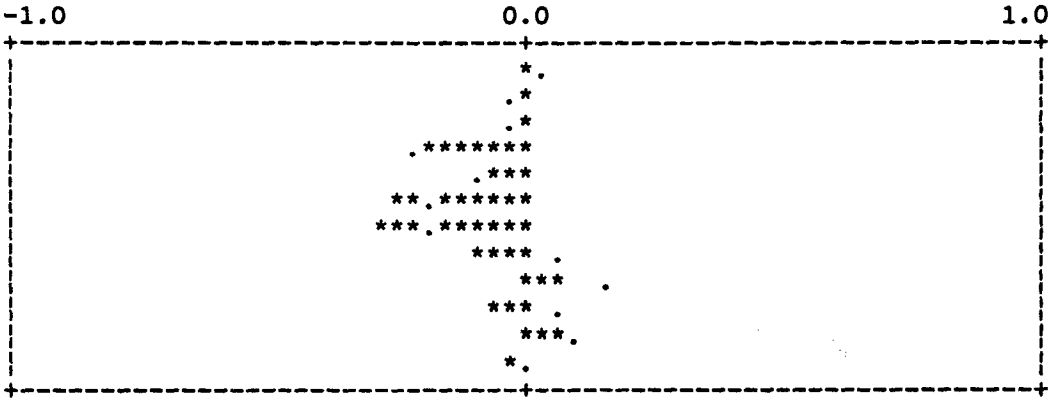
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-1)	-.216508	.107245	-2.01881
/_AR-TERM(-2)	-.237884	.107218	-2.21868
_MA-TERM(-12)	.897859	.794576E-01	11.2998

R-Squared = .8608

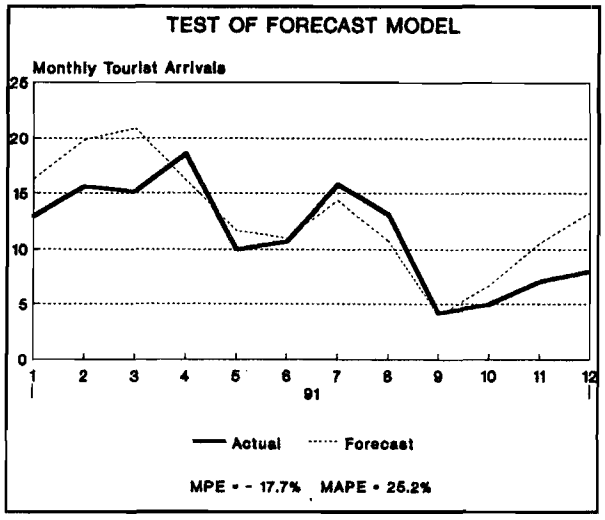
Autocorrelation Structure of ^RES

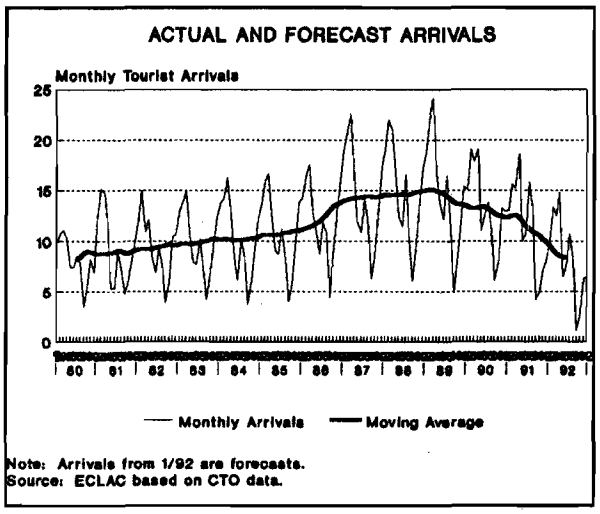
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	77026.6	1.00000	1.00000	.000000
1	1665.95	.216282E-01	.218234E-01	.110432
2	-2297.78	-.298311E-01	-.312443E-01	.111111
3	-1471.46	-.191033E-01	-.192914E-01	.111803
4	-15968.2	-.207308	-.225445	.112509
5	-6665.88	-.865399E-01	-.943239E-01	.113228
6	-15141.7	-.196577	-.262026	.113961
7	-15086.4	-.195859	-.291011	.114708
8	3752.00	.487105E-01	-.103455	.115470
9	11880.6	.154240	.612075E-01	.116248
10	4752.88	.617044E-01	-.671137E-01	.117041
11	8141.85	.105702	.474991E-01	.117851
12	547.133	.710316E-02	-.201636E-01	.118678

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



BRITISH VIRGIN ISLANDS TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		97	110	114	119	122	130	146	173	176	176	160	136	100

Tourist arrivals in the British Virgin Islands have been declining since 1989, when the territory was hit badly by Hurricane Hugo. Seasonal fluctuations are very large, with arrivals in peak months three to four times more numerous than arrivals in the slowest month.

An ARIMA$(0,1,1)(1,1,0)_{12}$ model was fitted to data for the years 1980 through 1991. The two parameters [the coefficients of AR(-12) and MA(-1)] are estimated with considerable precision, but an examination of the residuals of the equation shows considerable autocorrelation left unaccounted for. There is room for improvement of the B.V.I. model.

A test of the model, employing data through December 1990 to forecast arrivals in 1991, was not entirely successful. The forecast error is negative in the first quarter of 1991, which is understandable in light of the effect of the Gulf War on tourist travel, but it is also negative in the last quarter of the year. For the forecast period as a whole, the mean percentage error (MPE) is -17.7% and the mean absolute percentage error (MAPE) is 25.2%.

For 1992, the model forecasts a fall in arrivals to levels below those of a decade ago.

BRITISH VIRGIN ISLANDS FORECASTING MODEL

Using 1980M1 -1992M12
1-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

131 Observations, 2 Parameters

Parameter Estimates

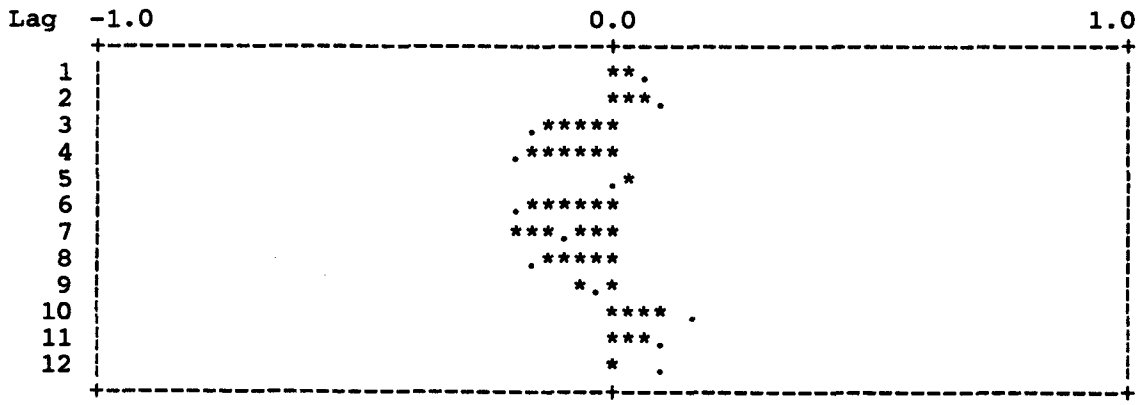
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.517383	.812072E-01	-6.37115
_MA-TERM(-1)	.629850	.711769E-01	8.84908

R-Squared = .8740

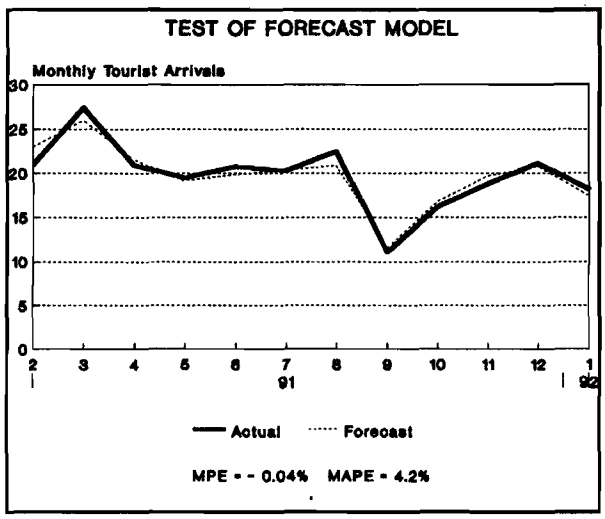
Autocorrelation Structure of ^RES

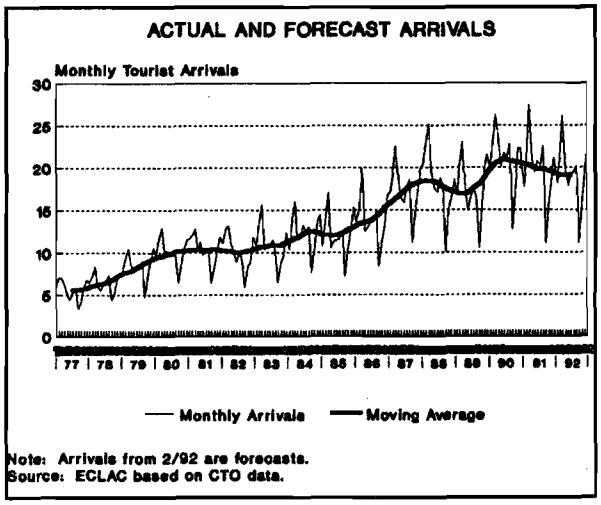
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.252648E+07	1.00000	1.00000	.000000
1	174353.	.690103E-01	.706723E-01	.877058E-01
2	225044.	.890741E-01	.911406E-01	.880451E-01
3	-381388.	-.150956	-.166428	.883883E-01
4	-463335.	-.183392	-.198921	.887357E-01
5	-2116.11	-.837574E-03	.354629E-01	.890871E-01
6	-448432.	-.177493	-.191021	.894427E-01
7	-253268.	-.100245	-.177426	.898027E-01
8	-373985.	-.148026	-.164020	.901670E-01
9	-40268.5	-.159386E-01	-.604340E-01	.905357E-01
10	380366.	.150552	.961706E-01	.909091E-01
11	247509.	.979661E-01	.621865E-01	.912871E-01
12	224188.	.887355E-01	-.677878E-02	.916698E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



CAYMAN ISLANDS TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
77	101	120	125	121	131	148	145	166	209	219	210	253	237	231

Tourist arrivals in the Cayman Islands grew at an annual rate of 10.7% from 1977 to 1990, but they have recently begun to decline.

An ARIMA$(0,1,1)(1,1,0)_{12}(1,0,0)_{24}$ model fits this time series remarkably well. The three parameters are estimated with very low standard errors, and the residuals are close to "white noise," i.e., random shocks with no discernible pattern.

The Cayman Islands model also performs well in an out-of-sample test. Actual arrivals for February 1991 through January 1992 are very close to forecasts based on data from 1977 through January 1991. The mean percentage error (MPE) for the test period is -0.04% and the mean absolute percentage error (MAPE) is 4.2%.

Tourist arrivals in 1992 are forecast to decline 2.5%, to 231,000. This decline is considerably less than the 6.3% fall recorded in 1991.

CAYMAN ISLANDS FORECASTING MODEL

Using 1977M1 -1992M12
2-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

168 Observations, 3 Parameters

Parameter Estimates

Dependent Variable is LOGARITHM OF TOURIST ARRIVALS

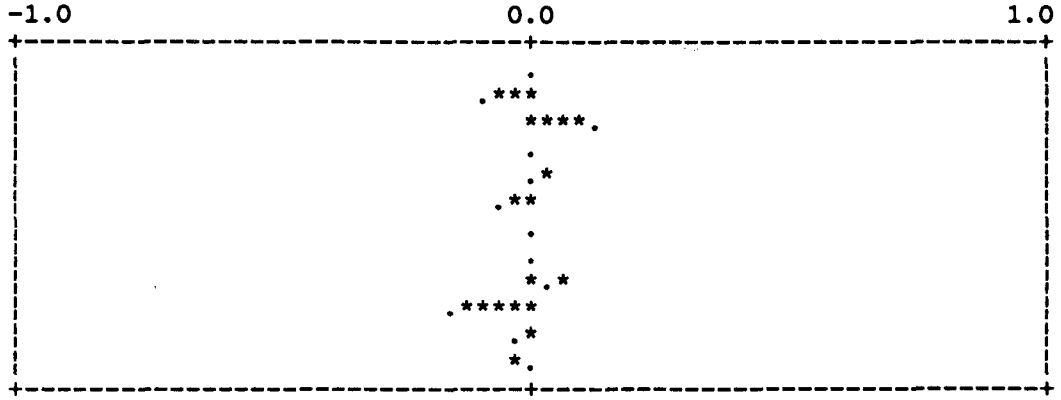
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.398500	.766646E-01	-5.19796
/_AR-TERM(-24)	-.429019	.754022E-01	-5.68975
_MA-TERM(-1)	.521857	.676583E-01	7.71312

R-Squared = .9661

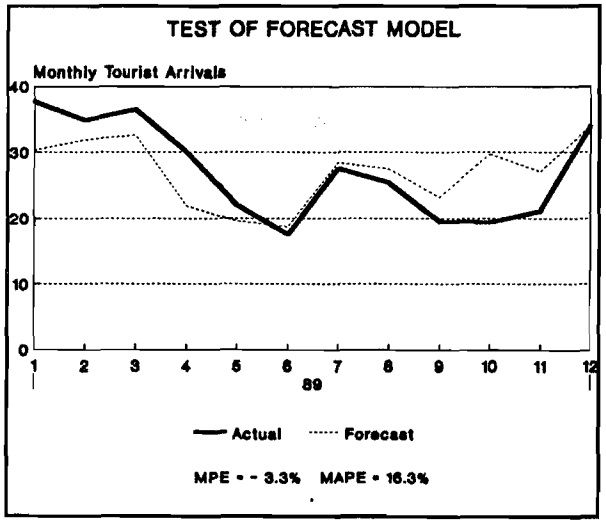
Autocorrelation Structure of ^RES

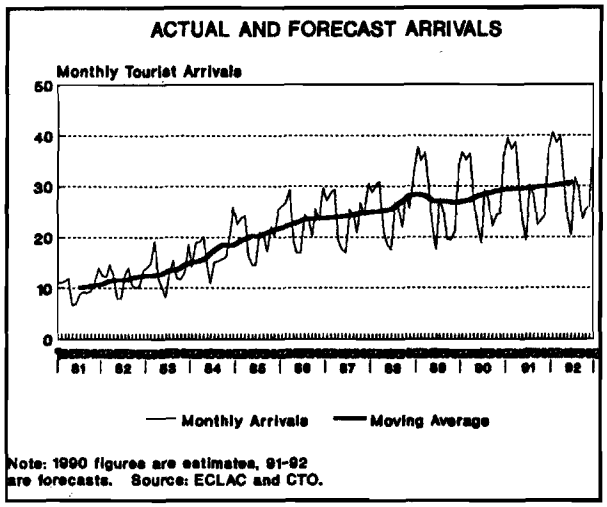
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.606773E-02	1.00000	1.00000	.000000
1	.605077E-04	.997205E-02	.100020E-01	.773823E-01
2	-.474879E-03	-.782631E-01	-.789774E-01	.776151E-01
3	.678538E-03	.111827	.116838	.778499E-01
4	.172757E-04	.284714E-02	-.945574E-02	.780869E-01
5	.340114E-05	.560529E-03	.168596E-01	.783260E-01
6	-.306682E-03	-.505432E-01	-.679332E-01	.785674E-01
7	-.155508E-04	-.256287E-02	.104018E-02	.788110E-01
8	.195694E-04	.322515E-02	-.932502E-02	.790569E-01
9	.243516E-03	.401330E-01	.580698E-01	.793052E-01
10	-.855554E-03	-.141001	-.152279	.795557E-01
11	-.251784E-03	-.414957E-01	-.281147E-01	.798087E-01
12	.681125E-04	.112254E-01	-.270484E-01	.800641E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



CUBA TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
			121	139	162	207	243	282	292	308	326	340	355	370

Cuba has become an increasingly popular destination for tourists in the Caribbean. Monthly data are available for 1981 through 1989, along with an annual figure for 1990. As is common in other Caribbean islands, tourism in Cuba is seasonal, with peaks in the winter months and troughs in the summer.

An ARIMA$(0,1,2)(1,1,0)_{12}$ model fits the Cuban data reasonably well. Each of the estimated coefficients is much larger than its standard error, and the residual autocorrelation does not suggest that relevant parameters have been omitted from the model.

A test employing data through 1988 to forecast monthly arrivals in 1989 gives good results for total arrivals in the year, but a number of the months have large forecast errors. Overall, the mean percentage error (MPE) is -3.3% and the mean absolute percentage error(MAPE) is 16.3%.

Using all the available monthly data (through 1989), the Cuba model forecasts a total of 322,012 tourist arrivals in calendar 1990. Actual arrivals were 340,329, implying an MPE somewhat in excess of 5%, so the monthly forecasts were multiplied by 340,329/322,012, the model re-estimated, and forecasts generated for 1991 and 1992. This is a very long forecast period, so the forecast error can be expected to be large for 1992.

CUBA FORECASTING MODEL

Using 1981M1 -1990M12
1-Term Autoregressive Process
2-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

95 Observations, 3 Parameters

Parameter Estimates

Dependent Variable is LOGARITHM OF TOURIST ARRIVALS

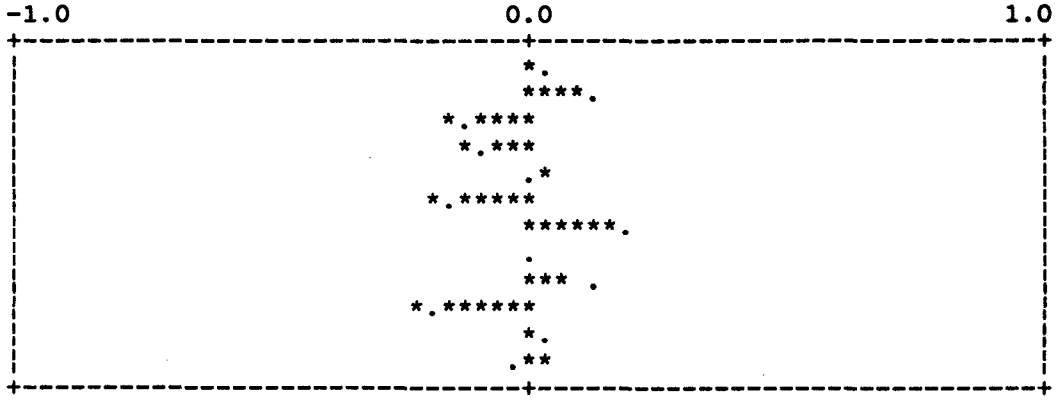
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.440111	.103778	-4.24088
_MA-TERM(-1)	.593718	.101565	5.84570
_MA-TERM(-2)	.231602	.104912	2.20759

R-Squared = .8993

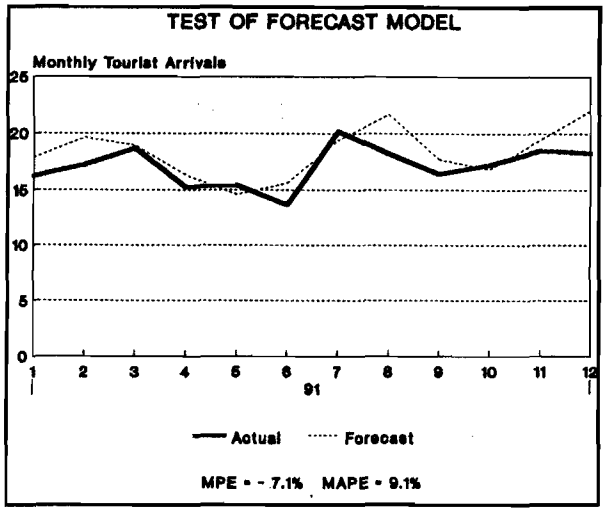
Autocorrelation Structure of ^RES

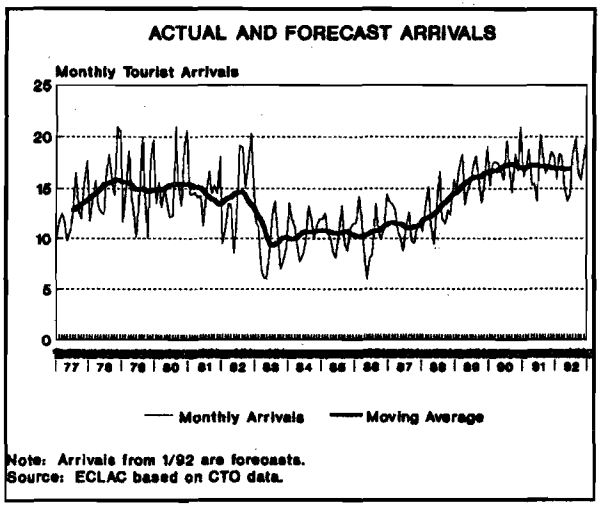
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.151628E-01	1.00000	1.00000	.000000
1	.445948E-03	.294107E-01	.295498E-01	.103142
2	.182385E-02	.120285	.120542	.103695
3	-.207623E-02	-.136930	-.156872	.104257
4	-.154871E-02	-.102139	-.130742	.104828
5	-.157482E-03	-.103861E-01	.291978E-01	.105409
6	-.251599E-02	-.165932	-.183602	.106000
7	.284685E-02	.187752	.176325	.106600
8	-.170530E-03	-.112466E-01	.910409E-02	.107211
9	.208318E-02	.137388	.649273E-01	.107833
10	-.297690E-02	-.196329	-.227218	.108465
11	.249195E-03	.164347E-01	.447142E-01	.109109
12	-.518928E-03	-.342238E-01	.378220E-01	.109764

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



CURACAO TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
186	179	185	176	174	111	130	127	128	136	155	193	208	206	204

Curaçao's tourist sector, which has shown strong growth in recent years, registered a small decline in tourist arrivals in 1991.

An ARIMA$(3,1,0)(0,1,1)_{12}$ model was applied to a logarithmic transformation of the Curaçao series. All four of the estimated parameters are statistically significant, but the R^2 of the equation is only 0.619, and the residual autocorrelation differs significantly from zero for some lags. Time and effort could profitably be invested in specifying an alternative model for Curacao.

In a test of the model, using data from 1977 through 1990 to forecast arrivals in 1991, the forecast is high for most months of the year. Of course, following the strong growth in the series from 1987 to 1989, and slower growth in 1990, any model is likely to project continued growth in 1991. For the twelve-month test period, the mean percentage error (MPE), a measure of bias, is -7.1% and the mean absolute percentage error (MAPE), a measure of accuracy, is 9.1%.

For 1992 the model forecasts a decline in tourist arrivals similar to that of 1991.

CURACAO FORECASTING MODEL

Using 1977M1 -1992M12
3-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

167 Observations, 4 Parameters

Parameter Estimates

Dependent Variable is LOGARITHM OF TOURIST ARRIVALS

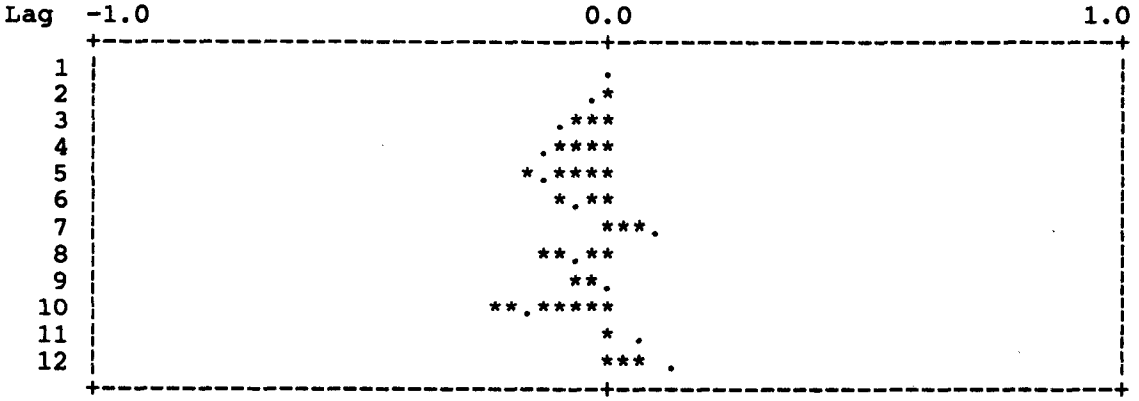
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-1)	-.277228	.775752E-01	-3.57366
/_AR-TERM(-2)	-.327946	.776930E-01	-4.22105
/_AR-TERM(-3)	-.141804	.776769E-01	-1.82556
_MA-TERM(-12)	.874487	.481283E-01	18.1699

R-Squared = .6190

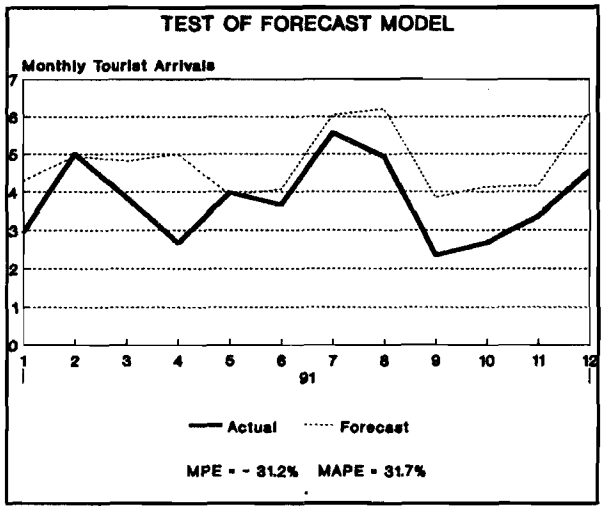
Autocorrelation Structure of ^RES

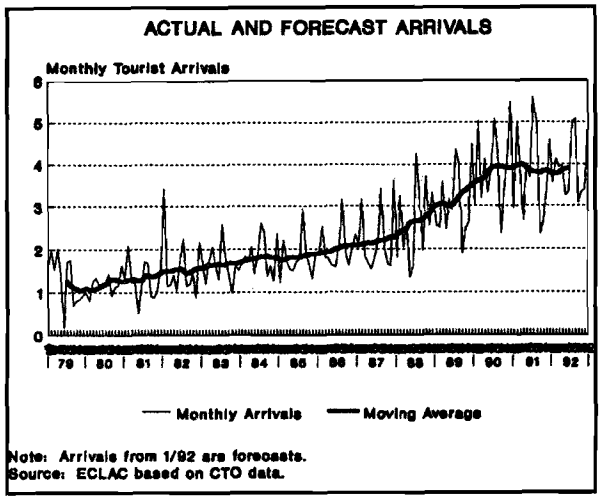
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.268797E-01	1.00000	1.00000	.000000
1	-.297499E-03	-.110678E-01	-.110794E-01	.776151E-01
2	-.116033E-02	-.431675E-01	-.434277E-01	.778499E-01
3	-.220986E-02	-.822129E-01	-.836666E-01	.780869E-01
4	-.326935E-02	-.121629	-.127673	.783260E-01
5	-.339859E-02	-.126437	-.143404	.785674E-01
6	-.177664E-02	-.660959E-01	-.990486E-01	.788110E-01
7	.241849E-02	.899743E-01	.495456E-01	.790569E-01
8	-.190375E-02	-.708248E-01	-.126035	.793052E-01
9	-.217671E-03	-.809796E-02	-.591193E-01	.795557E-01
10	-.432908E-02	-.161054	-.230445	.798087E-01
11	.129698E-02	.482512E-01	.556942E-02	.800641E-01
12	.302857E-02	.112671	.669629E-01	.803219E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



DOMINICA TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
15.5	14.3	15.4	19.0	19.7	22.2	21.5	24.4	26.7	31.8	37.0	47.3	45.7	47.1	

This is an extremely difficult series to model. Growth of tourist arrivals was rapid for many years in Dominica, then came to a sudden halt in 1990. Of the various alternatives considered, an ARIMA$(3,1,0)(0,1,1)_{12}$ model fits the data best. The variance of the series is not constant, so the model was applied to the logarithm of tourist arrivals rather than to the raw values of the series. All four of the estimated coefficients are highly significant, but the R^2 of the equation is only 0.702, and some of the coefficients of residual autocorrelation differ significantly from zero.

To test the forecast accuracy of the model, its parameters were estimated using only observations through December 1990. Forecasts were then made for each month of 1991. Actual arrivals are much lower than forecast arrivals for most months of the year. For the entire period, the mean percentage error (MPE) is -31.2% and the mean absolute percentage error (MAPE) is 31.7%. On average, forecast arrivals exceed actual arrivals by more than 30%.

This example illustrates the inability of a single-variable model to forecast a sudden turn in a series. Nonetheless, for what it's worth, the Dominica model forecasts a slight recovery in 1992, with the number of arrivals approaching the 1990 level of 47,300.

DOMINICA FORECASTING MODEL

Using 1979M1 -1992M12
3-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

143 Observations, 4 Parameters

Parameter Estimates

Dependent Variable is LOGARITHM OF TOURIST ARRIVALS

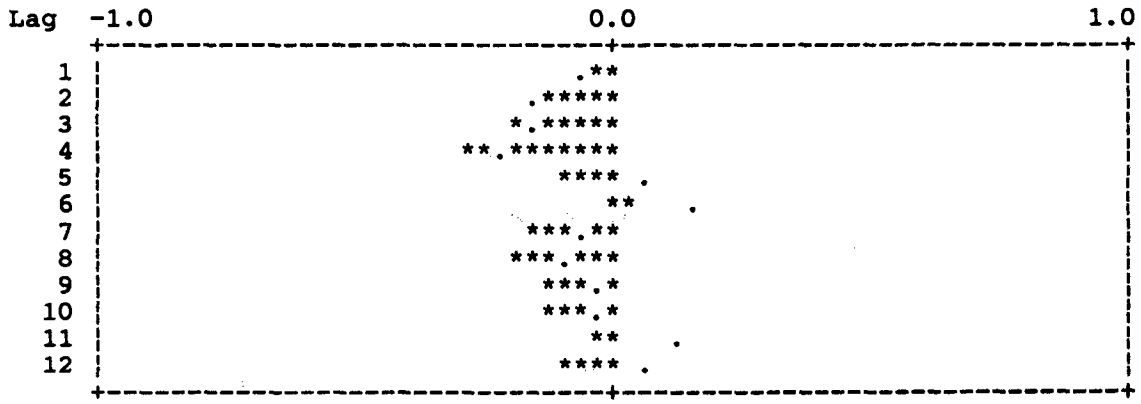
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-1)	-.738868	.831734E-01	-8.88346
/_AR-TERM(-2)	-.488745	.970155E-01	-5.03780
/_AR-TERM(-3)	-.239501	.831402E-01	-2.88068
_MA-TERM(-12)	.935483	.146824E-01	63.7144

R-Squared = .7020

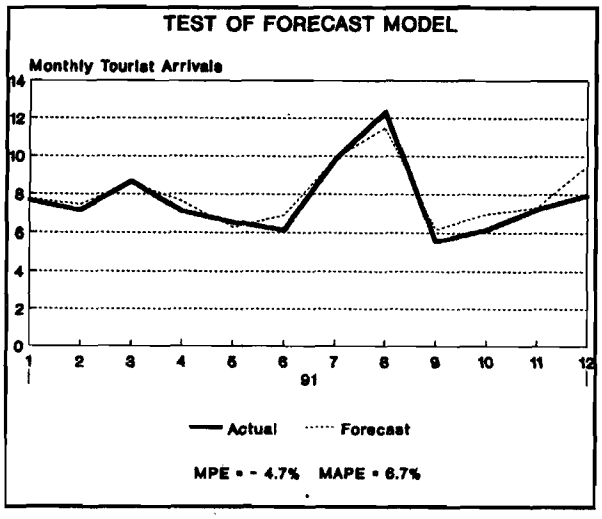
Autocorrelation Structure of ^RES

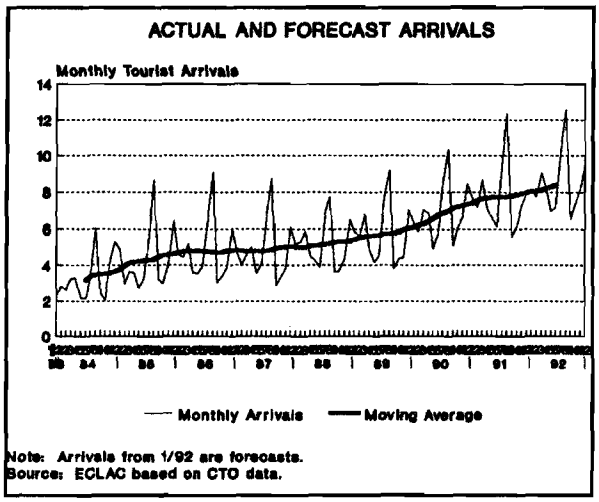
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.686993E-01	1.00000	1.00000	.000000
1	-.376059E-02	-.547398E-01	-.548527E-01	.839181E-01
2	-.101345E-01	-.147520	-.151641	.842152E-01
3	-.114953E-01	-.167328	-.191273	.845154E-01
4	-.141512E-01	-.205988	-.280256	.848189E-01
5	.329906E-02	.480217E-01	-.860598E-01	.851257E-01
6	.110415E-01	.160723	.430580E-01	.854358E-01
7	-.447040E-02	-.650721E-01	-.151653	.857493E-01
8	-.682583E-02	-.993581E-01	-.178911	.860663E-01
9	-.304211E-02	-.442815E-01	-.121261	.863868E-01
10	-.143081E-02	-.208272E-01	-.123026	.867110E-01
11	.895921E-02	.130412	-.262870E-01	.870388E-01
12	.384618E-02	.559857E-01	-.828678E-01	.873704E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



GRENADA TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
						40	52	57	57	62	69	82	92	102

Grenada has a small but expanding tourist sector. Because of the importance of intra-Caribbean tourism, especially holiday visitors from Trinidad, tourist arrivals peak in July and August rather than the winter months. This may change as tourism from Europe and North America increases in importance, but as yet there is no sign of any alteration of this seasonal pattern.

The Grenada forecasting model is a simple ARIMA$(0,1,1)(1,1,0)_{12}$ model with first differences and seasonal differences. The standard errors of the two coefficients are quite low, and the autocorrelation of the residuals is acceptable. The 0.15 coefficient of autocorrelation for lag 2 is bothersome, but neither AR(-2) nor MA(-2) had significant coefficients when added to the model.

In an an out-of-sample test, using data for 85 months (December 1983 through December 1990) to forecast arrivals in 1991, the model performed with considerable accuracy. Surprisingly, the Gulf War had little effect on tourist arrivals in the first quarter of 1991. For the entire test period, the mean percentage error (MPE) is -4.7% and the mean absolute percentage error (MAPE) is 6.7%.

The forecast for 1992 is for a year similar to 1991, with tourist arrivals increasing by 10,000 to reach a record 102,000.

GRENADA FORECASTING MODEL

Using 1983M12 -1992M12
1-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

84 Observations, 2 Parameters

Parameter Estimates

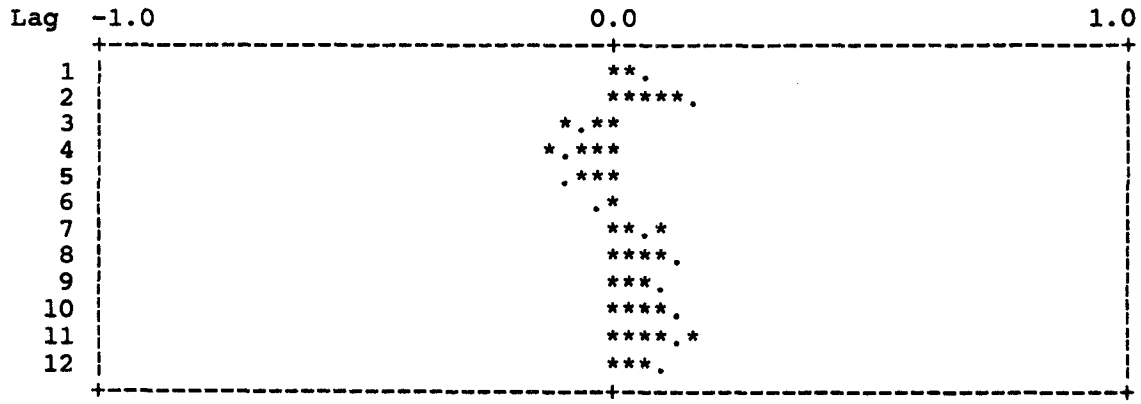
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.507516	.956748E-01	-5.30459
_MA-TERM(-1)	.765222	.658453E-01	11.6215

R-Squared = .8708

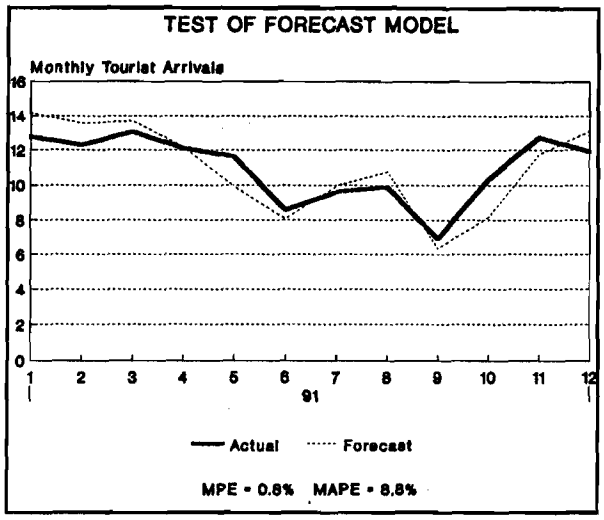
Autocorrelation Structure of ^RES

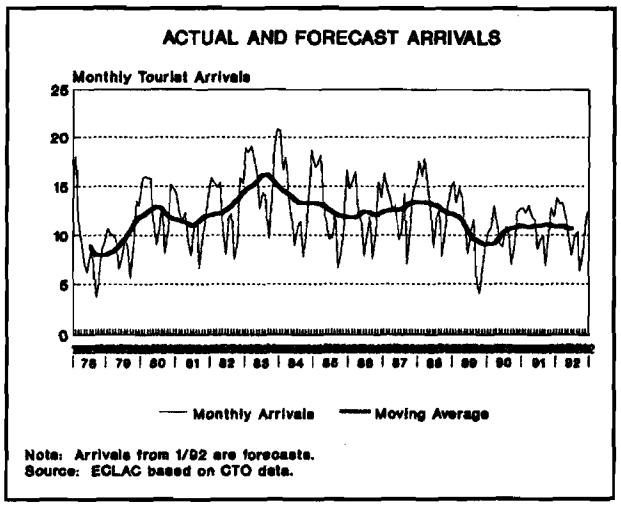
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	422332.	1.00000	1.00000	.000000
1	25913.5	.613581E-01	.629506E-01	.109764
2	61419.9	.145430	.146643	.110432
3	-25578.3	-.605645E-01	-.839530E-01	.111111
4	-38510.6	-.911856E-01	-.113949	.111803
5	-44833.8	-.106158	-.811973E-01	.112509
6	-7647.47	-.181077E-01	.905578E-02	.113228
7	25235.1	.597519E-01	.871855E-01	.113961
8	50051.0	.118511	.129471	.114708
9	41433.4	.981062E-01	.655517E-01	.115470
10	56800.9	.134494	.105402	.116248
11	57738.2	.136713	.145071	.117041
12	36824.2	.871926E-01	.820839E-01	.117851

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



GUADELOUPE TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
110	114	157	133	152	194	163	151	148	153	159	123	126	132	129

Tourist arrivals in the French island of Guadeloupe peaked in 1983 and have been declining, for the most part, since that year. The tourist sector was also affected by the damage caused by Hurricane Hugo in September of 1989. The variance of the series is not constant, but a logarithmic transformation of the data improves the model.

The forecasting model for Guadeloupe's tourist arrivals is an ARIMA$(2,1,0)(0,1,1)_{12}$ model. First differences remove the trend from the series and twelve-month differences, along with an MA(-12) term, model the seasonal structure. The two autoregressive terms have lags of one and two months, respectively. All the auto-correlation coefficients of the residuals are less than 0.1 in absolute value, an indication that the structure of the time series is captured very well by the model.

An out-of-sample test of the Guadeloupe model, using 1978-1990 data to forecast 1991 arrivals, is encouraging. Because of the Gulf War, actual arrivals are below forecast arrivals in the first quarter of 1991, while actual arrivals exceed forecast arrivals for much of the remainder of the year. For the entire forecast period, the mean percentage error (MPE) is 0.8% and the mean absolute percentage error (MAPE) is 8.8%.

For 1992 the model forecasts a 2% fall in tourist arrivals, to 129,000, despite the 5% increase in arrivals registered in 1991.

GUADELOUPE FORECASTING MODEL

Using 1978M1 -1992M12
2-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

155 Observations, 3 Parameters

Parameter Estimates

Dependent Variable is LOGARITHM OF TOURIST ARRIVALS

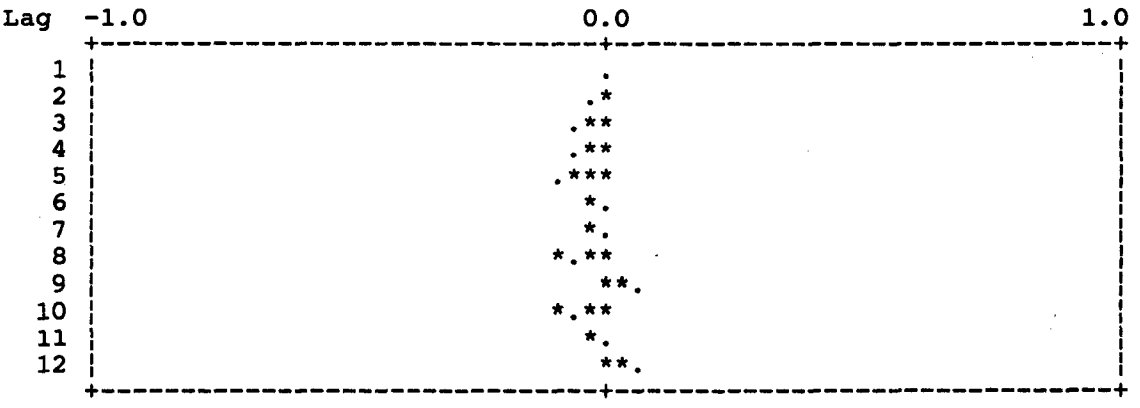
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-1)	-.279694	.811866E-01	-3.44508
/_AR-TERM(-2)	-.142454	.810254E-01	-1.75814
_MA-TERM(-12)	.897301	.336748E-01	26.6461

R-Squared = .8510

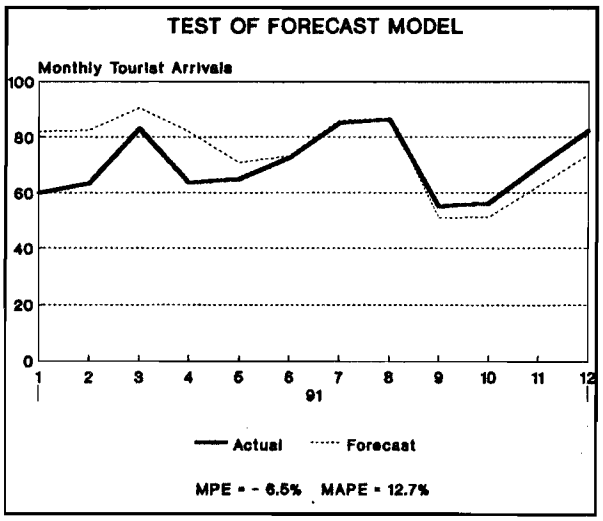
Autocorrelation Structure of ^RES

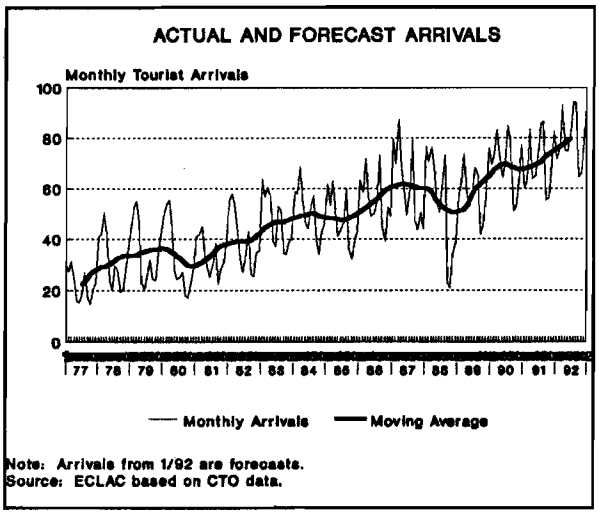
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.158133E-01	1.00000	1.00000	.000000
1	-.954089E-04	-.603347E-02	-.608783E-02	.805823E-01
2	-.416895E-03	-.263636E-01	-.266831E-01	.808452E-01
3	-.101520E-02	-.641995E-01	-.657342E-01	.811107E-01
4	-.106066E-02	-.670741E-01	-.707595E-01	.813788E-01
5	-.124101E-02	-.784789E-01	-.854760E-01	.816497E-01
6	-.198249E-03	-.125369E-01	-.227577E-01	.819232E-01
7	-.172466E-03	-.109064E-01	-.247771E-01	.821995E-01
8	-.109567E-02	-.692881E-01	-.954600E-01	.824786E-01
9	.810982E-03	.512849E-01	.310276E-01	.827606E-01
10	-.103161E-02	-.652367E-01	-.876006E-01	.830455E-01
11	.402328E-04	.254425E-02	-.180435E-01	.833333E-01
12	.867632E-03	.548674E-01	.444061E-01	.836242E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



JAMAICA TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
382	427	395	406	467	586	603	572	664	739	649	715	841	845	962

Jamaican tourist arrivals have increased markedly in the last decade and a half, despite the temporary setbacks suffered in 1980 and 1988. In 1991, arrivals averaged a record 70,400 per month.

The Jamaica model is an ARIMA$(0,1,1)(1,1,0)_{12}(1,0,0)_{24}$ model that incorporates first differences, seasonal differences, a moving-average term with a lag of one month, and two autoregressive terms with lags of twelve and twenty-four months, respectively. The estimated coefficients are highly significant and the coefficients of autocorrelation of the residuals are close to zero.

As a test, the parameters of the forecasting model were estimated using only data through the end of 1990. Forecast arrivals were generated for 1991, which were then compared to actual arrivals. Because of the conflict in the Persian Gulf, actual arrivals are well below forecast arrivals in the first months of the year. For the twelve-month period, the mean percentage forecast error (MPE) is -6.5% and the mean absolute percentage error (MAPE) is 12.7%.

Forecast arrivals in 1992 total 962,000, an increase of nearly 14% following virtual stagnation in 1991.

JAMAICA FORECASTING MODEL

Using 1977M1 -1992M12
2-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

167 Observations, 3 Parameters

Parameter Estimates

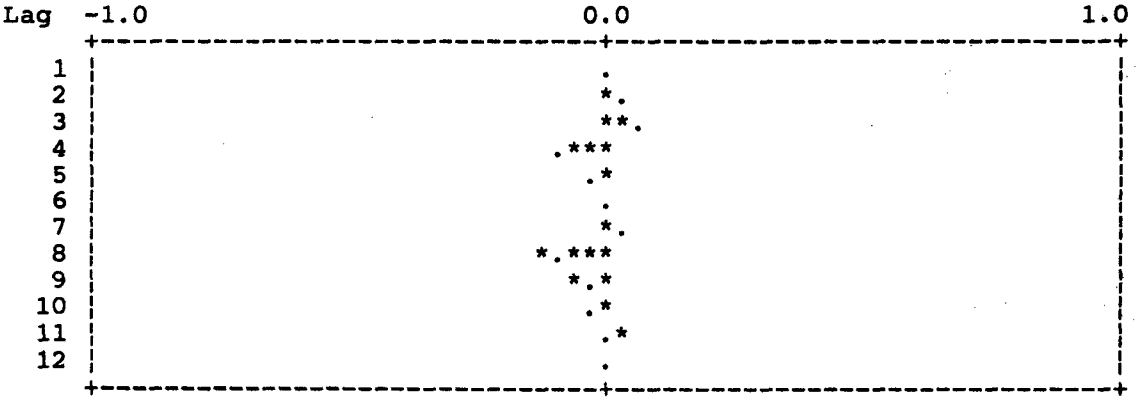
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.227815	.813920E-01	-2.79898
/_AR-TERM(-24)	-.180859	.841549E-01	-2.14912
_MA-TERM(-1)	.431731	.707471E-01	6.10246

R-Squared = .8791

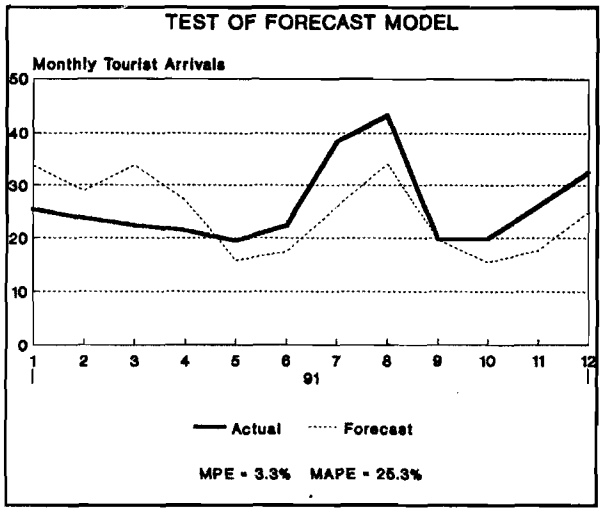
Autocorrelation Structure of ^RES

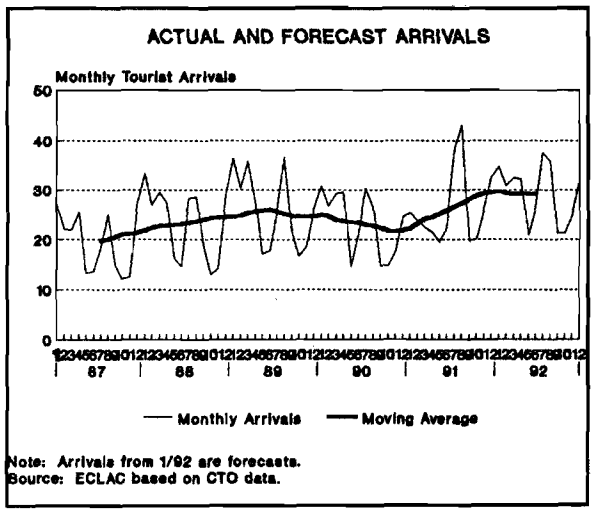
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.360379E+08	1.00000	1.00000	.000000
1	-402749.	-.111757E-01	-.111900E-01	.776151E-01
2	633214.	.175708E-01	.174504E-01	.778499E-01
3	.258949E+07	.718545E-01	.727058E-01	.780869E-01
4	-.366897E+07	-.101809	-.102038	.783260E-01
5	-.115840E+07	-.321440E-01	-.400632E-01	.785674E-01
6	-187700.	-.520841E-02	-.705940E-02	.788110E-01
7	793646.	.220225E-01	.393874E-01	.790569E-01
8	-.368080E+07	-.102137	-.112366	.793052E-01
9	-.167339E+07	-.464342E-01	-.614124E-01	.795557E-01
10	-828554.	-.229912E-01	-.278037E-01	.798087E-01
11	341439.	.947443E-02	.363666E-01	.800641E-01
12	-92570.8	-.256871E-02	-.142309E-01	.803219E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



MARTINIQUE TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
									234	280	311	281	315	351

The French island of Martinique has a well-developed tourist sector. Tourist arrivals increased by more than a third between 1987 and 1989, fell 10% in 1990, and regained their 1989 level in 1991. An earlier series, restricted to guests registered at selected hotels, shows an increase in arrivals of 17.6% between 1981 and 1987.

The Martinique forecasting model is an ARIMA$(0,1,2)(1,1,0)_{12}$ model. After taking first differences and seasonal differences, the five years of data yield only 47 observations, somewhat fewer than the minimum number recommended for estimation of this type of model. The estimated coefficients all have high t-statistics, but the R^2 is a low .665, and, beyond a lag of three months, a number of the coefficients of autocorrelation of the residuals differ significantly from zero.

Removing the observations for 1991 in order to estimate the model for an out-of-sample test leaves only 35 observations. As might be expected, the results of the test are not satisfactory. Actual arrivals are below forecast arrivals in the first four months of the year, understandable in light of the reduction in travel in the aftermath of the Gulf War, but they are well above forecast arrivals for the remainder of the year. For the twelve-month period, the mean percentage error (MPE) is only 3.3%, while the mean absolute percentage error (MAPE), a preferred measure of forecast accuracy, is 26.3%.

The 1992 forecast is based on an additional year of data, so can be expected to be more accurate than the 1991 test forecast. The model forecasts a record 351,000 arrivals in 1992, an increase similar to that registered in 1991.

MARTINIQUE FORECASTING MODEL

Using 1987M1 -1992M12
1-Term Autoregressive Process
2-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed
3 Parameters to be Estimated

Non-linear Gaussian Estimation Procedure

47 Observations, 3 Parameters

Parameter Estimates

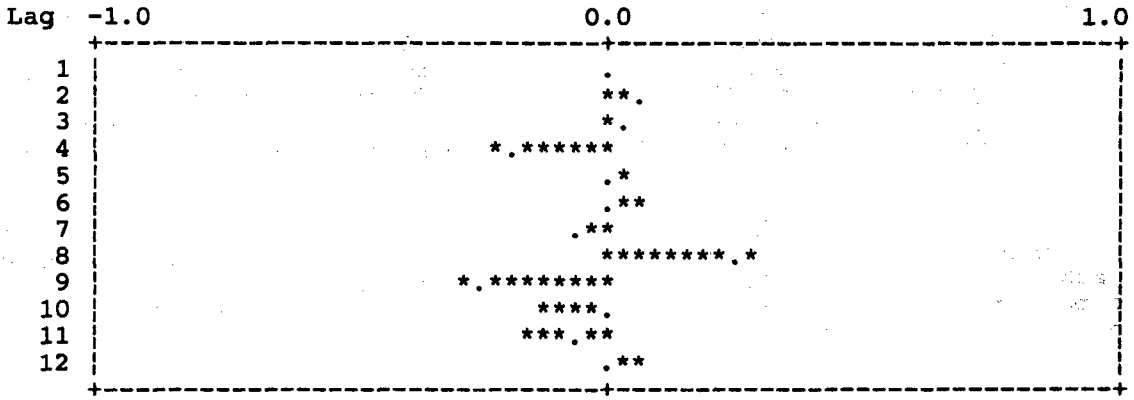
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.731767	.135166	-5.41383
_MA-TERM(-1)	.280919	.145613	1.92921
_MA-TERM(-2)	.338016	.147944	2.28475

R-Squared = .6649

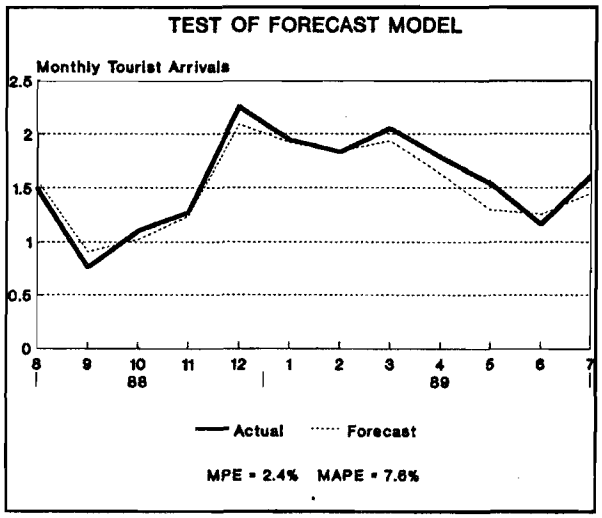
Autocorrelation Structure of ^RES

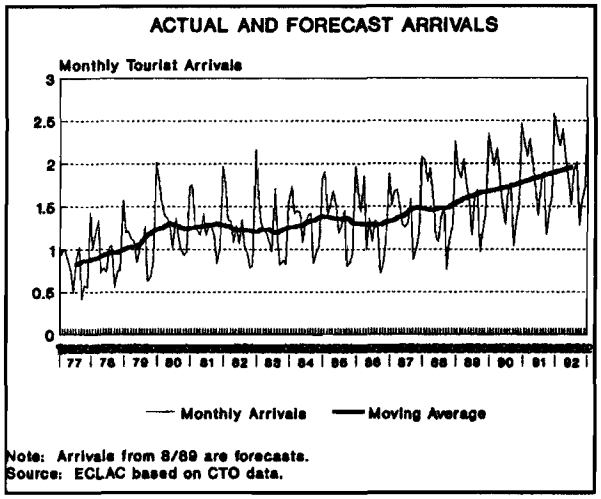
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.165985E+08	1.00000	1.00000	.000000
1	32053.8	.193112E-02	.194028E-02	.147442
2	.111029E+07	.668911E-01	.674070E-01	.149071
3	453273.	.273080E-01	.293316E-01	.150756
4	-.323542E+07	-.194922	-.209330	.152499
5	206458.	.124383E-01	.168492E-01	.154303
6	119224.	.718281E-02	.749502E-01	.156174
7	-.124429E+07	-.749638E-01	-.757039E-01	.158114
8	.426155E+07	.256743	.291361	.160128
9	-.407913E+07	-.245752	-.294244	.162221
10	-145577.	-.877049E-02	-.135214	.164399
11	-980245.	-.590560E-01	-.142796	.166667
12	4512.11	.271838E-03	.646462E-01	.169031

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



MONTSERRAT TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
11.5	13.1	15.5	15.6	15.0	14.3	15.9	16.5	15.6	17.0	17.9	19.6	20.8	22.2	23.6

Tourist arrivals in Montserrat are not available beyond the month of July, 1989. The existing series shows a fairly steady increase in tourist activity from 1977 through mid-1989, but there is no information as to the effect of Hurricane Hugo on tourist arrivals in the island.

Somewhat heroically, an ARIMA$(0,1,1)(1,0,0)_{12}$ model has been specified and estimated with the available data, and arrivals have been forecast from August 1989 through the end of 1992. When actual arrivals become known, the difference between forecast and actual arrivals can be taken as an estimate of the effects of Hurricane Hugo on tourism in Montserrat.

The Montserrat model has well-defined coefficients for its two terms, an autoregressive term with a twelve-month lag and a moving-average term with a one-month lag. Moreover, it performs well in an out-of-sample test. Forecast arrivals in the period August 1988 through July 1989, calculated using a series truncated in July 1988, are close to actual arrivals. The mean percentage error (MPE) of the forecast period is 2.4% and the mean absolute percentage error (MAPE) is 7.8%.

The Montserrat model, which takes no account of the effects of Hurricane Hugo's September 1989 visit, forecasts a steady increase in tourist arrivals, which reach 23,600 in 1992. Forty-one months is, of course, an extremely long forecast period. Data for tourist arrivals since July 1989 are needed to re-estimate and, possibly, to re-specify the model.

MONTSERRAT FORECASTING MODEL

Using 1977M1 -1992M12
1-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

138 Observations, 2 Parameters

Parameter Estimates

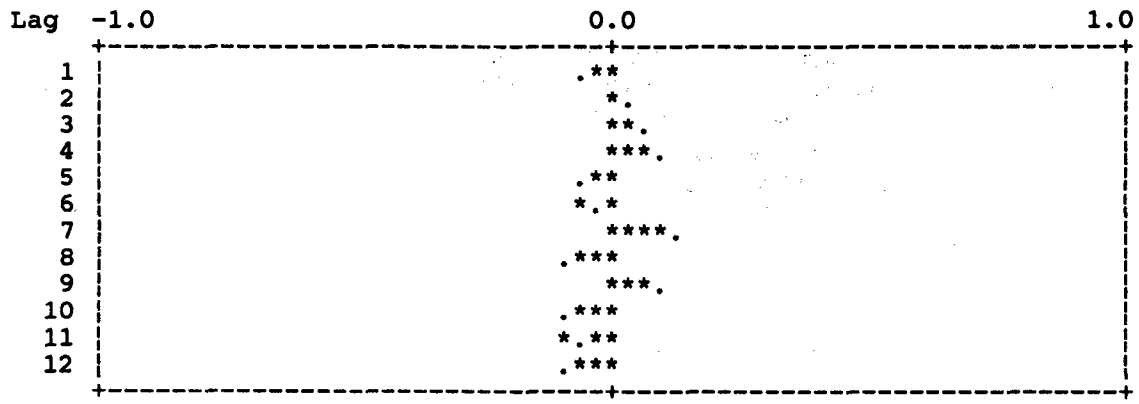
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.412506	.799037E-01	-5.16253
_MA-TERM(-1)	.853490	.459867E-01	18.5595

R-Squared = .7560

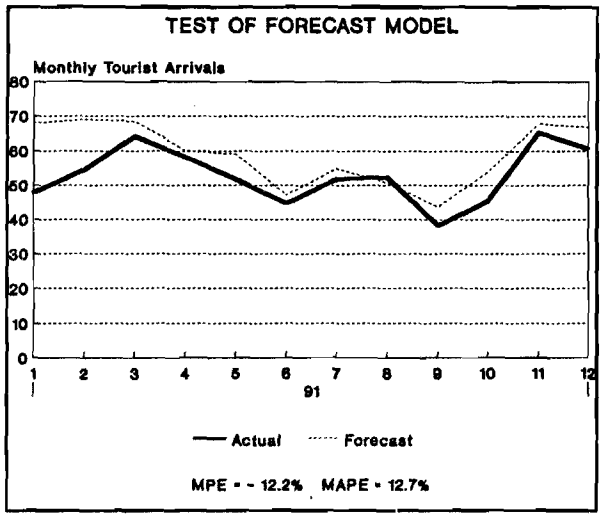
Autocorrelation Structure of ^RES

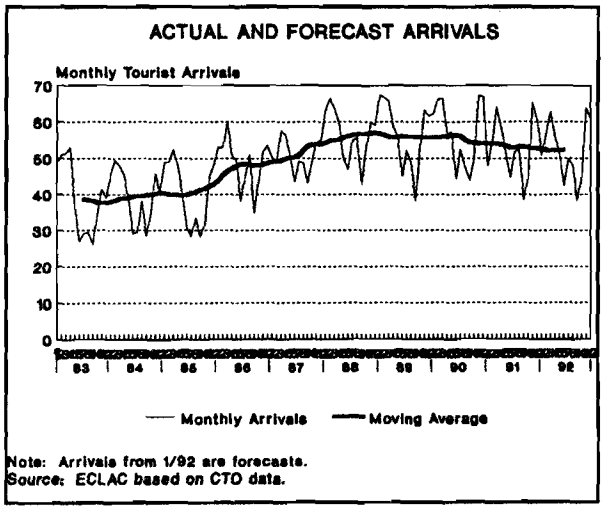
Lag		Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.	33633.0	1.00000	1.00000	.000000
1	.	-2547.28	-.757374E-01	-.759139E-01	.854358E-01
2	.	1467.30	.436269E-01	.385313E-01	.857493E-01
3	.	1973.30	.586716E-01	.658016E-01	.860663E-01
4	.	2851.53	.847837E-01	.946768E-01	.863868E-01
5	.	-2112.72	-.628169E-01	-.582761E-01	.867110E-01
6	.	-1168.58	-.347450E-01	-.591066E-01	.870388E-01
7	.	4207.64	.125104	.119466	.873704E-01
8	.	-3098.59	-.921293E-01	-.731993E-01	.877058E-01
9	.	3377.76	.100430	.981847E-01	.880451E-01
10	.	-3229.92	-.960342E-01	-.972452E-01	.883883E-01
11	.	-1651.84	-.491137E-01	-.913177E-01	.887357E-01
12	.	-3078.58	-.915345E-01	-.828208E-01	.890871E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



PUERTO RICO TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
					468	474	485	585	607	676	676	681	636	627

Puerto Rico has a very large, mature tourist sector. Tourist arrivals grew rapidly until 1988, but have declined somewhat in recent years.

The Puerto Rico model is an ARIMA$(0,1,2)(1,1,0)_{12}$ model, with first differencing, seasonal differencing, an autocorrelation term with a lag of twelve months and two moving-average terms with lags of one and two months. The estimated coefficients are highly significant, and the residual autocorrelation is very low for the first seven lags.

In an out-of-sample test, the model tends to forecast arrivals on the high side, but the results are satisfactory. Forecasts for each month of 1991 were generated using data from 1983 through the end of 1990. Because of the Gulf War, actual arrivals are well below forecast arrivals in the first two months of the year, but actual arrivals are close to forecast arrivals for the remainder of the forecast period. The mean absolute percentage error (MAPE) for March through December is 8.5%. For all of 1991, the mean percentage error (MPE) is -12.2% and the MAPE is 12.7%.

In 1992 tourist arrivals are expected to fall slightly to 627,000.

PUERTO RICO FORECASTING MODEL

Using 1983M1 -1992M12
1-Term Autoregressive Process
2-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

95 Observations, 3 Parameters

Parameter Estimates

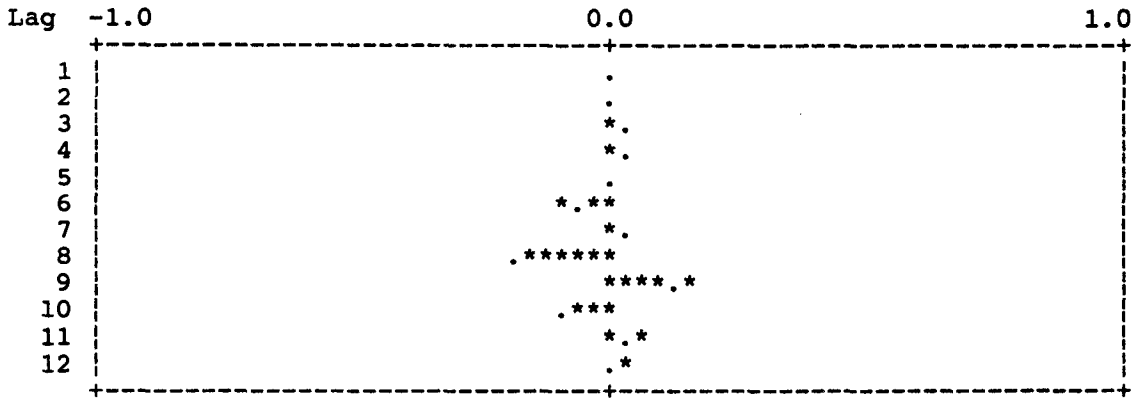
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.414701	.107647	-3.85243
_MA-TERM(-1)	.539364	.100753	5.35332
_MA-TERM(-2)	.256750	.100355	2.55841

R-Squared = .8280

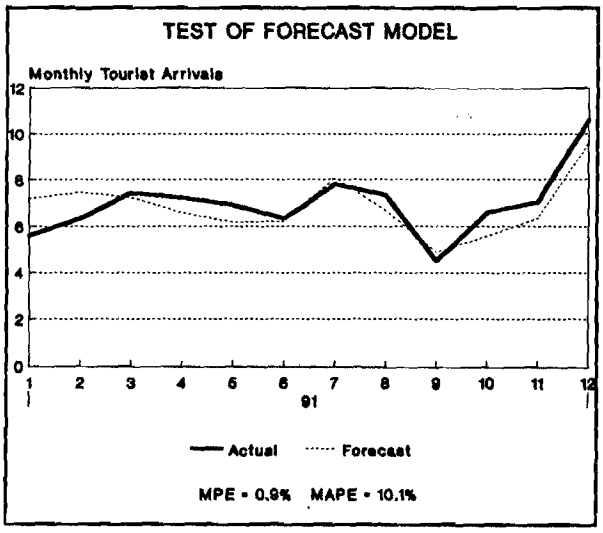
Autocorrelation Structure of ^RES

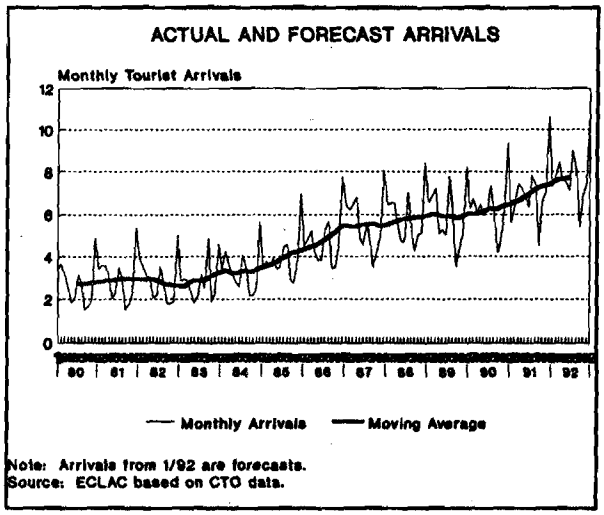
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.193722E+08	1.00000	1.00000	.000000
1	-35189.8	-.181650E-02	-.181834E-02	.103142
2	68612.8	.354181E-02	.356742E-02	.103695
3	708052.	.365498E-01	.369191E-01	.104257
4	605242.	.312427E-01	.318078E-01	.104828
5	-87419.0	-.451259E-02	-.611162E-02	.105409
6	-.142741E+07	-.736832E-01	-.786443E-01	.106000
7	597394.	.308376E-01	.308119E-01	.106600
8	-.345948E+07	-.178579	-.194023	.107211
9	.252866E+07	.130530	.157704	.107833
10	-.166442E+07	-.859177E-01	-.104151	.108465
11	812416.	.419371E-01	.646657E-01	.109109
12	226740.	.117044E-01	.232578E-01	.109764

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



SAINT KITTS AND NEVIS TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
		32.6	35.4	34.5	34.2	39.8	47.1	56.6	66.4	69.6	71.1	75.7	83.9	93.4

After some experimentation, ARIMA$(0,1,1)(1,1,0)_{12}(1,0,0)_{24}$ turned out to be the best forecasting model for Saint Kitts and Nevis. First differences remove the trend from the series, while twelve-month differences and two autoregressive terms with lags of 12 and 24 months, respectively, model the seasonal structure of tourist arrivals. The series is 144 months long, yielding 131 observations of differenced data. An examination of the residuals shows there is little autocorrelation not accounted for by the model.

To test the ability of the model to forecast future arrivals, its three parameters were estimated with data from 1980 through the end of 1990 and arrivals were forecast for each month of 1991. Because of the Gulf War, actual arrivals are well below forecast arrivals in January and February, while they exceed forecast arrivals for most of the remainder of the year. The mean percentage error (MPE) for 1991 is actually a positive 0.9%. In other words, 1991 arrivals, on average, exceed forecast arrivals. The mean absolute percentage error (MAPE) is 10.1% for the twelve month period.

In 1991, arrivals increased 10.8%, to nearly 84,000. Arrivals are forecast to increase by 11.3% in 1992, to 93,400.

SAINT KITTS AND NEVIS FORECASTING MODEL

Using 1980M1 -1992M12
2-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

131 Observations, 3 Parameters

Parameter Estimates

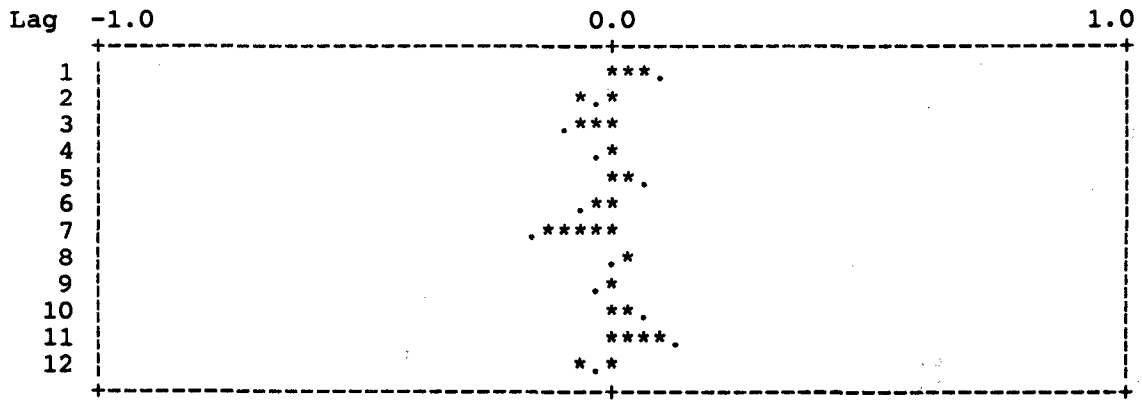
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.492086	.901034E-01	-5.46135
/_AR-TERM(-24)	-.350558	.960566E-01	-3.64950
_MA-TERM(-1)	.771325	.582418E-01	13.2435

R-Squared = .8550

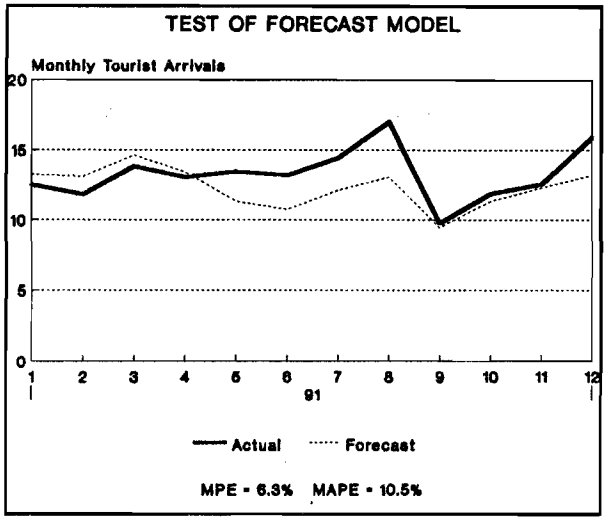
Autocorrelation Structure of ^RES

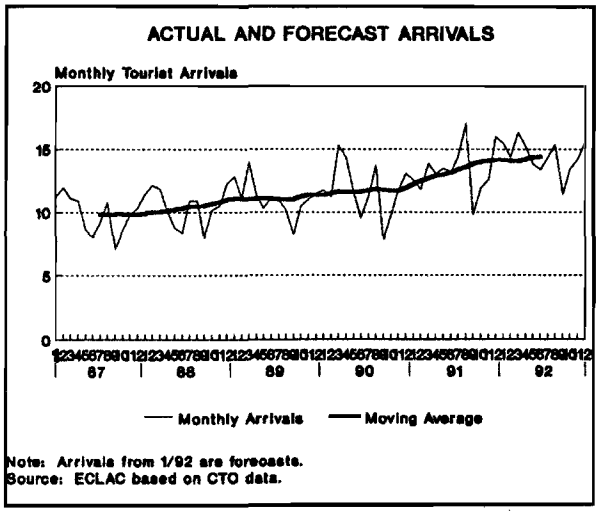
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.412403	1.00000	1.00000	.000000
1	.410412E-01	.995171E-01	.998256E-01	.877058E-01
2	-.154089E-01	-.373636E-01	-.477136E-01	.880451E-01
3	-.340993E-01	-.826844E-01	-.757135E-01	.883883E-01
4	-.177299E-01	-.429918E-01	-.307552E-01	.887357E-01
5	.252160E-01	.611441E-01	.642723E-01	.890871E-01
6	-.201248E-01	-.487988E-01	-.755695E-01	.894427E-01
7	-.630530E-01	-.152892	-.147095	.898027E-01
8	-.318961E-02	-.773421E-02	.291305E-01	.901670E-01
9	-.695459E-02	-.168636E-01	-.383208E-01	.905357E-01
10	.272480E-01	.660713E-01	.396849E-01	.909091E-01
11	.558567E-01	.135442	.126531	.912871E-01
12	-.158306E-01	-.383863E-01	-.522007E-01	.916698E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



SAINT LUCIA TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
									118	125	133	141	160	173

Consistent data for tourist arrivals in Saint Lucia date only from 1987. Previous data are not comparable to the new series, for they exclude arrivals by sea and include excursionists (those who visit the island for less than 24 hours).

After taking first differences and twelve-month differences, five years of monthly data yield 47 observations, somewhat fewer than the minimum of 50 recommended for time series models. Nonetheless, an ARIMA$(3,1,0)(0,1,1)_{12}$ model does fit the series tolerably well.

Removing twelve observations (all of 1991) to test the forecasting ability of the model leaves only 35 observations to estimate four parameters. In this test, actual arrivals are somewhat below forecast arrivals in the first quarter of 1991, which reflects the effect of the Gulf War on tourism, but they are well above forecast arrivals for the remainder of 1991. For the twelve-month period, the mean percentage error MPE) is 6.3% and the mean absolute percentage error (MAPE) is 10.5%.

Since they are based on an additional year of data, the 1992 forecasts can be expected to be more accurate than the 1991 exercise. The model predicts an increase of 13,000 tourist arrivals in 1992, far below the 19,000 increase recorded in 1991, but much larger than increases recorded in previous years.

SAINT LUCIA FORECASTING MODEL

Using 1987M1 -1992M12
3-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

47 Observations, 4 Parameters

Parameter Estimates

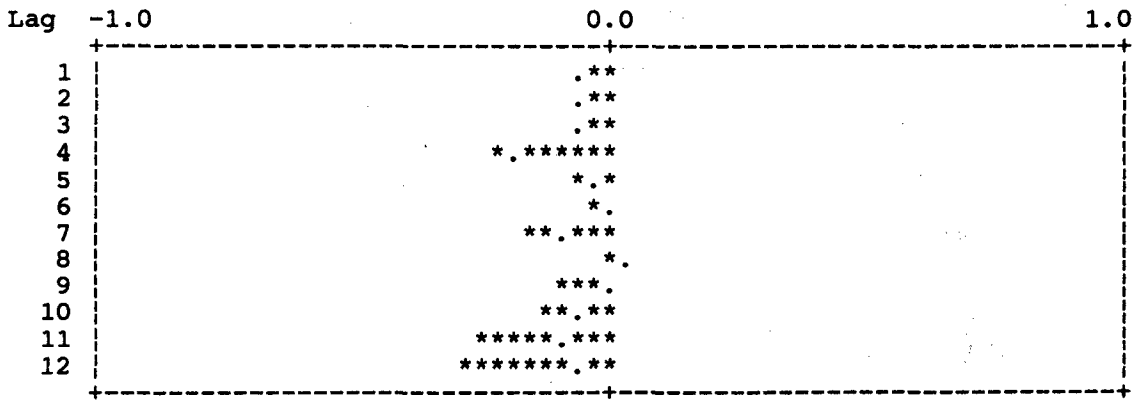
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-1)	-.379108	.152636	-2.48373
/_AR-TERM(-2)	-.433830	.149508	-2.90172
/_AR-TERM(-3)	-.255210	.148731	-1.71591
_MA-TERM(-12)	.926382	.345775E-01	26.7914

R-Squared = .5926

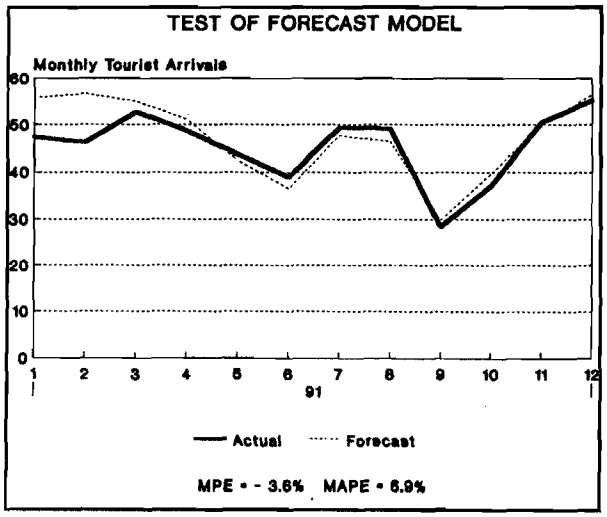
Autocorrelation Structure of ^RES

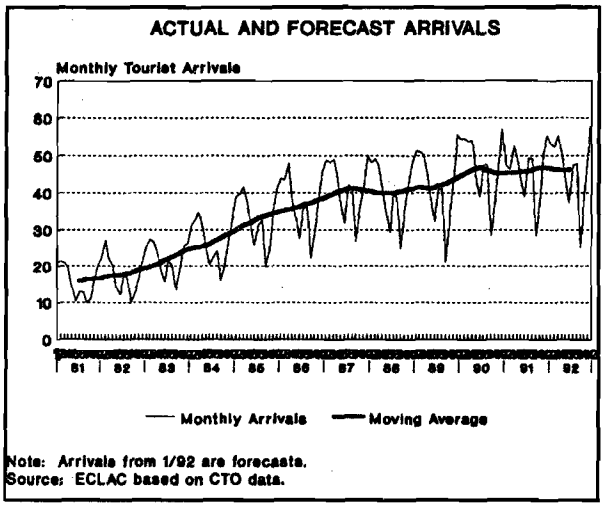
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	1.20243	1.00000	1.00000	.000000
1	-.742494E-01	-.617492E-01	-.638531E-01	.147442
2	-.812506E-01	-.675718E-01	-.731287E-01	.149071
3	-.739910E-01	-.615343E-01	-.721568E-01	.150756
4	-.213169	-.177281	-.231629	.152499
5	-.529318E-01	-.440205E-01	-.752105E-01	.154303
6	.596821E-02	.496344E-02	-.321691E-01	.156174
7	-.990207E-01	-.823502E-01	-.147644	.158114
8	.268155E-01	.223010E-01	-.139714E-02	.160128
9	-.502620E-02	-.418002E-02	-.980702E-01	.162221
10	-.587593E-01	-.488669E-01	-.113076	.164399
11	-.998485E-01	-.830387E-01	-.242802	.166667
12	-.571067E-01	-.474926E-01	-.269611	.169031

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



SAINT MAARTEN TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
			190	213	263	318	398	439	496	480	504	565	548	559

Saint Maarten, which is part of the Netherlands Antilles, is one of the most successful tourist destinations in the Caribbean. The territory receives well over a half million stayover visitors each year. Tourist arrivals grew rapidly from 1981 to 1987, then more slowly until 1990 when they began to decline.

The Saint Maarten model is an ARIMA$(0,1,1)(1,1,0)_{12}(1,0,0)_{24}$ model applied to a logarithmic transformation of the tourist arrival series. The model is specified extremely well, for the three estimated coefficients [AR(-12), AR(-24) and MA(-1)] are highly significant, the R^2 for the equation is 0.975, and the autocorrelation of the residuals is virtually nonexistent.

An out-of-sample test of the model, employing the series truncated in December 1990 to forecast arrivals in 1991, is highly successful. Because of the Gulf War, actual arrivals are below forecast arrivals in the first quarter of the year. For the remainder of 1991, forecast arrivals track actual arrivals very well. For the test period as a whole, the mean percentage error (MPE) is -3.6% and the mean absolute percentage error (MAPE) is 6.9%.

For 1992, the model forecasts a 2% increase in arrivals, to 559,000, following the 3% decrease in 1991.

SAINT MAARTEN FORECASTING MODEL

Using 1981M1 -1992M12
2-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

119 Observations, 3 Parameters

Parameter Estimates

Dependent Variable is LOGARITHM OF TOURIST ARRIVALS

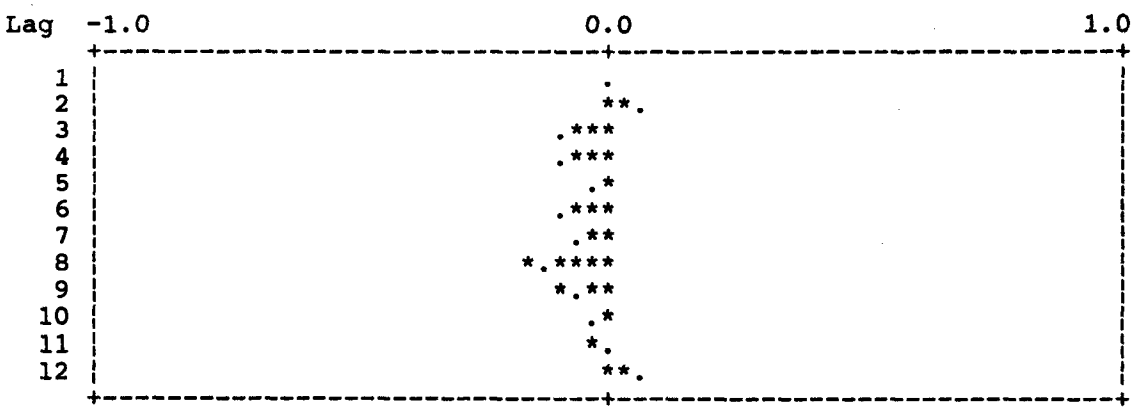
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.537824	.932122E-01	-5.76990
/_AR-TERM(-24)	-.650475	.681344E-01	-9.54693
_MA-TERM(-1)	.397287	.843004E-01	4.71276

R-Squared = .9748

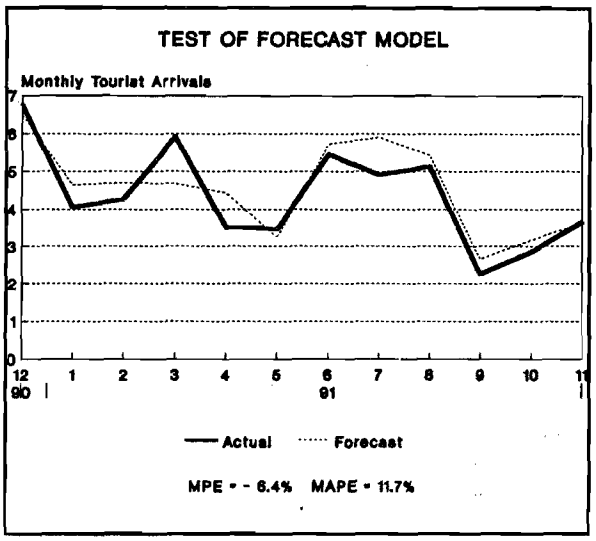
Autocorrelation Structure of ^RES

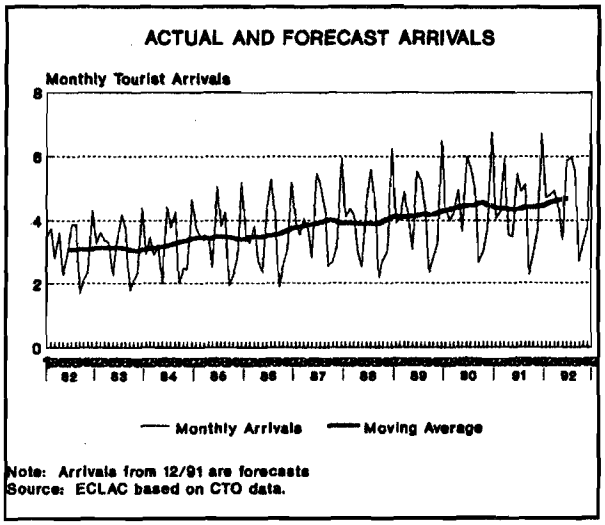
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.480619E-02	1.00000	1.00000	.000000
1	-.400610E-04	-.833528E-02	-.838967E-02	.920575E-01
2	.305772E-03	.636205E-01	.646581E-01	.924500E-01
3	-.443371E-03	-.922500E-01	-.943042E-01	.928477E-01
4	-.402467E-03	-.837392E-01	-.928086E-01	.932505E-01
5	-.116923E-03	-.243276E-01	-.127577E-01	.936586E-01
6	-.375527E-03	-.781340E-01	-.762657E-01	.940721E-01
7	-.230093E-03	-.478743E-01	-.633747E-01	.944911E-01
8	-.662915E-03	-.137929	-.150872	.949158E-01
9	-.372462E-03	-.774962E-01	-.109331	.953463E-01
10	-.115165E-03	-.239617E-01	-.400395E-01	.957826E-01
11	.470516E-04	.978978E-02	-.251458E-01	.962250E-01
12	.363029E-03	.755337E-01	.405480E-01	.966736E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



SAINT VINCENT AND THE GRENADINES TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
				37.1	37.7	38.5	42.1	42.1	47.4	47.0	50.1	53.9	52.3	56.4

Data for Saint Vincent and the Grenadines are available for January 1982 through November 1991. Nonetheless, it proved impossible to specify an ARIMA model with stable coefficients. Even attempts at simple exponential smoothing failed. One model that did prove feasible is a regression of tourist arrivals on a linear time trend and dummy variables.

Since the variance of this series increases as tourist arrivals increase, and regression, like ARIMA, assumes constant variance, the series was modified by a logarithmic transformation. The resulting series was then regressed, using the technique of ordinary least squares, on a time trend and eleven dummy variables, one for each month other than September. The choice of September is arbitrary, and has no effect on forecasts of the model. The constant term of the equation thus represents tourist arrivals in September, while arrivals in other months are represented by the constant plus the coefficient of the appropriate dummy variable. All of the coefficients of the dummies are significantly different from zero, but they do not necessarily differ significantly from each other. The coefficient for S1 (January), for example, is 0.59, which is very close to the 0.60 coefficient for S2 (February).

The coefficients of the regression model were estimated using data through November 1990, then forecasts were generated for the following twelve months. Actual arrivals are lower, on average, than forecast arrivals over this test period, for the mean percentage error (MPE) is -6.4%. The mean absolute percentage error (MAPE) is 11.7%. For calendar 1992, the Saint Vincent and the Grenadines model predicts an increase of 4,100 tourist arrivals, following a decrease of 1,600 in 1991.

SAINT VINCENT AND THE GRENADINES FORECASTING MODEL

REGRESS : dependent variable is LOGARITHM OF TOURIST ARRIVALS
Using 1982M1 -1991M11

Variable	Coefficient	Std Err	T-stat	Signf
^CONST	7.42200	.352305E-01	210.670	.000
TIME	.368261E-02	.263318E-03	13.9854	.000
S1	.591909	.440048E-01	13.4510	.000
S2	.603900	.439930E-01	13.7272	.000
S3	.630103	.439827E-01	14.3261	.000
S4	.525558	.439741E-01	11.9516	.000
S5	.241372	.439670E-01	5.48985	.000
S6	.791789	.439614E-01	18.0110	.000
S7	.806564	.439575E-01	18.3487	.000
S8	.731050	.439551E-01	16.6317	.000
S10	.181267	.439551E-01	4.12390	.000
S11	.327551	.439575E-01	7.45153	.000
S12	.950364	.451657E-01	21.0417	.000

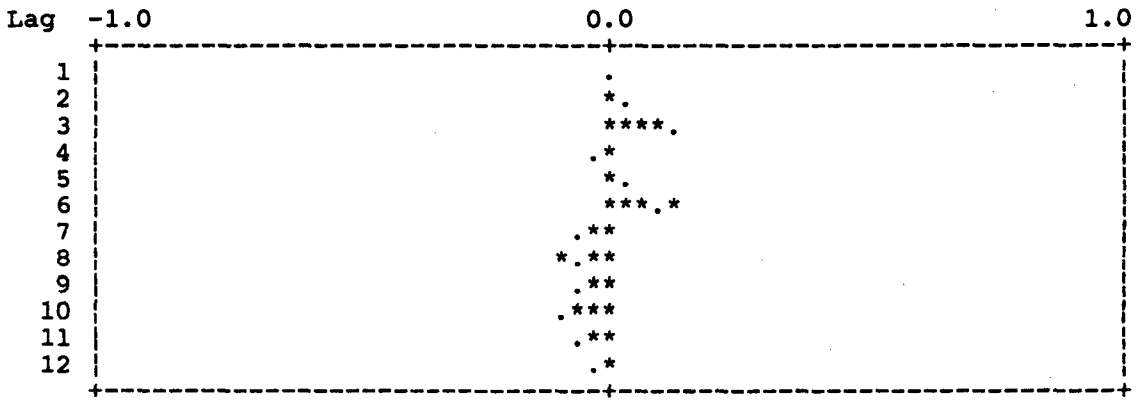
---------- Equation Summary ----------

No. of Observations =	119	R2= .9113 (adj)=	.9013
Sum of Sq. Resid. =	1.02395	Std. Error of Reg.=	.982849E-01
Log(likelihood) =	114.096	Durbin-Watson =	2.01244
Schwarz Criterion =	83.0315	F (12, 106) =	90.7612
Akaike Criterion =	101.096	Significance =	.000000

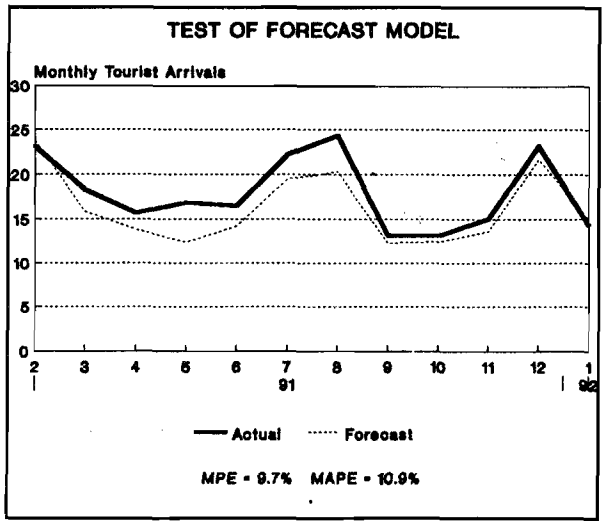
Autocorrelation Structure of RESID

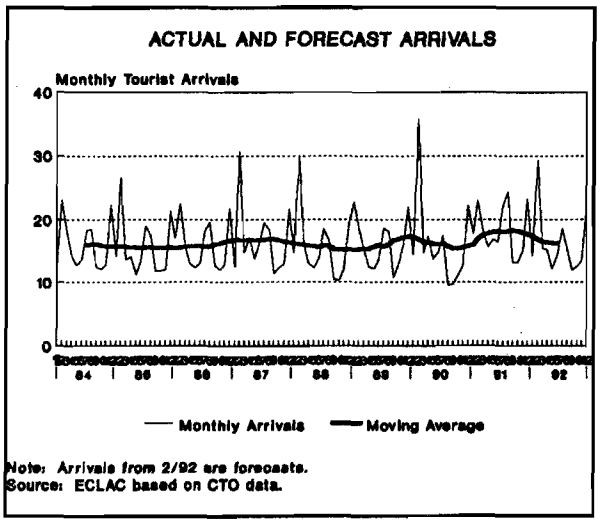
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.860464E-02	1.00000	1.00000	.000000
1	-.130431E-03	-.151582E-01	-.153175E-01	.920575E-01
2	.320769E-03	.372787E-01	.381230E-01	.924500E-01
3	.101032E-02	.117416	.125984	.928477E-01
4	-.169766E-03	-.197296E-01	-.192922E-01	.932505E-01
5	.138723E-03	.161219E-01	.145714E-01	.936586E-01
6	.903225E-03	.104970	.118725	.940721E-01
7	-.501954E-03	-.583353E-01	-.688411E-01	.944911E-01
8	-.435751E-03	-.506414E-01	-.818931E-01	.949158E-01
9	-.447664E-03	-.520259E-01	-.735358E-01	.953463E-01
10	-.827912E-03	-.962169E-01	-.988280E-01	.957826E-01
11	-.426965E-03	-.496204E-01	-.461151E-01	.962250E-01
12	-.266330E-03	-.309520E-01	-.188493E-01	.966736E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



TRINIDAD AND TOBAGO TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
						191	187	191	202	188	194	194	220	195

The tourist sector of Trinidad and Tobago has yet to be developed. The vast majority of visitors to the islands are on private or business visits. In 1989, only 15% of the 194,000 tourist arrivals represented persons on a hotel holiday. Before 1986, these numbers were even smaller, amounting to less than 10% of arrivals.

There is almost no trend in the series, so first differences are not necessary to "detrend" the data. Seasonal fluctuations are quite large, so twelve-month differences are required.

The Trinidad and Tobago forecasting model is an unusual ARIMA$(1,1,1)_{12}$ model. The model is unusual for two reasons. First, no allowance is made, not even differencing, for lags other than twelve-months. Seasonality is everything; trends and short lags are of no importance. Second, the model contains a large and highly significant constant. The second characteristic (the constant term) is a consequence of the first (the absence of first differences).

An examination of the residuals of the equation reveals significant "spikes" in both the autocorrelation and the partial autocorrelation function at a lag of two months. Nonetheless, the coefficient of an MA(-2) term proves to be insignificant while the addition of an AR(-2) term makes the model unstable.

An out-of-sample test of the model, using data through January 1991 to forecast tourist arrivals from February 1991 through January 1992, was satisfactory. Actual arrivals tend to exceed forecast arrivals in the test period. The mean percentage error (MPE) is 9.7% and the mean absolute percentage error (MAPE) is 10.9%.

For 1992, the model forecasts a decrease in tourist arrivals to the levels of 1989 and 1990.

TRINIDAD AND TOBAGO FORECASTING MODEL

Using 1984M1 -1992M12
1-Term Autoregressive Process
1-Term Moving Average Process
1-Order Common Seasonal Differencing--Season Length= 12

Non-linear Gaussian Estimation Procedure

85 Observations, 3 Parameters

Parameter Estimates

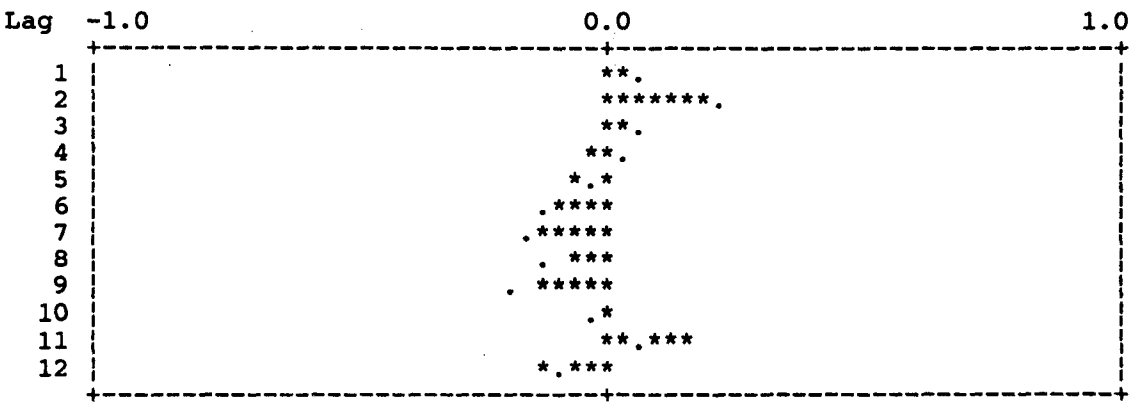
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
^CONST	181.528	72.9975	2.48677
/_AR-TERM(-12)	-.515439	.107133	-4.81119
_MA-TERM(-12)	.928638	.603489E-01	15.3878

R-Squared = .7966

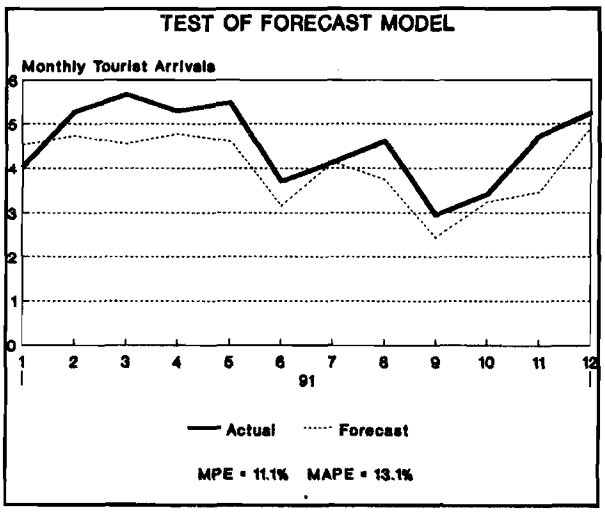
Autocorrelation Structure of ^RES

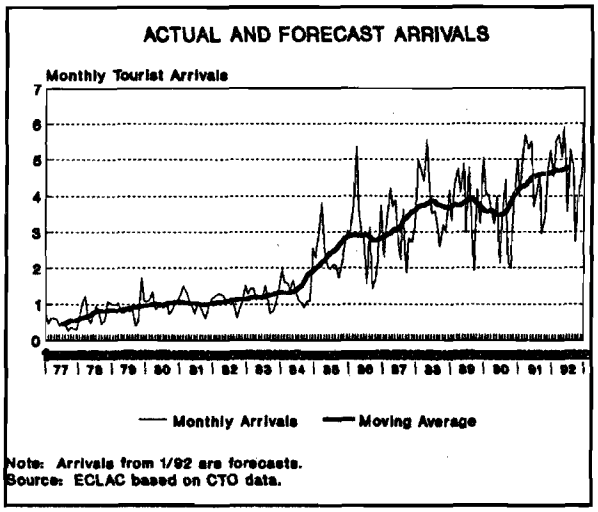
Lag		Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.	.471172E+07	1.00000	1.00000	.000000
1	.	279542.	.593291E-01	.595712E-01	.109109
2	.	.102917E+07	.218427	.216883	.109764
3	.	221306.	.469692E-01	.252625E-01	.110432
4	.	109900.	.233248E-01	-.296988E-01	.111111
5	.	-197991.	-.420209E-01	-.611524E-01	.111803
6	.	-585623.	-.124291	-.126556	.112509
7	.	-737221.	-.156465	-.135815	.113228
8	.	-570155.	-.121008	-.628312E-01	.113961
9	.	-911991.	-.193558	-.138769	.114708
10	.	-212435.	-.450865E-01	-.397724E-02	.115470
11	.	293431.	.622769E-01	.141048	.116248
12	.	-495556.	-.105175	-.128123	.117041

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



TURKS AND CAICOS ISLANDS TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
9.6	10.7	11.9	12.3	13.3	14.2	17.3	29.2	35.4	36.6	47.1	46.7	41.9	54.6	57.9

Tourist arrivals in the Turks and Caicos Islands have more than tripled since the inauguration in 1984 of a Club Méditerrané and an international airport on the island of Providenciales. The variance of the series has increased along with the number of tourists, so a logarithmic transformation of the series is necessary before specifying and estimating a forecasting model.

An ARIMA$(0,1,1)(1,1,0)_{12}(1,0,0)_{24}$ model captures quite well the trend and pattern of tourist arrivals in the Turks and Caicos Islands. Estimates of all three parameters are highly significant, the R^2 of the equation is 0.892, and residual autocorrelation is virtually nonexistent.

Tourist arrivals in this British dependency fell 1% in 1989 and 23% in 1990, then increased 30% in 1991. An out-of-sample test, using data through 1990 to forecast 1991 arrivals, is thus a difficult test. In such a test, the model forecasts a 15% increase in arrivals, to 48,319. Actual arrivals in 1991 number 54,616. For the twelve-month forecast period, the mean percentage error (MPE) is 11.1% and the mean absolute percentage error (MAPE) is 13.1%. With such strong growth in 1991 following two consecutive years of decline, this is a remarkably accurate forecast.

Tourist arrivals in 1992 are forecast to increase 6%, reaching 57,900.

TURKS AND CAICOS ISLANDS FORECASTING MODEL

Using 1977M1 -1992M12
2-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

167 Observations, 3 Parameters

Parameter Estimates

Dependent Variable is LOGARITHM OF TOURIST ARRIVALS

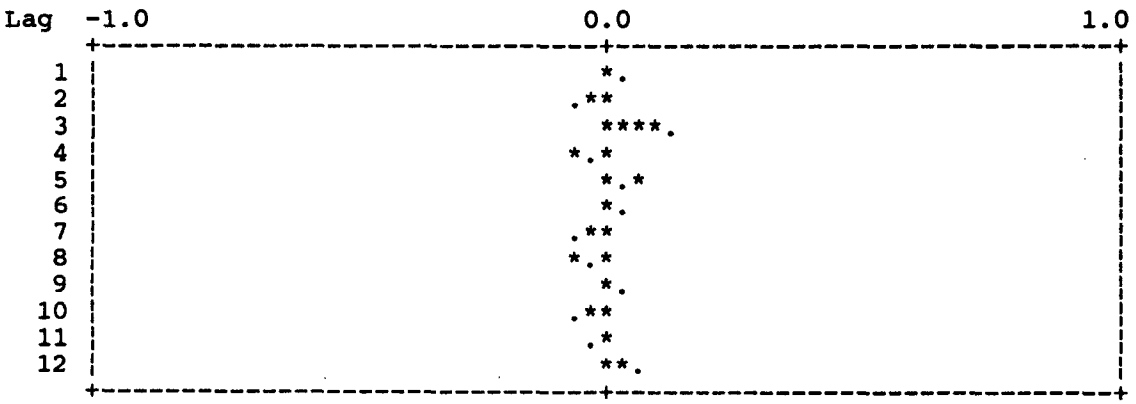
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.738738	.723377E-01	-10.2123
/_AR-TERM(-24)	-.483254	.668222E-01	-7.23193
_MA-TERM(-1)	.736555	.521660E-01	14.1194

R-Squared = .8924

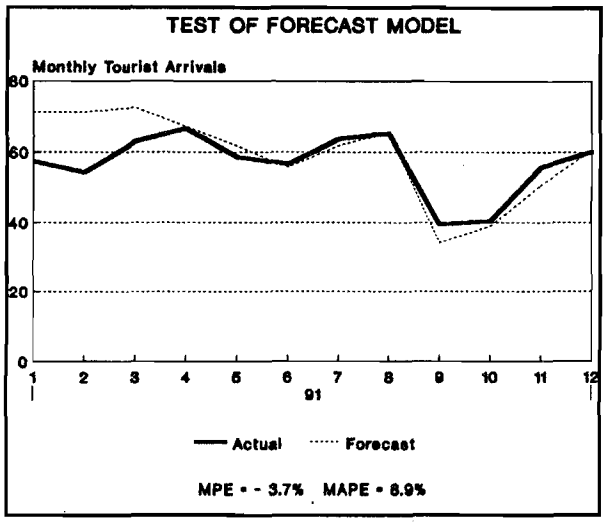
Autocorrelation Structure of ^RES

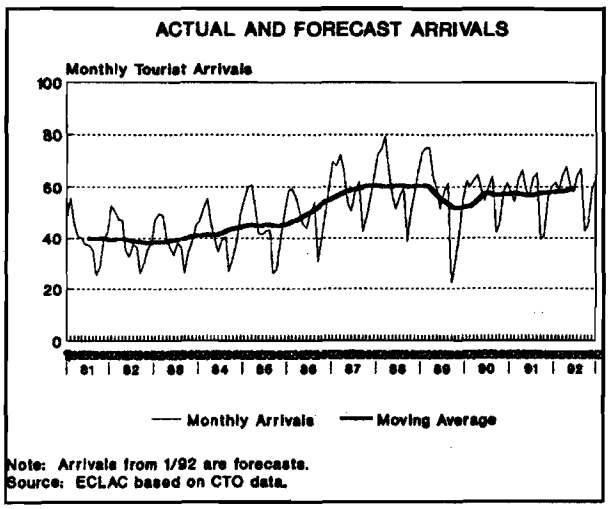
Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.550816E-01	1.00000	1.00000	.000000
1	.225901E-02	.410121E-01	.419915E-01	.776151E-01
2	-.320346E-02	-.581585E-01	-.609299E-01	.778499E-01
3	.638708E-02	.115957	.124370	.780869E-01
4	-.179377E-02	-.325656E-01	-.477506E-01	.783260E-01
5	.144791E-02	.262867E-01	.473342E-01	.785674E-01
6	.199114E-02	.361488E-01	.137911E-01	.788110E-01
7	-.361027E-02	-.655441E-01	-.559891E-01	.790569E-01
8	-.236514E-02	-.429388E-01	-.471182E-01	.793052E-01
9	.147111E-02	.267079E-01	.222346E-01	.795557E-01
10	-.287234E-02	-.521470E-01	-.467356E-01	.798087E-01
11	-.231223E-02	-.419783E-01	-.368160E-01	.800641E-01
12	.350055E-02	.635521E-01	.582603E-01	.803219E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



UNITED STATES VIRGIN ISLANDS TOURIST ARRIVALS





Annual Tourist Arrivals (thousands)

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
			475	470	475	502	542	600	709	729	663	695	682	715

The United States Virgin Islands has a large, mature tourist industry. Monthly arrivals averaged 40,000 from 1981 until the end of 1983, and increased gradually to 60,000 by the year 1987. They dropped sharply in September 1989 as a consequence of Hurricane Hugo, and have not yet fully recovered their former levels.

The United States Virgin Islands forecasting model is a simple ARIMA$(0,1,1)(1,1,0)_{12}$ model. First differences remove the trend from the data. Twelve month differences combined with an AR(-12) term reflect the seasonal pattern. The autocorrelation structure of the residuals of the model suggest that some trend may remain, for the correlation coefficients, though small, do not damp completely to zero. There is thus some scope for improvement in the model.

The model was tested by using 1981-1990 data to forecast arrivals in 1991. Because of the drop in travel during the Gulf War, tourist arrivals in the first quarter of 1991 are well below forecast arrivals. For the remainder of 1991, however, actual arrivals are close to forecast arrivals. For the twelve month period, the mean percentage error (MPE) is - 3.7% and the mean absolute percentage error (MAPE) is 8.9%.

Although tourist arrivals fell 2% in 1991, they are forecast to increase by nearly 5% in 1992 to reach 715,000.

UNITED STATES VIRGIN ISLANDS FORECASTING MODEL

Using 1981M1 -1992M12
1-Term Autoregressive Process
1-Term Moving Average Process
1st-Order Differencing on Dependent Variable
1-Order Common Seasonal Differencing--Season Length= 12
Constant Term Suppressed

Non-linear Gaussian Estimation Procedure

119 Observations, 2 Parameters

Parameter Estimates

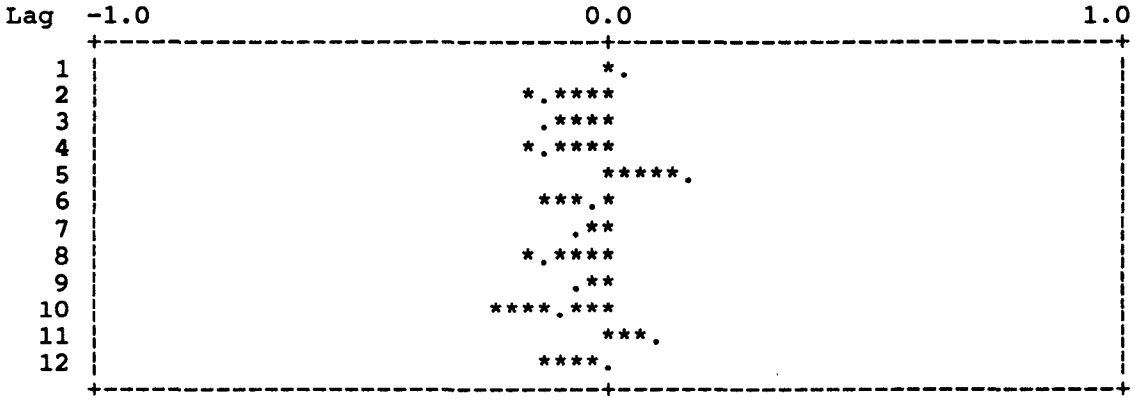
Coefficient Description	Estimated Coefficient	Standard Error	t-Statistic
/_AR-TERM(-12)	-.410379	.879029E-01	-4.66855
_MA-TERM(-1)	.204874	.906867E-01	2.25914

R-Squared = .8798

Autocorrelation Structure of ^RES

Lag	Auto-covariance	Auto-correlation	Partial Auto-correlation	Std. Err. of Partial Auto-correlation
0	.198763E+08	1.00000	1.00000	.000000
1	814881.	.409976E-01	.415562E-01	.920575E-01
2	-.271359E+07	-.136524	-.142556	.924500E-01
3	-.237295E+07	-.119386	-.110624	.928477E-01
4	-.265528E+07	-.133590	-.146765	.932505E-01
5	.297764E+07	.149808	.144073	.936586E-01
6	-610319.	-.307058E-01	-.111220	.940721E-01
7	-964443.	-.485222E-01	-.445308E-01	.944911E-01
8	-.271674E+07	-.136682	-.155444	.949158E-01
9	-.144774E+07	-.728375E-01	-.464343E-01	.953463E-01
10	-.168010E+07	-.845275E-01	-.212633	.957826E-01
11	.171070E+07	.860670E-01	.777196E-01	.962250E-01
12	-44364.9	-.223205E-02	-.115835	.966736E-01

Plot of Autocorrelation (.) and Partial Autocorrelation (*)



ANNEX: Monthly Tourist Arrivals, 1988-1992

	ANGUILLA	ANTIGUA	ARUBA	BAHAMAS	BARBADOS
1988M1	2388	17196	24904	104545	40574
1988M2	2582	18182	26074	125945	38090
1988M3	2873	16586	24436	159040	41397
1988M4	2555	15537	25040	145275	36361
1988M5	1955	11827	22159	129075	30996
1988M6	1576	10274	21108	127240	28389
1988M7	2500	16493	22888	140320	46312
1988M8	1921	13864	21355	130555	39152
1988M9	1051	10260	18816	91185	26986
1988M10	1382	13736	25308	96855	37202
1988M11	2007	15587	21910	108895	41035
1988M12	2953	17351	23975	116050	44991
1989M1	2927	17720	25741	114270	41636
1989M2	3323	18811	29556	130080	41262
1989M3	3190	17972	31276	172160	44342
1989M4	2571	16629	31444	141680	39054
1989M5	2085	13270	26847	136045	35260
1989M6	1705	10507	25842	140930	32164
1989M7	2378	14988	30226	153765	44551
1989M8	2088	14515	26256	146420	40507
1989M9	789	8307	23152	91560	28347
1989M10	1509	10933	31220	101590	33953
1989M11	3025	14747	30617	120135	38551
1989M12	3085	17101	32159	126435	41632
1990M1	3171	16269	31379	124000	37740
1990M2	3377	17760	34085	133045	38555
1990M3	3157	16679	30178	179660	40302
1990M4	3289	19939	37663	156375	40670
1990M5	2428	14096	30822	135395	30992
1990M6	2063	12508	33019	139490	29543
1990M7	2550	14995	39217	142205	39675
1990M8	2507	15343	38985	150210	37399
1990M9	979	10763	34772	83830	25813
1990M10	1380	12414	39128	93410	30525
1990M11	2830	16334	42195	112765	37885
1990M12	2902	17148	41319	111215	42993
1991M1	3011	14726	35703	100520	33489
1991M2	3458	15295	36888	104840	33710
1991M3	3383	15776	40200	155170	37502
1991M4	3149	18803	40144	126225	34549
1991M5	2605	15011	37495	128215	32739
1991M6	2330	12376	40300	130010	27387
1991M7	2330	16268	49388	142385	38887
1991M8	2481*	15780	50981	153510	36609
1991M9	955*	10446	39595	81325	23935
1991M10	1533*	13006	42001	91150	25734
1991M11	3113*	16652	42765	103735	32901
1991M12	3185*	18049	45864	109950	36800
1992M1	3291*	15816*	40383*	101479*	34331
1992M2	3661*	16574*	41347*	110229*	32225*
1992M3	3513*	16734*	44039*	157394*	35429*
1992M4	3430*	19809*	43993*	127551*	33431*
1992M5	2704*	15595*	41840*	127566*	29360*
1992M6	2366*	13176*	44120*	130502*	25129*
1992M7	2589*	16779*	51507*	143534*	36236*
1992M8	2665*	16462*	52801*	147319*	33959*
1992M9	1032*	11284*	43547*	81879*	21597*
1992M10	1568*	13657*	45502*	91799*	24234*
1992M11	3197*	17359*	46123*	106472*	31456*
1992M12	3274*	18636*	48642*	113099*	3570*

Note: An asterisk (*) denotes forecast arrivals.

ANNEX: Monthly Tourist Arrivals, 1988-1992

	BELIZE	BERMUDA	BONAIRE	BVI	CAYMAN
1988M1	12652	9649	3428	19062	20313
1988M2	14188	15304	3281	22029	22719
1988M3	14495	34659	3572	21023	25188
1988M4	11650	38465	3181	16751	19128
1988M5	12381	50162	2376	12557	17522
1988M6	12533	49979	2031	11533	17145
1988M7	14873	47465	2568	16569	18802
1988M8	15447	50060	3039	10808	17983
1988M9	11728	40493	2240	6105	10125
1988M10	11691	42812	2504	9096	14921
1988M11	14327	29499	3058	13132	16304
1988M12	18291	17321	2700	17303	18559
1989M1	17273	9184	4124	18699	16753
1989M2	17638	15606	3717	22033	19913
1989M3	21725	31454	3907	24089	22959
1989M4	16547	36737	3031	16710	17294
1989M5	15682	46029	2438	13778	14985
1989M6	15626	49259	2500	12217	16638
1989M7	19031	47483	3207	16478	17404
1989M8	16683	49303	3344	12471	16440
1989M9	17910	39496	2401	4868	10556
1989M10	14665	41531	2826	7943	15524
1989M11	15299	30921	3061	11139	19828
1989M12	19543	19046	2625	15370	21509
1990M1	18900*	11211	3682	15115	19894
1990M2	18335*	20552	3279	19120	22868
1990M3	20255*	37918	3736	17926	26308
1990M4	18173*	41713	3722	19126	23060
1990M5	17494*	49337	2969	11090	20052
1990M6	17813*	48520	2772	12497	21729
1990M7	19354*	47627	3633	13816	21187
1990M8	18316*	48230	3804	10981	22752
1990M9	18578*	37905	3243	6156	12706
1990M10	17386*	39964	3098	7918	18063
1990M11	17609*	31120	3843	13307	22249
1990M12	19587*	18609	3537	12994	22290
1991M1	19274*	10114	4163	13009	17733
1991M2	18722*	14789	3683	15639	20926
1991M3	19571*	32277	4251	15167	27447
1991M4	18793*	31706	3923	18586	20931
1991M5	18374*	45261	3726	10013	19497
1991M6	18632*	46093	3734	10712	20772
1991M7	19341*	42965	4718	15801	20243
1991M8	18867*	47978	5274	13183	22470
1991M9	18862*	33326	4140	4189	11114
1991M10	18442*	37841	3707	5010	16233
1991M11	18536*	26083	4453	7129	18829
1991M12	19427*	15613	3762	8005	21156
1992M1	19281*	6441*	5007*	10041*	18185
1992M2	18908*	12627*	4689*	13382*	20949*
1992M3	19285*	29456*	4966*	12537*	26103*
1992M4	19021*	31941*	4565*	14808*	19717*
1992M5	18786*	42780*	4041*	6513*	17842*
1992M6	18936*	44251*	3972*	7578*	19339*
1992M7	19269*	42047*	4443*	10716*	19427*
1992M8	19048*	45032*	4710*	7986*	20143*
1992M9	18992*	33036*	4021*	1149*	11102*
1992M10	18853*	36149*	4005*	2457*	16276*
1992M11	18901*	25357*	4629*	6268*	19640*
1992M12	19294*	13976*	4241*	6529*	21813*

Note: An asterisk (*) denotes forecast arrivals.

ANNEX: Monthly Tourist Arrivals, 1988-1992

	CUBA	CURACAO	DOMINICA	GRENADA	GUADELOUPE
1988M1	28756	10686	1802	5134	17558
1988M2	30302	13619	3253	5275	16061
1988M3	30920	15198	2053	5903	17823
1988M4	21026	11294	2624	4509	14752
1988M5	18552	9407	1360	4307	12979
1988M6	17555	13630	1593	3920	8804
1988M7	26900	16663	4256	6847	11686
1988M8	25973	12002	3299	7726	12562
1988M9	21983	11513	1979	3636	7823
1988M10	28137	12859	3704	3691	10627
1988M11	25664	12400	2549	4361	12966
1988M12	32462	15895	3312	6486	14883
1989M1	37742	14857	2549	5853	15460
1989M2	34928	17094	2501	5637	13318
1989M3	36626	18281	3582	6777	14882
1989M4	30165	13427	2466	4911	13935
1989M5	22130	14742	3177	4191	10737
1989M6	17523	15651	2909	4550	8161
1989M7	27533	17278	4347	7750	10514
1989M8	25385	18126	4015	9209	11621
1989M9	19613	15491	1902	3840	5149
1989M10	19386	13591	2473	4405	4076
1989M11	21156	15468	2644	4446	6382
1989M12	34115	19026	4483	7027	8803
1990M1	36742*	15340	3019	6266	10435
1990M2	35158*	17493	5019	5876	10812
1990M3	36427*	17599	3211	7040	13000
1990M4	27575*	17423	4109	6862	11336
1990M5	21942*	16690	3319	4932	9143
1990M6	18791*	15896	3908	5799	8819
1990M7	29202*	19639	5086	8536	10937
1990M8	27476*	16890	4265	10364	10397
1990M9	22098*	14623	2372	5074	7029
1990M10	24474*	18336	3341	6071	8635
1990M11	24681*	16772	4205	6721	12416
1990M12	35765*	20972	5477	8467	12704
1991M1	39534*	16199	2965	7666	12794
1991M2	37215*	17240	5013	7166	12294
1991M3	38760*	18708	3863	8670	13089
1991M4	30433*	15319	2678	7141	12116
1991M5	23378*	15464	3997	6556	11620
1991M6	19353*	13708	3668	6138	8606
1991M7	30219*	20206	5584	9815	9613
1991M8	28184*	18233	4937	12351	9926
1991M9	22276*	16473	2351	5588	6920
1991M10	23485*	17279	2691	6197	10362
1991M11	24508*	18507	3358	7236	12725
1991M12	37197*	18312	4566	7972	11938
1992M1	40656*	15919*	3556*	8176*	13775*
1992M2	38544*	18341*	4114*	7732*	13233*
1992M3	40053*	18126*	3923*	9063*	13317*
1992M4	30955*	15146*	3980*	8220*	11932*
1992M5	24145*	13710*	3253*	6952*	9859*
1992M6	20283*	14474*	3334*	7186*	7974*
1992M7	31606*	18344*	5004*	10386*	9722*
1992M8	29590*	19808*	5077*	12563*	10453*
1992M9	23565*	16434*	3090*	6547*	6294*
1992M10	25379*	15865*	3339*	7353*	8206*
1992M11	26095*	18067*	3401*	8195*	11607*
1992M12	38820*	20115*	4992*	9444*	12738*

Note: An asterisk (*) denotes forecast arrivals.

ANNEX: Monthly Tourist Arrivals, 1988-1992

	JAMAICA	MARTINIQUE	MONTSERRAT	PUERTO RICO	ST KITTS
1988M1	76636	33388	33388	62838	6452
1988M2	70559	26922	26922	66587	6545
1988M3	76402	29545	29545	63894	6562
1988M4	68667	27521	27521	59920	5381
1988M5	54493	16257	16257	50343	4754
1988M6	50720	14619	14619	46938	4704
1988M7	60299	28280	28280	54892	7021
1988M8	73220	28598	28598	55524	5406
1988M9	22979	19059	19059	42879	4253
1988M10	21152	13043	13043	53040	5035
1988M11	34144	14251	14251	59896	5114
1988M12	39602	28889	28889	59181	8381
1989M1	56961	36400	36400	67347	6577
1989M2	62614	30440	30440	66730	6805
1989M3	73521	35858	35858	65767	7213
1989M4	57181	27623	27623	58566	5085
1989M5	52909	17184	17184	55760	5273
1989M6	58479	17793	17793	45090	5023
1989M7	68339	25959	25959	52077	7803
1989M8	64927	36736	36736*	49007	6177
1989M9	41846	21604	21604*	38288	3518
1989M10	45449	16678	16678*	52817	4395
1989M11	56553	18804	18804*	63229	5052
1989M12	75992	26105	26105*	61557	8199
1990M1	69257	30794	30794*	62351	6275
1990M2	73614	26685	26685*	66418	6705
1990M3	83129	29201	29201*	66275	6089
1990M4	73427	29519	29519*	56791	6465
1990M5	64251	14589	14589*	57217	5972
1990M6	70146	21180	21180*	44410	6202
1990M7	84761	30396	30396*	52461	7320
1990M8	78707	26412	26412*	47608	6183
1990M9	51195	14940	14940*	43962	4162
1990M10	52643	14809	14809*	49992	4767
1990M11	62389	17432	17432*	67158	6166
1990M12	77258	24687	24687*	66825	9383
1991M1	60033	25430	25430*	47982	5609
1991M2	63531	23770	23770*	54600	6357
1991M3	83166	22489	22489*	64123	7434
1991M4	63781	21431	21431*	58321	7250
1991M5	65139	19525	19525*	51737	6948
1991M6	72815	22413	22413*	44735	6361
1991M7	85442	38329	38329*	51789	7806
1991M8	86651	43270	43270*	52426	7352
1991M9	55372	19748	19748*	38377	4504
1991M10	56472	20018	20018*	45440	6602
1991M11	69761	26121	26121*	65408	7078
1991M12	82444	32587	32587*	60629	10602
1992M1	71643*	34812*	34812*	50904*	7306*
1992M2	75571*	30950*	30950*	57276*	7827*
1992M3	93152*	32447*	32447*	62790*	8430*
1992M4	74772*	32396*	32396*	55461*	7644*
1992M5	74617*	20960*	20960*	51784*	7487*
1992M6	81829*	26558*	26558*	42375*	7133*
1992M7	94049*	37571*	37571*	49843*	9000*
1992M8	94081*	35981*	35981*	48203*	8039*
1992M9	64462*	21277*	21277*	38468*	5374*
1992M10	66031*	21253*	21253*	45103*	6832*
1992M11	78758*	24810*	24810*	63909*	7503*
1992M12	92766*	31853*	31853*	60973*	10851*

Note: An asterisk (*) denotes forecast arrivals.

	ST LUCIA	ST MAARTEN	ST VINCENT	TRINIDAD	TURKS&CAICOS	USVI
1988M1	11470	48111	4121	14804	4977	72920
1988M2	12116	49204	4354	29974	4713	74620
1988M3	11875	47217	4161	15820	4395	79240
1988M4	10125	41474	2954	13109	5551	65700
1988M5	8757	35301	2539	12342	4213	56040
1988M6	8318	29367	4643	13874	3508	51560
1988M7	10908	39878	5590	18644	3588	56650
1988M8	10881	38570	4514	16807	3184	59740
1988M9	7965	24891	2189	10386	2593	38580
1988M10	10162	34846	2734	10375	3190	49760
1988M11	10512	42562	3001	12144	3015	58000
1988M12	12203	48319	6247	19467	4152	66350
1989M1	12831	51313	3915	22915	3316	73390
1989M2	11114	51106	4040	18943	4327	74940
1989M3	13993	50139	4891	15360	4736	75220
1989M4	11299	45241	4075	12502	4093	63840
1989M5	10266	38343	3078	12212	4880	59120
1989M6	11141	32266	5513	13666	2974	59120
1989M7	10959	40808	5266	18753	4779	51620
1989M8	10158	41263	4432	18174	3268	61660
1989M9	8192	21098	2341	10700	1924	22430
1989M10	10459	32926	2775	12780	4167	28610
1989M11	11007	43801	3243	16191	3225	39550
1989M12	11433	55400	6492	22032	5042	54670
1990M1	11779	54435	4362	14504	4025	62329
1990M2	11176	54375	4002	35769	4026	60442
1990M3	15321	53789	4250	14768	3597	62689
1990M4	14315	53892	4955	17371	3220	64889
1990M5	11519	43409	3625	13763	3983	58600
1990M6	9507	39096	5970	14874	2128	54731
1990M7	11285	47627	5657	17472	3601	60427
1990M8	13743	47339	4957	9478	4433	64005
1990M9	7834	28376	2658	9753	2142	42149
1990M10	9719	36559	3002	11230	1995	45434
1990M11	11708	48924	3715	12728	3726	58031
1990M12	13087	56910	6760	22311	5013	61630
1991M1	12508	47430	4058	17785	4036	57489
1991M2	11828	46333	4276	23128	5287	54429
1991M3	13863	52737	5930	18347	5685	63017
1991M4	13055	48777	3533	15700	5297	66555
1991M5	13489	43799	3464	16929	5497	58730
1991M6	13221	39023	5457	16559	3702	56712
1991M7	14455	49407	4923	22280	4147	63830
1991M8	17000	49127	5146	24393	4610	65328
1991M9	9786	28488	2261	13235	2959	39473
1991M10	11894	37221	2848	13188	3413	40618
1991M11	12559	50507	3664	15053	4725	55902
1991M12	15932	55189	6730*	23239	5258	61352
1992M1	15472*	53219*	4720*	14325	4519*	61730*
1992M2	14368*	52514*	4794*	29296*	5516*	59152*
1992M3	16308*	55131*	4940*	15445*	5705*	65137*
1992M4	15188*	49728*	4466*	15254*	5074*	68126*
1992M5	13831*	43535*	3373*	12161*	5889*	60932*
1992M6	13389*	37328*	5871*	14375*	3562*	58154*
1992M7	14398*	47434*	5980*	18599*	5279*	64688*
1992M8	15345*	47684*	5566*	15624*	4762*	67040*
1992M9	11401*	25383*	2689*	11977*	2727*	42826*
1992M10	13411*	37286*	3236*	12577*	4038*	44849*
1992M11	14205*	50025*	3759*	13522*	4556*	59031*
1992M12	15545*	59696*	7034*	22243*	6272*	63131*

Note: An asterisk (*) denotes forecast arrivals.