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EXPORT COMMODITY PRICE PROJECTIONS

A study of autoregressive-moving average projections methods

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/INTRODUCTION

INTRODUCTION

The object of the present study is to apply the methodology developed by George Box and Gwilym Jenkins for statistical projections to the problem of price projections for an approximately two year period ending in the first quarter of 1977. The series selected were basic commodity prices of major importance to Latin America with the expectation that the projection of such series would be helpful in short and medium term planning in the region.

In the first part of this study we discuss some of the more common methodological approaches to price predictions and the reasons we feel a statistical approach is justified. Then we examine the recent historical situation in international commodity markets and their expected effect on commodity price projections. In the appendix to this section we present the projections, the models estimated prediction errors and graphs of both within sample and outside sample projections for individual commodities. In the third part, we attempt to interpret the projections in the light of the models estimated, through the use of confidence intervals, and average and relative errors of prediction. We also show how the projections can be revised without returning to the original model introducing the possibility of modified projections based on a combination of statistical and other projection methods.

In the second appendix we describe formally the statistical model which has been used in this study, the underlying assumptions, the methodology of identification, the derivation of the correction weights and outline the idea of best conditional predictor.

Finally, in the last appendix, we discuss the specification of the statistical models used for making price projections. We show that the correct specification of a statistical model is necessary in achieving "best conditional predictors" and that typical statistical models used in econometric work are not correctly specified and are therefore not best conditional predictors.

/I. The Methodology

I. THE METHODOLOGY OF PRICE PROJECTIONS

The importance in economic planning of price projections of commodity exports is obvious but has been made very difficult due to the highly complex nature of the international markets for these goods. In countries where a high percentage of exports are in primary commodities, any reasonable attempt at planning however will necessitate forecasts of future prices in these markets. Such forecasts will be important not only with respect to determining expected export earnings but also with respect to sensible programs of price supports through both national and international initiatives.

Many methods have been employed to make such projections, the majority of which are informal taking account of intuitive and explicit current factors affecting the different commodity markets in a qualitative fashion. More systematic projections methods based on trend analysis, naive autoregressive or econometric models are less frequently available to planners but certainly would be helpful at least as a basis for comparisons with less systematic methods.

The lack of more systematic methods for making price projections is not hard to understand. The simpler statistical projection methods, while easy to manipulate, are often poor and are used generally for either extremely short run or extremely long run projections only. They cannot capture the cyclical nature of price movements which occur over medium term time spans. More elaborate econometric models which attempt to explain price movements are often unwieldy for systematic projection purposes. These models are often impossible to duplicate and for projections into the future require some assumptions or projections of all the exogenous variables which are included to explain price movements but which are not themselves explained.

Systematic projections methods in themselves, however, would be of little use in medium term planning if they were not rigourously justified and the resulting projections evaluated over time against some acceptable standard of comparison. A minimum criteria for acceptable performance would naturally be that they perform on the

/average better

average better than more informal methods. One might also imagine that a combination of projection methods might lead to even better projections although this idea remains to be tested. 1/

In this study therefore we have given as much emphasis to the interpretation and evaluation of the price projections as to the projections themselves. We hope that in this manner these projections will be of greater use in economic planning. Moreover, we have made it relatively easy to revise or correct the projections on the basis of either new information or ad hoc estimates made by the planner himself. This revision process permits us in a limited sense to test if a combined method would produce better predictions than either method taken separately.

The price projections are made on a quarterly basis for approximately two years through the first quarter of 1977 and are based on readily available price quotations published by the United Nations, the World Bank and other sources. The most recent information through the first quarter of 1975 has been included in the set of observations although generally the quotations for the first quarter of 1975 were incomplete and will need to be revised.

The price series have been incorporated into our study without much scrutiny. Only in the case of price quotations in pounds sterling was some adjustment made for changes in the exchange rate. Some of the series, moreover, may not be the most useful from the point of view of the planner and it would be better to construct composit series of certain commodities if significant differences in quality exist among them.

The methodology used in this study is a generalization of statistical time series methods and includes as special cases the more common statistical models such as trend, random walk, and naive autoregressive. It is called the autoregressive moving average model (ARMA) and was most completely developed by Box and Jenkins. 2/ It is

1/ See P. Newbold and C.W.J. Granger, "Experience with Forecasting Univariate Time Series and the Combination of Forecasts", J. Royal Statistical Society (1974), Part 2.

2/ Box G.E. and Jenkins, "Time Series Analysis, Forecasting and Control" (San Francisco, Honden-Day Pub. 1970).

/distinguished

distinguished from common autoregressive methods in that the identification of the structure of the model is an integral part of the process of model building. It can therefore represent more complicated cyclical patterns and is useful for medium term planning where we suspect cyclical patterns are important.

The ARMA model can best be understood by explaining the role of each of the parameters which must be estimated in the process of model building. Our basic material is a set of observations of a price series which we shall call P, and our objective is to predict future P's on the basis of past P's. The role of the autoregressive parameters in the ARMA model, then, is to link future movements to past movements in prices in the form of levels, changes or rates of change. These patterns of adjustment are typical of econometric models which include ideas such as adaptive expectations or partial adjustments to optimal levels. Special cases of the autoregressive model estimated are simple trend and random walk models.

Most economic series, however, can be adequately described as simple random walk or trend models, that is, the series give the appearance of wandering about a given level or trend and in general the best prediction for tomorrow is today's level or today's level plus trend. To determine if in fact movements in the series obey more complex rules which would improve prediction results, it is often necessary to take first or second differences of the series and this is a second parameter which needs to be estimated in the ARMA model, along with any possible trend.

The moving average parameter acts to correct the path of prediction necessary because of past prediction errors. The moving average is not the same as a trend, however, for the level about which a series fluctuates is not systematically moving in one direction or another. The level about which the series varies is itself fluctuating randomly through time and future changes in levels are not predictable. And since future levels cannot be predicted, the best predictions are based on the current level and the importance of the moving average term disappears once this level has been determined. All predictions thereafter will be made on the basis of the

/ autoregressive

autoregressive parameters alone. The complete autoregressive moving average model can be written as

$$(1-\phi_1 B-\phi_2 B^2-\ldots\phi_p B^p)\nabla^d p_t-\theta_{00}+(1-\theta_1 B-\theta_2 B^2-\ldots\theta_q B^q)a_t$$

where

P_t-- price in time period t

a_t-- stochastic error in time period t

ϕ_i-- ith autoregressive parameter

θ_j-- jth moving average parameter

B^i-- lag operator such that $\phi_i B^i P_t=\phi_i P_{t-i}$

∇^d-- difference operator such that $\nabla^d P_t= (1-B)^d P_t$

Autoregressive and moving average parameters along with the number of differences of the series required are identified from an examination of the correlation of values of the series, its first difference, etc. for different lenght lags. That is, for a series which has, say, one hundered values we study all correlations one period apart (P_1P_2), $(P_2P_3)\ldots$ $(P_{99}P_{100})$ then all correlations two periods apart (P_1P_3),$(P_2P_4)\ldots$ $(P_{98}P_{100})$, then three periods apart, four periods apart, etc. The correlations one period apart when taken together may or may not be significant, that is prices in the previous period may or may not be significant in explaining current price levels. If significance was found a model with an autoregressive parameter ϕ_1 would be estimated. The same process occurs with correlations of higher order. The moving average parameter will enter into the model if it is found that a large number of autoregressive parameters seems to be important. The moving average parameter acts to simplify the structure of the model and it can be shown that an autoregressive model with an infinite number of parameters can be replaced by a first order moving average model, such as

$$P_t = (1 - \theta_1)\, a_t$$

By examining the autocorrelations of the series, all non-random elements can be identified and taken account of in the ARMA model.

/The estimated

The estimated ARMA model residuals are therefore random and it can be shown that the model is then the best predictor of the series for all periods in the future conditional on the last observation made. No other model could be found which could take advantage of additional information contained by the residuals of the ARMA model since those residuals are random.

In fact the ARMA models which we have estimated in this study are remarkably simple with only a few autoregressive or moving average parameters. Of the forty odd models estimated here, nineteen were simple autoregressive, 8 were simple moving average while thirteen were mixed autoregressive moving average containing one or two of each type of parameter. Only one model was estimated without differencing while seven required more than one difference and it was found necessary to estimate a tendency in only three cases.

Ideally economic predictions should be made using some sort of econometric model with a strong theoretical grounding for explaining as well as projecting price movements. Such models would be of great use not only in predicting future changes in prices but also the likely consequences of policy agreements on the part of commodity producers . Statistical models based on an entirely different set of assumptions would be used as a standard of comparison for these econometric models, the performance of the former being measured in terms of the latter.

Unfortunately, econometric models are not generally suitable for prediction purposes as has been mentioned already and comparisons of these with the ARMA model were impossible. In making preliminary comparisons with some other non-price models, however, it has been found that ARMA models perform considerably better than we have been led to expect from previous work. These tests are reported in the last appendix and bring us to an important result of this study. It appears that most autoregressive models used in comparative work are seriously misspecified. That is, the structure of the lag process is not correct and the model itself is generally unstable (explosive). This misspecification can lead to extremely large prediction errors

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and is one basic reason for the poor performance typical of auto-regressive models. The ARMA model can be specified correctly 3/ as will be explained in the last part of this study and the model which is developed can reduce prediction errors substantially over a period of one or two years.

II. HISTORAL AND PROJECTED PRICE MOVEMENTS

This study includes prices series for 38 commodities on a quarterly basis from 1960. These series include 11 metals and 27 agricultural and fisheries products. In general, as Table I indicates, price formation in the separate commodity markets is quite heterogeneous, there are few common tendencies across the series although the metals and wood products generally have a much longer lag structure than do agricultural products as would be expected.

Even related products or different varieties of the same product show substantial differences in short term price movements. These differences are reflected in the model used for predictions and therefore the predictions for related price series may also vary substantially. Inflation and devaluation, ought to have had some influence on price behavior but up to 1970 there seems to be little evidence of an upward drift in prices and one product, tobacco, actually appeared to decline in price over the period.

The sample period chosen for this study (1960-1975), however, may not reflect adequately long run tendencies in commodity prices. In fact, there is sufficient evidence to suspect that at least relative tendencies can be found if commodity prices are compared to prices of manufactured products over a thirty or forty year period. The present sample period is too short for such a comparison, however.

A. Price Movements 1973-1975

With regard to the entire fifteen years of price movements the period beginning in the first quarter of 1973 is exceptional. It is exceptional in the sense that prices for most commodities reached

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3/ It would be more accurate to say that the structure of the model is approximately correct, with slight variations in the model giving only slightly different prediction results.

/TABLE I

TABLE I

INTERNATIONAL COMMODITY PRICES: 1970-1974

(Index 1967-1969 = 100)

Commodities	1970	1971	1972	1973	1974
Agricultural & Fisheries					
Linseed oil	99.8	86.10	89.93	251.87	536.56
Ground nut oil	133.2	153.73	144.19	189.83	388.17
Soya oil	149.3	155.34	123.60	223.70	435.20
Cotton Brazilian	104.8	125.48	130.61	201.65	255.21
Cotton Mexican	101.9	118.50	124.67	214.75	219.74
Cotton Pima, Perú	102.0	101.9	106.30	198.67	233.77
Rice	78.5	71.19	76.01	187.59	313.35
Sugar	139.5	168.3	272.43	354.95	1095.36
Bananas	117.3	113.24	117.28	139.07	165.84
Cacao	94.0	74.71	90.95	178.39	257.15
Coffee Colombia	128.8	116.51	133.83	171.61	182.41
Coffee Santos	139.4	112.27	131.78	172.94	177.60
Shrimps	103.2	125.42	168.49	195.79	185.45
Beef	133.9	156.27	169.19	222.46	257.80
Hides and skins	111.1	138.4	226.58	247.10	207.26
Fish meal	126.2	113.48	127.39	286.96	237.67
Wool Buenos Aires	104.7	109.65	177.15	315.36	275.32
Wool Import Boston	83.0	72.1	119.03	282.82	209.76
Wood	90.3	115.19	141.18	177.27	155.40
Maize	115.6	113.43	123.03	135.67	160.41
Newsprint	101.7	101.19	103.28	108.47	133.68
Wood pulp	118.9	128.37	116.14	120.67	181.26
Quebracho	121.9	123.66	128.68	130.02	144.92
Sisal	90.3	102.90	138.32	301.11	647.57
Soybean meal	114.8	121.53	124.10	177.30	255.04
Tobacco	96.2	92.80	86.99	83.70	90.31
Wheat	101.8	101.38	106.96	222.88	305.52
Metals					
Aluminium	111.9	111.97	101.90	96.49	131.81
Bauxite	131.8	186.33	233.84	289.51	402.20
Copper	113.8	87.35	86.06	145.08	171.38
Tin	109.3	104.77	111.36	145.04	258.01
Iron ore	102.6	106.88	113.24	120.37	177.24
Manganese	96.7	103.08	91.54	108.21	164.10
Nickel	136.6	140.79	147.92	162.03	183.74
Silver New York	96.9	84.55	92.09	139.65	257.49
Silver Peru	102.2	89.27	93.56	125.85	184.07
Lead	118.1	98.62	116.24	168.31	214.63
Zinc	105.6	111.11	134.22	307.99	475.50

/peaks which

peaks which were at times one to four hundred percent above the average of the series, and this movement was common to almost all the series included in the study.

Because of this unique period, one must entertain the possibility that structural change has occured in international commodity markets. If this were the case, then models based on past price experience will be essentially useless for predicting future movements. Actually three different hypotheses can be identified for this period:

a) structural change has occured;

b) a sharp departure from normal conditions has occured, the underlying causes of this phenomena will not persist and prices will return to their normal levels;

c) as in b), except that prices will now fluctuate around a different level (mean).

Sufficient data has not been accumulated to test any of these hypotheses but it would be difficult to accept the first given that it implies radical changes in both demand and supply patterns for all the products studied simultaneously.

A careful examination of the individual price series indicates that substantial price changes persisted for five to seven quarters and for many commodities which experienced such increases during the first quarter of 1973 prices had declined significantly by the first quarter of 1975 or stabilized somewhat between peak levels. Moreover, after a period of five to seven quarters of very poor prediction performance, the models were able to "pick up" the series again and predictions improved in many instances. For these reasons we would be inclined to give more weight to either hypothesis B or C than to A.

It is often argued that if structural change has not yet occured it will occur in the future as producing countries try to maintain previous high price levels through various mechanisms. Countries which are traditional producers of basic commodities, of course, are attempting new methods for controlling prices in the light of recent successes among petroleum producers. But aside from the traditional problems associated with cooperative efforts of this sort, a number

of other factors enter into the results as well.

Even a cursory examination of investment activity in both mining and agricultural indicates the theoretical expected result that price increases stimulate investment activity leading to increased supply, etc. On the demand side one expects higher prices to stimulate product substitution and an absolute decline in demand as consumer's purchasing power decreases. When both demand and supply factors are brought together, the impact on prices is not at all clear. It is our expectation that the cyclical patterns previously exhibited by prices will be maintained but the swings will perhaps be wider in the near future to reflect the recent large increases. Structural change may occur but only in isolated instances not for all products simultaneously.

B. Price Perspectives 1975-1976

The predictions for the period 1975-1976 presented in Tables II and III indicate a general decline in prices from their high 1974 levels although in only a few instances are prices predicted to fall below 1973 levels. More important perhaps is the evident recovery in most prices for 1976 over 1975. In some cases 1976 prices are even above those recorded for 1974. 4/ Of twenty-five commodity prices predicted to decline in 1975, fourteen show a recovery in 1976. Only twelve commodities show continued price increases in 1975, the average increase being on the order of fifteen percent. 5/ In 1976, most of these same commodities experienced either sharp declines or only small gains. Only four series evidenced unusually large gains, and these have been revised subsequently. 6/

4/ Since we are dealing with current prices, inflationary tendencies are incorporated in the predictions and could explain future increases in prices.

5/ This average increase would be larger if the forecasts for aluminium, bauxite, ground unit and wood pulp has not been revised. See section on Prediction Revisions.

6/ See section on Prediction Revisions.

/Table II

Table II

QUARTERLY PREDICTIONS OF INTERNATIONAL PRICES OF LATIN AMERICAN COMMODITY EXPORTS

(Quarter)

Commodits Units of measurent	1974	1975				1976				1977
	Fourth	First	Second	Third	Fourth	First	Second	Third	Fourth	First
Linseed oil (lbs/long ton)			332.15	276.34	237.33	206.31	185.54	172.00	164.75	162.29
Ground nut oil (index 1970=100)			300.00a/	321.72	352.04	385.21	421.50	461.22	504.67	552.23
Soya oil (lbs/long ton)			291.59	266.73	238.08	218.03	206.74	205.91	213.68	228.06
Cotton Brazilian (cents/lbs)		40.63	35.90	34.75	38.46	44.74	55.15	65.93	73.95	74.84
Cotton Mexico (cents/lbs)			51.97	59.04	61.62	61.89	62.85	63.83	64.82	65.82
Cotton, Pima Peru (cents/lbs)		77.02	80.09	85.91	90.88	94.16	94.80	93.61	91.95	90.52
Rice (index 1970=100)			281.12	255.32	252.63	249.95	247.26	244.57	241.89	239.20
Sugar Alternative I (cents/lbs)			30.00	29.51	29.40	29.38	29.37	29.37	29.37	29.37
Sugar Alternative II (cents/lbs)			29.79	29.64	30.17	32.79	33.60	35.04	37.26	34.45
Bananas (marks/1 000kg)			1 231.87	1 058.79	986.77	1 181.12	1 280.79	1 100.84	1 025.96	1 228.02
Cacao (cents/lbs)			80.99	75.39	73.60	63.64	65.58	66.25	70.42	69.53
Coffee Colombia (cents/lbs)			78.14	77.11	78.80	77.27	72.90	72.62	76.46	77.39
Coffe Santos (cents/lbs)			60.99	59.78	62.80	63.46	64.35	64.92	65.50	64.71
Shrimps (index 1970=100)		151.33	145.80	140.96	136.69	132.92	129.59	126.62	123.99	121.64
Beef (new pence lbs)	68.54	70.43	77.32	76.72	75.73	78.13	82.53	83.31	83.44	85.82
Hides and skins (new pence/lbs)		23.34	20.48	20.88	22.02	22.51	22.48	21.96	22.05	22.17
Fish meal (index 1970=100)		79.68	78.79	88.89	85.02	76.40	75.38	103.20	103.20	-
Wool Buenos Aires (cents/lbs)			94.74	88.01	93.92	95.58	95.64	95.70	95.74	95.79
Wool import Boston (cents/lbs)			138.99	145.10	153.28	166.71	175.17	180.02	180.89	178.82
Wood (index 1970=100)		144.62	148.62	150.22	152.86	152.35	153.66	157.18	152.95	159.33
Maize (lbs/long tons)			30.60	32.57	33.37	34.08	35.35	34.69	35.18	35.61
Newsprint (index 1970=100)			124.00	122.83	122.42	122.28	122.23	122.22	122.21	122.21
Wood pulp Alternative I (index=100)	169.98a/	161.88	150.42	140.84	131.55	122.97	114.93	107.41	100.39	93.82
Wood pulp Alternative II (index=100)	169.98a/	153.58	141.73	133.02	126.50	121.57	117.81	114.92	112.68	110.94
Wood pulp Alternative III (index 1970=100)	169.98a/	148.90	129.37	109.91	92.42	72.35	57.08	46.49	43.75	41.27
Quebracho (dollars/100 lbs)		13.81	13.81	13.81	13.81	13.81	13.81	13.81	13.81	13.81
Sisal (index 1970=100)			615.44	551.88	544.05	500.96	501.11	512.77	516.02	538.69
Soybean meal (lbs/long ton)		152.60	143.14	152.14	162.22	165.76	161.71	165.57	169.72	-
Tobacco Alternative I (index 1970=100)		111.21	109.99	108.50	115.23	114.60	113.87	117.18	116.87	116.52
Tobacco Alternative II (index 1970=100)		115.17	106.98	108.29	118.26	112.50	115.22	116.36	113.80	125.97
Wheat (lbs/long ton)			70.80	71.01	83.16	85.58	82.23	87.28	84.40	86.68
Aluminium (cents/lbs)			39.00a/	37.16	36.78	33.69	31.35	27.92	26.21	22.78

Table II ... (concluded)

Commodits Units of measurent	1974	1975				1976				1977
	Fourth	First	Second	Third	Fourth	First	Second	Third	Fourth	First
Bauxite (index 1970=100)		280.00a/	338.57	385.94	398.42	453.75	525.33	578.17	657.88	766.91
Copper (cents/lbs)			56.51	56.17	56.07	56.04	56.03	56.03	56.03	56.03
Tin (lbs/long ton)			2 802.48	2 804.07	2 804.72	2 804.99	2 805.09	2 805.14	2 805.15	2 805.16
Iron ore (dollars/long ton)			17.77	18.50	18.37	19.17	19.70	19.84	19.74	15.05
Manganese (index 1970=100)			235.33	238.27	197.39	198.94	188.65	160.95	161.33	155.05
Nickel (index 1970=100)			157.03	157.03	159.30	159.30	164.70	164.70	168.17	168.17
Silver New York (cents/troy once)			397.48	444.99	439.60	412.59	462.71	443.91	424.98	474.77
Silver Peru (index 1970=100)		178.30	178.95	191.01	196.37	204.22	212.12	216.74	222.47	227.99
Lead (lbs/long ton)			173.47	173.26	172.21	167.95	164.57	164.40	170.72	176.66
Zinc (lbs/metric ton)			331.31	459.80	560.47	558.02	481.93	387.79	356.79	382.81

a/ Predictions for the indicated quarter are not based on ARMT model, see section on prediction revisions.

/Table III

Table III

QUARTERLY PREDICTIONS OF INTERNATIONAL PRICES OF LATIN AMERICAN COMMODITY EXPORTS

(Percentage changes)

Commodits Units of measurent	1974	1975				1976				1977
	Fourth	First	Second	Third	Fourth	First	Second	Third	Fourth	First
Linseed oil			-12	-17	-14	-13	-10	-07	-04	-01
Ground nut oil		-166a/	-26	07	09	09	09	09	09	09
Soya oil			-07	-09	-11	-08	-05	-	01	07
Cotton Brazilian		-21	-12	-03	11	16	23	20	12	01
Cotton Mexico			12	14	04	-	02	02	02	02
Cotton, Pima Peru		-05	04	07	06	04	01	-01	-02	-02
Rice			-	-09	-01	-01	-01	-01	-01	-01
Sugar model 1			-08	-02	-	-	-	-	-	-
Sugar model 2			-08	-01	02	09	02	04	06	-08
Bananas			08	-14	-07	20	08	-14	-07	20
Cacao			08	-07	-02	-14	03	01	06	-01
Coffee Colombia			01	-01	02	-02	-06	-	05	01
Coffee Santos			-01	-02	05	01	01	01	01	-01
Shrimps		-04	-04	-03	-03	-03	-03	-02	-02	-02
Beef	-03	03	10	-01	-01	03	06	01	-	03
Hides and skins		-07	-12	02	05	02	-	-02	-	01
Fish meal		-15	-01	13	-04	-10	-01	37	-	-
Wool Buenos Aires			-05	-07	07	02		-	-	-
Wool import Boston			01	04	06	09	05	03	-	-01
Wood		-02	03	01	02	-	01	02	-03	04
Maize			-03	06	02	02	04	-02	01	01
Newsprint			-03	-01	-	-	-	-	-	-
Wood pulp model 1	-91a/	-05	-07	-06	-07	-07	-07	-07	-07	-07
Wood pulp model 2	-91a/	-10	-08	-06	-05	-04	-03	-02	-02	-02
Wood pulp model 3	-91a/	-12	-13	-15	-16	-22	-21	-19	-06	-06
Quebracho		01	-	-	-	-	-	-	-	-
Sisal			-01	-10	-01	-08	-	02	01	04
Soybean meal		06	-06	06	07	02	-02	02	03	-
Tobacco model 1		13	-01	-01	06	-01	-01	03	-	-
Tobacco model 2		17	-07	01	09	-05	02	01	-02	11
Wheat			-21	-	17	03	-04	06	-03	03

Table III ... (concluded)

Commodits Units of measurent	1974	1975				1976				1977
	Fourth	First	Second	Third	Fourth	First	Second	Third	Fourth	First
Aluminium			-05a/	-05	-01	-08	-07	-0.11	-06	-13
Bauxite		-36a/	21	14	03	14	16	10	14	17
Copper			-02	-01	-	-	-	-	-	-
Tin			-	-	-	-	-	-	-	-
Iron ore			02	04	-01	04	03	01	-01	-24
Manganese			03	01	-17	01	-05	-15	-	-04
Nickel			-	-	01	-	03	-	02	-
Silver New York			-07	12	-01	-06	12	-04	-04	12
Silver Peru		-01	-	07	03	04	04	02	03	02
Lead			-02	-	-01	-02	-02	-	04	03
Zinc			13	39	22	-	-14	-20	-08	07

a/ Predictions for the indicated quarter are not based on ARMT model, see section on prediction revisions.

/By aggregating

By aggregating the quarterly series over an entire year, as was done in Table I, much useful information has been lost concerning cyclical movements in prices. Products such as cacao, sisal, soya, logs and iron ore exhibit complex cyclical behavior not readily seen in the more aggregated series presented in Table I. Nevertheless the annual series indicate clearly a cyclical movement in all three cotton series, wool, fish meal, in such metals as aluminium, manganese and zinc. 7/

In tracing out cyclical patterns, there is an obvious advantage in working with the quarterly series. But equally important, especially considering the type of models utilized here, is the possibility of revising the series as frequently as possible throughout the prediction period to account for observed prediction errors. The disaggregated series allow for a careful monitoring of price movements and any unexpected price movements can be accounted for in the generation of revised predictions for the remainder of the prediction period. Even if one is working with annual plans in which annual price predictions are needed, the quarterly projections will indicate if a revision of the plan is needed well before the end of the planning period.

The Commodities and Export Projections Division of the World Bank makes price predictions on an annual basis for many of the same products studied here. Their forecasting approach is quite different from that developed here and involves a fundamental analysis of each commodity market as well as the world economy in general. Their predictions, moreover, are made for a somewhat different purpose but nevertheless in Table IV we compare at least the price changes predicted for the current year over 1974.

7/ Copper prices were also estimated using a ten period lag and while the lag was highly significant, the resulting predictions appeared unreasonable. We have therefore worked with a simple autoregressive model with a simple period lag in this study.

/For those

TABLE IV

INTERNATIONAL COMMODITY PRICES

COMPARISON OF CEPAL AND IBRD PROJECTIONS c/

	CEPAL	IBRD
Ground nut oil	07	-35 a/
Brazilian cotton	-43	
Mexican cotton	-17	-06 b/
Cotton Pima Peru	-24	
rice	-29	-03 b/
sugar	-03	11 b/
cacao	-13	-09 b/
Colombia coffee	01	20 b/
Santos type coffee	-11	
beef	09	06 b/
hides and skins	-24	04 a/
fish meal	-55	44 a/
wood	-14	-02 b/
corn	-15	05 b/
sisal	-13	-45 a/
soya	23	-17 a/
tobacco	17	11 a/
wheat	-05	06 b/
Metals		
aluminium	43	19 b/
bauxite	32	23 a/
copper	-42	-09 b/
tin	-10	-01 b/
iron	26	09 b/
manganese	15	-01 a/
lead	-12	-07 b/
zinc	-13	-11 b/

a/ Prediction base is third quarter of 1974

b/ Prediction base is first quarter of 1975

c/ Source of IBRD projections: World Economic Indicators.

For those World Bank projections made from apparently the same base as ours they appear to be more optimistic, World Bank projections indicating either larger increases or smaller decreases in prices for 1975 than ECLA projections. But in general the agreement in the direction of price changes over 1974 is remarkable and there is substantial desagreement only with respect to groundnut oil and soyabean meal. Both these World Bank projections, however, were made from an earlier base and this could possibly account for the difference.

III. INTERPRETATION AND EVALUATION OF PRICE PROJECTIONS

The projections made for commodity prices are of two sorts, the first are point projections or what might be termed the expected future price of the commodity. These have already been presented in Table II, and can be found also in Appendix I. These predictions are highly misleading in themselves for planning purposes and one must be able to form confidence limits about expected prices as well to account for random fluctuations in prices which are assumed to be normal with constant variance.

Taking sugar price projections as an example, the ARMA projection of 29 cents per lbs for the second quarter of 1975 is apparently much too high but the 75% confidence range for sugar varies between 22 cents and 38 cents per lbs covering approximately the limits in which the average price of sugar can be expected to fall in the second quarter. In fact the lower confidence limit for sugar over the entire two year period seems to reflect current trends more accurately than the actual point projections for this particular product.

In general the confidence intervals increase around the point projections reflecting the decreasing reliability of the point projections as one moves farther into the future. Point projections presented by themselves do not indicate this fact, they appear equally reliable or unreliable as the case may be over the entire prediction

period.8/

Two other measures used to evaluate the price predictions were the Root Mean Square Error (RMSE) and Relative Root Mean Square Error (RRMSE). These are measures of standard and percentage predictions errors over the last twenty-five periods (approximately the last six years) for one to five period ahead predictions.

The Root Mean Square Error used in this study is defined as

$$RMSE = \frac{1}{25} \sum_{t=N-25}^{25} (P_t(t-f) - X_t)^2$$

where

f = number of periods ahead for which predictions are made; (from one to five)

N = number of observations in the series

$P_t(t-f)$ = predictions for time period t made from base period (t-f)

X_t = actual value of variable at time t.

It is a traditional measure of prediction performance and may be thought of as the average error of prediction for the period. The last twenty-five periods were chosen for calculating the RMSE for purposes of economy and because one is usually interested in the model's more recent prediction performance.

It has the unfortunate characteristic of being influenced greatly by extreme prediction errors and particularly by price movements during the years 1973-4. It is therefore useful to study the actual predictions that were used to calculate the RMSE and these are also presented in Appendix I, along with a graph of the four period ahead (annual) predictions compared to the actual realized value of the series. The problem of extreme values is readily evident from these graphs.

8/ The probability that a point projection will actually be realized exactly is in fact zero.

/The influence of

The influence of price movements during the period 1972-1975 can be measured directly by making use of a modified RMSE. We recalculate the RMSE for these extreme observations and then substract this from the entire twenty-five period result. The results are reported in Table V for one and five periods ahead predictions. The Table indicates the beginning of the period for the observations removed and the number of observations used to calculate the modified RMSE. Normally such a procedure would be unjustifiable since by removing the more extreme predictions one can always reduce the standard and relative errors to any desired level. But since we can clearly identify the set of observatins to be removed as extending from five to seven contiguous periods beginning approximately in the last quarter of 1972 to approximately the last quarter of 1974 with the first observations being significantly above the proceeding ones in all cases, there is considerable merit in performing this excercise.

Table V indicates a substantial decrease in the RMSE for many of the products studied. For the one period ahead predictions the error drops fifty percent or more for 11 products. For the five period ahead predictions the gain is even larger. If the observations removed from the sample to make this calculation were in fact random observations from the same populations as the rest of the series, one would not expect a significant decrease in the RMSE based on a smaller set of observations. Only in such cases as wood, corn and lead did the RMSE appear to vary insignificantly.

The RMSE is useful for purposes of evaluating a single prediction model. A measure useful for comparing among the various models was also thought necessary. The RRMSE which is identical to Theil's inequality coefficient 9/ gives an approximate percentage error of predictions. It is defined as:

$$\text{RRMSE} = \frac{\text{RMSE}}{\sqrt{\frac{1}{25} \sum_{t=N-25}^{25} X_t^2}}$$

9/ Since this is a measure of relative absolute errors, the interpretation is different from Theil's inequality coefficient which is a measure of relative changes in prediction errors.

/ Table VI indicates

TABLE V

COMMODITY PRICE PROJECTIONS: ROOT MEAN SQUARE ERRORS OF WITHIN SAMPLE PERIOD PROJECTIONS

		Root mean square error					
		One period actual			Five periods ahead		
		actual	revised	change	actual	revised	change
Agirucltural and fisheries							
Linseed oil	73.3/5[a]	36.4	23.7	-34	126.9	30.3	-76
ground nut oil	74.1/5	27.1	8.8	-67	41.5	22.0	-47
soya oil	73.3/5	24.5	19.2	-21	47.5	30.9	-35
cotton Brazilian	73.2/5	3.6	2.3	-36	14.7	4.0	-73
cotton Mexico	73.2/5	6.4	2.3	-64	18.1	12.4	-31
cotton, Pima Peru	73.2/5	14.7	3.8	-74	32.7	4.7	-36
rice	73.3/5	22.95	15.4	-32	114.76	51.96	-55
sugar model 1	74.1/5	5.4	1.1	-79	10.4	2.6	-75
sugar model 2	74.1/5	5.2	1.2	-76	10.1	2.9	-71
bananas	73.3/7	62.3	57.3	-08	118.7	66.9	-44
cacao	73/2/5	7.6	5.6	-26	19.2	10.1	-47
coffee Colombia	72.3/5	3.3	2.7	-18	8.7	7.2	-17
coffee Santos	73.1/5	4.2	4.3	02	11.9	9.8	-18
shrimps	73.1/5	14.1	11.9	-15	36.1	28.2	-22
beef							
hides and skins	72.3/5	2.4	1.8	-25	5.5	3.0	-45
fish meal	72.4/7	25.8	14.4	-44	60.3	29.7	-51
wool Buenos Aires	72.4/7	11.9	11.5	- 0.3	28.3	16.3	-42
wool import Boston	72.4/7	23.4	7.0	-70	68.3	18.4	-73
wood	73.1/5	9.2	9.4	02	34.4	33.3	-03
maize	72.4/7	2.8	2.9	03	4.0	3.5	-03
newsprint	73.4/6	4.2	2.3	-45	12.0	3.6	- 7
wood pulp model 1	73.3/5	4.9	2.1	-57	27.5	13.5	-51
wood pulp model 2	73.3/5	4.4	2.0	-55	26.0	10.2	-61
wood pulp model 3	73.3/5	3.4	1.8	-47	22.6	11.5	-49
quebracho	74.1/4	0.7	0.4	-42	1.0	0.9	- 1
sisal	73.3/7	48.3	19.5	-59	165.8	52.6	-68
soybean meal	72.4/7	7.8	4.4	-43	21.0	12.9	-39
tobacco model 1	74.2/3	5.5	3.1	-44	7.4	5.1	-31
tobacco model 2	74.2/3	5.4	3.6	-33	7.7	6.7	-13
wheat	72.4/7	6.7	2.8	-58	18.9	7.7	-59
Metals							
Aluminium	74.1/5	1.1	0.6	-45	5.5	3.0	-45
bauxite		23.36			26.196		
copper	73.2/5	13.1	13.8	05	30.6	20.8	-32
tin	73.2/5	183.65	144.43	-21	653.75	437.24	-33
iron ore	74.1/5	1.07	0.53	-50	1.93	1.57	-19
manganese	73.3/5	12.25	10.06	-18	35.03	16.52	-53
nickel	74.1/5	5.84	4.65	-21	14.51	12.69	-13
silver New York	73.2/7	36.5	18.9	-48	104.2	45.8	-56
silver Peru	73.2/7	11.4	6.1	-47	33.4	26.9	-19
lead	73.2/5	11.4	11.5	01	39.7	38.1	-04
zinc	73.3/7	62.2	7.6	-87	378.7	389.9	03

a/ For calculation of corrected root mean square error, the column indicate the date of the first observations removed from the sample and the total number of observations removed.

Table VI indicates the variation in relative errors for the first and fifth periods in original and corrected form. For the one period ahead predictions, the mean error of the corrected series for agricultural and fisheries products was 0.088 while for metals it was 0.087. Most commodity price predictions fell quite close to this mean with only sugar, wool Buenos Aires, and copper having relatively large errors in comparison. The mean error for the five period ahead predictions was 0.192 for the former group and 0.221 for the latter. In this case a total of seven commodity price predictions had relative errors of over 0.30. These were Mexican cotton, sugar, rice, sisal, copper, lead and zinc.

The results for these seven products could imply one of three things: a) extreme errors have still not been entirely eliminated; b) the models had not been properly identified; c) or the large error reflects the basic randomness of the series. No choice can be made among these alternative hypotheses at this time but the results do not seem especially poor in the light of other studies with respect to series which are considerably more stable than prices.

In general, the results for these measures and the confidence intervals are the same. For series with large random components one can expect large RMSE's and wide confidence bounds around the expected point predictions. If there is some obvious contradiction between these measures it is generally due to extreme errors which influence more the RMSE than the confidence interval.

It is important to recognize that the ARMA model is the best predictor conditional on the choice of a prediction base. The best conditional prediction implies that no additional information can be obtained from the series itself which would allow for better predictions. In other words, deviation from the predictions are in general random and therefore essentially unpredictable.

The best conditional predictor, then, is one which captures systematic price movements but by definition sets all random movements to their conditional expectation of zero. It is usually

/ thought that

thought that the random components of price movements are large compared to the systematic components. In this case prediction errors can be quite large especially as one moves farther from the base period. But this outcome is just a reflection of the general uncertainty which one has about the more distant future.

IV. REVISION OF PROJECTIONS BY USE OF CORRECTION WEIGHTS

It is often the case that planners have additional information available to them beyond the base period of the prediction which could be used to modify the predictions based on the ARMA model. Moreover, revisions in the value of the base period estimates themselves will cause the need to revise the predictions. Making use of the correction weights provided in Appendix I alongside the predictions and confidence limits one can easily revise the predictions without going back to the original model by making use of the following formula.10/

$$X_{t+1} - P_{t+1} = e_{t+1}$$

$$P_{t+2} + (e_{t+1} \times PC_{t+1}) = P'_{t+1}$$

$$P_{t+3} + (e_{t+1} \times PC_{t+2}) = P'_{t+2}$$

$$\vdots$$

$$P_{t+N} + (e_{t+1} \times PC_{t+N-1}) = P'_{t+N-1}$$

where

- P_{t+1} is the prediction made for period t+1 from base period t
- X_{t+1} is the realized value of the series for period t+1
- e_{t+1} is the error of prediction for period t+1
- PC_{t+1} is the correction weight for period t+1
- P'_{t+1} is the new prediction for period t+2 (since this is the first prediction based on the new base period value (X_{t+1}), it is referred to as P'_{t+1}).

10/ If the model is logarithmic then all predictions and realized values of the series should be converted into natural logs before the calculation is made.

/ For example,

TABLE VI

COMMODITY PRICE PROJECTION: RELATIVE ROOT MEAN SQUARE ERRORS

	Relative root mean square errors			
	One period actual	Ahead projections corrected a/	Five period actual	Ahead projections corrected a/
Agriculture and Fisheries				
Linseed oil	0.164	0.153	0.571	0.195
ground nut oil	0.148	0.070	0.227	0.175
soya oil	0.125	0.121	0.243	0.195
cotton Brazilian	0.085	0.068	0.351	0.119
cotton Mexico	0.136	0.062	0.381	0.333
cotton Pima Peru	0.204	0.071	0.452	0.088
rice	0.112	0.110	0.561	0.372
sugar model 1	0.354	0.175	0.679	0.413
sugar model 2	0.340	0.193	0.660	0.465
bananas	0.089	0.094	0.169	0.109
cacao	0.142	0.121	0.359	0.219
coffee Colombia	0.054	0.045	0.141	0.120
coffee Santos	0.075	0.082	0.213	0.188
shrimps	0.101	0.095	0.258	0.225
beef	0.113	-	0.180	-
hides and skins	0.099	0.087	0.225	0.145
wool Buenos Aires	0.129	0.177	0.307	0.251
wool import Boston	0.168	0.077	0.490	0.201
wood	0.061	0.068	0.229	0.241
maize	0.097	0.104	0.135	0.125
newsprint	0.040	0.024	0.115	0.037
wood pulp model 1	0.043	0.020	0.244	0.131
wood pulp model 2	0.039	0.019	0.230	0.099
wood pulp model 3	0.030	0.017	0.201	0.111
quebracho	0.074	0.041	0.103	0.092
sisal	0.145	0.147	0.496	0.396
soybean meal	0.104	0.067	0.279	0.196
tobacco model 1	0.057	0.032	0.077	0.053
tobacco model 2	0.056	0.037	0.080	0.070
wheat	0.145	0.073	0.406	0.201
fish meal	0.182	0.140	0.425	0.288
metals				
Aluminium	0.037	0.022	0.187	0.111
bauxite	0.119	-	0.133	-
copper	0.185	0.23	0.432	0.350
tin	0.099	0.086	0.354	0.262
iron ore	0.103	0.060	0.187	0.177
manganese	0.088	0.078	0.251	0.129
nickel	0.053	0.045	0.130	0.124
silver New York	0.136	0.096	0.388	0.233
silver Peru	0.096	0.062	0.281	0.274
lead	0.084	0.096	0.293	0.318
zinc	0.237	0.062	1.439	0.139

a/ For explanation, see table V

For example, the predictions for Santos type coffee based on the ARMA model are entered in the following table under predictions. Since this model was originally estimated in natural logarithms all value except the correction weight must be converted to logs before the calculations are made.

TABLE VII

Santos type coffee: example of prediction revision based on correction weights

Quarter	Predictions	Revised predictions	Correction weights
1975.2	60.9854	(64.31)	1.3171
1975.3	59.7844	64.11	1.4177
1975.4	62.8043	67.71	1.4495
1976.1	63.4599	68.54	1.4596
1976.2	64.3458	69.53	1.1601
1976.3	64.9211	69.04	0.9692
1976.4	65.4977	68.95	0.8782
1977.1	64.7096	67.80	0.8397

The first entry under revised predictions is the supposed realized value of the series for the period 1975.2. The error of prediction for this period is then the difference between the log of the new observation for period t ! 1 and the original prediction for the same period (ln 64.31 - ln 60.99 = .053). Multiplying this by the first correction weight 1.3171 and adding to the log of the original prediction for 1975.3 (4.09) gives the revised prediction for this period in logarithms (4.16) or 64.11 cents. For the revised prediction of the period 1975.4 we have

$$.053 \times 1.417 \; ! \; \ln 62.80 = 4.21$$

or 67.71 cents.

The remaining revisions were carried out similarly. The revised prediction for the period 1975.3 would now be the first period ahead prediction based on the latest observation for period 1975.2.

/ One could

One could suppose that the planner had some additional knowledge which led him to believe that our prediction of 64.11 cents was too high for the period 1975.3. He could use his own estimates plus the correction weights of the ARMA models for the following periods and a similar process of revision could then be carried out. If he were to believe that the correct prediction for 1975.3 would be 63.00, we would then have a prediction error (ln 63.00-ln 64.11) of -.0175 for 1975.3 and our revised predictions for Santos coffee for 1975.4 forward are presented in Table VIII.

TABLE VIII

Santos Type Coffee: Example of Second Revision

Quarter	Predictions	Revised predictions	Correction weights
1975.3	64.11	(63.00)	1.3171
1975.4	67.71	66.17	1.4177
1976.1	68.54	66.86	1.4495
1976.2	69.53	67.79	1.4596
1976.3	69.04	67.30	1.1601
1976.4	68.95	67.56	0.9692
1977.1	67.80	66.66	0.8782

The importance of making the price revisions as new information is obtained is obvious. We are in fact able to employ the technique to advantage immediately, to "outguess" the prediction of the ARMA model with respect to aluminium and other seemingly explosive price series. The aluminium series as graphed in Graph I of Appendix II 1.1.a displays an impressive stability. Ignoring the last five observations, this series is characterized reasonably well by an auto-regressive model of orders one and five. Discounting these latest observations, the RMSE is only .6 cents for the one period ahead

/predictions and

predictions and 3 cents for the five period ahead predictions.

The stability of this series, however, leads to the estimation of a model which is significantly influenced by small variations in price. The model 11/ estimated is

$$P_t = 2.3P_{t-1} - 1.6\,P_{t-2} + .3P_{t-3} - .51P_{t-5} + 1.02P_{t-6} - .51P_{t-7}.$$

The sum of the coefficients of the model is equal to approximately 1 and therefore leads to the quite reasonable result that if aluminium prices remain constant for seven consecutive periods then the best prediction for the period t+1 is just the price for period t. As is evident from the graph, in Annex II.1.1.a, however, the last five period increase in the aluminium series leads to a set of explosive results for the prediction period.

Simply on the basis of what we have learned from the other price series studied here, we would expect that the last five period movement in aluminium prices is exceptional and that after the fifth or perhaps seventh period a downturn should occur. We would therefore estimate (guess) a price decline from 40.9 cents to 39.0 cents instead of a price increase of 46.81 cents for the second quarter of 1975. We can then revise the rest of the predictions for aluminium prices through 1977.1 as in Table IX.12/

11/ In natural logarithms

12/ Bauxite, groundnut oil and wood pulp were revised in the same fashion in Table X.

/Table IX

TABLE IX

Revised aluminium price predictions

Quarter	Predictions	Revised predictions	Correction weights
1975.2	46.8156	(39.00)	1.6974
1975.3	50.6751	37.16	2.4864
1975.4	56.3407	35.78	3.2476
1976.1	60.7965	33.59	4.0173
1976.2	65.2950	31.35	5.2954
1976.3	73.4393	27.92	6.2651
1976.4	79.1606	25.21	7.3749
1977.1	87.6228	22.78	8.4281

V. SUMMARY AND RECOMMENDATIONS

Projections for international prices of important Latin American export commodities have been presented for an approximately two year period ending in the first quarter of 1977. These projections have been reviewed and evaluated in the first part of this study and the actual projections presented in the first appendix. We have, moreover been careful in explaining the methodology utilized so that both the advantages and limitations of such price projections would be clear to the reader. We can summarize the points developed here in the following manner:

a. The model is a generalization of common statistical models commonly used for projection purposes but nevertheless is simple to estimate. The model rarely contains more than three or four autoregressive and moving average parameters.

b. The model captures the cyclical nature of price movements as well as trends making it useful for medium and short term planning.

/Table X

TABLE X

REVISED PREDICTIONS BASED ON CORRECTION WEIGHTS

Period	Predictions	Revised Predictions	Correction weights
Bauxite			
1975.1	375.5374	(280)	0.6523
1975.2	410.0295	338.57	0.4698
1975.3	443.0208	385.94	0.7971
1975.4	503.4685	398.42	0.7615
1976.1	567.4265	453.75	0.6338
1976.2	632.7520	525.33	0.7622
1976.3	723.1506	578.17	0.8083
1976.4	833.0505	657.88	0.7563
1977.1	957.5696	766.91	0.8056
Ground Nut Oil			
1975.2	334.8044	(300)	1.0425
1975.3	360.7249	321.72	0.9015
1975.4	388.6519	352.04	0.7605
1976.1	418.7412	385.21	0.6195
1976.2	451.1599	421.50	0.4785
1976.3	486.0884	461.22	0.3375
1976.4	523.7207	504.67	0.1965
1977.1	564.2673	552.23	0.0555
Wood Pulp			
Model 1			
1974.4	223.5528	(169.98)	1.6902
1975.1	257.2161	161.88	2.4764
1975.2	296.4438	150.42	3.2328
1975.3	341.4768	140.84	3.9985
1975.4	393.4141	131.55	4.7613
1976.1	453.2278	122.97	5.5249
1976.2	522.1426	114.93	6.2884
1976.3	601.5330	107.41	7.0518
1976.4	692.9951	100.39	7.8153
1977.1	798.3633	93.82	8.5788
Model 2			
1974.4	213.8768	(169.98)	1.7909
1975.1	231.7383	153.58	2.4164
1975.2	246.9139	141.73	2.9111
1975.3	259.6155	133.02	3.3024
1975.4	270.1206	126.50	3.6119
1976.1	278.7280	121.57	3.8566
1976.2	285.7275	117.81	4.0502
1976.3	291.3860	114.92	4.2033
1976.4	295.9390	112.68	4.3244
1977.1	299.5889	110.94	4.4201
Model 3			
1974.4	220.4653	(169.98)	2.0000
1975.1	250.4853	148.90	3.0000
1975.2	282.2695	129.37	4.0000
1975.3	311.0461	109.91	5.0000
1975.4	339.2068	92.42	6.0000
1976.1	344.4326	72.35	7.0000
1976.2	352.4612	57.08	8.0000
1976.3	372.2922	46.49	8.4363
1976.4	392.4565	43.75	8.8726
1977.1	414.6699	41.27	9.3089

c. Interval and point projections are necessary for proper planning in the light of uncertainty. The model generates both sorts of projections.

d. As new observations become available the projections can be revised without the necessity of utilizing the original model. It is therefore possible to monitor actual price movements with respect to expected movements leading to the modification of plans as expectations change.

e. The quality of the predictions made with the model is readily evaluated and can therefore be compared systematically with other projections and projection methods available to the planner.

There is, of course, much that remains to be done with respect to such statistical models as described here. We might take for example the Relative Root Mean Square Error corrected for the most recent price increases as a guide to problem models. The mean of the RRMSE's could be used to indicate normality and one could then concentrate his attention on those series which performed poorly relative to this mean. One could and should also study the predictions made through time against new observations as they become available and accumulate a set of errors for the outside sample prediction period. Outside sample period predictions are, of course, the only predictions of real interest to the planner and it is therefore essential that statistical models be evaluated for such predictions as well as for the within sample period prediction presented in this study.

The methodology itself can be generalized further incorporating new ideas which are still in the process of development and remain relatively untried. Instead of the univariate model with future prices being determined by past price history exclusively, we could introduce an independent variable into the model which is both theoretically and statistically justified. Statistically, the independent variable would have to fulfill the same set of conditions as the dependent variable (normality, constant variance, constant covariance) and in addition be non-correlated with the error term. The independent variable, moreover, would have to be theoretically relevant in explaining

/movements in

movements in the dependent variable. The logical candidate in the price series would be production volume although other relevant variables could be relative prices, cyclical patterns in the major consumer markets, etc.

For forecasting purposes in the independent variable would be predicted from a univariate ARMA model as was done in this study while the dependent variable would be predicted as a result of the more complex model. The lag process governing movements in each variable independently would be determined through use of the separate autocorrelation functions as done here for the univariate model while a cross-correlation function would be utilized to investigate interdependent lag structures.

From a statistical point of view the bivariate model, is a generalization of the univariate model and assuming that all statistical requirements are met should lead to better predictions than the univariate model. Moreover, prices would no longer be rigidly determined with little intervention on the part of planners possible. The bivariate model leads directly to considerations of optimal control based on the assumption that the independent variable is also a policy variable or can be affected by policy instruments. Such an analytical instrument would be of great use on the international level among commodity producers but could also be used on the national or subnational level if the market is organized monopolistically.

Naturally, the bivariate model is much more difficult to work with than the univariate model, and could not be applied to every case where the univariate model would be relevant. In some cases where the costs of developing the bivariate model are large, it would probably not be worthwhile. But for price models as developed here, the importance of the bivariate model is obvious and it will be of great interest to see if such models are someday developed.

But the univariate model by itself has been quite fruitful in increasing our (statistical) understanding of cyclical price movements. The predictions are at least reasonable in comparison to the only other set of predictions made independently and in the form that they have been presented are of great use in medium term planning. Hopefully, the questions raised by the objections made to these models will stimulate further research in as many directions as possible.

APPENDIX I

MODELS, PREDICTIONS AND PREDICTION ERRORS

In the following tables and graphs, the actual prediction of individual commodity prices is presented along with a description of the ARMA models, within sample prediction errors, correction weights and confidence limits. Since these tables are all presented in Spanish, translations of the more important terms is presented in the glossary that follows:

GLOSSARY OF SPANISH TERMS AND ENGLISH EQUIVALENTS

Autoregresivo regular	Regular autoregressive
Autoregresivo estacional	Seasonal autoregressive
Características	Characteristics
Cuadro	Table
Diferencias	Differences
Diferencias regulares	Regular differences
Diferencias estacionales de orden	Seasonal differences of order
Exportación	Export
Error	Error
Indice	Index
Intervalo abscisa	Unit value along the absciss
Límite confianza inferior	Lower confidence limit
Límite confianza superior	Upper confidence limit
Modelo Logarítmico	Logarithmic model
Modelo y Predicciones	Model and predictions
Número	Number
Observaciones	Observations
Orden	Order
Parámetros del modelo	Parameters of the model
Período	Period
Período base	Base period

/Período de

Período de muestra	Sample period
Período de predicción	Prediction period
Pesos de corrección	Correction weights
Predicciones para el período	Predictions for the period
Promedio	Mean
Promedio móvil regular	Regular moving average
Promedio móvil estacional	Seasonal moving average
Raíz error medioccuadrático	Root mean square error
Raíz error medio cuadrático relativo	Relative root mean square error
Serie	Series
Tendencias	Trends
Trimestre	Quarter
Valores	Values

/Appendix II

APPENDIX II

A FORMAL DESCRIPTION OF THE ARMA MODEL

The basic idea behind the Box Jenkins model is that a series of random shocks a_t with zero mean and constant variance σ_{at} affect a particular variable z at time t in some linearly functional way. The random shocks are commonly known as "white noise" which are functionally transformed by a "linear filter" ψ (B) to act on z_t as in Figure 1.

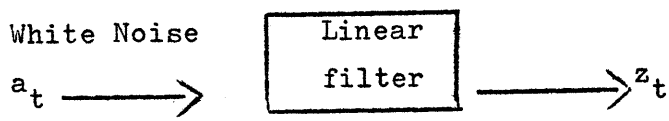


Figure 1

This process then may be represented as a weighted sum of previous observations on the white noise as in (1).

$$(1) \quad z_t = u + a_t + \psi_1 a_{t-1} + \psi_2 a_{t-2} + \cdots\cdots$$

where the weights are either finite or infinite and convergent. u is a parameter which determines the level of the process and for convenience we let $\tilde{z}_t = z_t - u$. Using a backwards shift operator ($B\tilde{z}_t = \tilde{z}_{t-1}$; $B^m \tilde{z}_t = \tilde{z}_{t-m}$) and a linear filter operator $\psi(B) = 1 + \psi_1 B + \psi_2 B^2 + \ldots$ eq. 1 may be written economically as

$$(1) \quad \tilde{z}_t = \psi(B)\, a_t$$

Instead of making $\tilde{z}_t$ dependent on an infinite and converging weighted sum of a_i's, one can assume that $\tilde{z}_t$ is dependent only on a finite number of the a_i's. This is the so-called moving average model although the weights are not restricted to sum to one or to be positive.

Defining a moving average operator of order q

$$\theta^q(B) = 1 - \theta_1 B - \theta_2 B^2 - \ldots - \theta_q B^q$$

/ The MA model

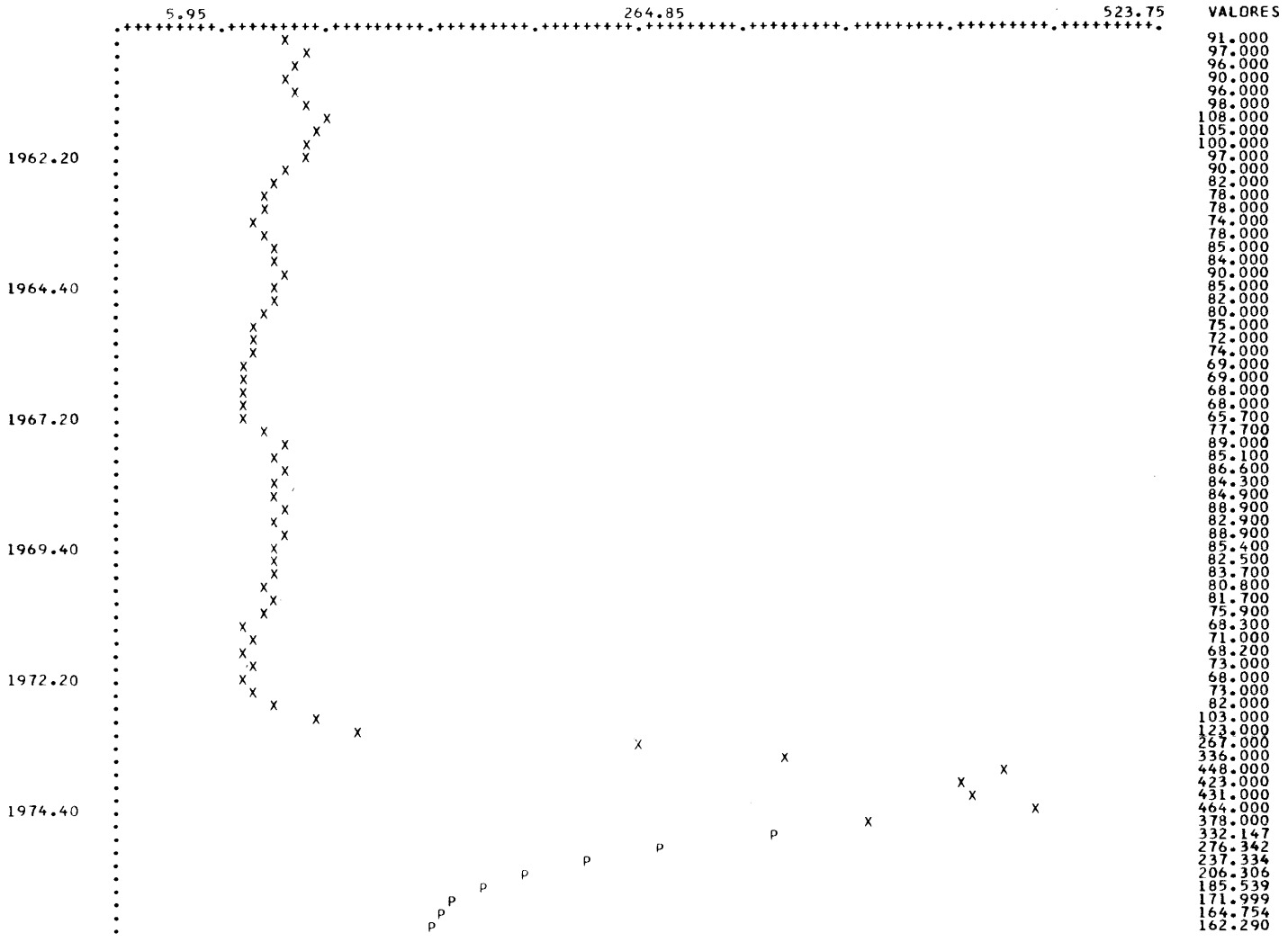
Anexo I.1.1.a

GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

ACEITE LINAZA UK IMPORT CIF BULK LB/LONG TON AJUSTADAS

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 5.178

CUADRO I-- MODELO Y PREDICCIONES

Anexo I.1.1.b

LA SERIE - ACEITE LINAZA UK IMPORT CIF BULK LB/LONG TON AJUSTADAS 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	1.22090
2	AUTOREGRESIVO REGULAR	3	-0.35320
3	PROMEDIO MOVIL REGULAR	1	0.84260

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	36.357	57.283	88.059	108.640	126.869
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.164	0.258	0.397	0.489	0.571

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	289.7410	332.1472	380.7600	1.3783
1975.30	218.9939	276.3418	348.7070	1.8402
1975.40	168.5127	237.3342	334.2622	2.0509
1976.10	132.5453	206.3059	321.1133	2.174[illegible]
1976.20	108.8949	185.5395	316.1292	2.1623
1976.30	93.5249	171.9985	316.3162	2.0729
1976.40	84.1510	164.7536	322.5601	1.920[illegible]
1977.10	78.8983	162.2896	333.8203	1.7381

Anexo I.1.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA ACEITE LINAZA UK IMPORT CIF BULK LB/LONG TON AJUSTADAS

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	89.0000	0.0	0.0	0.0	0.0	0.0
1968.10	85.1000	99.7709	0.0	0.0	0.0	0.0
1968.20	86.6000	86.8239	108.1049	0.0	0.0	0.0
1968.30	84.3000	84.5084	84.8098	113.6462	0.0	0.0
1968.40	84.9000	83.0484	83.3315	83.7287	116.0211	0.0
1969.10	88.8999	83.5447	81.0437	81.4129	81.8455	115.6637
1969.20	82.9000	90.0960	82.701[illegible]	79.4133	79.8167	80.2564
1969.30	88.8999	81.4473	91.3489	81.4801	77.8773	78.2970
1969.40	85.4000	88.4810	78.4224	91.4038	80.4688	76.7015
1970.10	82.5000	85.8714	90.1704	76.7[illegible]24	91.[illegible]403	79.5355
1970.20	83.7000	79.8130	84.342[illegible]	90.0273	75.[illegible]299	90.1574
1970.30	80.8000	83.0123	77.7469	83.6926	68.[illegible]029	74.3999
1970.40	81.6999	80.1489	83.1892	76.2192	82.7944	89.3740
1971.10	75.9000	81.0711	78.9574	82.9815	75.2709	82.1706
1971.20	68.3000	74.2548	81.3163	78.4983	82.9699	74.3193
1971.30	71.0000	64.1754	72.0121	81.2981	78.1645	82.0935
1971.40	68.2000	70.1664	61.0429	71.1935	81.4980	78.1712
1972.10	73.0000	69.0296	71.7877	59.6054	70.7522	81.6555
1972.20	68.0000	74.6406	69.1034	72.8142	59.1840	70.9815
1972.30	73.0000	68.4158	77.7913	70.1839	74.3969	59.7198
1972.40	82.0000	73.5830	67.2907	79.8767	71.2212	75.7623
1973.10	102.9999	88.4522	76.1866	67.6156	81.8537	72.4812
1973.20	123.0000	116.7162	94.6207	77.5232	67.8681	83.1113
1973.30	267.0000	140.2731	130.4924	98.6047	78.9648	68.5781
1973.40	336.0000	368.9443	151.9411	137.9646	108.8595	79.7755
1974.10	448.0002	452.0913	514.2979	157.3333	141.2913	101.4660
1974.20	422.9998	487.8130	493.9634	586.7397	156.7312	139.8413
1974.30	430.9998	410.0171	499.0415	507.4604	61[illegible].7690	151.6582
1974.40	464.0002	381.9612	356.5701	463.5269	472.2510	578.7681
1975.10	378.0002	439.7910	336.3428	306.8291	411.0281	419.2356

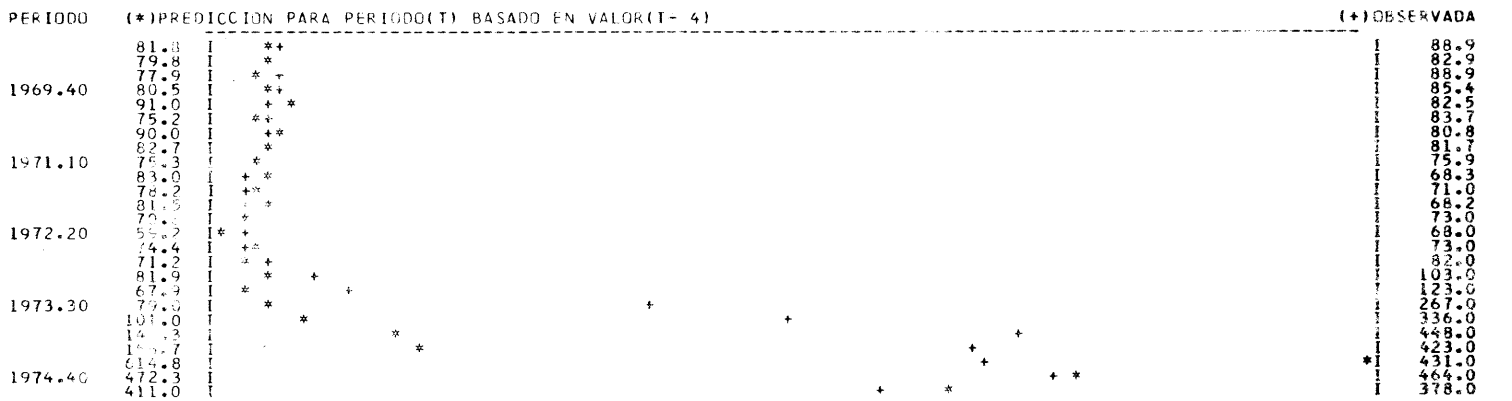
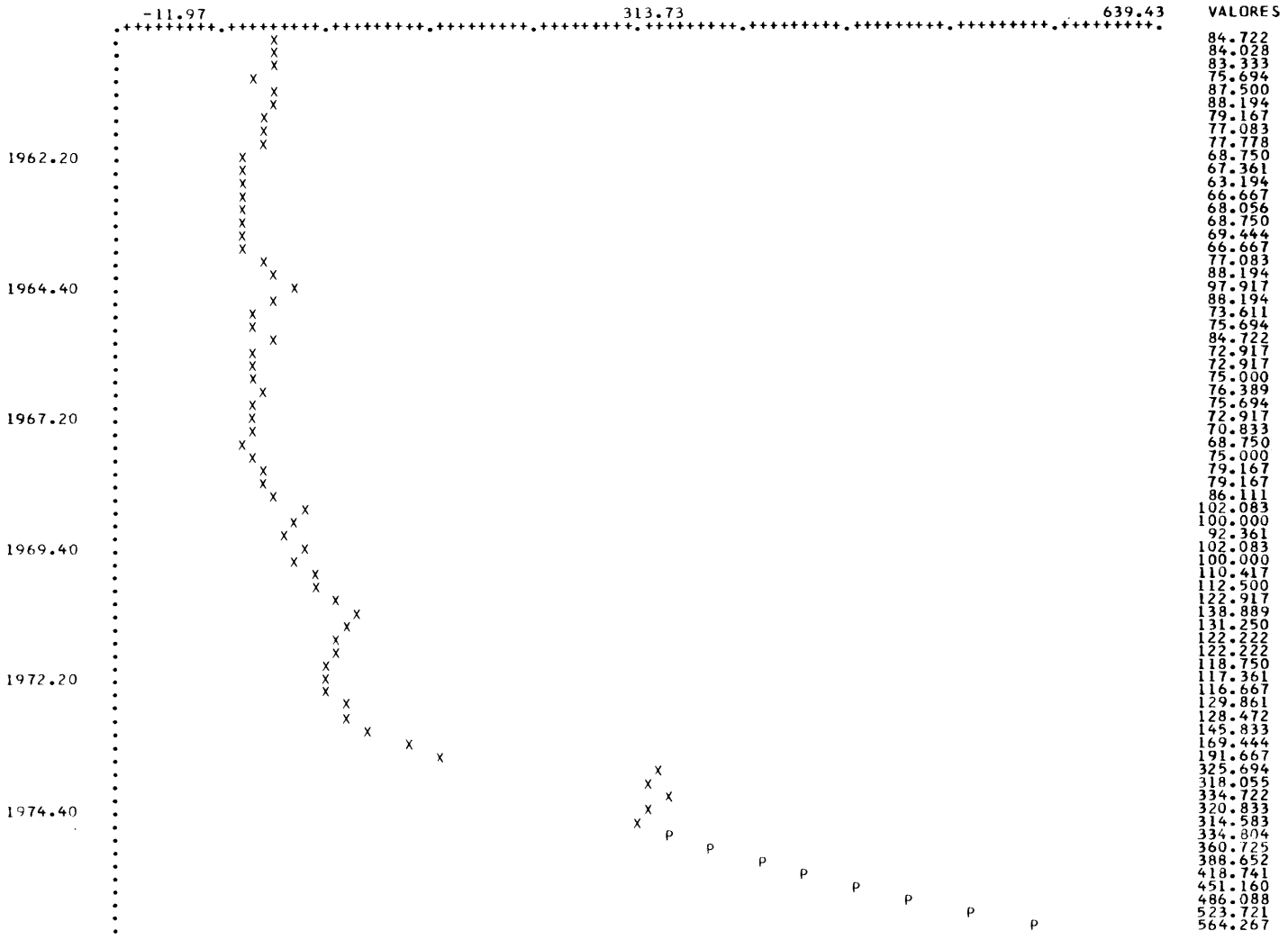


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

ACEITE MANI INDICE EXPORTACION DE BRASIL,ARGENTINA

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 6.514

Anexo I.2.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - ACEITE MANI INDICE EXPORTACION DE BRASIL,ARGENTINA — 61 OBSERVACIONES

DIFERENCIAS - 2 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 — MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	PROMEDIO MOVIL REGULAR	1	0.95750
2	PROMEDIO MOVIL REGULAR	2	0.18350

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	27.109	35.009	41.398	44.866	41.495
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.148	0.191	0.226	0.245	0.227

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

BASE DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	300.0065	334.8044	373.6387	1.0425
1975.30	307.3406	360.7249	422.6936	0.9015
1975.40	322.4067	388.6519	468.5081	0.7605
1976.10	341.2492	418.7412	513.8401	0.6195
1976.20	363.6403	451.1599	559.7429	0.4785
1976.30	389.3320	486.0884	606.8901	0.3375
1976.40	418.1885	523.7207	655.8848	0.1965
1977.10	450.1001	564.2673	707.3923	0.0555

Anexo I.2.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA ACEITE MANI INDICE EXPORTACION DE BRASIL,ARGENTINA

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	69.7500	0.0	0.0	0.0	0.0	0.0
1968.10	74.9999	71.4651	0.0	0.0	0.0	0.0
1968.20	79.1667	79.0039	75.1317	0.0	0.0	0.0
1968.30	79.1667	82.6707	82.5001	78.9866	0.0	0.0
1968.40	86.1111	82.4886	86.2984	86.1445	83.0392	0.0
1969.10	102.0833	90.6057	86.6353	90.0853	89.9498	87.2997
1969.20	100.0000	107.1094	94.5860	90.9914	94.0384	93.9233
1969.30	92.3611	102.3528	109.9500	98.7412	95.5660	98.1649
1969.40	102.0833	95.3161	106.0895	112.8658	103.0789	100.3706
1970.10	100.0000	107.6673	100.2372	109.9628	115.8591	107.6072
1970.20	110.4166	103.8243	112.1363	105.4124	113.9774	118.9317
1970.30	112.5000	116.5082	109.2660	116.7908	110.8547	118.1385
1970.40	122.9166	117.1986	121.5549	114.9930	121.6385	116.5780
1971.10	128.8889	129.1367	122.3802	126.8202	121.0201	126.6875
1971.20	131.2500	145.0955	134.4907	128.8374	132.3136	127.3631
1971.30	122.2223	134.7197	149.5677	140.0667	135.0833	138.0449
1971.40	122.2223	127.2559	140.8499	154.1778	145.8739	141.6319
1972.10	[illegible]	129.3277	134.8850	147.2587	158.9301	151.9218
1972.20	[illegible]	126.1293	137.8633	142.9715	153.9592	163.8287
1972.30	[illegible]	126.2341	136.0813	146.9623	151.5428	160.9646
1972.40	129.3611	125.7321	137.5850	146.8186	156.6618	160.6280
1973.10	128.4722	143.2492	139.2713	149.9565	158.4030	167.0015
1973.20	135.8333	140.4508	157.3537	153.9316	163.4404	170.9015
1973.30	152.4445	162.9120	156.6435	172.8241	169.6479	178.1368
1973.40	141.6667	158.3006	181.7393	174.7142	189.8154	186.9688
1974.10	325.6941	211.6240	297.7594	200.5168	194.8634	208.4771
1974.20	318.0554	365.0686	232.9308	229.2102	222.4587	217.3363
1974.30	334.7222	327.4634	375.0792	256.3171	252.8863	246.8016
1974.40	320.9333	353.7817	345.7875	391.5471	232.0874	279.0076
1975.10	314.5835	336.3401	372.4253	365.1372	405.4980	310.4490

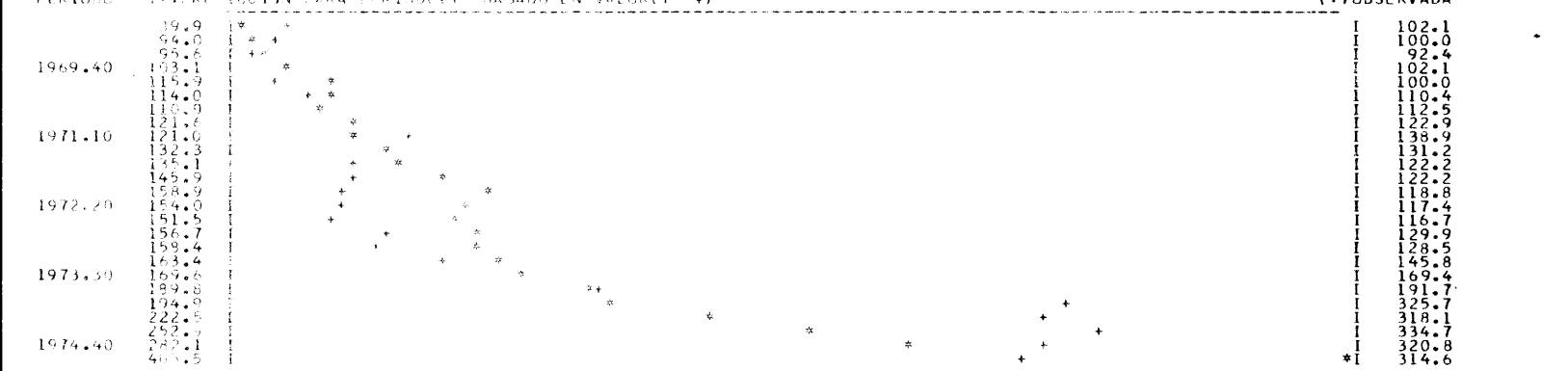
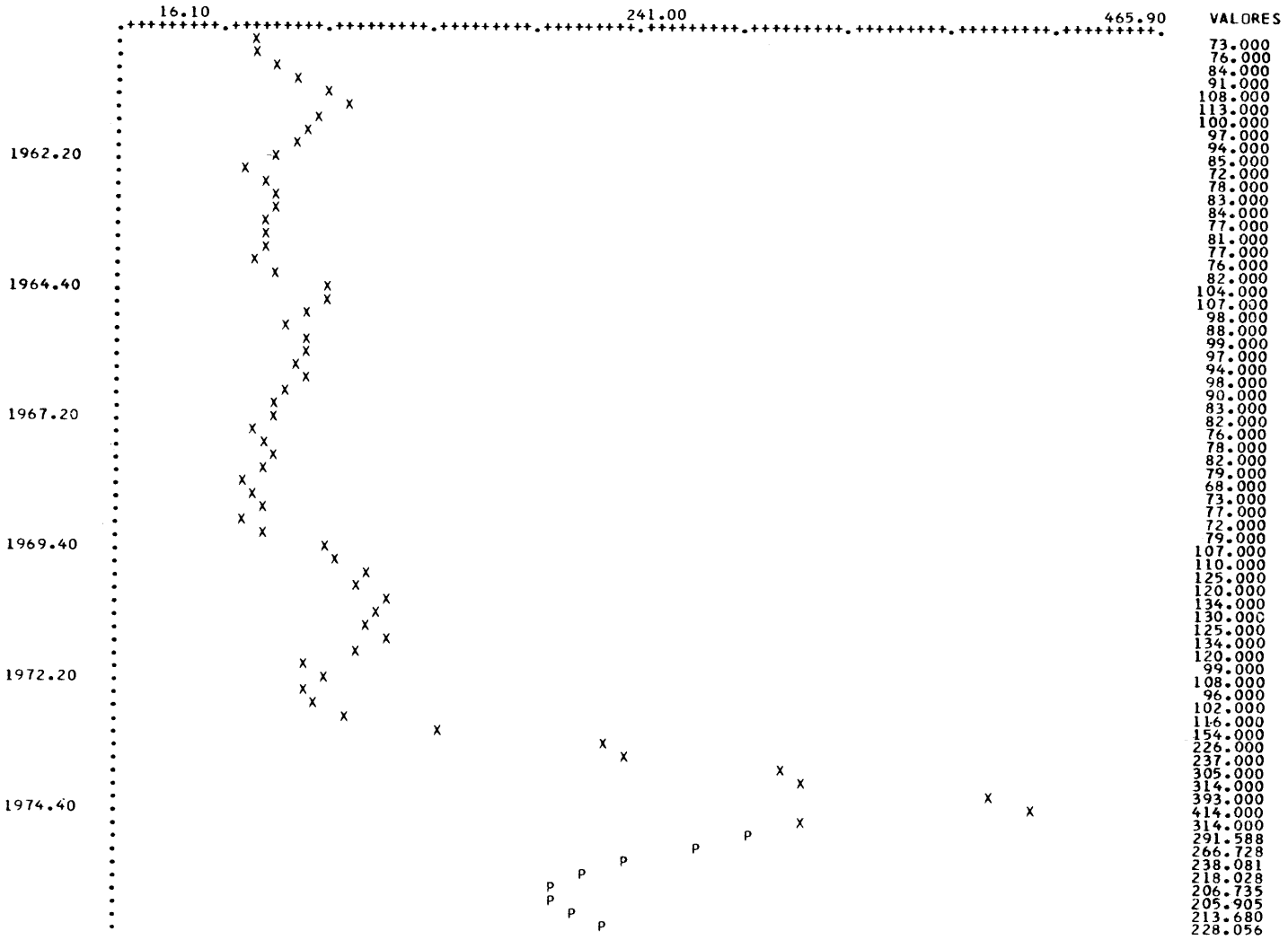


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

ACEITE SOYA ROTTERDAM LB/LTON EXPORTACION DE BRASIL

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 4.498

Anexo I.3.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - ACEITE SOYA ROTTERDAM LB/LTON EXPORTACION DE BRASIL 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	1.08120
2	AUTOREGRESIVO REGULAR	3	-0.47070
3	PROMEDIO MOVIL REGULAR	1	1.20960
4	PROMEDIO MOVIL REGULAR	3	-0.76850

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	24.459	26.709	30.455	39.308	47.529
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.125	0.137	0.156	0.201	0.243

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	258.7678	291.5879	328.5703	0.8716
1975.30	227.6540	266.7278	312.5076	0.7328
1975.40	198.6709	238.0811	285.3091	0.8805
1976.10	176.8565	218.0284	268.7852	1.1006
1976.20	161.4684	206.7355	264.6926	1.4040
1976.30	152.7480	205.9053	277.5618	1.6624
1976.40	149.2906	213.6803	305.8413	1.8382
1977.10	149.7779	228.0556	347.2427	1.8856

Anexo I.3.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA ACEITE SOYA ROTTERDAM LB/LTON EXPORTACION DE BRASIL

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	78.0000	0.0	0.0	0.0	0.0	0.0
1968.10	82.0000	77.9980	0.0	0.0	0.0	0.0
1968.20	79.0000	77.4175	74.1138	0.0	0.0	0.0
1968.30	68.0000	73.0004	71.7241	69.1419	0.0	0.0
1968.40	73.0000	63.9520	68.0321	67.0307	64.1418	0.0
1969.10	77.0000	69.4221	61.8597	65.1611	64.0105	60.5807
1969.20	72.0000	73.1282	66.8141	60.6396	64.5489	63.1273
1969.30	79.0000	73.0523	74.0490	68.6355	61.0871	66.0489
1969.40	107.0000	83.8973	78.3644	79.2622	72.3520	62.5462
1970.10	110.0000	112.8748	91.3113	86.2213	87.4097	77.9901
1970.20	125.0000	118.8738	121.5771	101.7288	94.9540	96.5928
1970.30	120.0000	141.1564	135.1072	137.6854	111.1421	101.9682
1970.40	134.0000	135.2227	155.7807	150.1486	153.5980	117.5231
1971.10	130.0000	149.3931	150.5806	169.6067	162.2656	166.9389
1971.20	125.0000	133.9394	151.1967	152.2063	175.5991	166.1503
1971.30	134.0000	122.7976	130.4176	144.4067	145.5661	174.0499
1971.40	120.0000	118.4886	109.8069	115.5078	130.5517	131.8633
1972.10	99.0000	101.3145	100.2012	93.9919	99.8855	116.4039
1972.20	108.0000	85.5796	87.3208	86.5133	80.1125	86.4404
1972.30	96.0000	95.2432	77.7599	79.0879	78.2100	71.0448
1972.40	102.0000	90.0366	89.4176	75.4005	76.9503	75.8842
1973.10	115.9999	107.4985	96.4224	95.8648	78.1060	80.1180
1973.20	154.0001	129.2961	120.9971	110.4261	109.6593	84.8840
1973.30	226.0000	181.1214	155.5195	147.0833	131.7825	130.6397
1973.40	237.0001	261.2429	215.4013	189.4990	177.2163	154.4796
1974.10	305.0000	280.9673	305.8584	260.0588	222.9535	205.0384
1974.20	313.9998	359.0053	334.2212	358.9441	295.3[illegible]	243.6720
1974.30	392.9998	345.7241	388.5369	365.8582	398.6143	312.4216
1974.40	413.9998	405.7573	362.8694	400.2915	372.3850	414.5181
1975.10	313.9998	380.3901	373.7805	340.2729	382.8650	349.7964

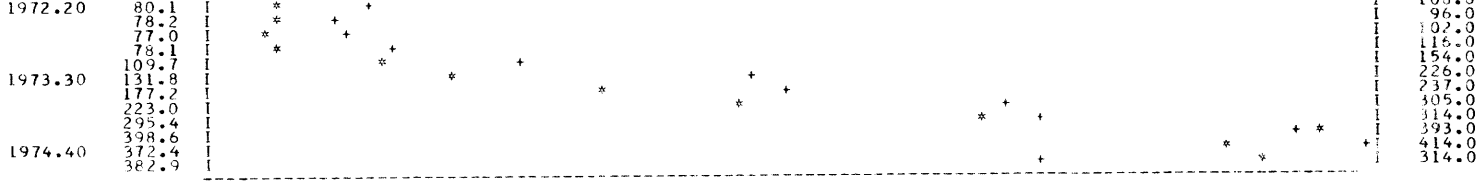
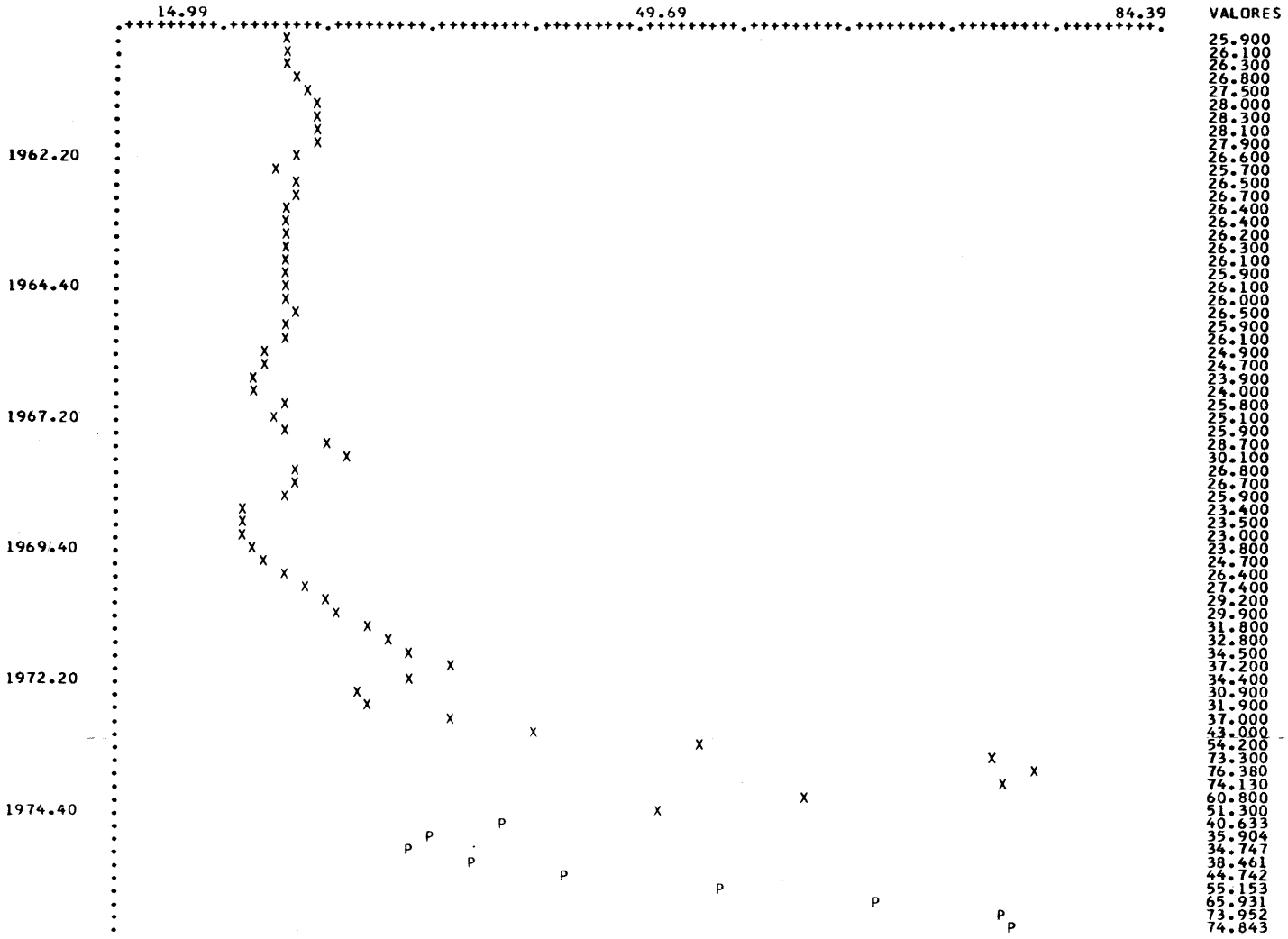


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

ALGODON BRAZILIAN 5 UK DOM IMPORT CIF LIVERPOOL SPOT CENTS/LB

PERIODO DE MUESTRA I TRIMESTRE,1960 AL IV TRIMESTRE, 1974

PERIODO DE PREDICCION I TRIMESTRE,1975 AL I TRIMESTRE, 1977



INTERVALO ABSCISA ES 0.694

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - ALGODON BRAZILIAN 5 UK DOM IMPORT CIF LIVERPOOL SPOT CENTS/LB 60 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 MODELO LOGARITMICO

NUMERO	PARAMETROS DEL MODELO CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	0.48320
2	AUTOREGRESIVO REGULAR	5	-0.53670
3	TENDENCIA CONSTANTE	0	0.01100

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	3.569	6.453	9.832	12.709	14.688
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.085	0.154	0.235	0.304	0.351

PREDICCIONES PARA EL PERIODO I TRIMESTRE,1975 AL I TRIMESTRE, 1977
CON PERIODO BASE =1974.40 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.10	37.9180	40.6327	43.5417	1.4832
1975.20	31.7262	35.9035	40.6309	1.7167
1975.30	29.2726	34.7469	41.2449	1.8295
1975.40	31.0809	38.4614	47.5943	1.8840
1976.10	34.8544	44.7420	57.4345	1.3736
1976.20	42.2213	55.1530	72.0454	0.8677
1976.30	50.1372	65.9306	86.6989	0.4979
1976.40	56.1162	73.9523	97.4574	0.2587
1977.10	56.7589	74.8426	98.6878	0.1138

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA ALGODON BRAZILIAN 5 UK DOM IMPORT CIF LIVERPOOL SPOT CENTS/LB

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.30	25.9000	0.0	0.0	0.0	0.0	0.0
1967.40	28.7000	27.0604	0.0	0.0	0.0	0.0
1968.10	30.1000	30.4247	27.8826	0.0	0.0	0.0
1968.20	26.8000	29.9557	30.4363	27.5128	0.0	0.0
1968.30	26.7000	25.9988	30.6662	31.2363	28.0492	0.0
1968.40	25.9000	26.4966	25.4711	30.8348	31.4462	28.1472
1969.10	23.4000	24.4210	25.2600	24.1320	29.5829	30.1871
1969.20	23.5000	21.9578	23.3938	24.3264	23.1704	28.5770
1969.30	23.0000	25.3399	22.9130	24.6561	25.7050	24.4480
1969.40	23.8000	23.0601	26.6239	23.6954	25.6212	26.7444
1970.10	24.7000	24.8667	23.7289	28.0227	24.7502	26.8241
1970.20	26.4000	26.8486	27.1178	25.6869	30.6684	26.9869
1970.30	27.4000	27.5013	28.1973	28.5248	26.9235	32.3151
1970.40	29.2000	28.5325	28.6892	29.5312	29.8969	28.1700
1971.10	29.9000	29.8911	28.8833	29.0670	29.9769	30.3593
1971.20	31.8000	29.9755	29.9623	28.7962	28.9914	29.9265
1971.30	32.8000	31.9608	29.2790	29.2641	28.0520	28.2478
1971.40	34.5000	32.9975	31.7531	28.6902	28.6746	27.4522
1972.10	37.2000	34.5437	32.3359	30.9288	27.7598	27.7442
1972.20	34.4000	38.5132	34.5055	31.9662	30.4858	27.2742
1972.30	30.9000	32.4006	38.3093	33.7343	31.0951	29.6132
1972.40	31.9000	29.1743	31.3001	37.9971	33.1809	30.5108
1973.10	37.0000	31.8766	27.9215	30.2895	37.2418	32.3903
1973.20	43.0000	38.5957	30.9407	26.5424	28.9479	35.8121
1973.30	54.2000	48.7551	41.5350	32.1583	27.3103	29.8625
1973.40	73.3000	64.9175	55.4833	46.0896	35.0896	29.6550
1974.10	76.3800	84.2958	70.4009	58.7013	48.1715	36.3779
1974.20	74.1299	72.7484	84.2060	68.3599	56.3226	45.9481
1974.30	60.8000	68.1499	66.2747	78.4994	62.8600	51.4931
1974.40	51.3000	49.3317	58.4300	56.5732	67.7580	53.9007

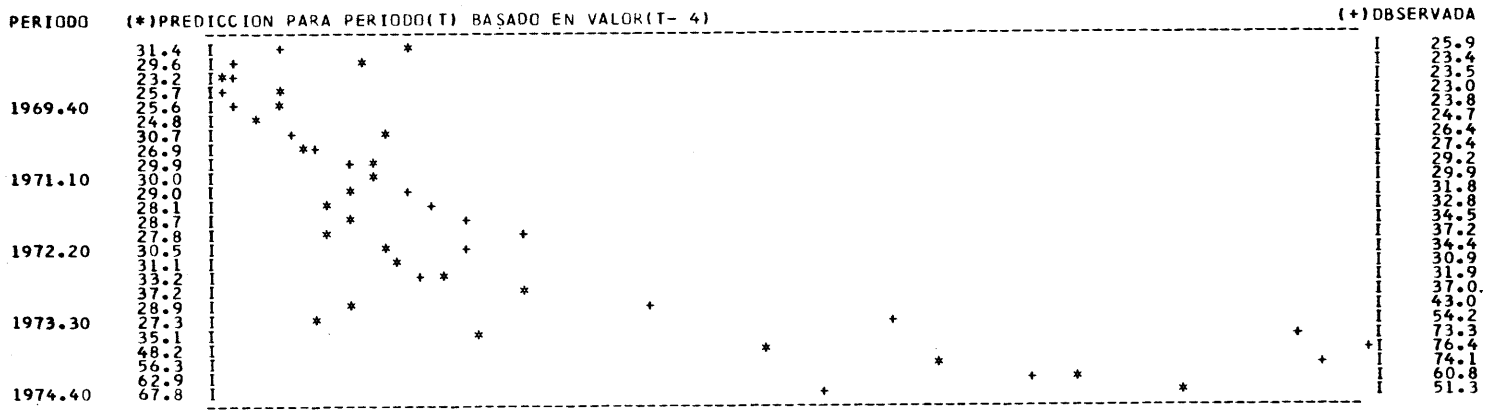
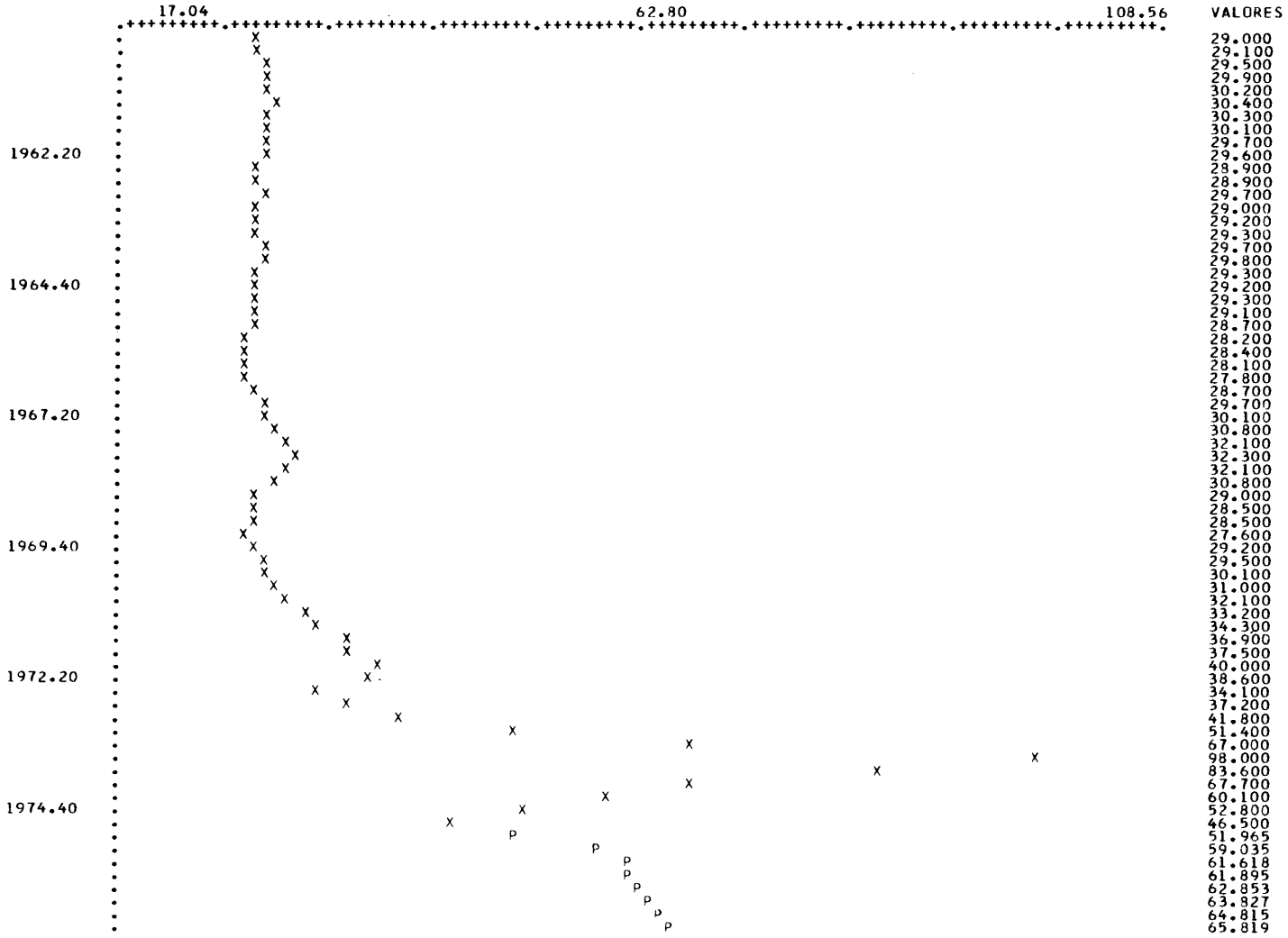


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

ALGODON MEX UK DOM IMPORT CIF LIVERPOOL SM 1 1/16 UN MONTHLY CENTS/LB

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 0.915

Anexo I.5.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - ALGODON MEX UK DOM IMPORT CIF LIVERPOOL SM 1 1/16 UN MONTHLY CENTS/LB 61 OBSERVACIONES

DIFERENCIAS - 2 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	PROMEDIO MOVIL REGULAR	1	0.47870
2	PROMEDIO MOVIL REGULAR	4	0.56780
3	PROMEDIO MOVIL REGULAR	5	0.69930

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	6.435	9.932	13.314	16.467	18.080
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.136	0.209	0.281	0.347	0.381

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	48.2534	51.9651	55.9622	1.5213
1975.30	51.5846	59.0353	67.5621	2.0426
1975.40	50.3094	61.6181	75.4689	2.5639
1976.10	46.8787	61.8948	81.7209	2.5174
1976.20	44.9754	62.8533	87.8377	1.7716
1976.30	44.5518	63.8266	91.4402	1.0258
1976.40	44.8836	64.8150	93.5972	0.2800
1977.10	45.5519	65.8186	95.1022	-0.4658

Anexo I.5.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA ALGODON MEX UK DOM IMPORT CIF LIVERPOOL SM 1 1/16 UN MONTHLY CENTS

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	32.1000	0.0	0.0	0.0	0.0	0.0
1968.10	32.3000	32.5749	0.0	0.0	0.0	0.0
1968.20	32.1000	33.2326	33.6638	0.0	0.0	0.0
1968.30	30.8000	32.5890	34.3543	34.9541	0.0	0.0
1968.40	29.0000	29.3566	31.9896	34.3375	35.0917	0.0
1969.10	28.5000	26.7745	27.2770	30.6113	33.4574	34.1788
1969.20	28.5000	27.8890	25.3612	26.0023	30.0525	32.7936
1969.30	27.6000	29.8396	28.8718	25.4139	26.2229	30.2279
1969.40	29.2000	29.0639	32.7267	31.3095	26.6768	27.5104
1970.10	29.5000	30.0052	29.7928	34.9399	33.0514	28.2428
1970.20	30.1000	28.4105	29.1540	28.8772	35.2720	33.3992
1970.30	31.0000	30.7581	28.1704	29.1647	28.8176	35.0717
1970.40	32.1000	33.5020	33.1051	29.4206	30.7299	30.3707
1971.10	33.2000	34.1433	36.4376	35.8592	30.9228	32.2735
1971.20	34.3000	34.0807	35.5646	38.8097	38.0380	32.8899
1971.30	36.9000	33.7785	33.4505	35.4205	39.5236	38.7518
1971.40	37.5000	38.7745	33.8961	33.4549	35.9464	40.0307
1972.10	40.0000	40.5393	42.6538	35.6083	35.0275	37.5870
1972.20	38.6000	43.6314	44.5296	47.6756	38.0083	37.3996
1972.30	34.1000	37.3976	45.0605	46.3102	50.4535	40.3886
1972.40	37.2000	30.1655	34.7135	44.5852	46.1428	50.1930
1973.10	41.8000	37.8623	27.5245	33.2358	45.5028	47.0631
1973.20	51.4000	48.4755	41.7016	27.1776	34.4347	46.8763
1973.30	67.0000	70.5579	64.5420	52.7319	30.8089	38.8684
1973.40	98.0000	84.7793	91.7222	81.3783	63.1452	37.2543
1974.10	83.6000	109.1926	87.5887	97.3524	83.7758	65.3053
1974.20	67.7000	73.1503	109.8163	81.6794	93.2664	80.4787
1974.30	60.1000	56.2388	63.2693	109.1712	75.2913	85.7656
1974.40	52.8000	49.3553	44.6131	52.2576	103.6401	71.9599
1975.10	46.5000	47.2295	42.6226	37.2164	45.3892	88.9072

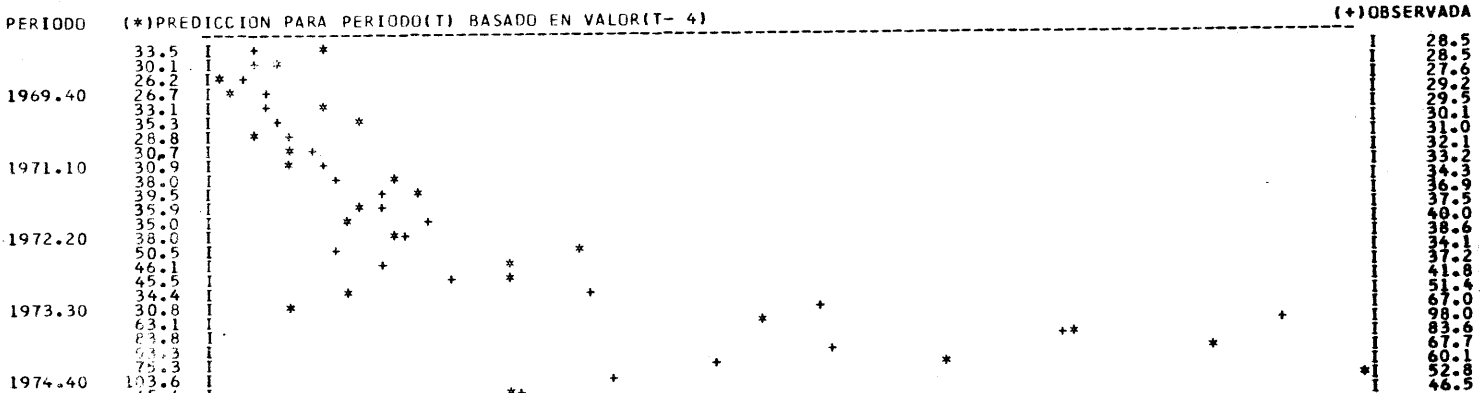
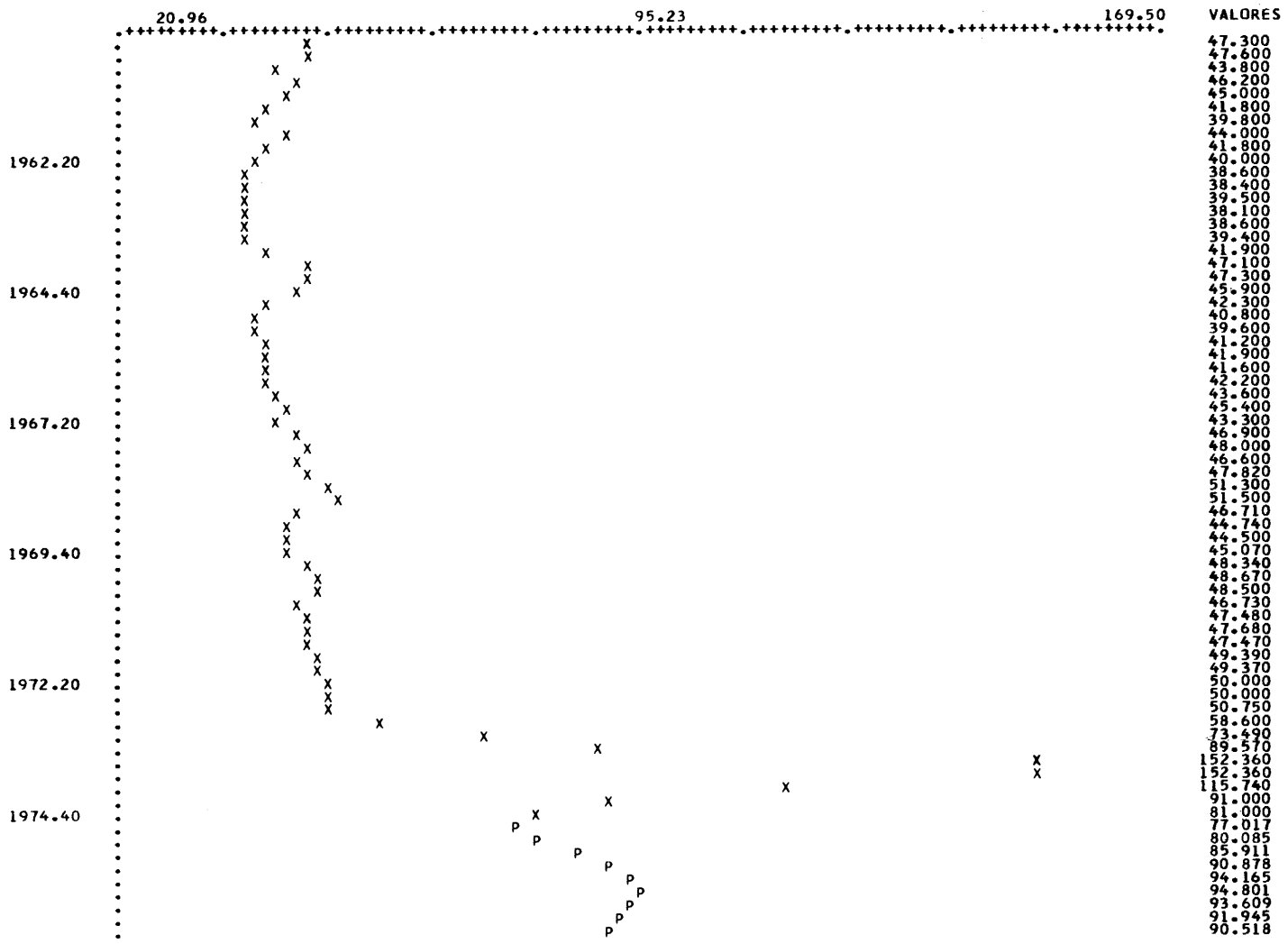


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

ALGODON PIMA PERU CIF LIVERPOOL CENTS/LB

PERIODO DE MUESTRA I TRIMESTRE,1960 AL IV TRIMESTRE, 1974

PERIODO DE PREDICCION I TRIMESTRE,1975 AL I TRIMESTRE, 1977



INTERVALO ABSCISA ES 1.485

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - ALGODON PIMA PERU CIF LIVERPOOL CENTS/LB 60 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	0.43320
2	AUTOREGRESIVO REGULAR	4	-0.22160

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	14.735	26.026	32.265	34.199	32.683
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.204	0.360	0.446	0.473	0.452

PREDICCIONES PARA EL PERIODO I TRIMESTRE,1975 AL I TRIMESTRE, 1977
CON PERIODO BASE =1974.40 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.10	69.0995	77.0165	85.8406	1.4332
1975.20	66.2560	80.0852	96.8008	1.6209
1975.30	66.3378	85.9106	111.2582	1.7022
1975.40	66.1427	90.8782	124.8641	1.5158
1976.10	65.8459	94.1648	134.6631	1.3390
1976.20	64.4368	94.8007	139.4726	1.2209
1976.30	62.2375	93.6094	140.7948	1.1517
1976.40	59.9992	91.9454	140.9008	1.1630
1977.10	57.9997	90.5182	141.2688	1.2071

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA ALGODON PIMA PERU CIF LIVERPOOL CENTS/LB

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.30	46.9000	0.0	0.0	0.0	0.0	0.0
1967.40	48.0000	48.2011	0.0	0.0	0.0	0.0
1968.10	46.6000	48.0516	48.3405	0.0	0.0	0.0
1968.20	47.8200	46.4916	48.5812	48.9117	0.0	0.0
1968.30	51.3000	47.5100	45.6299	47.9561	48.2987	0.0
1968.40	51.5000	52.6140	47.1335	45.0297	47.4434	47.7451
1969.10	46.7100	51.9263	53.5437	47.2803	45.0667	47.2117
1969.20	44.7400	44.5200	51.8144	53.6434	47.0736	45.1060
1969.30	44.5000	43.2343	42.9299	50.9664	52.8573	47.0520
1969.40	45.0700	44.3582	42.5611	42.2223	50.5596	52.2268
1970.10	48.3400	46.3102	45.2655	43.1971	42.8362	50.2925
1970.20	48.6700	50.3073	47.3075	46.1024	43.8926	43.5659
1970.30	48.5000	48.8718	51.2452	47.8031	46.5252	44.5339
1970.40	46.7300	48.2901	48.8216	51.5113	47.8841	46.7425
1971.10	47.4800	45.2752	47.4571	48.0482	50.8318	47.6319
1971.20	47.6800	47.7366	44.5917	47.0297	47.6450	50.0954
1971.30	47.4700	47.8039	47.8852	44.3332	46.8820	47.4278
1971.40	49.3900	47.7712	48.2535	48.3464	44.5874	46.8631
1972.10	49.3700	50.0686	47.7335	48.2789	48.3765	45.0123
1972.20	50.0000	49.3154	50.3186	47.6727	48.2449	48.3317
1972.30	50.0000	50.3245	49.3399	50.4766	47.6930	48.2025
1972.40	50.7500	49.5625	50.0242	48.9188	50.1030	47.6349
1973.10	58.6000	51.0829	49.3785	49.8991	48.7418	49.7911
1973.20	73.4900	62.1920	51.0839	49.1606	49.7051	48.6772
1973.30	89.5699	81.0633	63.8156	51.0844	49.0665	49.5501
1973.40	152.3600	97.2648	84.3031	64.3194	50.9162	49.1213
1974.10	152.3600	185.7686	97.6382	83.0567	62.5143	50.7699
1974.20	115.7399	144.9040	192.5221	93.0143	78.4841	60.9393
1974.30	91.0000	98.3379	135.7054	187.1352	87.1723	74.9355
1974.40	81.0000	72.8907	81.4595	117.2554	164.3202	83.2229

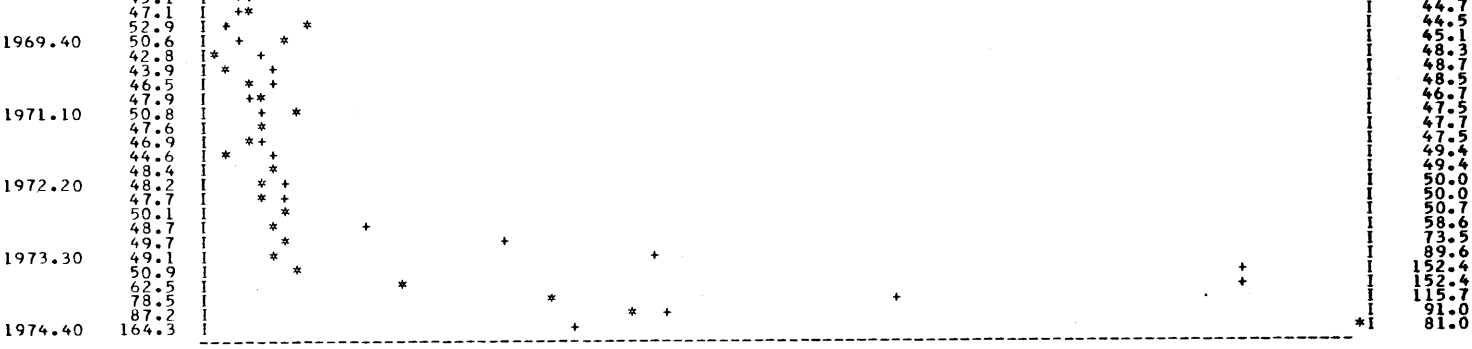
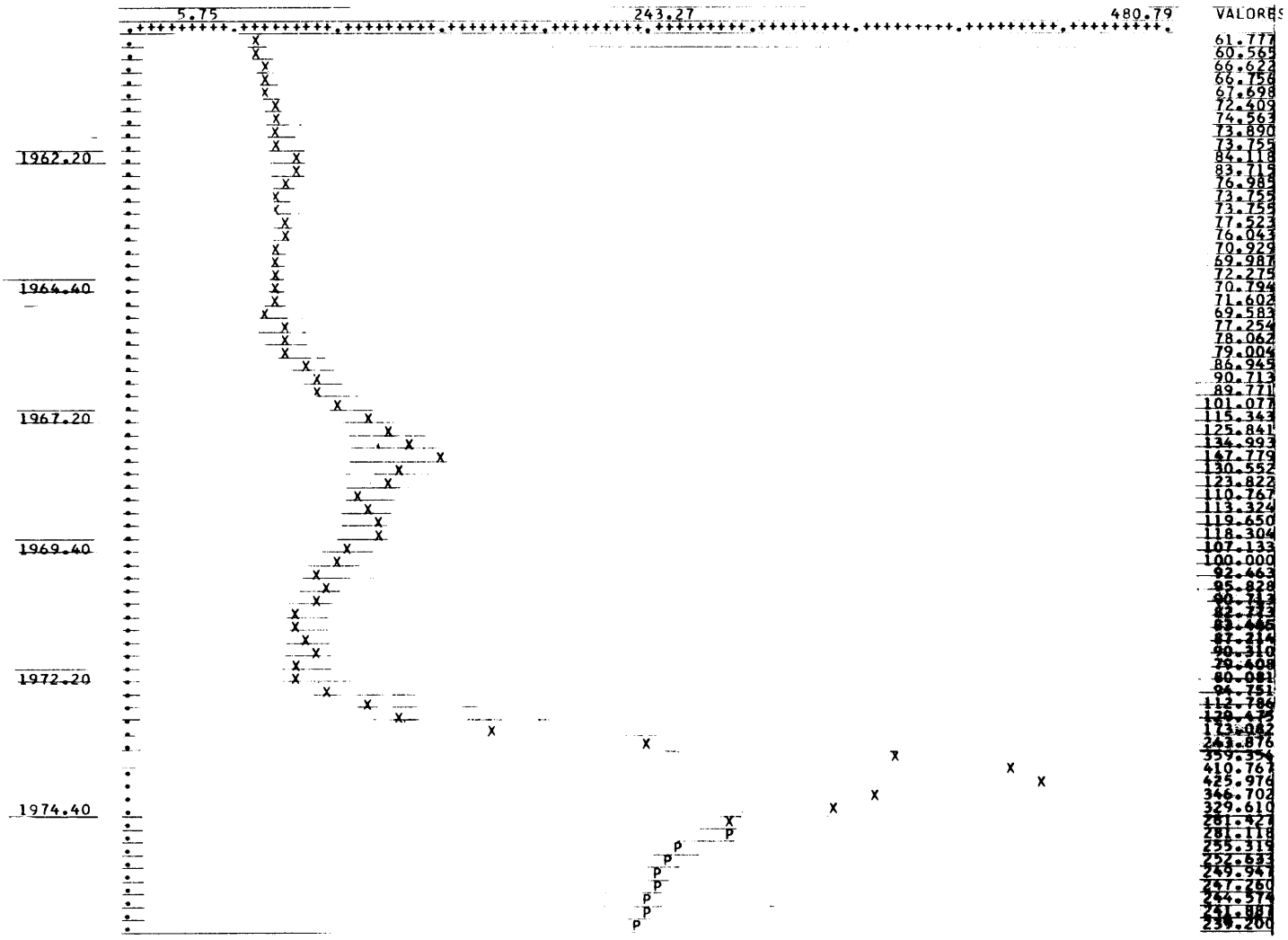


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

ARROZ INDICE EXPORTACION DE GUYANA,ARGENTINA

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



Anexo I.7.b.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - ARROZ INDICE EXPORTACION DE GUYANA,ARGENTINA 61 OBSERVACIONES

DIFERENCIAS - 2 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	PROMEDIO MOVIL REGULAR	1	0.27020
2	PROMEDIO MOVIL REGULAR	3	0.74190

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	22.951	46.046	78.319	99.567	114.760
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.112	0.225	0.383	0.487	0.561

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO
DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	261.9355	281.1177	300.3000	1.7298
1975.30	216.9919	255.3191	293.6462	2.4596
1975.40	191.8465	252.6331	313.4197	2.4475
1976.10	173.1407	249.9468	326.7529	2.4354
1976.20	157.3625	247.2605	337.1582	2.4233
1976.30	143.3691	244.5740	345.7786	2.4112
1976.40	130.6142	241.8873	353.1599	2.3991
1977.10	118.7862	239.2004	359.6145	2.3870

Anexo I.7.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA ARROZ INDICE EXPORTACION DE GUYANA,ARGENTINA

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	134.9932	0.0	0.0	0.0	0.0	0.0
1968.10	147.7792	136.9771	0.0	0.0	0.0	0.0
1968.20	130.5518	162.2202	143.5347	0.0	0.0	0.0
1968.30	123.8224	113.4835	168.2635	141.6946	0.0	0.0
1968.40	110.7671	106.2852	88.4011	166.2928	139.8545	0.0
1969.10	113.3243	119.9957	112.2428	86.8134	164.3220	138.0144
1969.20	119.6500	110.0138	121.5538	110.5301	85.2258	162.3512
1969.30	118.3041	120.0469	103.3781	119.7369	108.8174	83.6382
1969.40	107.1332	122.3786	125.3931	101.6918	118.0199	107.1047
1970.10	100.0000	92.9324	119.3039	123.5902	100.0055	116.2529
1970.20	92.4629	92.2500	80.0245	117.5220	121.7874	98.3192
1970.30	95.8277	96.1789	95.8105	78.4272	115.7402	119.9845
1970.40	90.7133	94.0439	94.6514	94.1276	76.8298	113.9584
1971.10	82.7726	86.3408	92.1021	92.9660	92.4446	75.2324
1971.20	83.4455	76.0565	82.2288	90.4209	91.2805	90.7617
1971.30	87.2140	84.5929	71.8114	80.5879	88.7397	89.5950
1971.40	90.3095	92.9215	88.3876	70.2136	78.9469	87.0584
1972.10	79.4078	88.6289	93.1471	86.7004	68.6158	77.3060
1972.20	80.0808	69.0530	85.0037	91.4282	85.0132	67.0180
1972.30	94.7510	79.7118	60.6360	83.3164	89.7093	83.3259
1972.40	112.7860	112.1988	86.1840	59.0602	81.6290	87.9903
1973.10	129.4751	122.4808	121.4651	84.4748	57.4844	79.9417
1973.20	173.0821	133.1168	121.0181	119.5740	82.7656	55.9086
1973.30	243.8762	205.4548	136.3223	119.1198	117.6828	81.0564
1973.40	359.3540	299.0991	232.6382	134.3398	117.2215	115.7916
1974.10	410.7671	428.9001	324.6716	230.1712	132.3569	115.3231
1974.20	425.9758	438.5747	469.9414	321.7390	227.7039	130.3739
1974.30	346.7024	399.8857	421.6797	466.2800	318.8064	225.2366
1974.40	329.6096	295.2524	387.2493	418.2380	462.6184	315.8733
1975.10	281.4265	312.5803	253.1498	383.9602	414.7964	458.9570

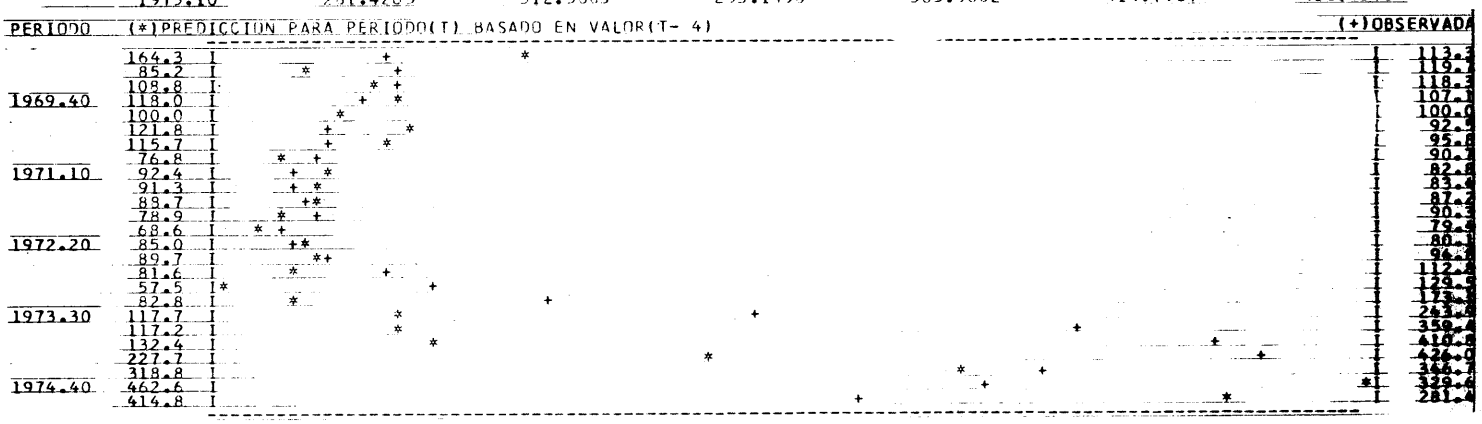
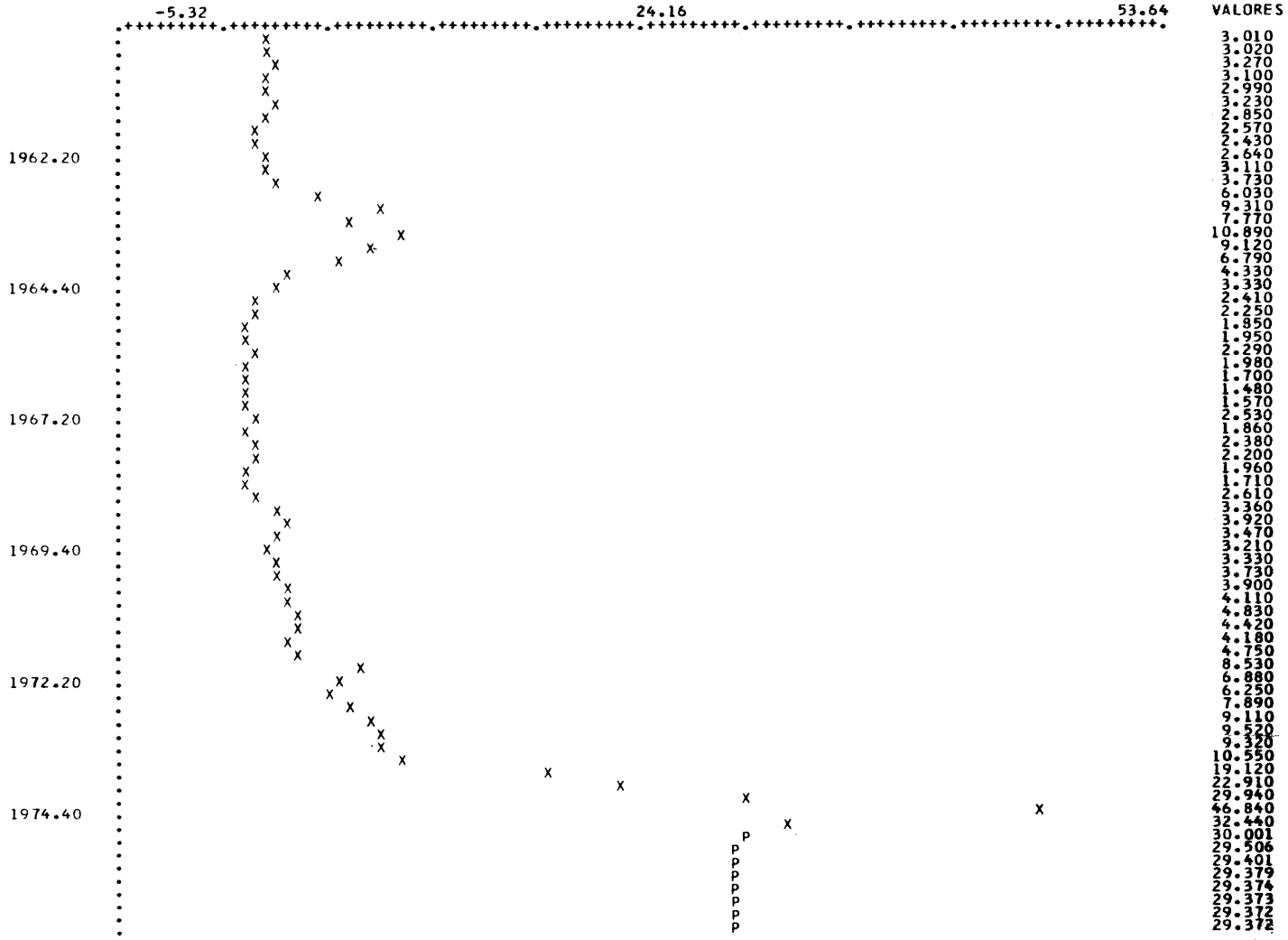


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

AZUCAR MERCADO LIBRE CENTS/LB EXPORTACION DE CUBA,BRASIL

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 0.590

Anexo I.8.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - AZUCAR MERCADO LIBRE CENTS/LB EXPORTACION DE CUBA,BRASIL — 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 — MODELO LOGARITMICO

NUMERO	PARAMETROS DEL MODELO CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	0.21280

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	5.404	5.929	7.398	9.291	10.360
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.354	0.389	0.485	0.609	0.679

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	22.8466	30.0006	39.3947	1.2128
1975.30	19.2280	29.5055	45.2764	1.2581
1975.40	16.9889	29.4011	50.8816	1.2677
1976.10	15.3657	29.3788	56.1715	1.2698
1976.20	14.0897	29.3739	61.2381	1.2702
1976.30	13.0397	29.3728	66.1641	1.2703
1976.40	12.1500	29.3724	71.0072	1.2703
1977.10	11.3807	29.3722	75.8064	1.2703

Anexo I.8.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA AZUCAR MERCADO LIBRE CENTS/LB EXPORTACION DE CUBA,BRASIL

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	2.3800	0.0	0.0	0.0	0.0	0.0
1968.10	2.2000	2.5082	0.0	0.0	0.0	0.0
1968.20	1.9600	2.1635	2.5363	0.0	0.0	0.0
1968.30	1.7100	1.9124	2.1558	2.5424	0.0	0.0
1968.40	2.6100	1.6611	1.9024	2.1542	2.5436	0.0
1969.10	3.3600	2.8557	1.6503	1.9003	2.1538	2.5439
1969.20	3.9200	3.5455	2.9109	1.6487	1.8999	2.1537
1969.30	3.4700	4.0507	3.5863	2.9228	1.6482	1.8998
1969.40	3.2100	3.3811	4.0791	3.5950	2.9254	1.6481
1970.10	3.3300	3.1572	3.3625	4.0851	3.5969	2.9259
1970.20	3.7300	3.3561	3.1461	3.3585	4.0864	3.5973
1970.30	3.9000	3.8211	3.3617	3.1437	3.3577	4.0867
1970.40	4.1100	3.9372	3.8408	3.3629	3.1432	3.3575
1971.10	4.8300	4.1561	3.9451	3.8450	3.3631	3.1431
1971.20	4.4200	4.9988	4.1660	3.9468	3.8459	3.3632
1971.30	4.1800	4.3373	5.0354	4.1681	3.9471	3.8461
1971.40	4.7500	4.1306	4.3199	5.0433	4.1685	3.9472
1972.10	8.5300	4.8810	4.1202	4.3162	5.0449	4.1686
1972.20	6.8800	9.6617	4.9093	4.1180	4.3154	5.0453
1972.30	6.2500	6.5723	9.9212	4.9153	4.1175	4.3153
1972.40	7.8900	6.1236	6.5087	9.9773	4.9166	4.1174
1973.10	9.1100	8.2911	6.0970	6.4952	9.9893	4.9169
1973.20	9.5200	9.3930	8.3790	6.0913	6.4923	9.9918
1973.30	9.3200	9.6096	9.4543	8.3978	6.0901	6.4917
1973.40	10.5500	9.2780	9.6287	9.4674	8.4018	6.0898
1974.10	19.1200	10.8320	9.2690	9.6328	9.4702	8.4026
1974.20	22.9100	21.6989	10.8929	9.2671	9.6336	9.4707
1974.30	29.9400	23.8087	22.2911	10.9059	9.2666	9.6337
1974.40	46.8400	31.6944	24.0044	22.4191	10.9086	9.2665
1975.10	32.4400	51.5200	32.0807	24.0461	22.4463	10.9092

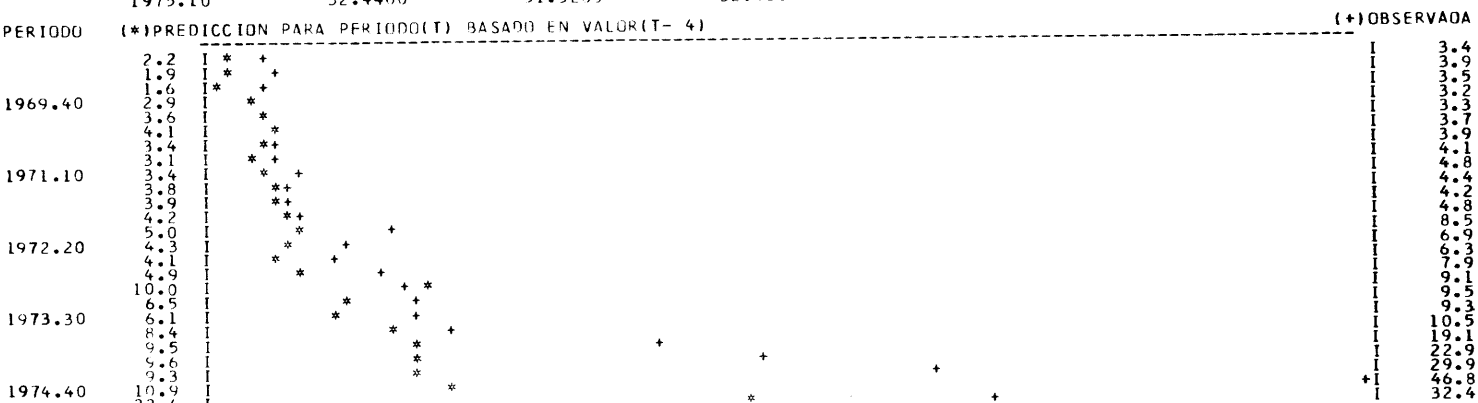
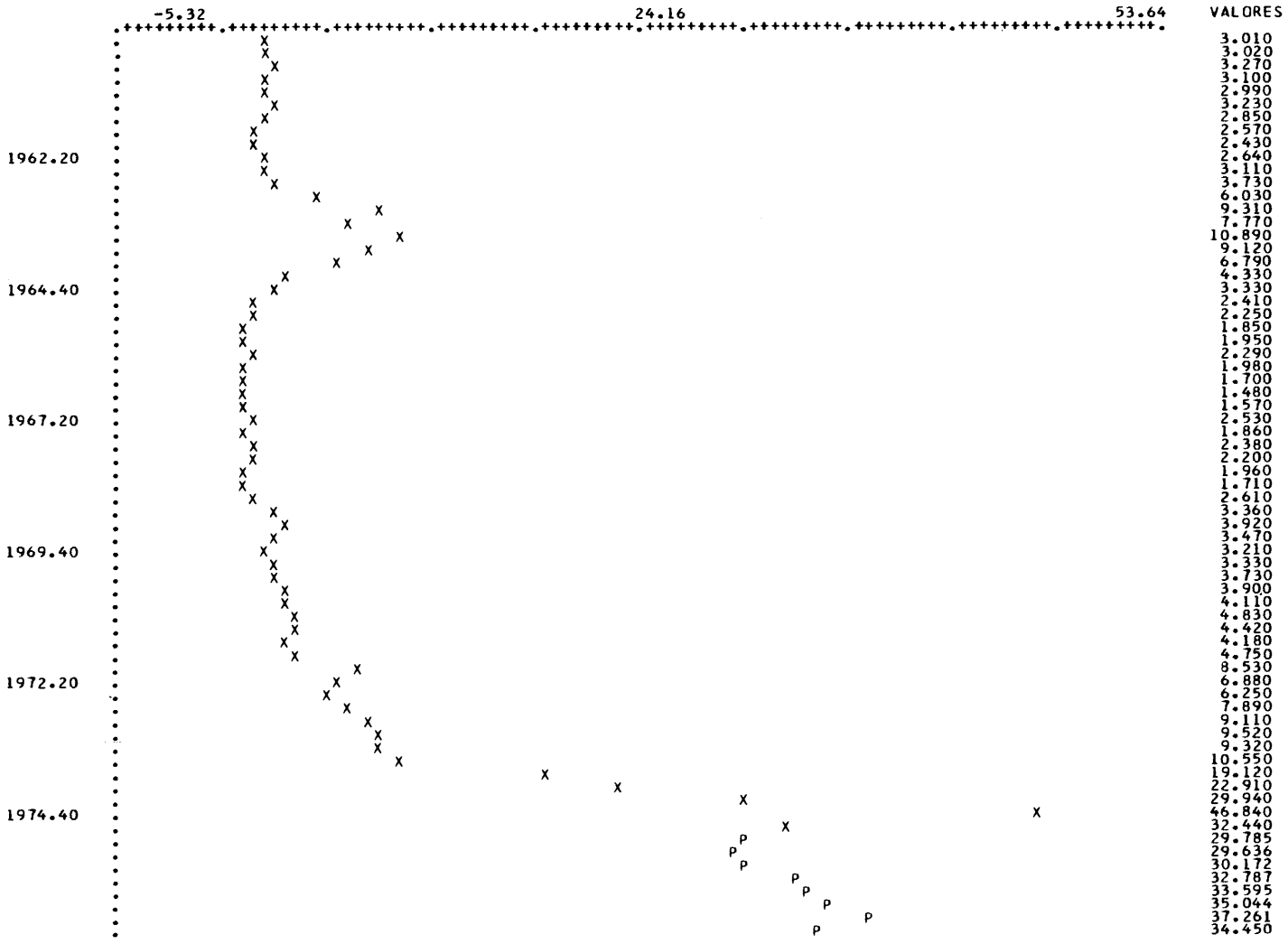


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

AZUCAR MERCADO LIBRE CENTS/LB EXPORTACION DE CUBA,BRASIL

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 0.590

Anexo I.8.2.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - AZUCAR MERCADO LIBRE CENTS/LB EXPORTACION DE CUBA,BRASIL 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 MODELO LOGARITMICO

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PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	PROMEDIO MOVIL REGULAR	1	-0.20850
2	PROMEDIO MOVIL REGULAR	8	-0.17320

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	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERRDR MEDIO CUADRATICO	5.183	5.899	7.481	9.150	10.061
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.340	0.387	0.490	0.600	0.660

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO 8ASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	22.7568	29.7850	38.9837	1.2085
1975.30	19.4298	29.6356	45.2022	1.2085
1975.40	17.7076	30.1724	51.4114	1.2085
1976.10	17.5612	32.7874	61.2148	1.2085
1976.20	16.6164	33.5951	67.9227	1.2085
1976.30	16.1369	35.0441	76.1039	1.2085
1976.40	16.0706	37.2606	86.3906	1.2085
1977.10	13.9832	34.4501	84.8734	1.3817

Anexo I.8.2.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA AZUCAR MERCADO LIBRE CENTS/L8 EXPORTACION DE CUBA,8RASIL

8ASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	2.3800	0.0	0.0	0.0	0.0	0.0
1968.10	2.2000	2.6361	0.0	0.0	0.0	0.0
1968.20	1.9600	2.0668	2.5717	0.0	0.0	0.0
1968.30	1.7100	1.9217	2.0490	2.5495	0.0	0.0
1968.40	2.6100	1.6423	1.8910	2.0163	2.5088	0.0
1969.10	3.3600	2.9455	1.6827	1.9376	2.0660	2.5706
1969.20	3.9200	3.7377	3.1879	1.8212	2.0971	2.2360
1969.30	3.4700	3.7085	3.5012	2.9861	1.7060	1.9643
1969.40	3.2100	3.6190	3.9217	3.7024	3.1578	1.8040
1970.10	3.3300	3.0342	3.5074	3.8008	3.5883	3.0604
1970.20	3.7300	3.3642	3.0064	3.4753	3.7660	3.5554
1970.30	3.9000	3.7349	3.2968	2.9463	3.4057	3.6907
1970.40	4.1100	4.2641	4.0469	3.5723	3.1924	3.6903
1971.10	4.8300	4.1727	4.3625	4.1403	3.6547	3.2660
1971.20	4.4200	5.0208	4.2072	4.3986	4.1745	3.6849
1971.30	4.1800	4.2548	4.9633	4.1590	4.3482	4.1267
1971.40	4.7500	4.0790	4.1673	4.8613	4.0735	4.2588
1972.10	8.5300	4.9829	4.1452	4.2350	4.9403	4.1397
1972.20	6.8800	9.7138	5.0729	4.2200	4.3114	5.0294
1972.30	6.2500	6.4507	9.7869	5.1109	4.2517	4.3438
1972.40	7.8900	6.1695	6.4097	9.7247	5.0785	4.2247
1973.10	9.1100	8.5183	6.3278	6.5742	9.9742	5.2088
1973.20	9.5200	9.0367	8.3323	6.1896	6.4306	9.7565
1973.30	9.3200	9.5944	9.0090	8.3068	6.1707	6.4109
1973.40	10.5500	9.5114	9.8509	9.2498	8.5288	6.3356
1974.10	19.1200	11.8324	10.4395	10.8121	10.1524	9.3610
1974.20	22.9100	19.9065	11.1462	9.8341	10.1851	9.5636
1974.30	29.9400	23.4623	19.7978	11.0853	9.7804	10.1295
1974.40	46.8400	32.8723	24.4835	20.6595	11.5678	10.2061
1975.10	32.4400	51.0190	33.2568	24.7699	20.9012	11.7031

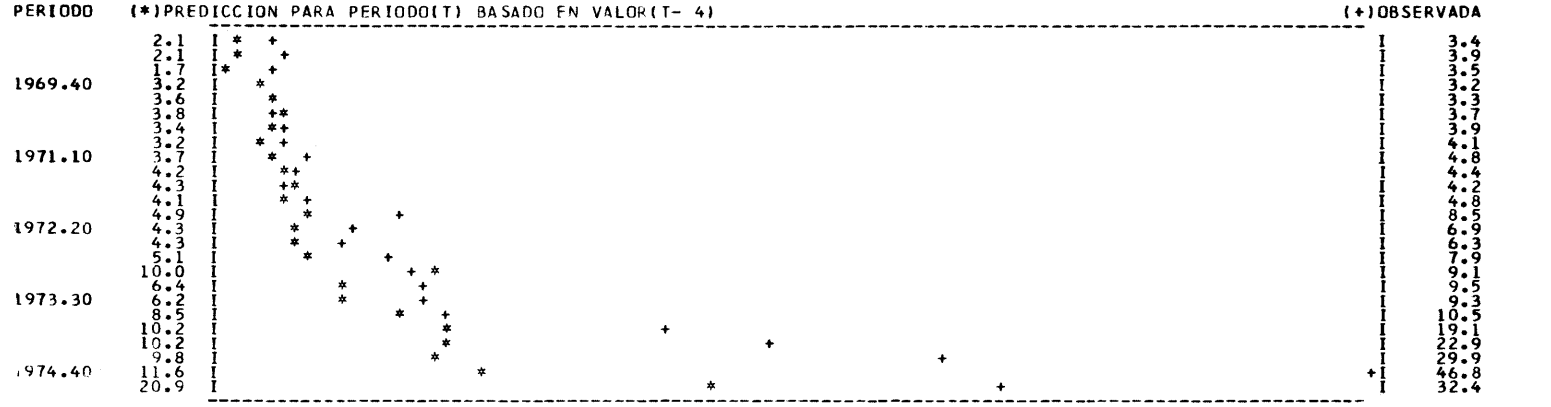
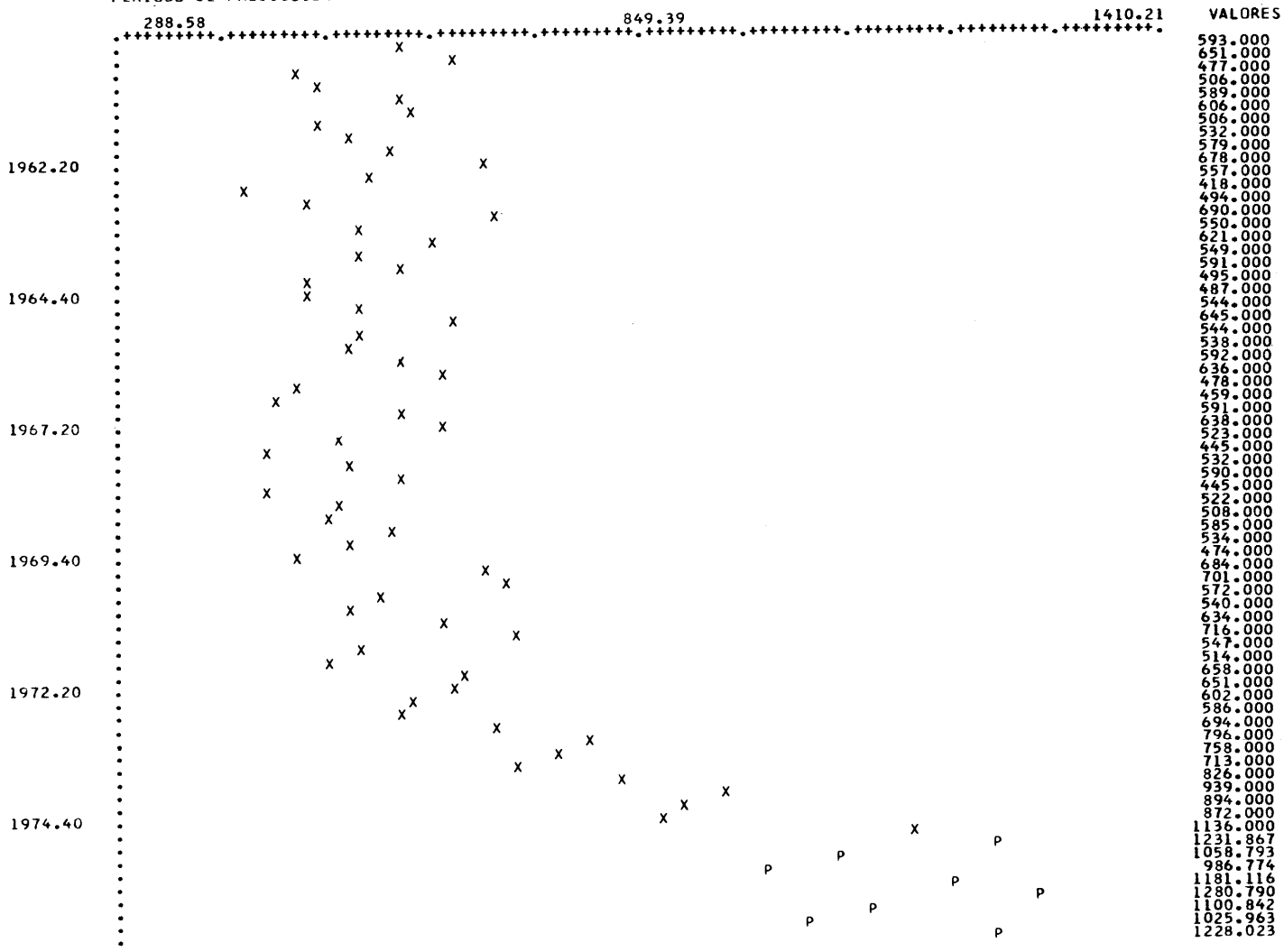


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

BANANAS HAMBURG MARCOS/1000KG AJUSTADA EXPORTACION DE ECUADOR,HONDURAS

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 11.216

Anexo I.9.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - BANANAS HAMBURG MARCOS/1000KG AJUSTADA EXPORTACION DE ECUADOR,HONDURAS 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 1DIFERENCIAS ESTACIONALES DE ORDEN , 4 MODELO LOGARITMICO

NUMERO	PARAMETROS DEL MODELO CARACTERISTICAS	ORDEN	VALOR
1	PROMEDIO MOVIL REGULAR	1	0.11250
2	PROMEDIO MOVIL REGULAR	4	0.82720

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	62.295	74.146	92.190	109.430	118.724
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.089	0.106	0.131	0.156	0.169

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	1085.6033	1231.8672	1397.8359	0.8875
1975.30	894.1655	1058.7930	1253.7292	0.8875
1975.40	805.6140	986.7737	1208.6699	0.8875
1976.10	936.7603	1181.1160	1489.2124	1.0603
1976.20	979.9390	1280.7900	1674.0039	0.9478
1976.30	820.9888	1100.8423	1476.0894	0.9478
1976.40	747.3584	1025.9629	1408.4258	0.9478
1977.10	875.1790	1228.0232	1723.1216	1.1206

Anexo I.9.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA BANANAS HAMBURG MARCOS/1000KG AJUSTADA EXPORTACION DE ECUADOR,HONDURAS

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	444.9998	0.0	0.0	0.0	0.0	0.0
1968.10	532.0002	516.4871	0.0	0.0	0.0	0.0
1968.20	590.0002	597.7087	582.2148	0.0	0.0	0.0
1968.30	444.9998	468.9587	474.3926	462.0952	0.0	0.0
1968.40	522.0000	426.4363	446.7522	451.9287	440.2136	0.0
1969.10	507.9998	595.2666	497.4788	521.1792	527.2180	510.9321
1969.20	584.9998	579.7122	667.2910	557.6711	584.2393	592.3362
1969.30	534.0002	460.3186	456.6245	525.6082	439.2634	464.3796
1969.40	474.0000	521.1414	456.8013	453.1353	521.5920	420.9390
1970.10	684.0000	531.5620	578.2280	506.8398	502.7725	594.8013
1970.20	701.0002	759.9185	607.5527	660.8901	579.2966	573.7468
1970.30	572.0002	571.0925	613.4963	490.4890	533.5493	455.8308
1970.40	540.0002	549.0562	548.2834	588.9941	470.8992	520.7012
1971.10	634.0002	633.7288	643.1526	642.2473	689.9348	528.0847
1971.20	715.9998	694.5806	694.3171	704.6418	703.6499	766.5122
1971.30	547.0002	581.4817	566.0176	565.8027	574.2163	573.2512
1971.40	514.0002	527.1648	556.5554	541.7542	541.5486	551.1836
1972.10	658.0002	604.9788	618.7109	653.2053	635.8337	635.5457
1972.20	651.0002	717.8499	666.2737	681.3970	719.3865	696.5894
1972.30	602.0005	528.9229	576.8582	535.4119	547.5649	584.2322
1972.40	586.0000	569.2910	507.5200	553.5156	513.7463	527.7090
1973.10	694.0000	597.5339	679.8540	606.0864	661.0149	604.6799
1973.20	796.0005	744.8679	748.2334	729.2686	650.1389	721.1387
1973.30	758.0005	556.4365	618.8743	621.6704	605.9136	528.2231
1973.40	713.0002	708.8408	623.8799	588.1807	590.8381	572.9917
1974.10	826.0000	847.4028	843.0146	741.9717	699.5151	703.2932
1974.20	938.9998	899.3567	920.0093	915.2451	805.5447	750.7874
1974.30	894.0000	790.0100	760.3381	777.7983	773.7708	664.3074
1974.40	872.0005	825.3040	739.5217	711.7461	728.0906	723.5884
1975.10	1136.0002	1025.4336	976.5486	875.0461	842.1804	865.3376

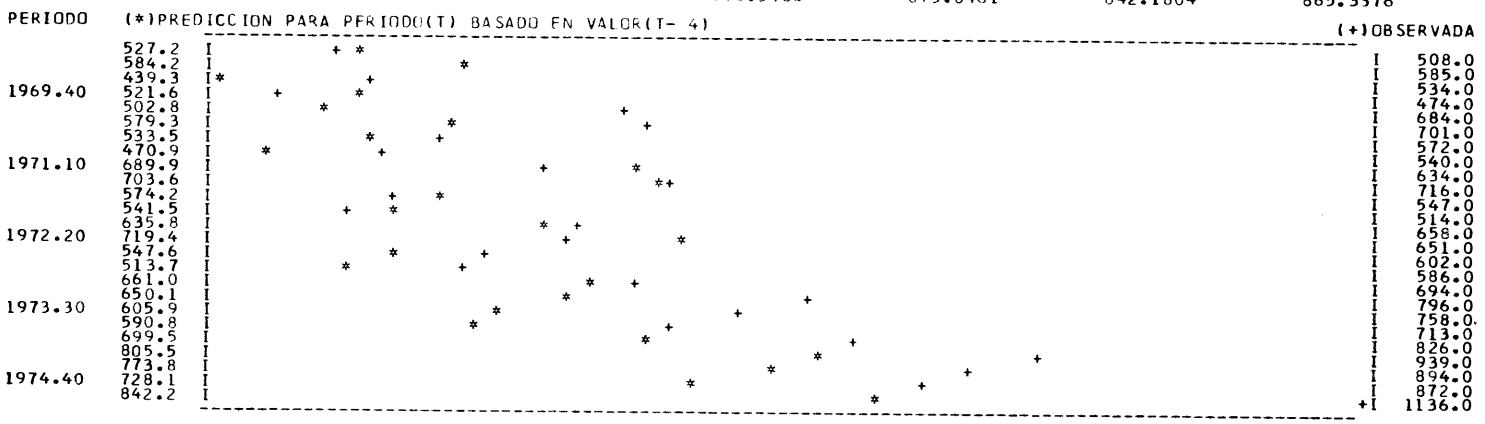
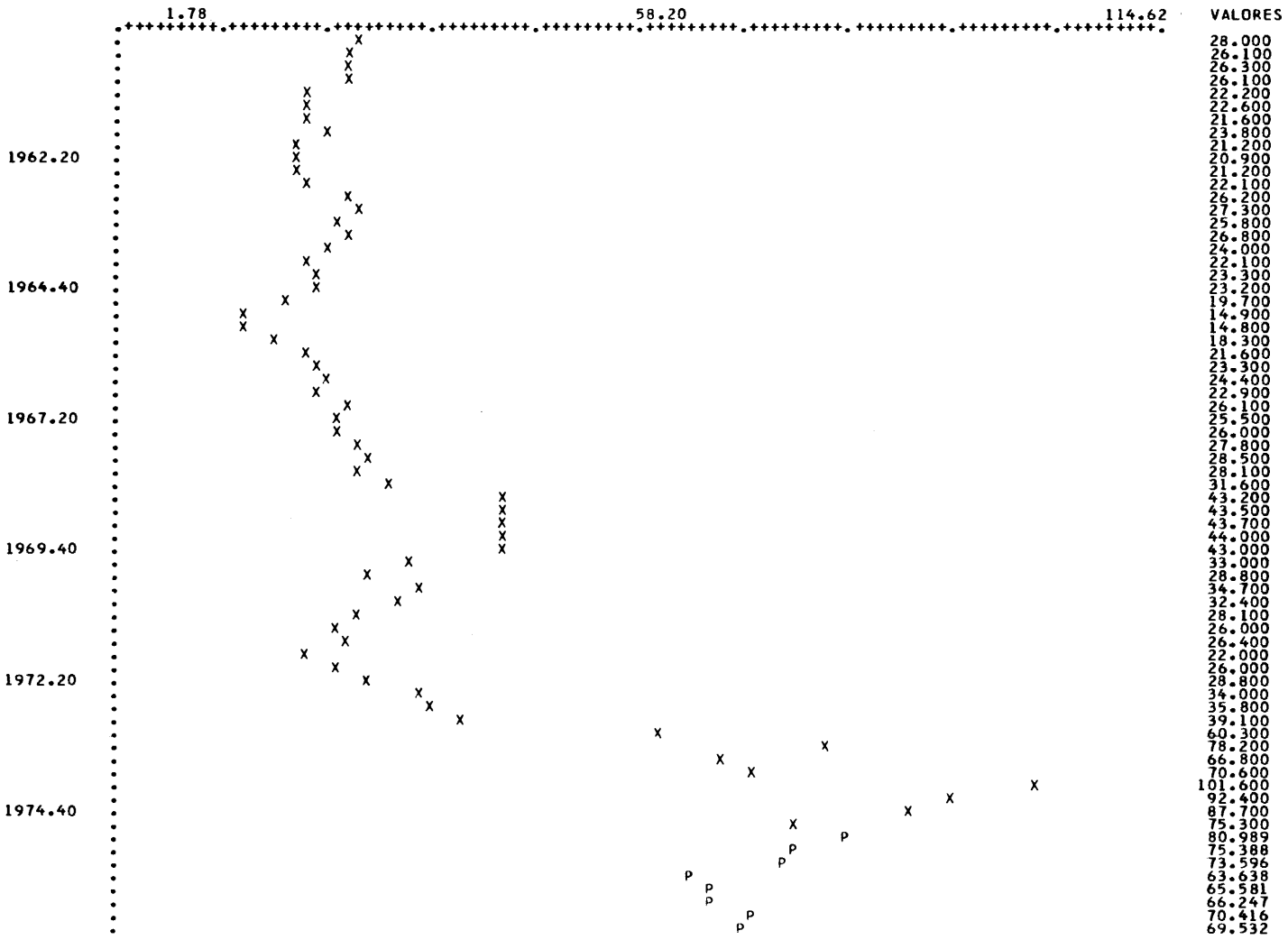


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

CACAO US DOM IMPORT EXWAREHOUSE NY SPOT BAHIA CENTS/LB

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 1.128

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - **CACAO** US DOM IMPORT EXWAREHOUSE NY SPOT BAHIA CENTS/LB 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

NUMERO	PARAMETROS DEL MODELO CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	3	-0.41980
2	PROMEDIO MOVIL REGULAR	3	-0.60200
3	PROMEDIO MOVIL REGULAR	4	-0.68500

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	7.591	9.692	10.603	12.626	19.183
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.142	0.181	0.199	0.236	0.359

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	70.0188	80.9888	93.6774	1.0000
1975.30	61.3635	75.3881	92.6179	1.0000
1975.40	57.1970	73.5964	94.6978	1.1822
1976.10	46.8986	63.6376	86.3512	1.8672
1976.20	43.5807	65.5812	98.6878	1.8672
1976.30	40.5526	66.2467	108.2205	1.7907
1976.40	40.3957	70.4160	122.7461	1.5031
1977.10	38.2667	69.5324	126.3435	1.5031

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA **CACAO** US DOM IMPORT EXWAREHOUSE NY SPOT BAHIA CENTS/LB

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	27.8000	0.0	0.0	0.0	0.0	0.0
1968.10	28.5000	24.6476	0.0	0.0	0.0	0.0
1968.20	28.1000	24.3156	21.0288	0.0	0.0	0.0
1968.30	31.6000	30.3398	26.2538	22.7050	0.0	0.0
1968.40	43.2000	39.1132	37.5535	32.4959	27.3695	0.0
1969.10	43.5000	52.3699	47.4156	45.5248	38.3690	29.2561
1969.20	43.7000	46.8553	56.4093	51.0730	48.6741	37.1534
1969.30	44.0000	41.8371	44.8579	54.0046	48.0184	44.5050
1969.40	43.0000	41.9989	39.9343	42.8178	53.3213	44.2908
1970.10	33.0000	36.2409	35.3971	33.6571	36.5486	51.6837
1970.20	28.8000	32.3373	35.5131	34.6863	32.6797	37.2232
1970.30	34.7000	30.5307	34.2806	37.6472	36.6133	33.3246
1970.40	32.4000	37.2479	32.7724	36.7976	41.1072	39.3384
1971.10	28.1000	30.0059	34.4956	30.3508	34.8056	41.4588
1971.20	26.0000	25.9257	27.6841	31.8264	27.3569	33.9633
1971.30	26.4000	26.8598	26.7830	28.5996	33.7249	26.5551
1971.40	22.0000	24.4963	24.9128	24.8416	26.8456	34.8294
1972.10	26.0000	21.7675	24.2275	24.6494	24.5662	27.7687
1972.20	28.8000	25.6169	21.4467	23.8705	24.3627	24.2330
1972.30	34.0000	28.8072	25.6233	21.4521	24.3469	25.1446
1972.40	35.8000	32.7810	27.7744	24.7046	20.0241	24.4557
1973.10	39.1000	41.5637	38.0587	32.2460	28.0765	20.1493
1973.20	60.3000	43.6603	46.4114	42.4975	34.9359	28.0735
1973.30	78.2000	69.7026	50.4683	53.6483	48.3420	35.4756
1973.40	66.8000	77.1547	68.7709	49.7937	53.5240	45.4054
1974.10	70.6000	64.8686	74.9239	66.7825	45.5914	51.1017
1974.20	101.6000	84.6339	77.7633	89.8174	78.3973	42.9007
1974.30	92.4000	107.6871	89.7046	82.4223	97.7315	78.8414
1974.40	87.7000	86.0692	100.3089	83.5585	75.6000	98.9427
1975.10	75.3000	89.0406	87.3849	101.8423	82.0583	70.0594

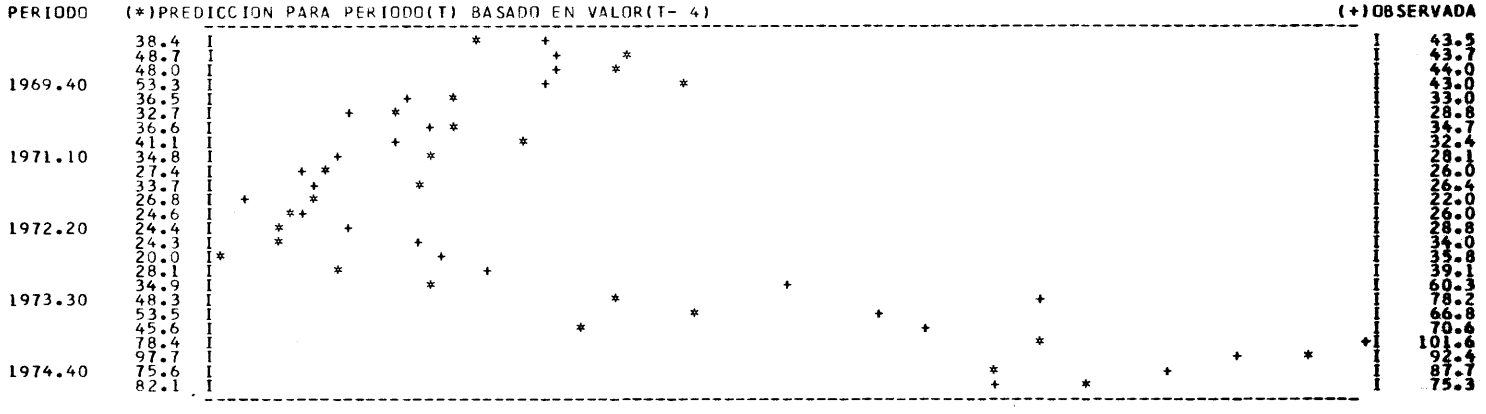


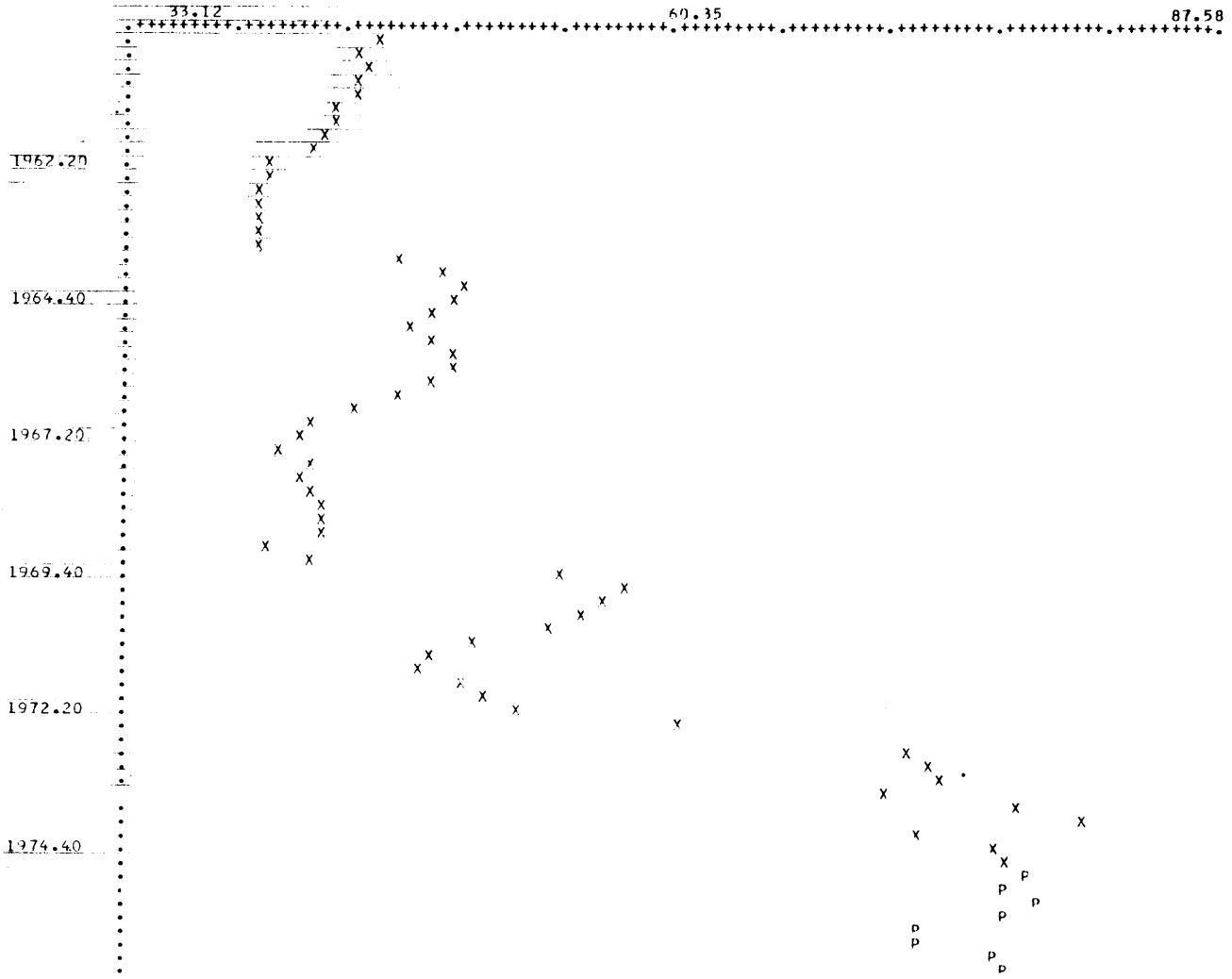
GRAFICO I--. MUESTRA (X) Y PREDICCION (P)

Anexo I.11.1.a

CAFE COLOMBIA MANIZALES US DOM IMPORT EXDOCK NY SPOT CENTS/LB

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



VALORES
45.600
44.800
44.900
44.400
44.600
43.600
43.400
43.000
42.500
40.400
40.200
39.900
39.900
39.400
39.500
39.500
46.900
48.800
50.000
49.600
48.600
47.500
48.400
49.600
49.500
48.600
46.800
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40.700
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73.300
73.700
71.500
77.900
81.300
73.000
76.800
77.400
78.140
77.106
78.799
77.271
72.905
72.617
76.457
77.386

INTERVALO ABSCISAS 0.545

CUADRO I-- MODELO Y PREDICCIONES

Anexo I.11.1.b

LA SERIE = CAFE COLOMBIA MANIZALES US DOM IMPORT EXDOCK NY SPOT CENTS/LB — 61 OBSERVACIONES

DIFERENCIAS = 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 — MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	6	0.29090
2	AUTOREGRESIVO REGULAR	17	0.54060
3	PROMEDIO MOVIL REGULAR	6	0.81960
4	PROMEDIO MOVIL REGULAR	17	0.50420

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	3.332	5.044	6.227	7.529	8.656
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.054	0.082	0.101	0.122	0.141

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	73.6595	78.1402	82.8934	1.0000
1975.30	70.9286	77.1062	83.8219	1.0000
1975.40	71.1381	78.7992	87.2853	1.0000
1976.10	68.6637	77.2714	86.9579	1.0000
1976.20	63.8866	72.9046	83.1954	1.0000
1976.30	62.8377	72.6171	83.9133	0.4713
1976.40	65.9849	76.4566	88.5901	0.4713
1977.10	66.6131	77.3859	89.9009	0.4713

AnexoI.11.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA CAFE COLOMBIA MANIZALES US DOM IMPORT EXDOCK NY SPOT CENTS/LB

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	42.5000	0.0	0.0	0.0	0.0	0.0
1968.10	42.1000	42.4172	0.0	0.0	0.0	0.0
1968.20	42.6000	47.7186	48.3043	0.0	0.0	0.0
1968.30	42.9000	45.3792	50.8317	51.4562	0.0	0.0
1968.40	42.8000	42.3054	45.2792	50.7197	51.3428	0.0
1969.10	42.7000	42.6057	42.5113	44.9586	50.3717	50.9906
1969.20	40.2000	41.8553	41.7629	41.6709	44.0790	49.3753
1969.30	42.3000	40.5086	42.1767	42.0835	41.9908	44.4174
1969.40	54.7000	47.5083	46.4964	47.3698	47.2652	47.1610
1970.10	58.0000	57.7091	50.1218	47.9992	49.9757	49.8653
1970.20	57.3000	57.1453	56.8592	49.3836	47.2923	49.2397
1970.30	56.0000	56.9627	56.8094	56.5245	49.0929	47.0139
1970.40	54.4000	56.2000	57.1662	57.0124	55.7264	49.2683
1971.10	50.8000	53.5103	55.2809	56.2312	56.0799	55.7986
1971.20	43.3000	49.0953	51.7146	53.4258	54.3442	54.1980
1971.30	46.0000	48.7710	49.5741	52.2189	53.9468	54.8742
1971.40	50.1000	47.0307	47.7861	48.5730	51.1644	52.8574
1972.10	51.2000	50.7432	47.6344	48.3996	49.1965	51.8213
1972.20	52.8000	52.1973	51.7315	48.5623	49.3424	50.1549
1972.30	51.3000	57.5576	56.9006	54.3229	52.9381	53.7885
1972.40	61.7000	62.9095	59.3593	58.6318	58.1582	54.5952
1973.10	72.2000	62.3226	63.5504	59.9641	59.2796	58.7507
1973.20	73.3000	69.1611	66.7052	60.8754	57.4402	56.7846
1973.30	73.7000	72.3317	68.2476	55.6155	60.0714	56.6814
1973.40	71.5000	74.0830	72.7126	69.6064	59.2267	60.3877
1974.10	77.9000	76.0954	79.8497	77.3859	73.0163	63.0332
1974.20	81.3000	81.7600	79.3660	82.7520	81.2205	76.6344
1974.30	73.0000	74.8466	75.2701	73.5264	76.1878	74.7734
1974.40	76.8000	69.6448	71.4065	71.8106	70.1470	72.6861
1975.10	77.4000	75.8054	68.7429	70.4818	73.8806	69.2386

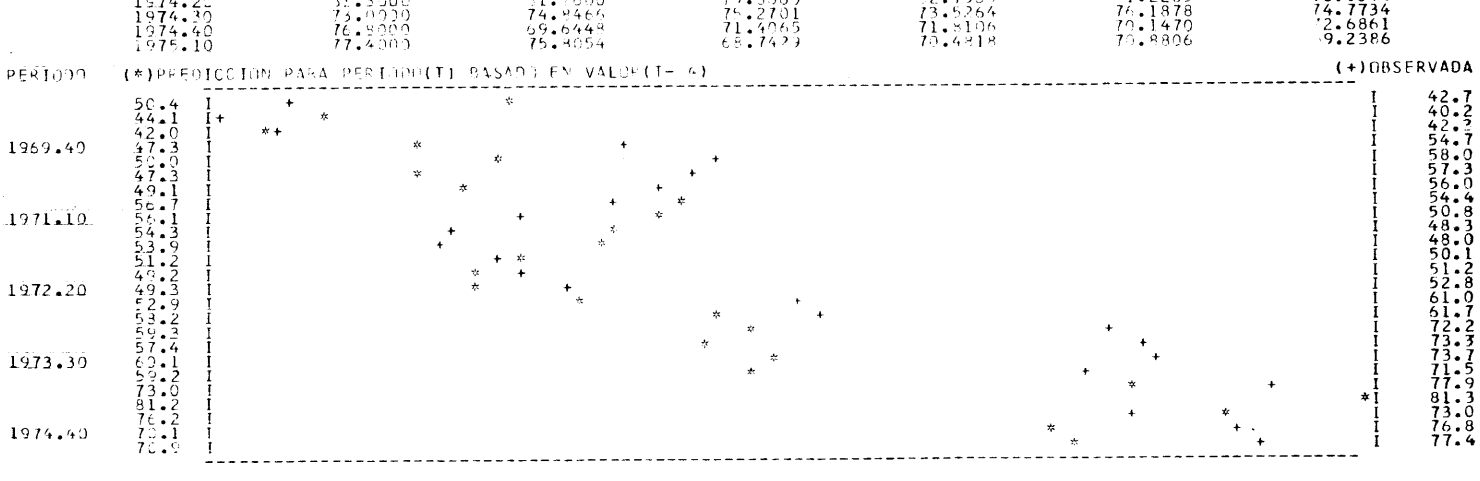
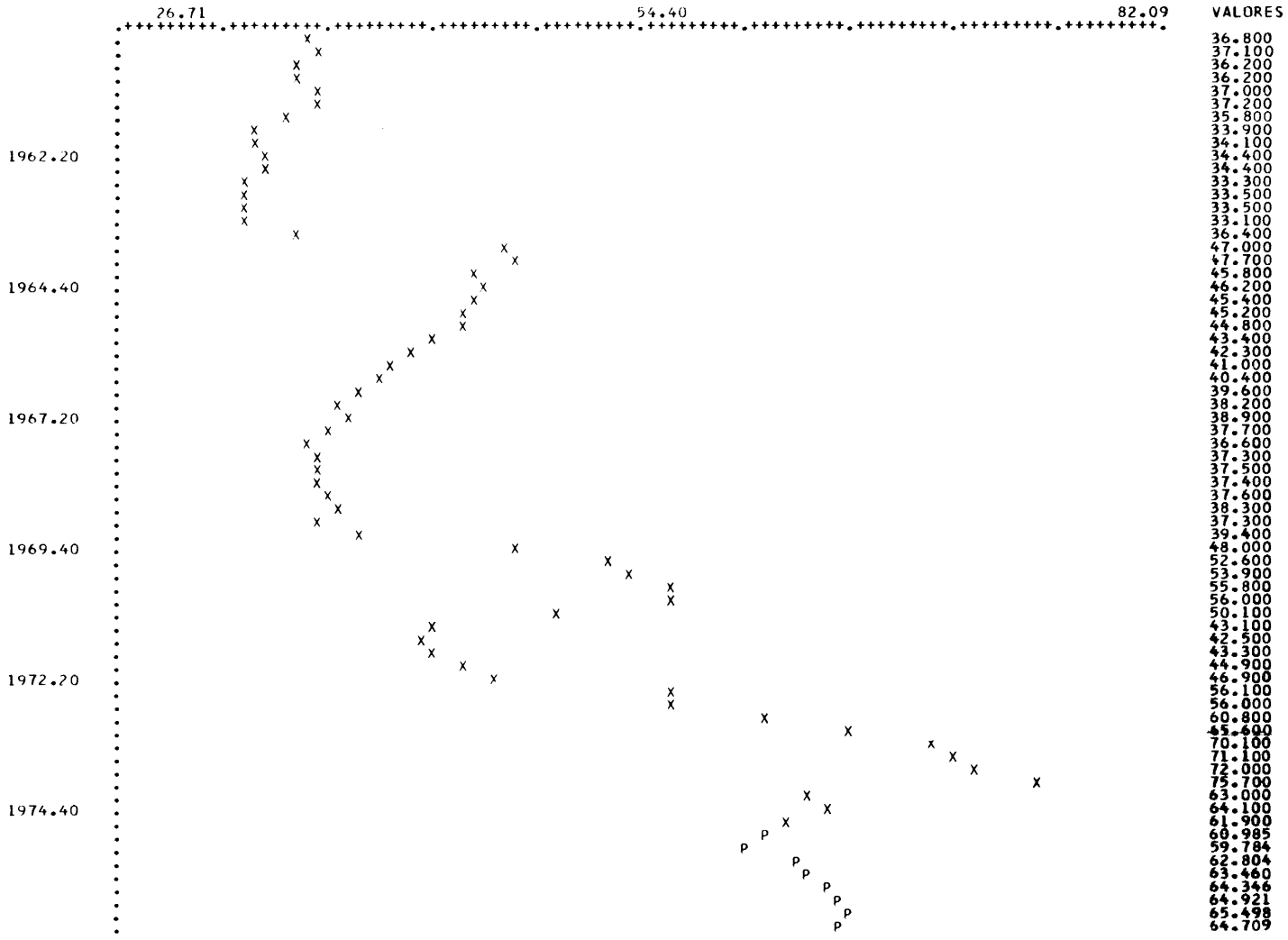


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

CAFE SANTOS 4 US DOM IMPORT NY SPOT CENTS/LB

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA FS 0.554

Anexo I.12.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - CAFE SANTOS 4 US DOM IMPORT NY SPOT CENTS/LB 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	0.31710
2	AUTOREGRESIVO REGULAR	5	-0.30270

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	4.182	6.034	8.257	10.019	11.879
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.075	0.108	0.148	0.179	0.213

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	56.6428	60.9854	65.6609	1.3171
1975.30	52.9097	59.7844	67.5523	1.4177
1975.40	53.4701	62.8043	73.7679	1.4495
1976.10	52.3073	63.4599	76.9904	1.4596
1976.20	51.5709	64.3458	80.2852	1.1601
1976.30	51.2054	64.9211	82.3106	0.9692
1976.40	51.1173	65.4977	83.9234	0.8782
1977.10	50.0820	64.7090	83.6079	0.8397

Anexo I.12.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA CAFE SANTOS 4 US DOM IMPORT NY SPOT CENTS/LB

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	36.6000	0.0	0.0	0.0	0.0	0.0
1968.10	37.3000	36.4781	0.0	0.0	0.0	0.0
1968.20	37.5000	37.9357	36.8386	0.0	0.0	0.0
1968.30	37.4000	37.3577	37.9304	36.7511	0.0	0.0
1968.40	37.6000	37.7244	37.6682	38.2902	37.0733	0.0
1969.10	38.3000	38.0027	38.1685	38.1072	38.7507	37.5107
1969.20	37.3000	38.3043	37.9132	38.0913	38.0288	38.6754
1969.30	39.4000	36.9284	38.2436	37.8235	38.0052	37.9424
1969.40	48.0000	40.1227	36.8411	38.2553	37.8256	38.0086
1970.10	52.6000	51.0186	40.2895	36.7541	38.1972	37.7652
1970.20	53.9000	53.8472	51.7252	40.1178	36.5220	37.9662
1970.30	55.8000	54.7556	54.6849	52.3690	40.3855	36.7417
1970.40	56.0000	55.4886	54.1243	54.0496	51.7102	39.8053
1971.10	50.1000	52.8111	52.1767	50.7977	50.7256	48.5151
1971.20	43.1000	47.0407	50.4219	49.7703	48.4258	48.3565
1971.30	42.5000	40.7888	45.7706	49.3212	48.6696	47.3457
1971.40	43.3000	41.8700	39.6640	44.9017	48.4662	47.8215
1972.10	44.9000	43.5096	41.6270	39.2711	44.5812	48.1460
1972.20	46.9000	46.9762	45.0697	42.9743	40.4891	46.0045
1972.30	56.1000	49.7689	49.8755	47.7002	45.4338	42.7886
1972.40	56.0000	59.6310	50.9304	51.0478	48.7724	46.4393
1973.10	60.8000	55.6532	60.4541	51.0155	51.1357	48.8408
1973.20	65.6000	61.7245	54.9368	60.0542	50.4848	50.6047
1973.30	70.1000	66.3191	61.2078	53.9945	59.1425	49.6582
1973.40	71.1000	67.8121	63.0365	57.8231	50.8651	55.7501
1974.10	72.0000	71.4585	67.1384	62.0633	56.8199	49.9379
1974.20	75.7000	70.5103	69.8127	65.2807	60.2393	55.1161
1974.30	63.0000	75.1635	68.4516	67.7230	63.2310	58.3152
1974.40	64.1000	58.2542	73.5029	66.4630	65.7397	61.3499
1975.10	61.9000	64.1770	66.5821	72.6717	65.5627	64.8443

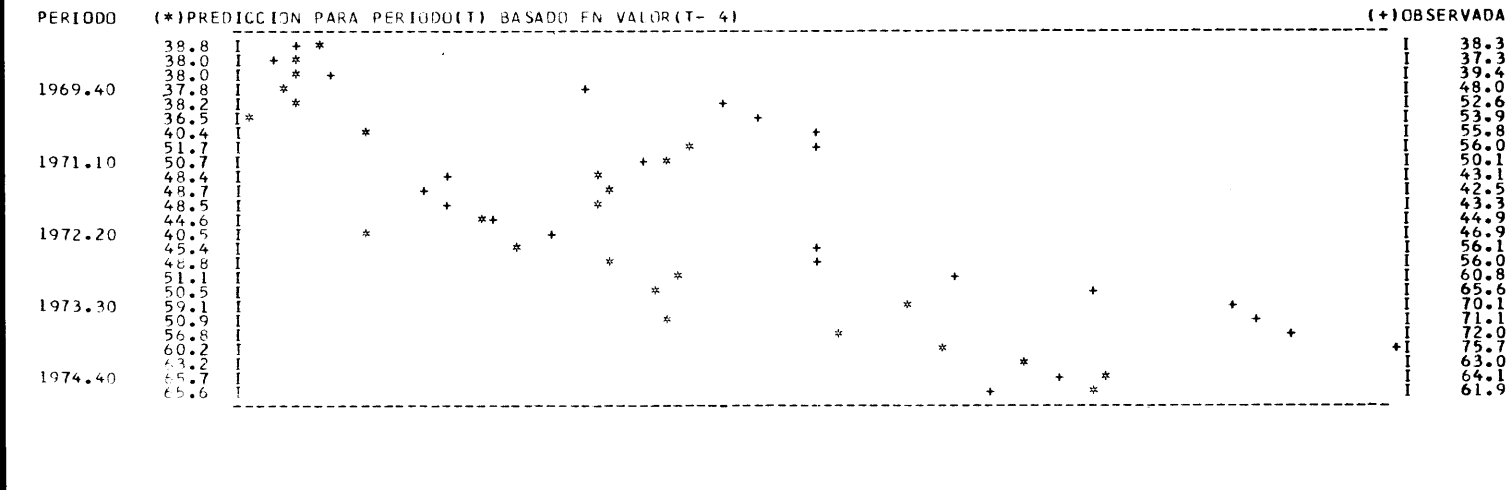
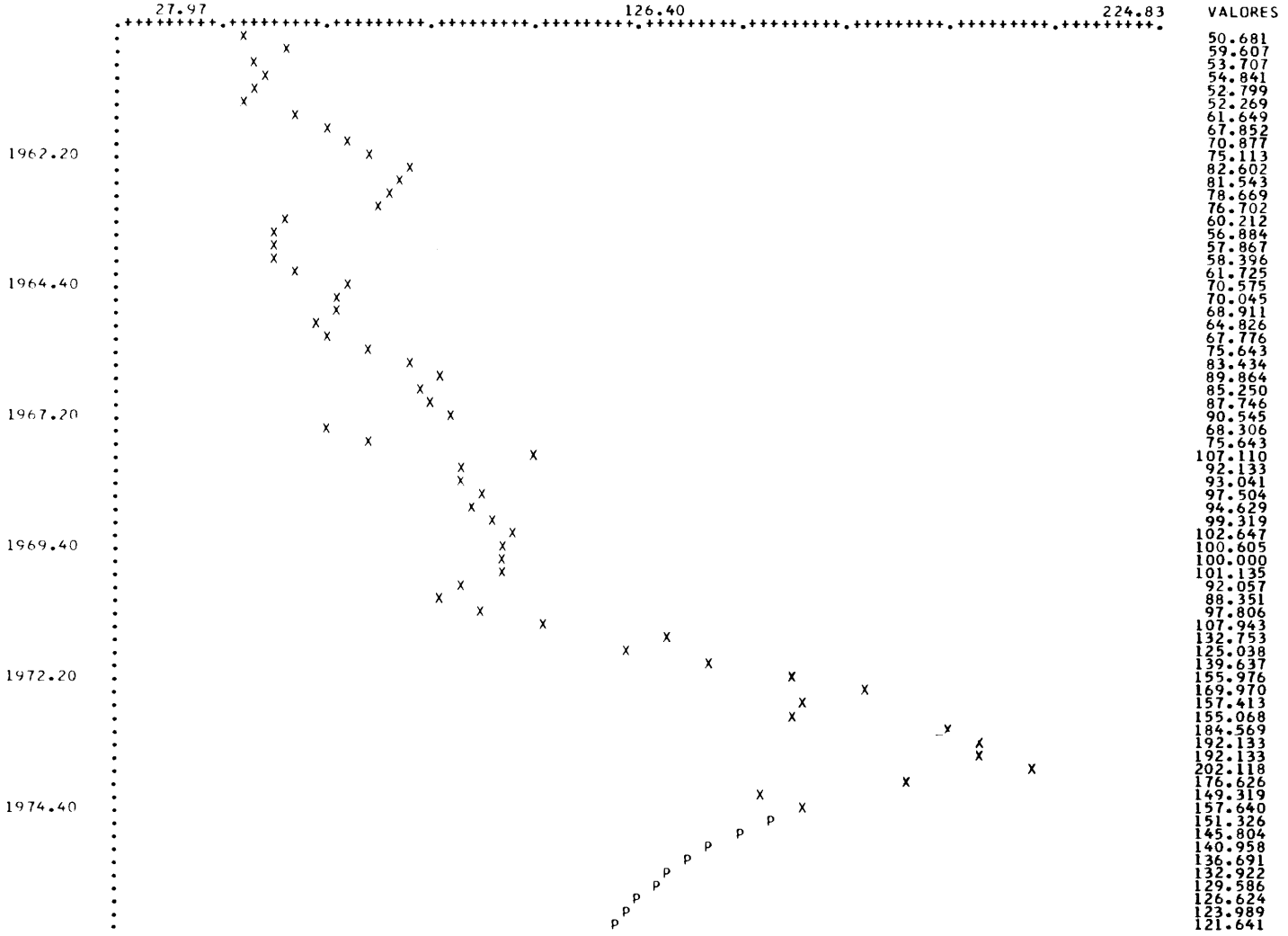


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

CAMARONES INDICE EXPORTACION DE MEXICO,PANAMA

PERIODO DE MUESTRA I TRIMESTRE,1960 AL IV TRIMESTRE, 1974

PERIODO DE PREDICCION I TRIMESTRE, 1975 AL I TRIMESTRE, 1977



INTERVALO ABSCISA ES 1.969

Anexo I.13.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - CAMARONES INDICE EXPORTACION DE MEXICO,PANAMA 60 OBSERVACIONES

DIFERENCIAS - 0 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	0.90940
2	PROMEDIO	0	4.88830

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	14.100	21.521	26.791	31.807	36.102
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.101	0.154	0.192	0.228	0.258

PREDICCIONES PARA EL PERIODO I TRIMESTRE, 1975 AL I TRIMESTRE, 1977
CON PERIODO BASE =1974.40 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

BASE DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.10	133.9179	151.3263	170.9975	0.9094
1975.20	123.6032	145.8044	171.9932	0.8270
1975.30	116.1411	140.9580	171.0776	0.7521
1975.40	110.3172	136.6908	169.3693	0.6839
1976.10	105.6027	132.9223	167.3093	0.6220
1976.20	101.7003	129.5856	165.1166	0.5656
1976.30	98.4199	126.6239	162.9103	0.5144
1976.40	95.6307	123.9894	160.7574	0.4678
1977.10	93.2381	121.6412	158.6966	0.4254

Anexo I.13.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA CAMARONES INDICE EXPORTACION DE MEXICO,PANAMA

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.30	68.3056	0.0	0.0	0.0	0.0	0.0
1967.40	75.6430	70.7312	0.0	0.0	0.0	0.0
1968.10	107.1104	77.6084	73.0118	0.0	0.0	0.0
1968.20	92.1332	106.4842	79.4401	75.1496	0.0	0.0
1968.30	93.0409	92.8531	105.9181	81.1433	77.1479	0.0
1968.40	97.5038	93.6847	93.5128	105.4058	82.7240	79.0113
1969.10	94.6293	97.7626	94.2741	94.1167	104.9421	84.1881
1969.20	99.3192	95.1380	97.9986	94.8132	94.6693	104.5222
1969.30	102.6475	99.4165	95.6032	98.2137	95.3062	95.1747
1969.40	100.6052	102.4417	99.5051	96.0281	98.4097	95.7568
1970.10	100.0000	100.5865	102.2549	99.5858	96.4162	98.5883
1970.20	101.1346	100.0360	100.5695	102.0854	99.6592	96.7703
1970.30	92.0574	101.0677	100.0688	100.5541	101.9315	99.7261
1970.40	88.3510	92.7837	101.0070	100.0987	100.5400	101.7917
1971.10	97.8063	89.3801	93.4492	100.9518	100.1259	100.5272
1971.20	107.9426	98.0384	90.3266	94.0585	100.9016	100.1507
1971.30	132.7534	107.2363	98.2500	91.1959	94.6161	100.8559
1971.40	125.0378	129.4358	106.5981	98.4428	91.9937	95.1261
1972.10	139.6369	122.5761	126.4908	106.0211	98.6185	92.7253
1972.20	155.9759	135.5252	120.3796	123.8708	105.4991	98.7785
1972.30	169.9698	149.8728	131.8911	118.4164	121.5354	105.0265
1972.40	157.4130	162.0529	144.5303	128.6710	116.6588	119.4499
1973.10	155.0682	151.1281	155.1738	139.8375	125.8110	115.0830
1973.20	184.5689	149.0796	145.6308	149.1718	135.7022	123.2652
1973.30	192.1332	174.6631	143.8344	140.8054	143.9155	132.0478
1973.40	192.1332	181.1610	166.1172	139.2250	136.5561	139.2964
1974.10	202.1180	181.1610	171.7278	158.7090	135.1616	132.8033
1974.20	176.6264	189.7029	171.7278	163.5764	152.2593	131.5694
1974.30	149.3193	167.8143	179.0759	163.5764	156.5001	146.6218
1974.40	157.6400	144.0449	160.1830	169.9295	156.5001	150.3309

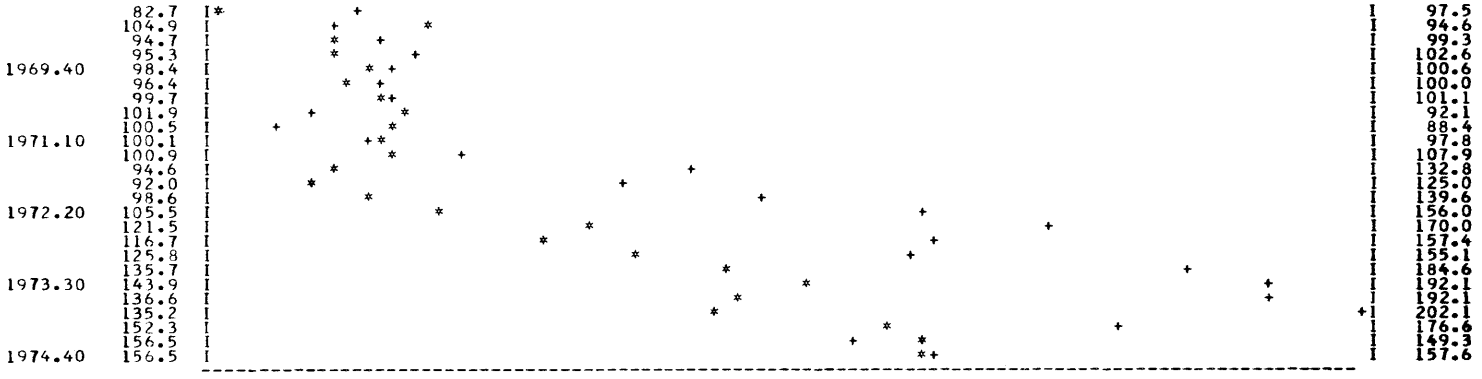
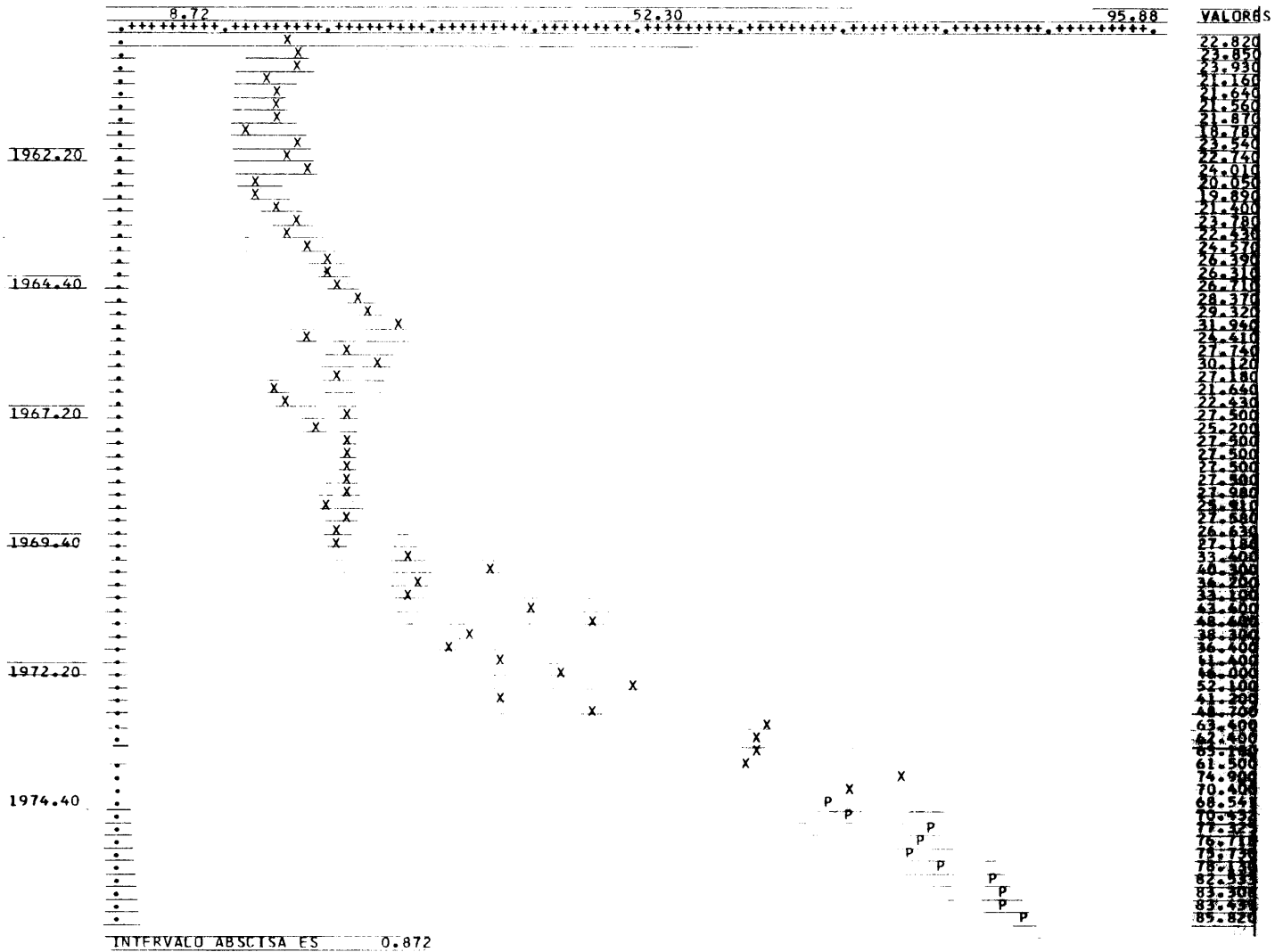


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

CARNE VACUNO UK DOM IMPORT LONDON ARG CHILLED RUMPS NEWPENCE/LB

PERIODO DE MUESTRA I TRIMESTRE, 1960 AL III TRIMESTRE, 1974

PERIODO DE PREDICCION IV TRIMESTRE,1974 AL I TRIMESTRE, 1977



Anexo I.14.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - CARNE VACUNO UK DOM IMPORT LONDON ARG CHILLED RUMPS NEWPENCE/LB 59 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	2	-0.25630
2	AUTOREGRESIVO REGULAR	4	0.33740
3	TENDENCIA CONSTANTE	0	0.02000

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	5.225	5.883	6.100	6.755	8.329
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.113	0.127	0.132	0.146	0.180

PREDICCIONES PARA EL PERIODO IV TRIMESTRE,1974 AL I TRIMESTRE, 1977
CON PERIODO BASE =1974.30 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1974.40	60.2386	68.5413	77.9882	1.0000
1975.10	53.6767	70.4322	84.5426	0.7437
1975.20	62.9095	77.3248	95.0431	0.7437
1975.30	61.1031	76.7178	96.3226	1.1468
1975.40	57.7240	75.7302	99.3531	1.1468
1976.10	57.3469	78.1303	106.4459	0.9570
1976.20	59.1553	82.5331	115.1495	0.9570
1976.30	58.4005	83.3078	118.8379	1.1416
1976.40	56.7995	83.4393	122.5735	1.1416
1977.10	56.8477	85.8200	129.5578	1.0303

Anexo I.14.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA CARNE VACUNO UK DOM IMPORT LONDON ARG CHILLED RUMPS NEWPENCE/LB

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.20	27.5000	0.0	0.0	0.0	0.0	0.0
1967.30	25.2000	26.8520	0.0	0.0	0.0	0.0
1967.40	27.5000	22.5945	24.0757	0.0	0.0	0.0
1968.10	27.5000	29.0398	23.8596	25.0134	0.0	0.0
1968.20	27.5000	29.3871	31.0326	26.8138	28.1104	0.0
1968.30	27.5000	27.2409	29.1101	30.3138	26.1927	28.1712
1968.40	27.9800	28.8946	28.6222	30.0705	31.3139	24.9966
1969.10	25.9100	28.5452	29.4783	29.2713	30.7524	32.7351
1969.20	27.5800	26.3164	23.9929	29.6948	29.4864	31.8183
1969.30	26.6300	28.6969	27.3821	29.4274	30.1398	29.8142
1969.40	27.1800	26.8930	28.9803	27.9869	30.0773	31.2075
1970.10	33.4000	27.2630	26.9751	28.5172	27.5397	30.7751
1970.20	40.3000	34.6185	28.2576	28.0354	29.6381	28.0862
1970.30	34.2000	38.5403	33.1070	28.4672	28.2434	30.7713
1970.40	33.1000	33.4814	37.7305	33.6986	28.9759	28.6254
1971.10	43.4000	37.7554	38.1904	41.7392	37.2789	29.5357
1971.20	43.6000	47.5698	41.3829	41.7370	45.6154	38.3202
1971.30	38.3000	43.7638	42.8362	38.6197	38.9501	44.6700
1971.40	36.4000	37.5402	42.8957	42.2176	38.0620	38.5654
1972.10	41.4000	43.2510	44.6059	49.2566	48.4781	41.3192
1972.20	46.0000	44.4561	46.4438	47.5215	52.4762	51.2026
1972.30	52.1000	41.9002	40.4939	41.8328	42.8035	49.8767
1972.40	41.2000	50.8557	40.8995	39.8742	41.1926	42.6758
1973.10	48.7000	42.5189	52.4837	44.6328	43.5139	45.7523
1973.20	63.4000	54.6739	47.7346	55.8264	47.4754	45.6527
1973.30	62.4000	64.6258	55.7310	50.3800	58.9203	45.8936
1973.40	63.1000	54.9685	56.9292	50.9928	46.0966	58.6862
1974.10	61.5000	68.3897	59.5765	61.1498	54.7732	46.9779
1974.20	74.0000	68.3867	76.0479	68.6322	70.4447	59.4528
1974.30	70.4000	76.5061	69.8531	75.5931	68.2218	71.0197

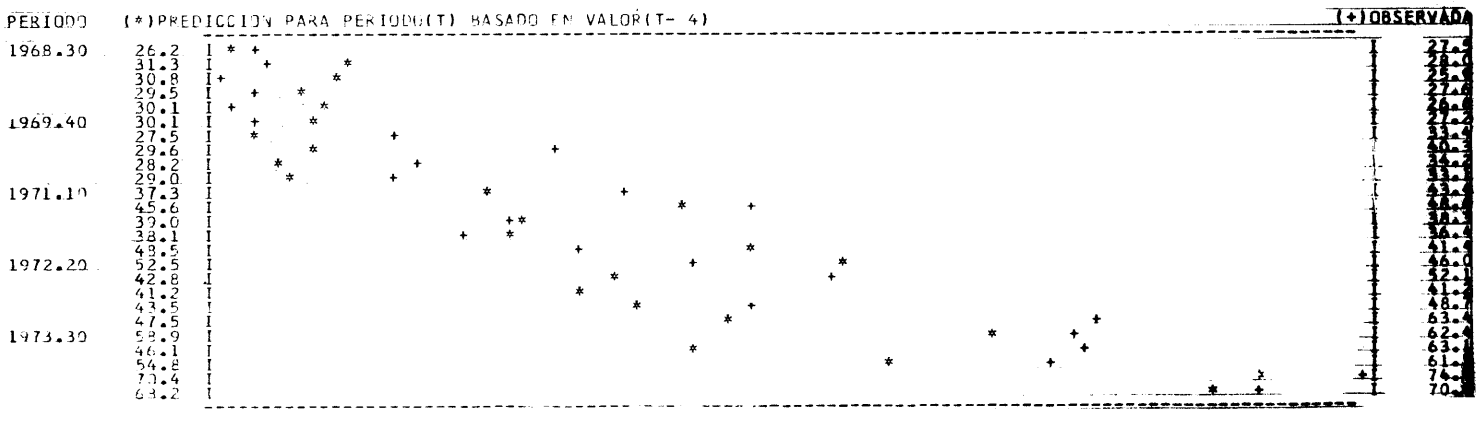
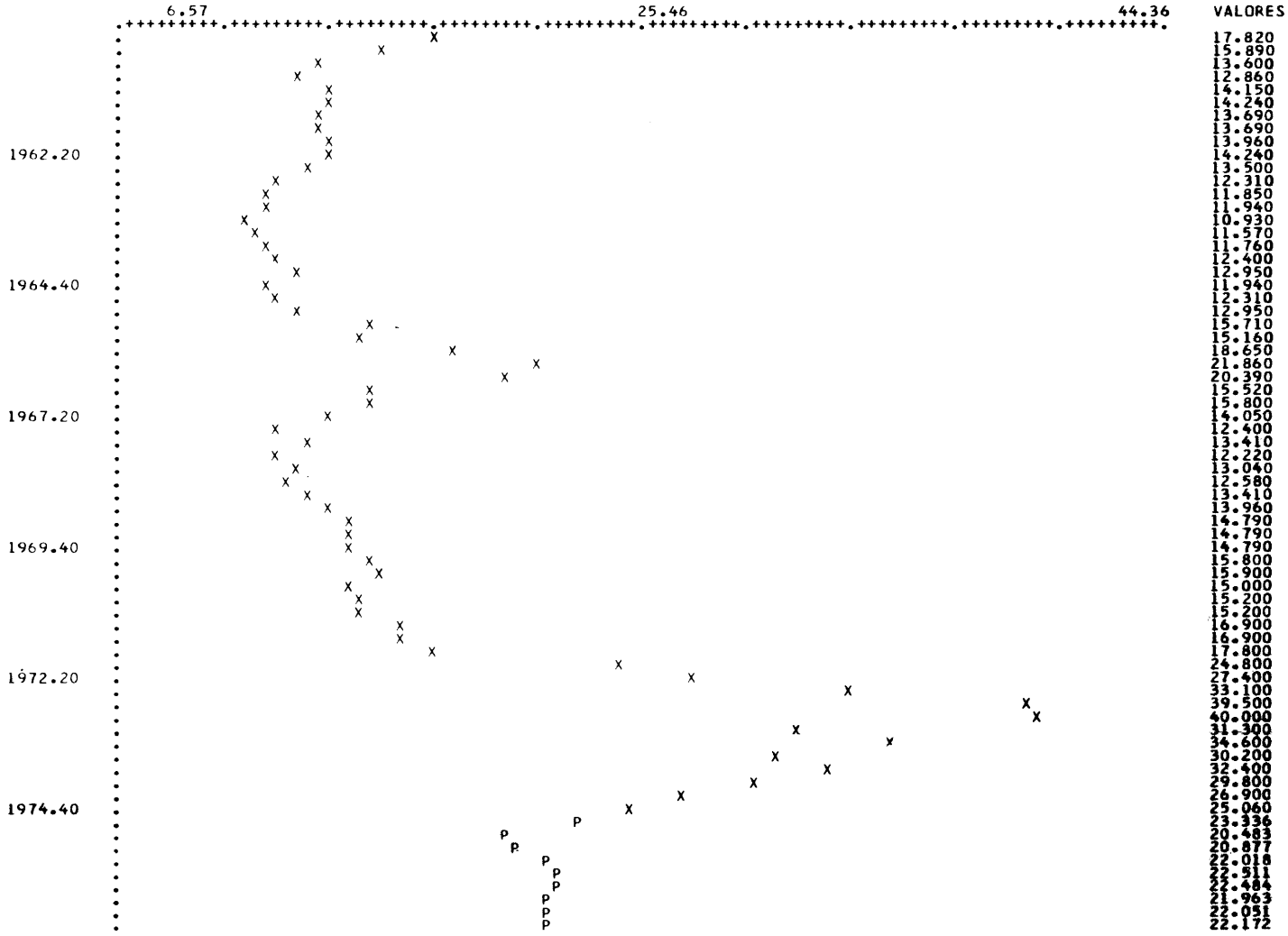


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

CUERO UK ARGENTINA FRIG OX C.F. NEW PENCE/KG AJUSTADAS

PERIODO DE MUESTRA I TRIMESTRE,1960 AL IV TRIMESTRE, 1974

PERIODO DE PREDICCION I TRIMESTRE,1975 AL I TRIMESTRE, 1977



INTERVALO ABSCISA ES 0.378

Anexo I.15.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - CUERO UK ARGENTINA FRIG OX C.F. NEW PENCE/KG AJUSTADAS 60 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

NUMERO	PARAMETROS DEL MODELO CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	2	0.28230
2	AUTOREGRESIVO REGULAR	5	0.22760
3	PROMEDIO MOVIL REGULAR	2	0.40490
4	PROMEDIO MOVIL REGULAR	5	0.99770

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	2.423	3.808	4.552	5.003	5.535
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.099	0.155	0.185	0.203	0.225

PREDICCIONES PARA EL PERIODO I TRIMESTRE,1975 AL I TRIMESTRE, 1977
CON PERIODO BASE =1974.40 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.10	20.9726	23.3359	25.9656	1.0000
1975.20	17.6121	20.4830	23.8218	0.8774
1975.30	17.4782	20.8774	24.9375	0.8774
1975.40	18.0105	22.0177	26.9165	0.8428
1976.10	18.0631	22.5110	28.0540	0.0727
1976.20	18.0388	22.4837	28.0238	0.0629
1976.30	17.6194	21.9632	27.3778	-0.1824
1976.40	17.6747	22.0511	27.5110	-0.1851
1977.10	17.7563	22.1725	27.6869	-0.2623

Anexo I.15.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA CUERO UK ARGENTINA FRIG OX C.F. NEW PENCE/KG AJUSTADAS

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.30	12.4000	0.0	0.0	0.0	0.0	0.0
1967.40	13.4100	13.7905	0.0	0.0	0.0	0.0
1968.10	12.2200	13.3520	13.7308	0.0	0.0	0.0
1968.20	13.0400	14.0777	15.3818	15.7641	0.0	0.0
1968.30	12.5800	12.6326	13.6380	14.7403	15.1066	0.0
1968.40	13.4100	13.5503	13.6070	14.5526	15.7289	16.1041
1969.10	13.9600	13.9195	14.0651	14.1167	15.0977	16.2681
1969.20	14.7900	15.2669	15.2225	15.3622	15.4185	16.4464
1969.30	14.7900	16.3676	16.8953	16.8522	17.0068	17.0668
1969.40	14.7900	15.1666	16.7843	17.2582	17.2142	17.3659
1970.10	15.8000	15.7985	16.2008	17.7074	18.2074	18.1628
1970.20	15.9000	16.0618	16.0602	16.4184	17.9453	18.4317
1970.30	15.0000	16.9410	17.1133	17.1119	17.4936	19.0535
1970.40	15.2000	16.6940	18.8542	19.0223	19.0207	19.4281
1971.10	15.2000	16.1062	17.6893	19.6824	19.8580	19.8563
1971.20	16.9000	16.0858	17.0448	18.5061	20.5913	20.7677
1971.30	16.9000	17.5016	16.6584	17.5267	19.0294	21.0845
1971.40	17.8000	19.0181	19.6952	18.8601	19.8432	21.4747
1972.10	24.8000	19.8840	21.2448	21.9069	20.9781	22.0273
1972.20	27.4000	27.3871	21.9582	23.2713	23.9966	23.0185
1972.30	33.1000	26.8315	26.8189	22.0930	23.4142	24.1147
1972.40	39.5000	35.2473	28.5722	28.5604	23.5277	24.8775
1973.10	40.0000	41.3676	36.9133	30.7033	30.6906	25.4766
1973.20	31.3000	34.7340	35.9216	32.5049	27.0362	27.0255
1973.30	34.6000	32.5574	36.1294	37.2109	33.6716	28.2108
1973.40	30.2000	28.5116	26.8284	29.3943	30.2742	27.5029
1974.10	32.4000	28.1651	26.5905	25.2081	27.6190	28.4127
1974.20	29.8000	31.5910	27.4619	26.1101	24.7526	27.0225
1974.30	26.9000	30.1349	31.9460	28.2516	26.8609	25.5181
1974.40	25.0600	25.9001	29.0148	30.5393	27.0075	25.7292

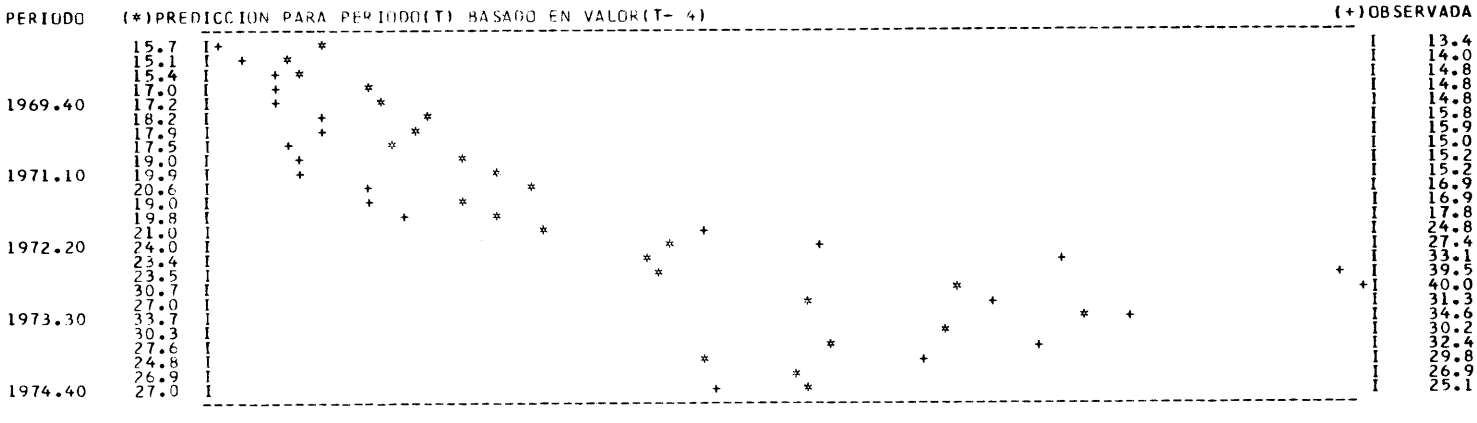
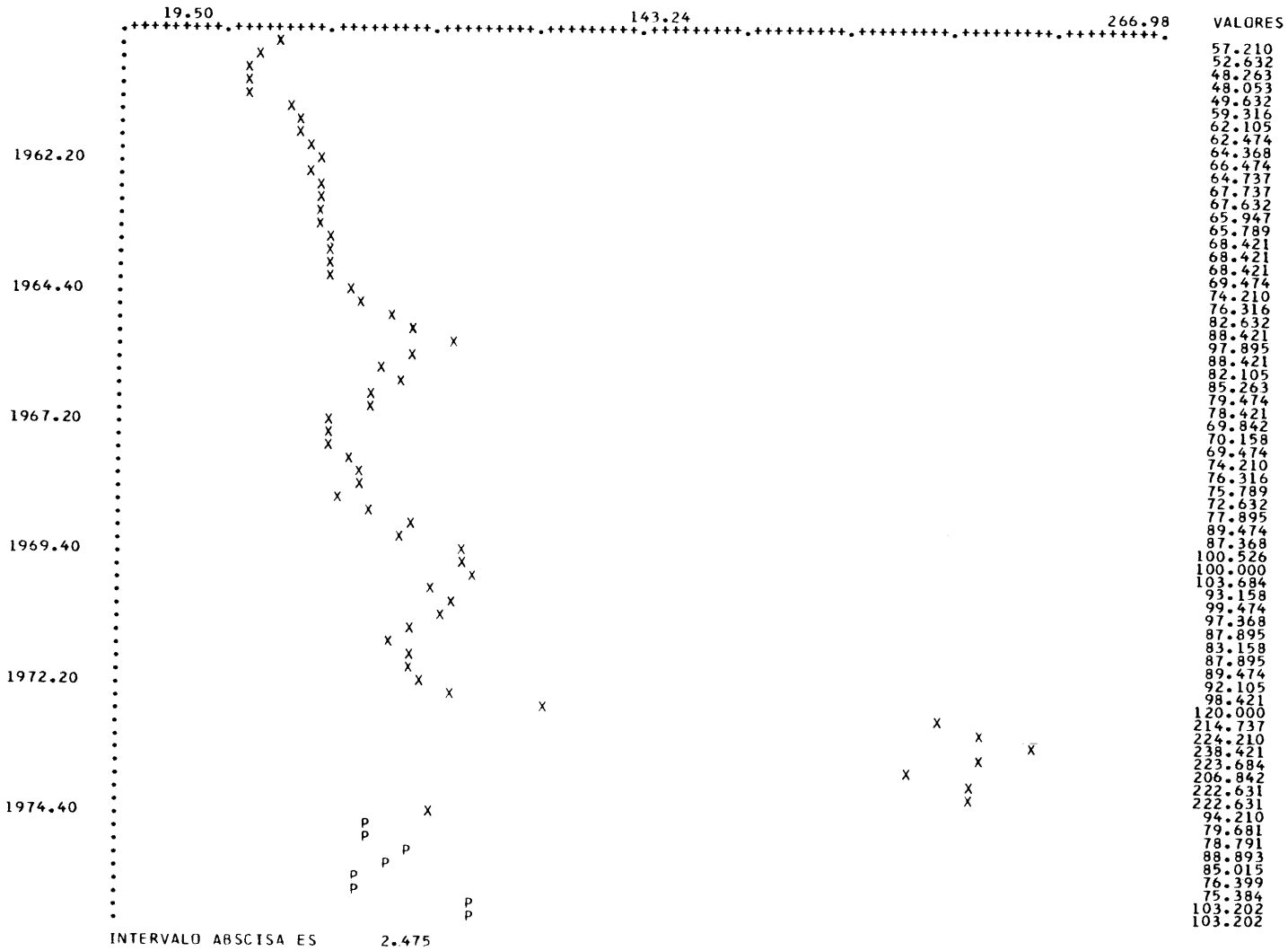


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

HARINA PESCADO INDICE EXPORTACION DE PERU,CHILE

PERIODO DE MUESTRA I TRIMESTRE,1960 AL IV TRIMESTRE, 1974

PERIODO DE PREDICCION I TRIMESTRE,1975 AL IV TRIMESTRE, 1976



Anexo I.16.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - HARINA PESCADO INDICE EXPORTACION DE PERU,CHILE — 60 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 — MODELO LOGARITMICO

NUMERO	PARAMETROS DEL MODELO CARACTERISTICAS	ORDEN	VALOR
1	PROMEDIO MOVIL REGULAR	1	-0.24130
2	PROMEDIO MOVIL REGULAR	4	-0.38400
3	PROMEDIO MOVIL REGULAR	7	0.66930

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	25.770	39.571	46.643	54.559	60.276
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.182	0.279	0.329	0.385	0.425

PREDICCIONES PARA EL PERIODO I TRIMESTRE,1975 AL IV TRIMESTRE, 1976
CON PERIODO BASE =1974.40 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

BASE DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.10	69.0502	79.6809	91.9481	1.2413
1975.20	62.7120	78.7915	98.9936	1.2413
1975.30	66.5620	88.8927	118.7151	1.2413
1975.40	60.5390	85.0150	119.3866	1.6253
1976.10	50.6190	76.3993	115.3094	1.6253
1976.20	46.9798	75.3843	120.9624	1.6253
1976.30	60.9248	103.2023	174.8170	0.9560
1976.40	59.8686	103.2023	177.9012	0.9560

Anexo I.16.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA HARINA PESCADO INDICE EXPORTACION DE PERU,CHILE

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.30	70.1578	0.0	0.0	0.0	0.0	0.0
1967.40	69.4736	71.6072	0.0	0.0	0.0	0.0
1968.10	74.2105	73.1398	75.9383	0.0	0.0	0.0
1968.20	76.3158	65.3230	64.1553	66.6100	0.0	0.0
1968.30	75.7894	82.0264	67.6249	66.4160	68.9572	0.0
1968.40	72.6315	69.5638	76.7390	63.2658	62.1348	65.2660
1969.10	77.8947	79.1508	75.0225	82.7607	68.2303	66.6377
1969.20	89.4736	84.6795	86.3778	81.8725	90.3173	70.1433
1969.30	87.3684	89.7572	83.8266	85.5078	81.0479	92.1645
1969.40	100.5263	87.3975	90.3736	84.4022	86.0950	80.2634
1970.10	100.0000	93.1253	78.2747	80.9401	75.5920	77.5832
1970.20	103.6842	109.5557	100.2857	84.2933	87.1636	79.7009
1970.30	93.1578	98.3777	105.3397	96.4265	81.0494	84.6820
1970.40	99.4736	98.0608	104.9269	112.3522	102.8456	81.9220
1971.10	97.3684	98.8728	97.1327	103.9338	111.2889	99.1239
1971.20	87.8947	96.7087	98.5670	96.8323	103.6123	113.3165
1971.30	83.1579	76.5906	86.2369	87.8940	86.3471	94.3477
1971.40	87.8947	81.3217	73.4274	82.6753	84.2639	82.3275
1972.10	89.4736	92.3765	83.8803	75.7376	85.2765	87.4285
1972.20	92.1052	88.7684	92.3574	83.8629	75.7219	88.4457
1972.30	98.4210	94.9974	90.7443	94.4132	85.7296	75.0004
1972.40	120.0000	103.3276	98.8851	94.4579	98.2769	86.6140
1973.10	214.7366	131.0116	108.8101	104.1319	99.4698	104.7682
1973.20	224.2104	232.2357	125.7624	104.4505	99.9597	94.1410
1973.30	238.4211	213.9348	223.4808	121.0213	100.5128	94.8925
1973.40	223.6839	264.8057	231.4773	241.8061	130.9450	102.6840
1974.10	206.8419	253.2961	312.3250	273.0156	285.1978	127.7508
1974.20	222.6313	189.7799	244.0463	300.9194	263.0457	278.5193
1974.30	222.6313	218.2269	178.9952	230.1778	283.8191	237.9857
1974.40	94.2104	150.6280	146.9379	120.5222	154.9849	203.8977

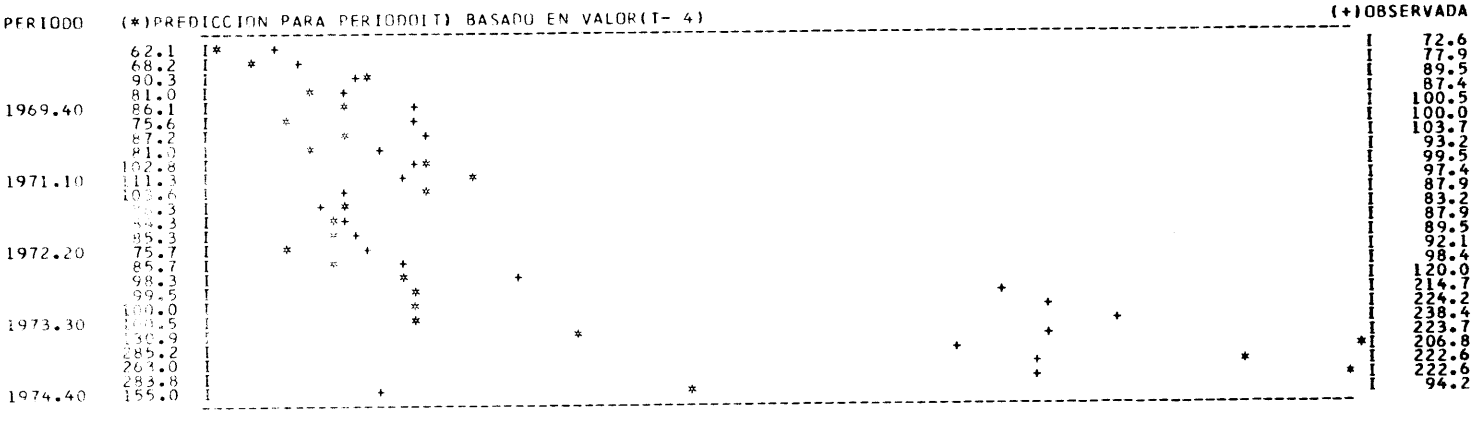
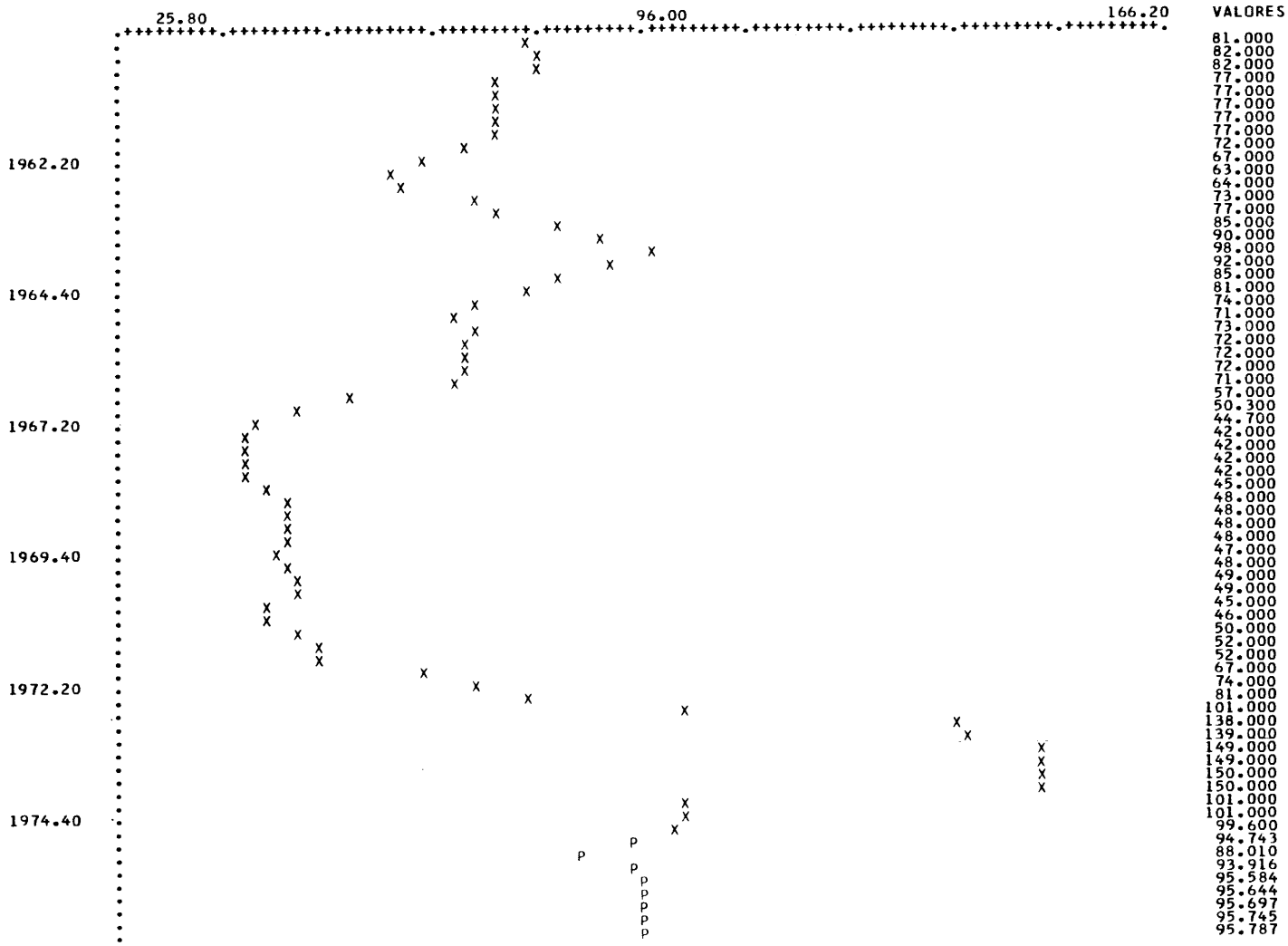


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

LANA BUENOS AIRES IMPORT BOSTON CENTS/LB

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 1.404

Anexo I.17.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - LANA BUENOS AIRES IMPORT BOSTON CENTS/LB 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	0.89630
2	PROMEDIO MOVIL REGULAR	1	0.65410
3	PROMEDIO MOVIL REGULAR	5	0.35390

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	11.925	16.414	19.971	23.262	28.330
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.129	0.178	0.216	0.252	0.307

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	85.7383	94.7434	104.6942	1.2422
1975.30	75.0525	88.0103	103.2052	1.4593
1975.40	75.6804	93.9163	116.5463	1.6538
1976.10	72.8335	95.5836	125.4397	1.8282
1976.20	68.9356	95.6436	132.6991	1.6306
1976.30	66.3850	95.6972	137.9520	1.4535
1976.40	64.5998	95.7449	141.9057	1.2948
1977.10	63.3042	95.7875	144.9388	1.1525

Anexo I.17.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA LANA BUENOS AIRES IMPORT BOSTON CENTS/LB

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	42.0000	0.0	0.0	0.0	0.0	0.0
1968.10	42.0000	44.0742	0.0	0.0	0.0	0.0
1968.20	42.0000	44.5436	47.2923	0.0	0.0	0.0
1968.30	45.0000	44.5932	47.9721	51.4681	0.0	0.0
1968.40	48.0000	47.7055	47.1703	51.3963	55.6616	0.0
1969.10	48.0000	49.9370	49.5567	48.9042	53.8985	58.8643
1969.20	48.0000	50.1057	52.6295	52.1590	51.3814	57.2123
1969.30	48.0000	50.4050	53.1662	56.3259	55.7554	54.8373
1969.40	47.0000	49.4006	52.4937	55.8878	59.6667	58.9991
1970.10	48.0000	47.5452	50.5803	54.3208	58.3180	62.6924
1970.20	49.0000	49.2959	48.7164	52.3898	56.8018	61.4399
1970.30	49.0000	50.8781	51.2600	50.5529	54.8942	60.0268
1970.40	45.0000	51.0968	53.5407	54.0133	53.1695	58.2393
1971.10	46.0000	46.1120	53.9957	57.0422	57.6132	56.6190
1971.20	50.0000	46.8317	46.9733	56.5426	60.1715	60.8377
1971.30	52.0000	51.7315	47.6913	47.8607	59.0528	63.2564
1971.40	52.0000	54.3976	54.0489	49.1245	49.3224	62.2198
1972.10	67.0000	56.0190	59.2452	58.7993	52.7657	53.0008
1972.20	74.0000	74.8609	59.9359	64.0110	63.4653	56.3065
1972.30	81.0000	79.6409	80.7935	62.2204	67.0362	66.4047
1972.40	100.9999	86.7090	84.9053	86.3507	64.2240	69.7408
1973.10	138.0000	113.1897	93.6489	91.3646	93.1293	67.1368
1973.20	139.0000	150.5106	117.6651	94.1804	91.5811	93.5385
1973.30	149.0000	147.9797	163.3515	122.3260	95.0473	92.1517
1973.40	149.0000	156.9186	155.5851	174.7389	125.9035	95.2587
1974.10	150.0000	146.0312	155.7329	154.1795	175.8617	122.4078
1974.20	150.0000	138.2341	133.7054	144.2002	142.5712	164.8929
1974.30	100.9999	146.2557	132.1431	127.0721	138.4341	136.7064
1974.40	100.9999	90.0492	142.6315	126.6036	121.1115	133.1375
1975.10	99.6000	95.4284	82.7494	142.0381	124.0889	118.1522

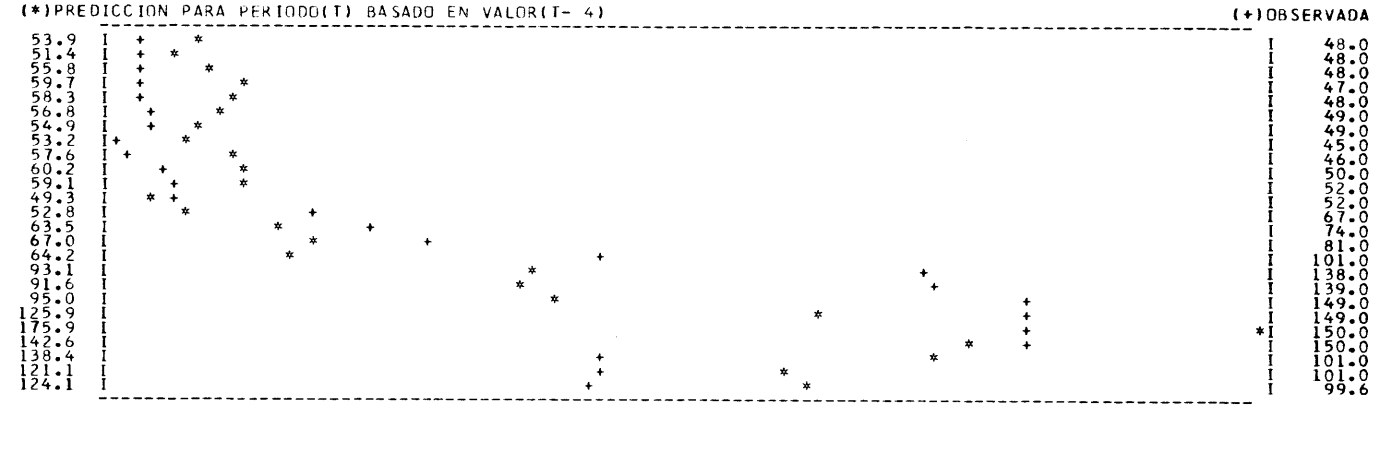
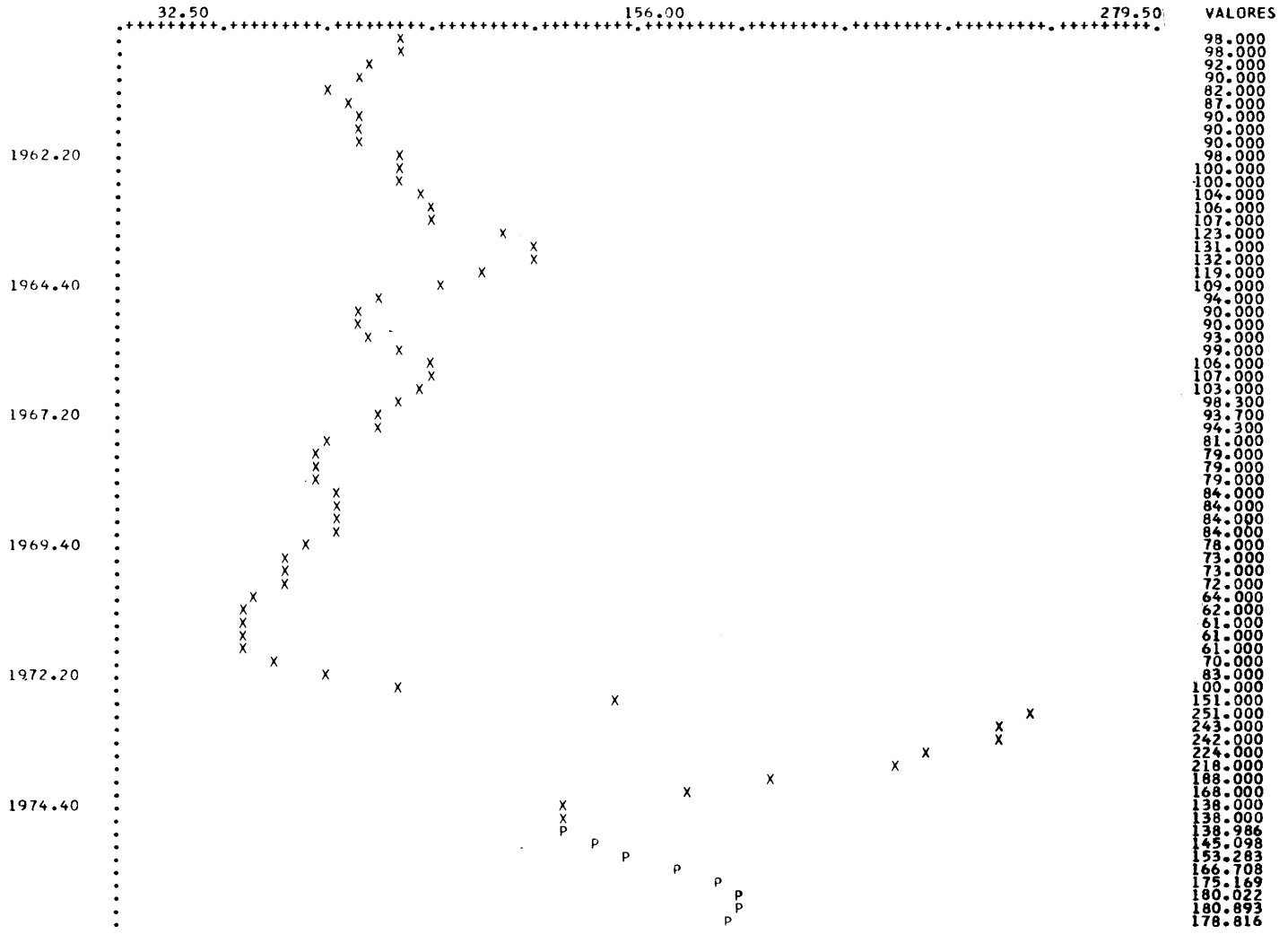


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

LANA IMPORT BOSTON MONTEVIDEO CENTS/LB

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 2.470

Anexo I.18.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - LANA IMPORT BOSTON MONTEVIDEO CENTS/LB 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

NUMERO	PARAMETROS DEL MODELO CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	0.58970
2	AUTOREGRESIVO REGULAR	5	-0.26230

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	23.447	40.088	53.447	60.586	68.311
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.168	0.287	0.383	0.434	0.490

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	125.2825	138.9861	154.1885	1.5897
1975.30	119.3974	145.0976	176.3296	1.9374
1975.40	115.8381	153.2828	202.8314	2.1425
1976.10	116.5821	166.7079	238.3858	2.2634
1976.20	114.1867	175.1692	268.7197	2.0724
1976.30	111.5117	180.0220	290.6233	1.8051
1976.40	108.1594	180.8928	302.5366	1.5563
1977.10	104.3011	178.8157	306.5647	1.3558

Anexo I.18.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA LANA IMPORT BOSTON MONTEVIDEO CENTS/LB

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	81.0000	0.0	0.0	0.0	0.0	0.0
1968.10	79.0000	74.7978	0.0	0.0	0.0	0.0
1968.20	79.0000	78.8033	72.2449	0.0	0.0	0.0
1968.30	79.0000	79.9992	79.6823	71.6758	0.0	0.0
1968.40	84.0000	78.8678	80.4595	80.0718	71.2229	0.0
1969.10	84.0000	90.6389	81.9953	84.0166	83.5691	73.8440
1969.20	84.0000	84.5526	95.4207	84.4493	86.7544	86.2663
1969.30	84.0000	83.9999	84.8800	98.3579	85.9307	88.4104
1969.40	78.0000	83.9999	83.9997	85.0736	100.1320	86.8162
1970.10	73.0000	73.4723	82.6584	82.6583	83.8276	99.5772
1970.20	73.0000	70.2030	70.9264	81.8774	81.8772	83.1014
1970.30	72.0000	72.9999	68.6040	69.4666	81.4202	81.4199
1970.40	64.0000	71.4166	72.9998	67.6782	68.6198	81.1516
1971.10	62.0000	60.8776	72.4698	74.4326	68.4559	69.4624
1971.20	61.0000	61.9166	60.1442	74.3795	76.6103	70.1267
1971.30	61.0000	60.4179	61.8674	59.7157	75.5290	77.9242
1971.40	61.0000	61.2211	60.2949	62.0625	59.6801	76.4914
1972.10	70.0000	62.9139	63.2763	62.1120	64.1286	61.5308
1972.20	83.0000	76.5526	64.6064	65.0608	63.7377	65.9258
1972.30	100.0000	92.1628	81.0454	65.9061	66.4189	64.9928
1972.40	151.0000	111.6142	98.0333	83.8173	66.6847	67.2329
1973.10	250.9999	192.5390	119.0855	101.6688	85.4961	67.1480
1973.20	242.9999	326.6931	214.3279	119.3369	100.1926	83.4348
1973.30	241.9999	227.9842	364.9517	218.3382	114.2641	94.9914
1973.40	224.0000	229.8966	209.0946	370.9978	210.2091	106.0618
1974.10	217.9999	192.0911	200.1919	178.3390	336.2275	184.4965
1974.20	137.9999	187.7645	153.5539	161.4821	142.1055	277.6780
1974.30	168.0001	173.7522	173.4064	135.7076	143.4768	125.3531
1974.40	138.0000	157.3884	166.0411	165.6384	126.3082	133.9596
1975.10	138.0000	125.4023	154.5494	164.9659	164.5235	123.5531

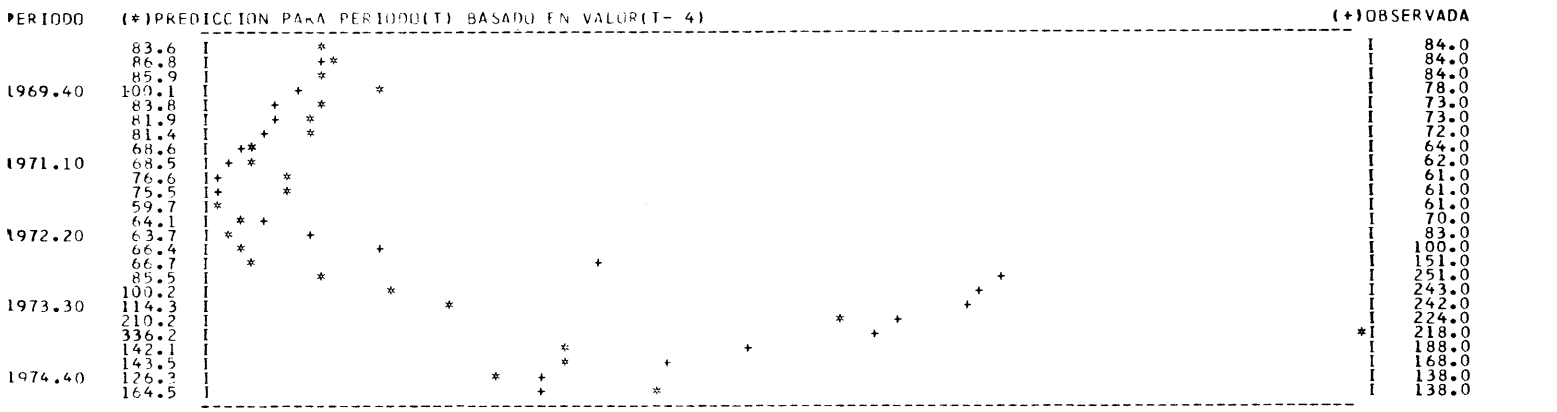
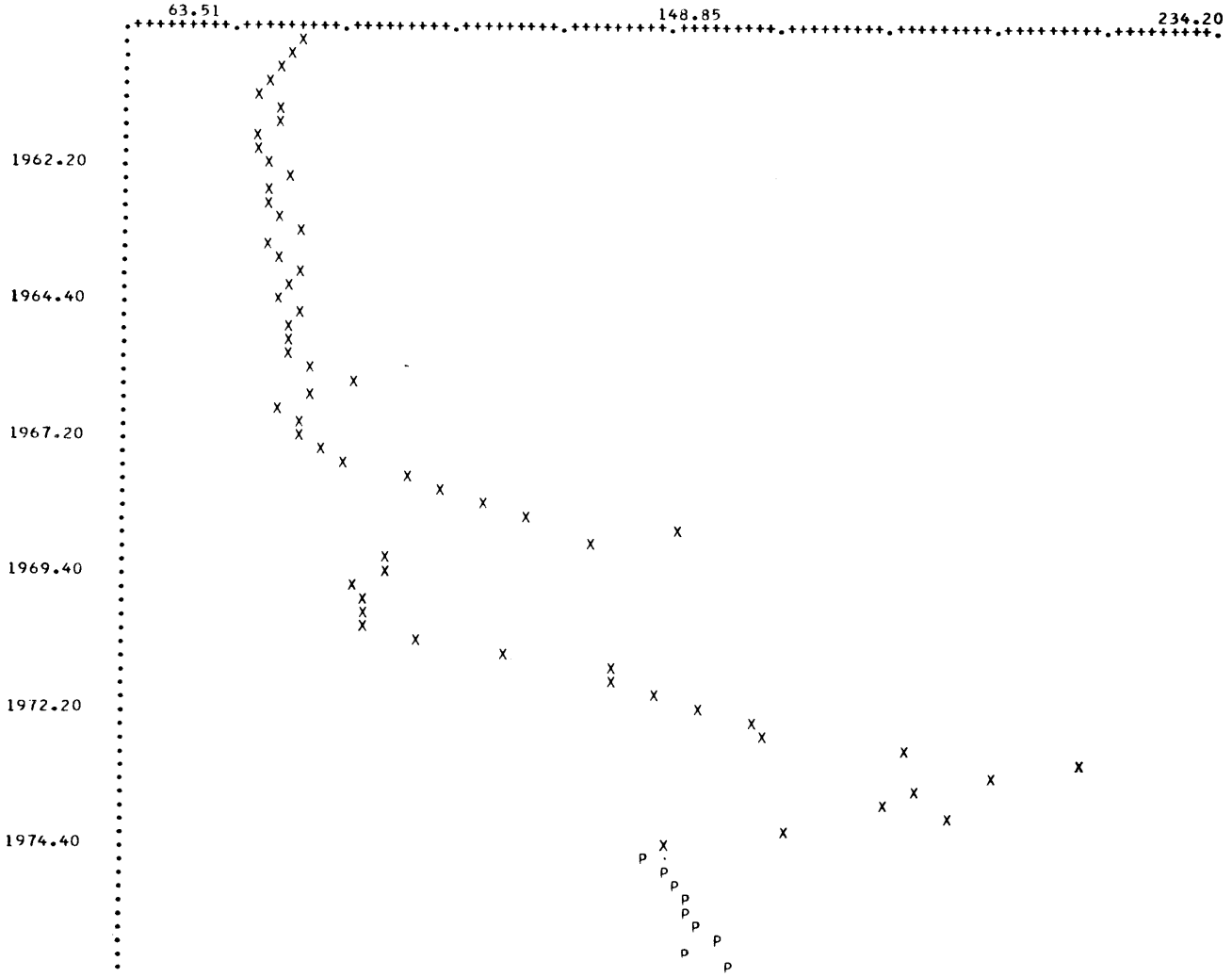


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

MADERA INDICE EXPORTACION DE BRASIL,HONDURAS

PERIODO DE MUESTRA I TRIMESTRE,1960 AL IV TRIMESTRE, 1974

PERIODO DE PREDICCION I TRIMESTRE,1975 AL I TRIMESTRE, 1977



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159.327

INTERVALO ABSCISA ES 1.707

Anexo I.19.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - MADERA INDICE EXPORTACION DE BRASIL,HONDURAS — 60 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 — MODELO LOGARITMICO

NUMERO	CARACTERISTICAS	PARAMETROS DEL MODELO ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	-0.17840
2	AUTOREGRESIVO REGULAR	16	0.54150
3	PROMEDIO MOVIL REGULAR	1	-0.95790
4	PROMEDIO MOVIL REGULAR	16	0.66930

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	9.228	19.845	24.651	28.769	34.355
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.061	0.132	0.164	0.192	0.229

PREDICCIONES PARA EL PERIODO I TRIMESTRE,1975 AL I TRIMESTRE, 1977
CON PERIODO BASE =1974.40 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

BASE DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.10	135.2335	144.6238	154.6660	1.7795
1975.20	129.5867	148.6188	170.4459	1.6404
1975.30	126.0019	150.2197	179.0921	1.6652
1975.40	124.1106	152.8581	188.2642	1.6608
1976.10	120.2883	152.3508	192.9593	1.6616
1976.20	118.3244	153.6583	199.5434	1.6615
1976.30	118.3046	157.1773	208.8227	1.6615
1976.40	112.7155	152.9468	207.5374	1.6615
1977.10	115.1220	159.3267	220.5051	1.6615

Anexo I.19.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA MADERA INDICE EXPORTACION DE BRASIL,HONDURAS

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.30	94.3293	0.0	0.0	0.0	0.0	0.0
1967.40	97.8189	92.0142	0.0	0.0	0.0	0.0
1968.10	107.6335	104.9007	94.0808	0.0	0.0	0.0
1968.20	113.4133	106.9975	102.2112	92.4518	0.0	0.0
1968.30	120.6107	121.0145	109.1023	104.5952	94.4647	0.0
1968.40	127.2628	115.5669	116.2566	105.6648	101.2352	91.4549
1969.10	150.7089	139.4862	117.4973	118.1435	107.2249	102.7415
1969.20	136.7502	161.2033	140.4655	119.9191	120.5886	109.4722
1969.30	103.7077	114.3140	153.1926	134.9295	114.9177	115.5576
1969.40	103.9258	102.2953	121.6483	159.3349	140.0705	119.3471
1970.10	100.0000	101.8943	99.0672	116.2256	152.8539	134.4191
1970.20	100.2180	103.9392	107.4688	104.7169	123.1510	161.8441
1970.30	101.1995	96.8388	103.3298	106.5603	103.7910	122.0095
1970.40	100.9814	101.3331	93.6942	99.4688	102.6263	99.9662
1971.10	109.4875	102.1327	102.7666	95.6034	101.5874	104.8036
1971.20	123.6640	115.9845	102.4849	103.0712	95.7821	101.7609
1971.30	139.8037	129.5755	115.6048	103.1420	103.7410	96.4232
1971.40	140.3489	144.0061	125.7956	113.2376	100.8558	101.4399
1972.10	147.5463	141.6496	148.2847	130.9088	117.6530	104.8207
1972.20	153.5441	150.4506	139.9182	145.9491	128.6044	115.6148
1972.30	163.3588	161.0845	155.3548	145.3008	151.6605	133.6820
1972.40	164.7764	158.0435	154.1494	149.0978	139.2983	145.3787
1973.10	187.2410	178.1778	165.4294	161.6581	156.2805	146.0452
1973.20	214.5039	203.2824	186.1042	173.7941	169.7835	164.1404
1973.30	200.4362	202.5424	184.0732	169.6851	158.2970	154.6538
1973.40	187.8952	198.9665	202.7023	185.6003	170.8822	159.4433
1974.10	183.0970	178.4443	197.5825	200.9999	183.7964	169.2585
1974.20	193.6750	193.4203	184.7609	202.9544	206.5182	188.8873
1974.30	167.7208	187.3947	186.9565	179.2271	197.1555	200.6081
1974.40	148.0916	154.9154	188.7184	188.3116	180.4107	198.4071

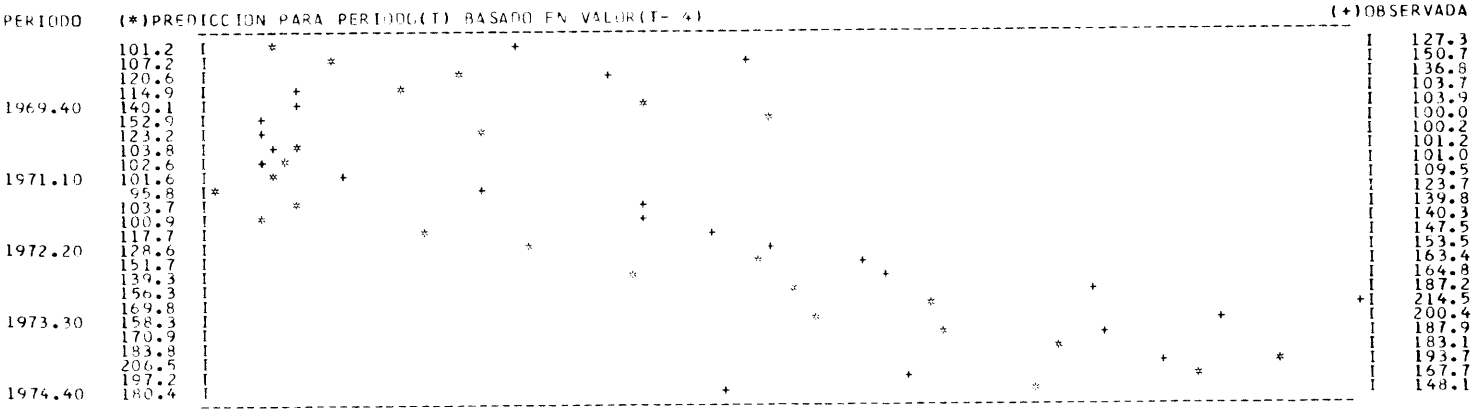
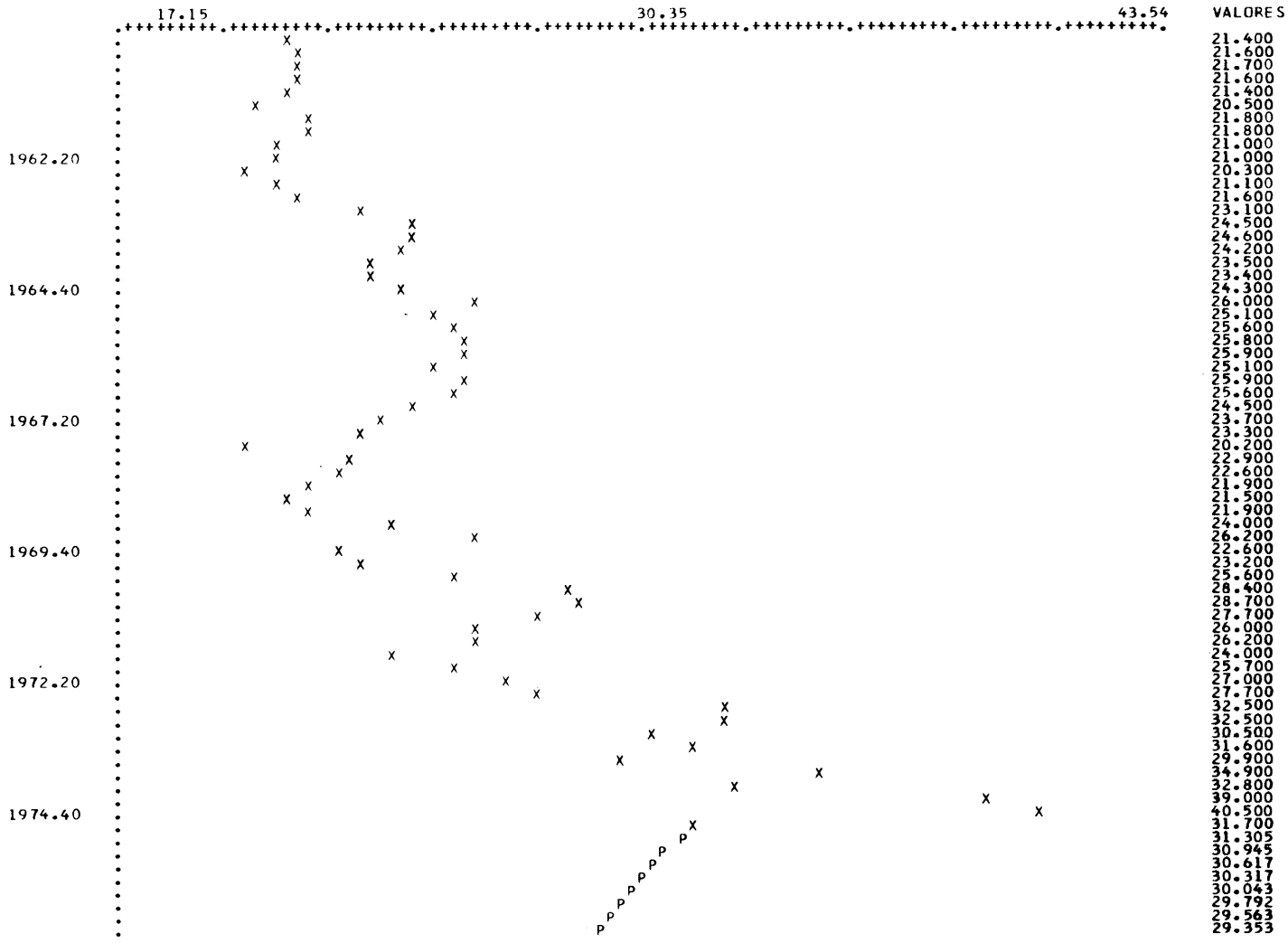


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

MAIZ UK CIF FUT ARG L8/LONG TON AJUSTADAS

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 0.264

Anexo I.20.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - MAIZ UK CIF FUT ARG LB/LONG TON AJUSTADAS 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 MODELO LOGARITMICO

NUMERO	PARAMETRCS CEL MODELO CARACTERISTICAS	ORDEN	VALOR
1	PROMEDIO MOVIL REGULAR	7	0.09830
2	PROMEDIO MOVIL REGULAR	14	-0.48710

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	2.834	3.450	3.677	4.090	3.951
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.097	0.118	0.126	0.140	0.135

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	28.2361	30.6020	33.1662	1.0000
1975.30	29.0651	32.5681	36.4933	1.0000
1975.40	29.0267	33.3677	38.3578	1.0000
1976.10	29.0138	34.0797	40.0301	1.0000
1976.20	29.5291	35.3502	42.3187	1.0000
1976.30	28.4862	34.6924	42.2506	1.0000
1976.40	28.4360	35.1825	43.5295	0.9017
1977.10	28.4347	35.6065	44.5870	0.9017

Anexo I.20.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA MAIZ UK CIF FUT ARG LB/LONG TON AJUSTADAS

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	20.2000	0.0	0.0	0.0	0.0	0.0
1968.10	22.9000	20.3376	0.0	0.0	0.0	0.0
1968.20	22.6000	23.5207	20.8888	0.0	0.0	0.0
1968.30	21.9000	23.1969	24.1419	21.4406	0.0	0.0
1968.40	21.5000	21.7488	23.0363	23.9753	21.2926	0.0
1969.10	21.9000	21.9514	22.2055	23.5205	24.4787	21.7397
1969.20	24.0000	21.9772	22.0288	22.2838	23.6034	24.5650
1969.30	26.2000	24.5088	22.4431	22.4958	22.7562	24.1039
1969.40	22.6000	25.2808	23.6490	21.6558	21.7066	21.9579
1970.10	23.2000	23.0002	25.7285	24.0678	22.0392	22.0910
1970.20	25.6000	22.8492	22.6524	25.3395	23.7039	21.7060
1970.30	28.4000	24.7038	22.0494	21.8595	24.4525	22.8741
1970.40	28.7000	28.0274	24.3798	21.7601	21.5727	24.1317
1971.10	27.7000	28.3503	27.6859	24.0827	21.4949	21.3098
1971.20	26.0000	25.8783	26.4857	25.8651	22.4988	20.0813
1971.30	26.2000	27.8523	27.7219	28.3727	27.7078	24.1017
1971.40	24.0000	25.6734	27.2926	27.1648	27.8025	27.1509
1972.10	25.7000	23.0774	24.6865	26.2434	26.1205	26.7337
1972.20	27.0000	25.2084	22.6360	24.2143	25.7414	25.6209
1972.30	27.7000	26.9063	25.1210	22.5575	24.1303	25.6521
1972.40	32.5000	28.9799	28.1495	26.2817	23.5997	25.2452
1973.10	32.5000	33.5581	29.9234	29.0660	27.1373	24.3681
1973.20	30.5000	30.9585	31.9665	28.5041	27.6874	25.8502
1973.30	31.6000	30.8323	31.2959	32.3148	28.8147	27.9891
1973.40	29.9000	33.0475	32.2447	32.7295	33.7950	30.1346
1974.10	34.9000	31.7859	35.1320	34.2786	34.7939	35.9267
1974.20	32.8000	35.2047	32.0634	35.4387	34.5778	35.0976
1974.30	39.0000	32.0679	34.4189	31.3478	34.6477	33.8060
1974.40	40.5000	39.2125	32.2426	34.6064	31.5186	34.8365
1975.10	31.7000	39.3690	38.1174	31.3422	33.6400	30.6384

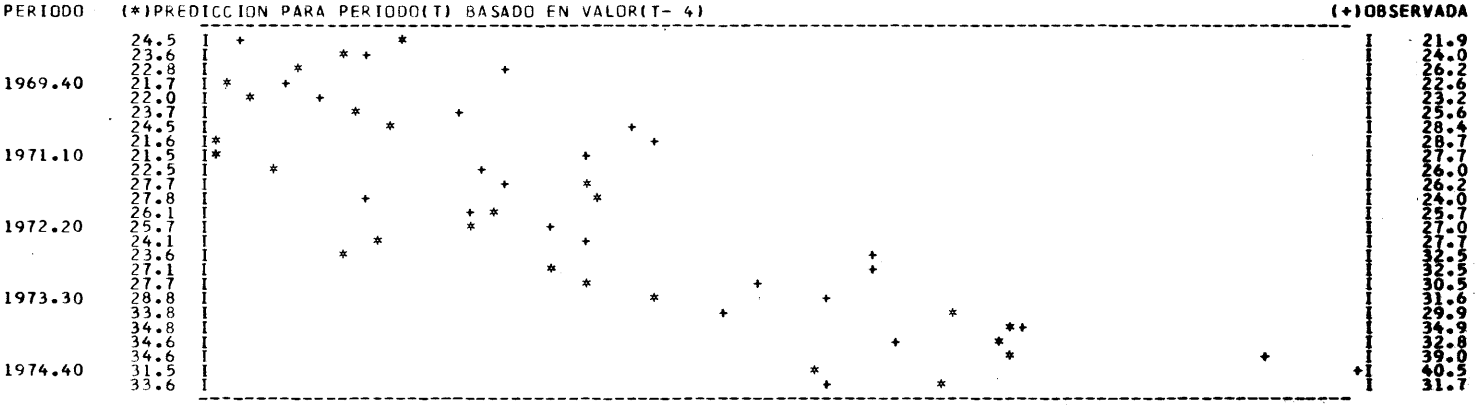
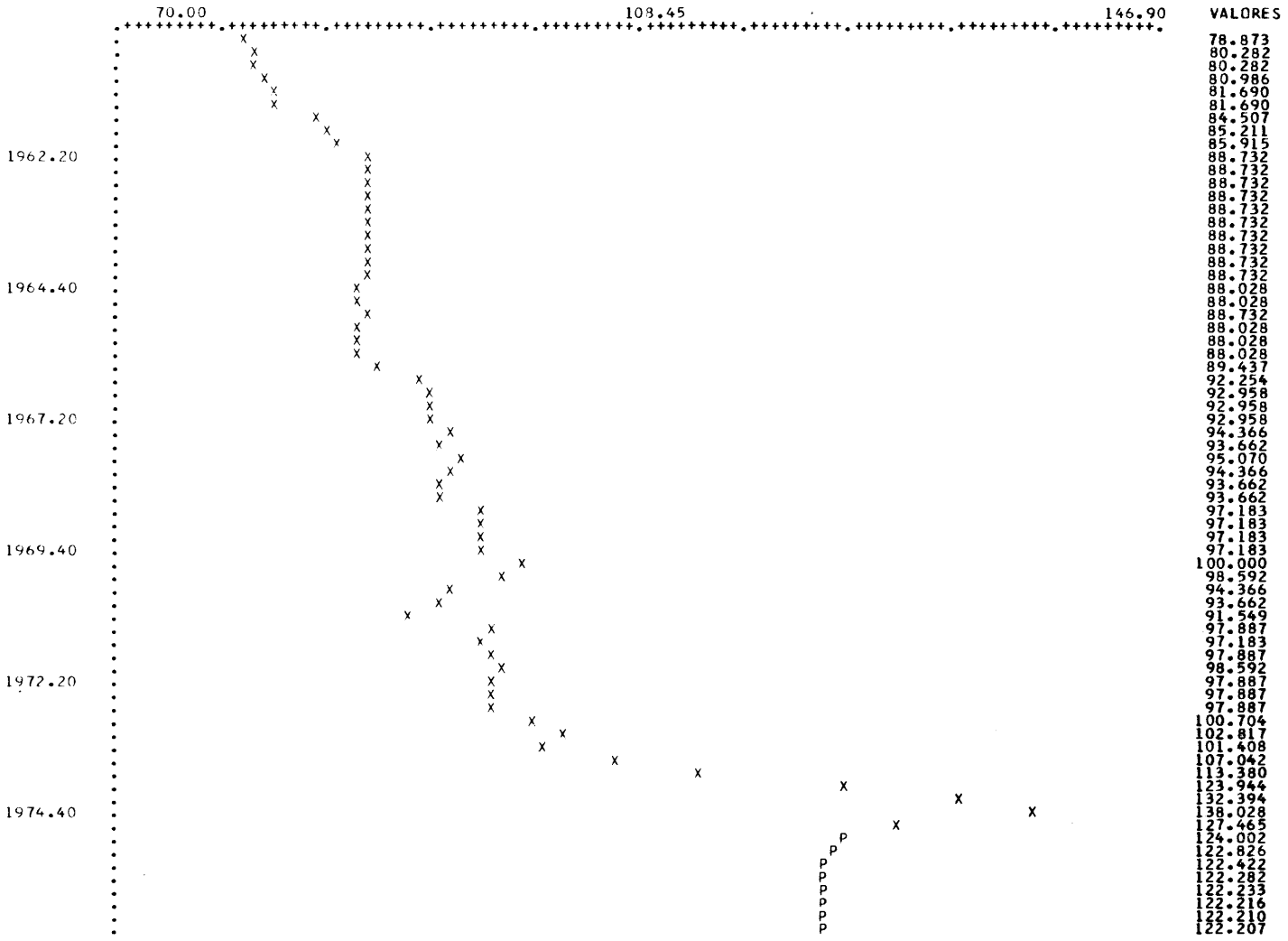


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

PAPEL DE DIARIO INDICE EXPORTACION DE CHILE

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 0.769

Anexo I.21.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - PAPEL DE DIARIO INDICE EXPORTACION DE CHILE — 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 — MODELO LOGARITMICO

NUMERO	CARACTERISTICAS	PARAMETROS DEL MODELO ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	0.34590

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	4.150	6.335	8.786	10.655	12.024
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.040	0.060	0.084	0.102	0.115

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

BASE DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	120.4245	124.0022	127.6860	1.3459
1975.30	116.9425	122.8261	129.0057	1.4655
1975.40	114.6950	122.4216	130.6687	1.5069
1976.10	113.0250	122.2818	132.2967	1.5212
1976.20	111.6632	122.2332	133.8037	1.5262
1976.30	110.4887	122.2161	135.1881	1.5279
1976.40	109.4415	122.2099	136.4680	1.5285
1977.10	108.4883	122.2075	137.6614	1.5287

Anexo I.21.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA PAPEL DE DIARIO INDICE EXPORTACION DE CHILE

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	93.6620	0.0	0.0	0.0	0.0	0.0
1968.10	95.0704	93.4194	0.0	0.0	0.0	0.0
1968.20	94.3662	95.5622	93.3355	0.0	0.0	0.0
1968.30	93.6620	94.1237	95.7328	93.3064	0.0	0.0
1968.40	93.6620	93.4194	94.0397	95.7917	93.2961	0.0
1969.10	97.1831	93.6618	93.3355	94.0105	95.8120	93.2923
1969.20	97.1831	98.4314	93.6616	93.3064	94.0002	95.8187
1969.30	97.1831	97.1829	98.8667	93.6613	93.2961	93.9964
1969.40	97.1831	97.1829	97.1827	99.0175	93.6610	93.2923
1970.10	100.0000	97.1829	97.1827	97.1825	99.0695	93.6608
1970.20	98.5916	100.9931	97.1827	97.1825	97.1822	99.0873
1970.30	94.3662	98.1088	101.3387	97.1825	97.1822	97.1819
1970.40	93.6620	92.9470	97.9423	101.4583	97.1822	97.1819
1971.10	91.5493	93.4194	92.4610	97.8844	101.4995	97.1819
1971.20	97.8873	90.8295	93.3355	92.2932	97.8642	101.5136
1971.30	97.1831	100.1801	90.5817	93.3064	92.2351	97.8569
1971.40	97.8873	96.9405	100.9854	90.4960	93.2961	92.2148
1972.10	98.5916	98.1320	96.8566	101.2652	90.4662	93.2923
1972.20	97.8873	98.8362	98.2165	96.8274	101.3620	90.4556
1972.30	97.8873	97.6447	98.9207	98.2456	96.8171	101.3952
1972.40	97.8873	97.8872	97.5608	98.9498	98.2555	96.8134
1973.10	100.7043	97.8872	97.8869	97.5316	98.9597	98.2587
1973.20	102.8169	101.6972	97.8869	97.8865	97.5212	98.9629
1973.30	101.4085	103.5577	102.0427	97.8865	97.8861	97.5174
1973.40	107.0423	100.9256	103.8149	102.1623	97.8861	97.8859
1974.10	113.3803	109.0628	100.7589	103.9037	102.2035	97.8859
1974.20	123.9438	115.6587	109.7704	100.7011	103.9342	102.2176
1974.30	132.3943	127.8221	116.4571	110.0159	100.6809	103.9446
1974.40	138.0282	135.4492	129.1913	116.7343	110.1008	100.6737
1975.10	127.4648	140.0318	136.5219	129.6632	116.8301	110.1299

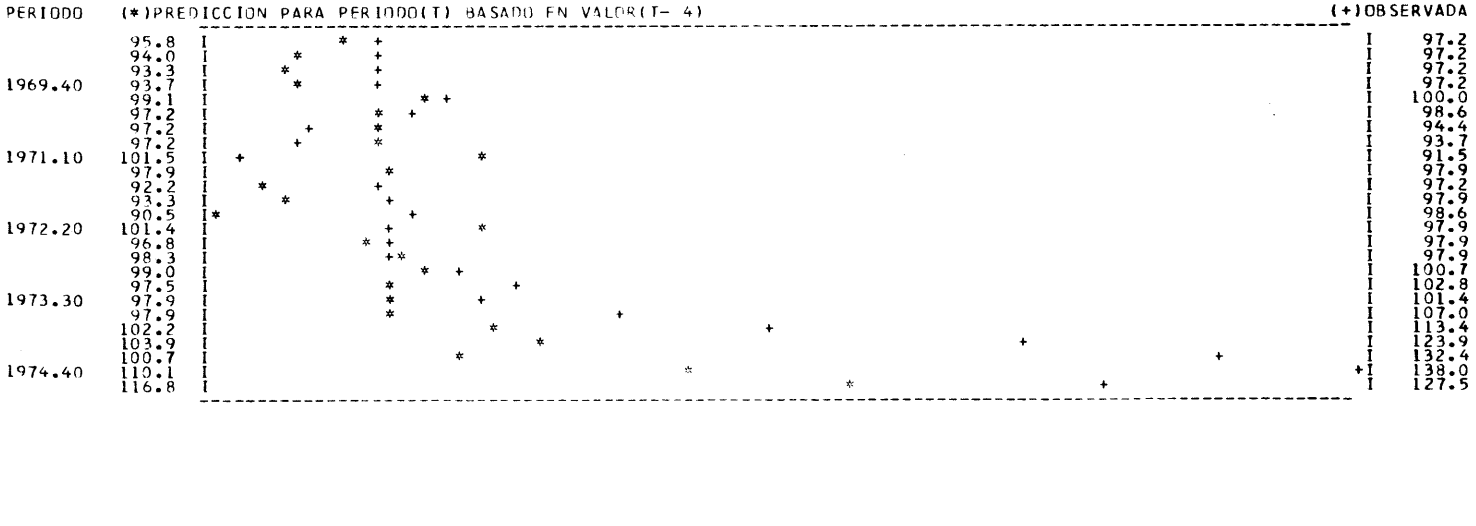
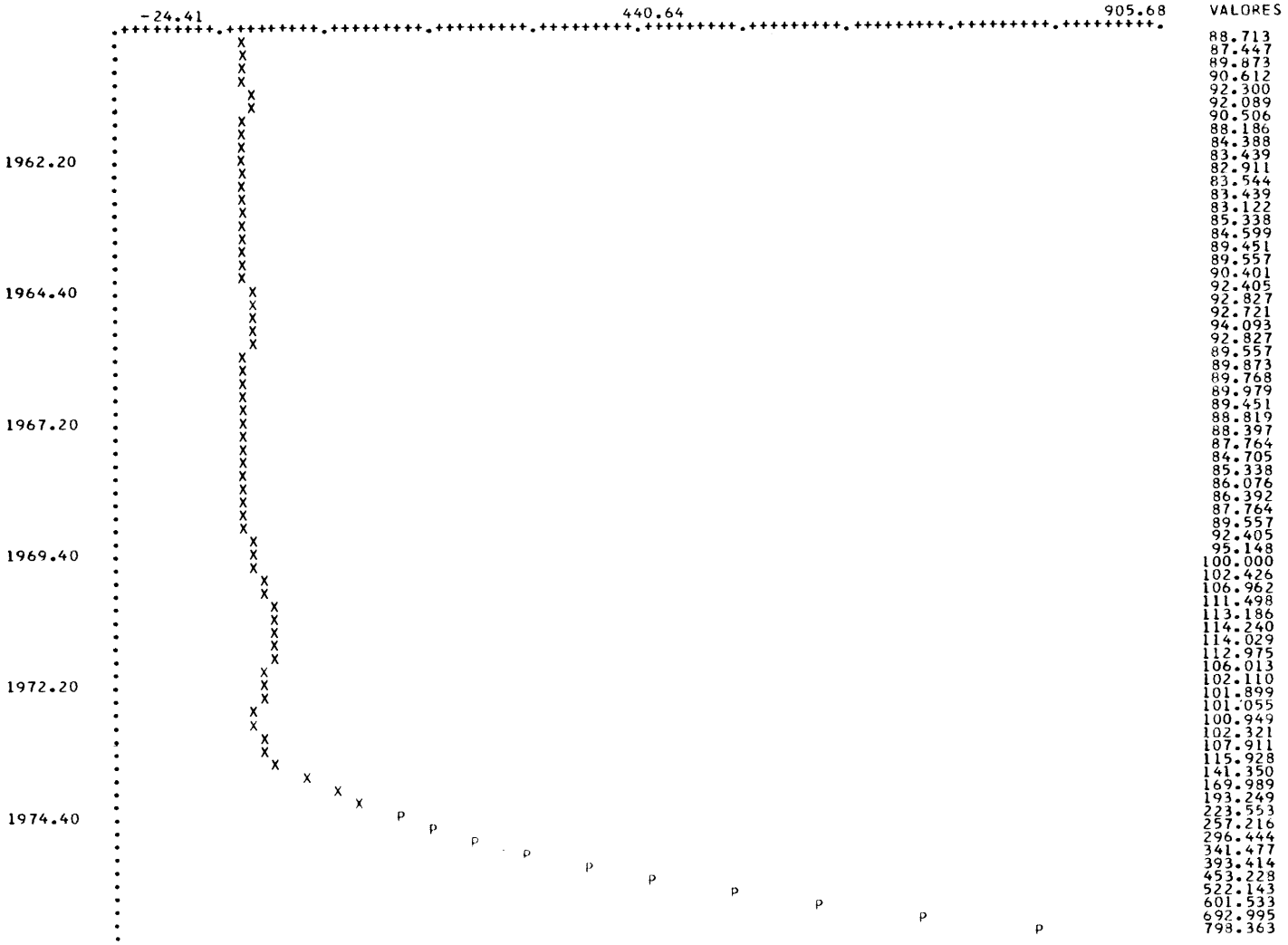


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

PULPA INDICE EXPORTACION DE CHILE,BRASIL

PERIODO DE MUESTRA I TRIMESTRE,1960 AL III TRIMESTRE,1974

PERIODO DE PREDICCION IV TRIMESTRE, 1974 AL I TRIMESTRE, 1977



INTERVALO ABSCISA ES 9.301

Anexo I.22.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - PULPA INDICE EXPORTACION DE CHILE,BRASIL — 59 OBSERVACIONES

DIFERENCIAS - 2 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE OROEN , 0 — MODELO LOGARITMICO

NUMERO	CARACTERISTICAS	PARAMETROS DEL MODELO ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	-0.30980

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	4.882	10.176	17.366	22.436	27.517
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.043	0.090	0.154	0.199	0.244

PREDICCIONES PARA EL PERIODO IV TRIMESTRE, 1974 AL I TRIMESTRE, 1977
CON PERIODO BASE =1974.30 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

BASE DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1974.40	216.1834	223.5528	231.1733	1.6902
1975.10	240.8292	257.2161	274.7180	2.4764
1975.20	266.6445	296.4438	329.5732	3.2328
1975.30	293.4578	341.4768	397.3533	3.9985
1975.40	321.3564	393.4141	481.6289	4.7613
1976.10	350.2722	453.2278	586.4448	5.5249
1976.20	380.1670	522.1426	717.1399	6.2884
1976.30	410.9714	601.5330	880.4543	7.0518
1976.40	442.6104	692.9951	1085.0215	7.8153
1977.10	474.9951	798.363	1341.8718	8.5788

Anexo I.22.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA PULPA INDICE EXPORTACION DE CHILE,BRASIL

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.20	88.8185	0.0	0.0	0.0	0.0	0.0
1967.30	88.3966	88.2235	0.0	0.0	0.0	0.0
1967.40	87.7636	87.9128	87.6221	0.0	0.0	0.0
1968.10	84.7045	87.2005	87.4513	87.0280	0.0	0.0
1968.20	85.3375	82.4717	86.6209	86.9861	86.4369	0.0
1968.30	86.0759	84.8395	80.0799	86.0513	86.5252	85.8501
1968.40	86.3924	86.7891	84.6925	77.8229	85.4834	86.0661
1969.10	87.7636	86.8429	87.5180	84.4378	75.6097	84.9198
1969.20	89.5569	88.8235	87.2543	88.2498	84.2173	73.4654
1969.30	92.4050	91.2600	90.0005	87.6803	88.9888	83.9870
1969.40	95.1476	95.0170	93.0354	91.1603	88.1045	89.7335
1970.10	100.0000	98.0341	97.8067	94.8328	92.3452	88.5318
1970.20	102.4261	104.4346	100.9882	100.6451	96.6687	93.5424
1970.30	106.9620	105.7518	109.2806	104.0375	103.5763	98.5389
1970.40	111.4978	111.0307	108.9158	114.2817	107.1767	106.5896
1971.10	113.1856	116.2908	115.4686	112.2603	119.5342	110.4112
1971.20	114.2405	115.8465	121.2688	120.0146	115.6799	125.0207
1971.30	114.0294	115.5105	118.2684	126.4665	124.7619	119.2124
1971.40	112.9746	114.2117	116.7303	120.8361	131.8846	129.6898
1972.10	106.0126	112.1879	114.2721	117.9830	123.4294	137.5355
1972.20	102.1097	101.1674	111.3269	114.3702	119.2428	126.0880
1972.30	101.8987	97.5585	96.0418	110.4970	114.4565	120.5180
1972.40	101.0548	100.5776	93.4439	91.3232	109.6656	114.5465
1973.10	100.9493	100.4120	99.6119	89.4334	86.7930	108.8428
1973.20	102.3206	100.6170	99.7133	98.5515	85.6156	82.5002
1973.30	107.9114	103.2446	100.3557	99.0379	97.5340	81.9546
1973.40	115.9282	112.4162	104.3222	100.0734	98.3615	96.5172
1974.10	141.3502	123.8303	117.5561	105.3655	99.7986	97.6913
1974.20	169.9894	165.7177	132.5055	122.7860	106.4334	99.5224
1974.30	193.2489	205.3053	196.6610	141.7104	128.2954	107.5076

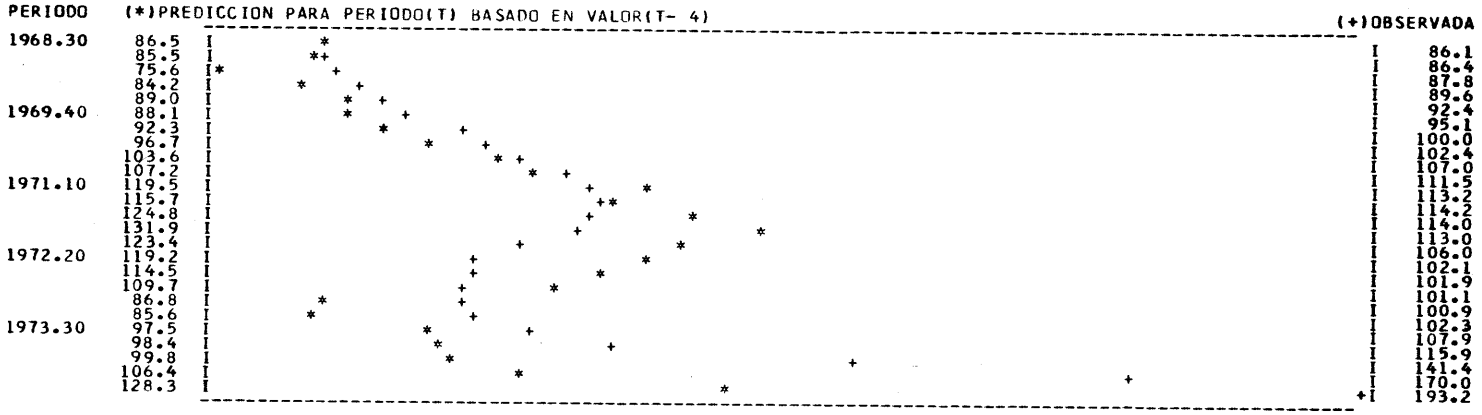
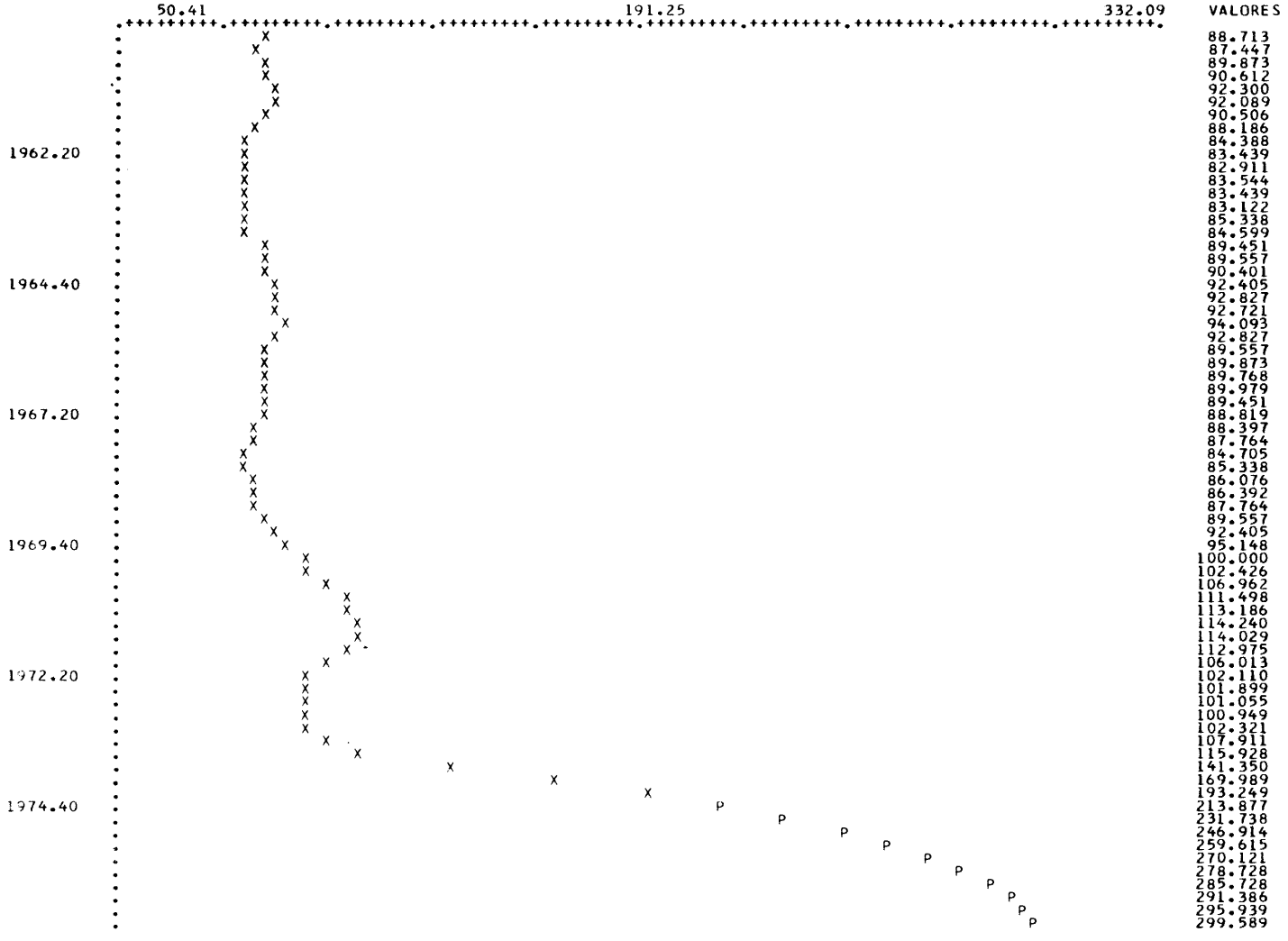


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

PULPA INDICE EXPORTACION DE CHILE,BRASIL

PERIODO DE MUESTRA I TRIMESTRE,1960 AL III TRIMESTRE,1974

PERIODO DE PREDICCION IV TRIMESTRE, 1974 AL I TRIMESTRE, 1977



INTERVALO ABSCISA ES 2.817

Anexo I.22.2.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - PULPA INDICE EXPORTACION DE CHILE,BRASIL — 59 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 — MODELO LOGARITMICO

NUMERO	CARACTERISTICAS	PARAMETROS DEL MODELO ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	0.79090

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	4.427	10.799	18.480	22.435	25.971
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.039	0.096	0.164	0.199	0.230

PREDICCIONES PARA EL PERIODO IM TRIMESTRE, 1974 AL I TRIMESTRE, 1977
CON PERIODO BASE =1974.30 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

BASE DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1974.40	206.8455	213.8768	221.1470	1.7909
1975.10	216.3814	231.7383	248.1850	2.4164
1975.20	222.0909	246.9139	274.5110	2.9111
1975.30	224.8292	259.6155	299.7839	3.3024
1975.40	225.3227	270.1206	323.8252	3.6119
1976.10	224.1651	278.7280	346.5713	3.8566
1976.20	221.8271	285.7275	368.0349	4.0502
1976.30	218.6731	291.3860	388.2771	4.2033
1976.40	214.9792	295.9390	407.3877	4.3244
1977.10	210.9519	299.5889	425.4690	4.4201

Anexo I.22.2.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA PULPA INDICE EXPORTACION DE CHILE,BRASIL

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.20	88.8185	0.0	0.0	0.0	0.0	0.0
1967.30	88.3966	88.3208	0.0	0.0	0.0	0.0
1967.40	87.7636	88.0638	87.9286	0.0	0.0	0.0
1968.10	84.7045	87.2659	87.8011	87.6194	0.0	0.0
1968.20	85.3375	82.3604	86.8738	87.5934	87.3750	0.0
1968.30	86.0759	85.8410	80.5521	86.5645	87.4291	87.1819
1968.40	86.3924	86.6640	86.2409	79.1496	86.3202	87.2989
1969.10	87.7636	86.6430	87.1316	86.5582	78.0574	86.1272
1969.20	89.5569	88.8632	86.8413	87.5027	86.8095	77.2038
1969.30	92.4050	91.0006	89.7421	86.9982	87.7970	87.0083
1969.40	95.1476	94.7212	92.1585	90.4429	87.1220	88.0300
1970.10	100.0000	97.3738	96.5935	93.0842	91.0006	87.2197
1970.20	102.4261	104.0118	99.1709	98.1001	93.8225	91.4437
1970.30	106.9620	104.3859	107.2973	100.6151	99.3078	94.4100
1970.40	111.4978	110.6906	105.9619	109.9696	101.7719	100.2730
1971.10	113.1856	115.2204	113.7309	107.2247	112.1291	102.6956
1971.20	114.2405	114.5379	118.2518	116.1939	108.2336	113.8664
1971.30	114.0294	115.0811	115.6184	120.7052	118.1790	109.0376
1971.40	112.9746	113.8622	115.7493	116.4796	122.6809	119.7724
1972.10	106.0126	112.1467	113.7296	116.2808	117.1645	124.2657
1972.20	102.1097	100.8109	111.4955	113.6242	116.7018	117.7085
1972.30	101.8987	99.1244	96.8777	110.9827	113.5404	117.0353
1972.40	101.0548	101.7316	96.8243	93.8754	110.5782	113.4735
1973.10	100.9493	100.3919	101.5992	95.0434	91.5666	110.2589
1973.20	102.3206	100.8655	99.8703	101.4941	93.6573	89.7804
1973.30	107.9114	103.4178	100.7988	99.4591	101.4106	92.5749
1973.40	115.9282	112.5481	104.2935	100.7455	99.1347	101.3440
1974.10	141.3502	122.6879	116.3555	104.9907	100.7030	98.8783
1974.20	169.9894	165.3470	128.3114	119.4570	105.5450	100.6688
1974.30	193.2489	196.6938	187.1779	132.9404	121.9679	105.9850

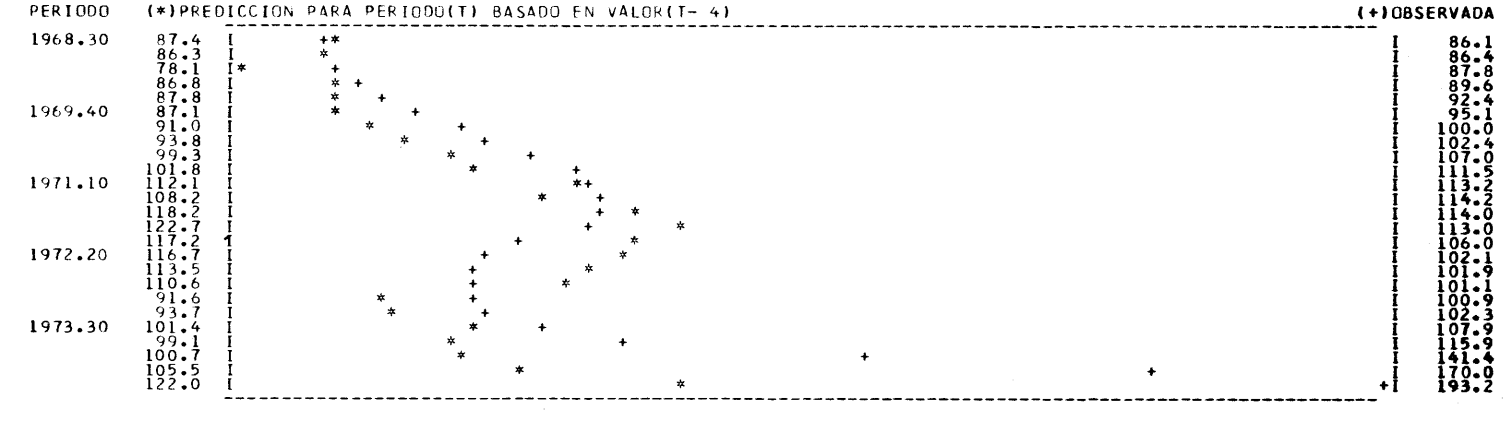
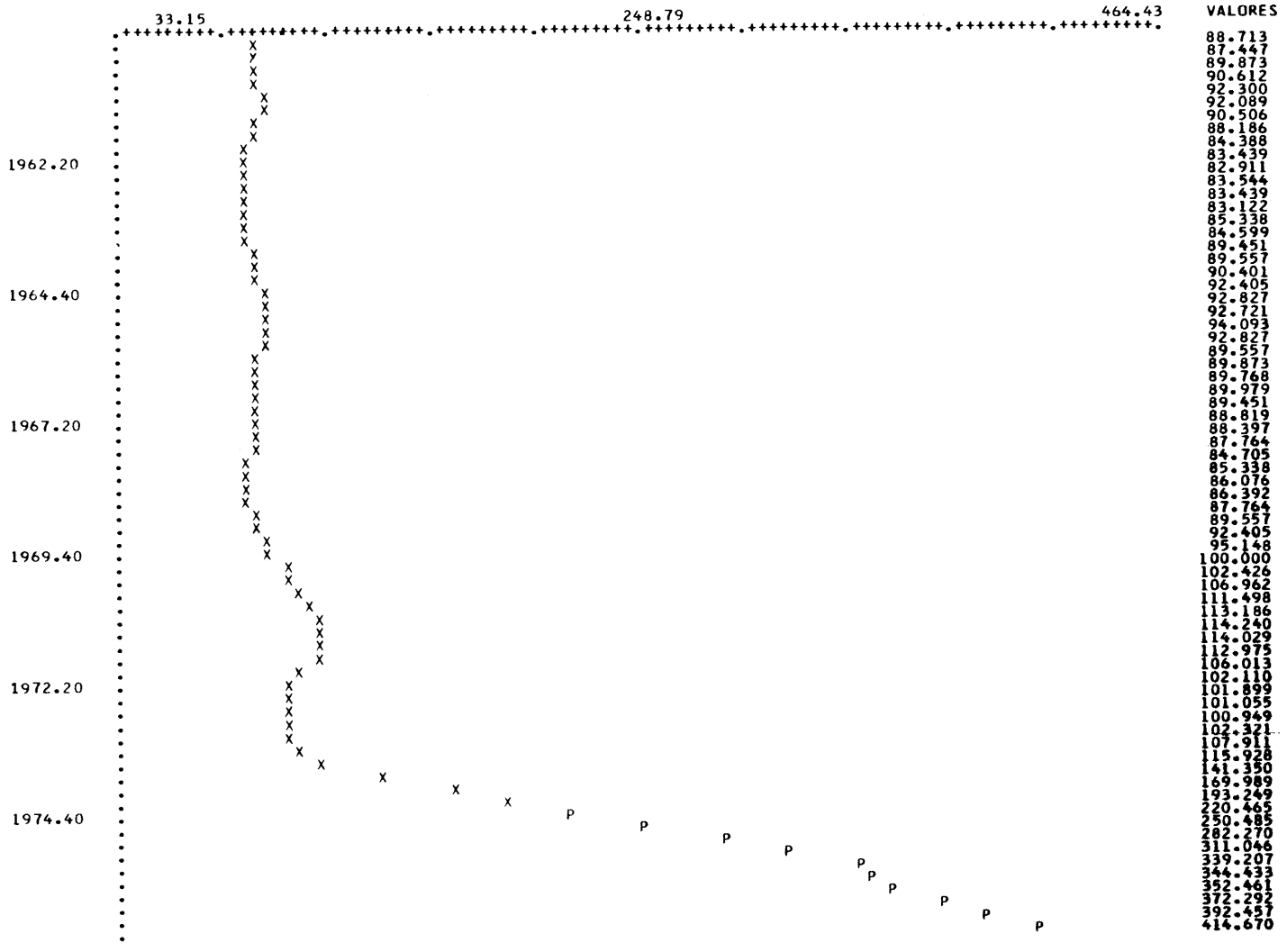


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

PULPA INDICE EXPORTACION DE CHILE,BRASIL

PERIODO DE MUESTRA I TRIMESTRE,1960 AL III TRIMESTRE,1974

PERIODO DE PREDICCION IV TRIMESTRE, 1974 AL I TRIMESTRE, 1977



INTERVALO ABSCISA ES 4.313

Anexo I.22.3.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - PULPA INDICE EXPORTACION DE CHILE,BRASIL — 59 OBSERVACIONES

DIFERENCIAS - 2 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 — MODELO LOGARITMICO

NUMERO	CARACTERISTICAS	PARAMETROS DEL MODELO ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	8	-0.56370

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	3.428	8.318	14.182	18.243	22.646
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.030	0.074	0.126	0.162	0.201

PREDICCIONES PARA EL PERIODO IM TRIMESTRE, 1974 AL I TRIMESTRE, 1977
CON PERIODO BASE =1974.30 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

BASE DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1974.40	213.6019	220.4653	227.5491	2.0000
1975.10	233.3834	250.4853	268.8401	3.0000
1975.20	250.7683	282.2695	317.7280	4.0000
1975.30	261.5742	311.0461	369.8740	5.0000
1975.40	268.2893	339.2068	428.8701	6.0000
1976.10	254.7307	344.4326	465.7224	7.0000
1976.20	242.4361	352.4612	512.4185	8.0000
1976.30	236.9790	372.2922	584.8687	8.4363
1976.40	232.2484	392.4565	663.1792	8.8726
1977.10	228.7281	414.6699	751.7703	9.3089

Anexo I.22.3.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA PULPA INDICE EXPORTACION DE CHILE,BRASIL

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.20	88.8185	0.0	0.0	0.0	0.0	0.0
1967.30	88.3966	87.4071	0.0	0.0	0.0	0.0
1967.40	87.7636	89.3873	87.3972	0.0	0.0	0.0
1968.10	84.7045	88.2382	91.5333	88.4937	0.0	0.0
1968.20	85.3375	79.9566	86.7670	91.6723	87.6360	0.0
1968.30	86.0759	86.2032	75.6750	85.5465	92.0550	87.0167
1968.40	86.3924	86.6481	86.9045	71.4803	84.1756	92.2556
1969.10	87.7636	87.1128	87.6294	88.0186	67.8318	83.2114
1969.20	89.5569	89.2177	87.3994	88.6825	89.2080	64.4136
1969.30	92.4050	91.2663	90.5762	88.5760	89.6297	90.2942
1969.40	95.1476	95.4739	93.1351	92.0809	89.3797	90.7107
1970.10	100.0000	99.5464	100.2302	96.5699	95.1152	91.6403
1970.20	102.4261	102.5871	101.6586	102.7078	97.7375	95.9006
1970.30	106.9620	104.8415	105.1714	103.7468	105.1770	98.8537
1970.40	111.4978	112.0104	107.6134	108.1216	106.1732	108.0059
1971.10	113.1856	115.4371	116.5008	109.7086	110.4001	107.9189
1971.20	114.2405	114.6090	119.2138	120.8654	111.5624	112.4420
1971.30	114.0294	114.5869	115.3274	122.3473	124.6124	112.7408
1971.40	112.9746	113.9506	115.0675	116.1847	125.7086	128.6244
1972.10	106.0126	110.6437	112.5636	114.2227	115.7037	127.6783
1972.20	102.1097	100.9348	109.9460	112.8202	115.0428	116.9102
1972.30	101.8987	97.2827	95.0569	108.0665	111.8496	114.6107
1972.40	101.0548	101.7911	92.7777	89.6118	106.3266	110.9996
1973.10	100.9493	101.7264	103.2140	89.8131	85.7503	106.1894
1973.20	102.3206	101.1709	102.7343	104.9962	87.2251	82.3212
1973.30	107.9114	104.3628	102.0306	104.4048	107.4809	85.2444
1973.40	115.9282	114.2858	106.8928	103.3299	106.5482	110.4865
1974.10	141.3502	128.4122	124.7994	112.8878	107.8988	112.1157
1974.20	169.9894	169.8297	140.1630	134.2897	117.4777	111.0242
1974.30	193.2489	200.3871	200.0106	149.9625	141.6430	119.8356

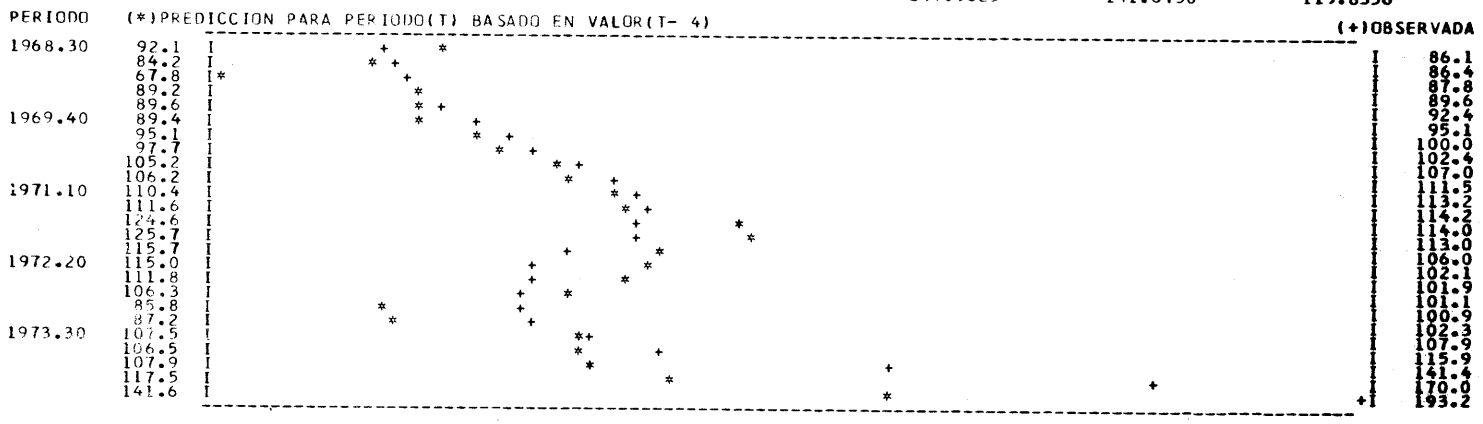
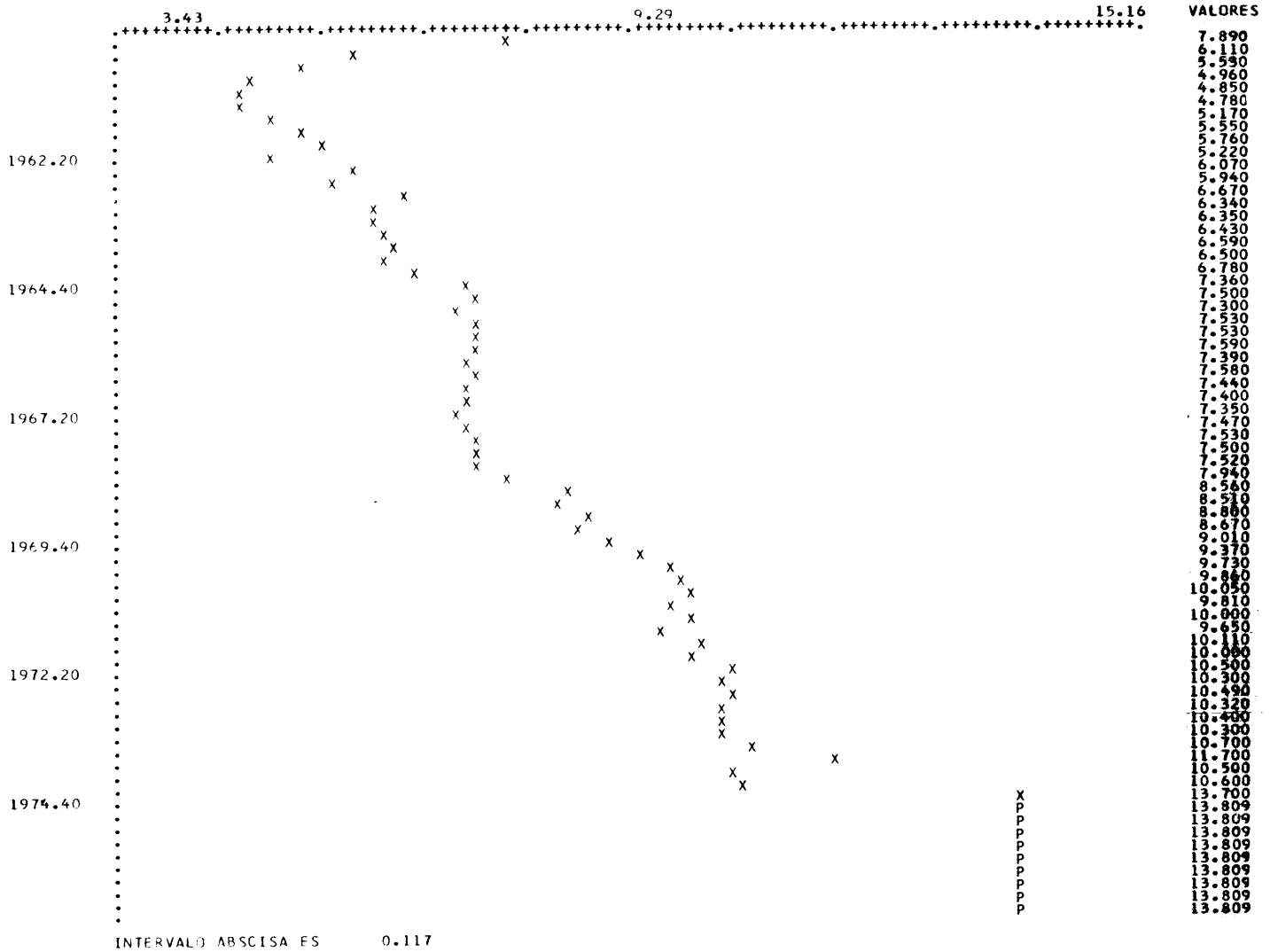


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

QUEBRACHO ARG ANUARIO VALOR UNITARIO DOL/100LB

PERIODO DE MUESTRA I TRIMESTRE,1960 AL IV TRIMESTRE, 1974

PERIODO DE PREDICCION I TRIMESTRE,1975 AL I TRIMESTRE, 1977



INTERVALO ABSCISA ES 0.117

Anexo I.23.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - QUEBRACHO ARG ANUARIO VALOR UNITARIO DOL/100LB 60 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

NUMERO	CARACTERISTICAS	PARAMETROS DEL MODELO ORDEN	VALOR
1	PROMEDIO MOVIL REGULAR	1	-0.03100

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	0.748	0.827	0.716	0.911	1.045
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.074	0.082	0.071	0.090	0.103

PREDICCIONES PARA EL PERIODO I TRIMESTRE,1975 AL I TRIMESTRE, 1977
CON PERIODO BASE =1974.40 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.10	12.7624	13.8092	14.9419	1.0310
1975.20	12.3309	13.8092	15.4648	1.0310
1975.30	12.0126	13.8092	15.8745	1.0310
1975.40	11.7516	13.8092	16.2271	1.0310
1976.10	11.5268	13.8092	16.5436	1.0310
1976.20	11.3275	13.8092	16.8346	1.0310
1976.30	11.1474	13.8092	17.1066	1.0310
1976.40	10.9825	13.8092	17.3635	1.0310
1977.10	10.8299	13.8092	17.6082	1.0310

Anexo I.23.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA QUEBRACHO ARG ANUARIO VALOR UNITARIO DOL/100LB

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.30	7.4700	0.0	0.0	0.0	0.0	0.0
1967.40	7.5300	7.4738	0.0	0.0	0.0	0.0
1968.10	7.5000	7.5317	7.4738	0.0	0.0	0.0
1968.20	7.5200	7.4990	7.5317	7.4738	0.0	0.0
1968.30	7.9400	7.5206	7.4990	7.5317	7.4738	0.0
1968.40	8.5600	7.9534	7.5206	7.4990	7.5317	7.4738
1969.10	8.5100	8.5795	7.9534	7.5206	7.4990	7.5317
1969.20	8.8000	8.5079	8.5795	7.9534	7.5206	7.4990
1969.30	8.6700	8.8092	8.5079	8.5795	7.9534	7.5206
1969.40	9.0100	8.6657	8.8092	8.5079	8.5795	7.9534
1970.10	9.3700	9.0209	8.6657	8.8092	8.5079	8.5795
1970.20	9.7300	9.3810	9.0209	8.6657	8.8092	8.5079
1970.30	9.8600	9.7410	9.3810	9.0209	8.6657	8.8092
1970.40	10.0500	9.8637	9.7410	9.3810	9.0209	8.6657
1971.10	9.8100	10.0558	9.8637	9.7410	9.3810	9.0209
1971.20	10.0000	9.8025	10.0558	9.8637	9.7410	9.3810
1971.30	9.6500	10.0062	9.8025	10.0558	9.8637	9.7410
1971.40	10.1100	9.6391	10.0062	9.8025	10.0558	9.8637
1972.10	10.0000	10.1249	9.6391	10.0062	9.8025	10.0558
1972.20	10.5000	9.9961	10.1249	9.6391	10.0062	9.8025
1972.30	10.3000	10.5160	9.9961	10.1249	9.6391	10.0062
1972.40	10.4900	10.2934	10.5160	9.9961	10.1249	9.6391
1973.10	10.3200	10.4961	10.2934	10.5160	9.9961	10.1249
1973.20	10.4000	10.3146	10.4961	10.2934	10.5160	9.9961
1973.30	10.3000	10.4027	10.3146	10.4961	10.2934	10.5160
1973.40	10.7000	10.2968	10.4027	10.3146	10.4961	10.2934
1974.10	11.7000	10.7127	10.2968	10.4027	10.3146	10.4961
1974.20	10.5000	11.7320	10.7127	10.2968	10.4027	10.3146
1974.30	10.6000	10.4639	11.7320	10.7127	10.2968	10.4027
1974.40	13.7000	10.6042	10.4639	11.7320	10.7127	10.2968

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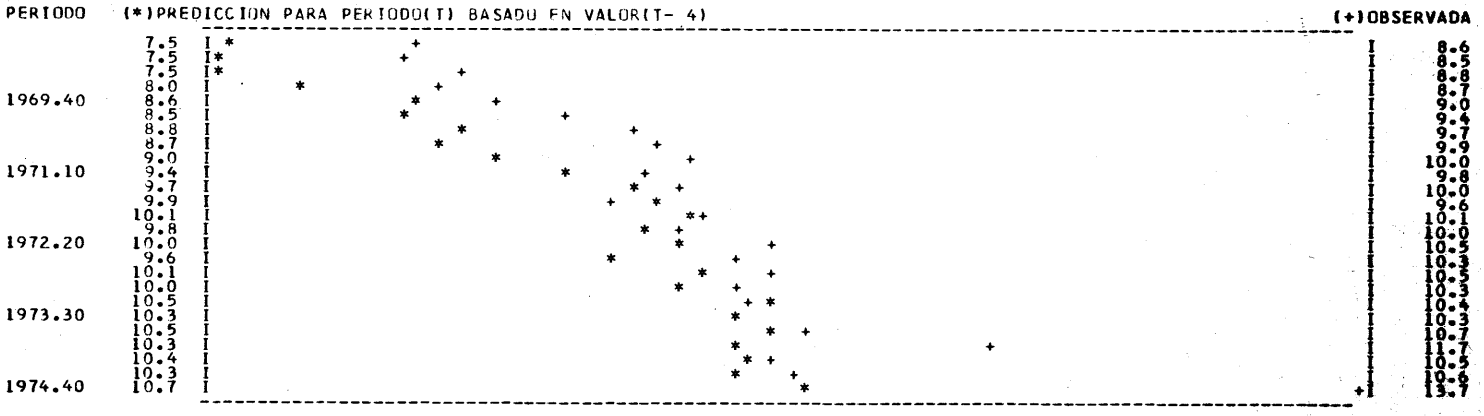
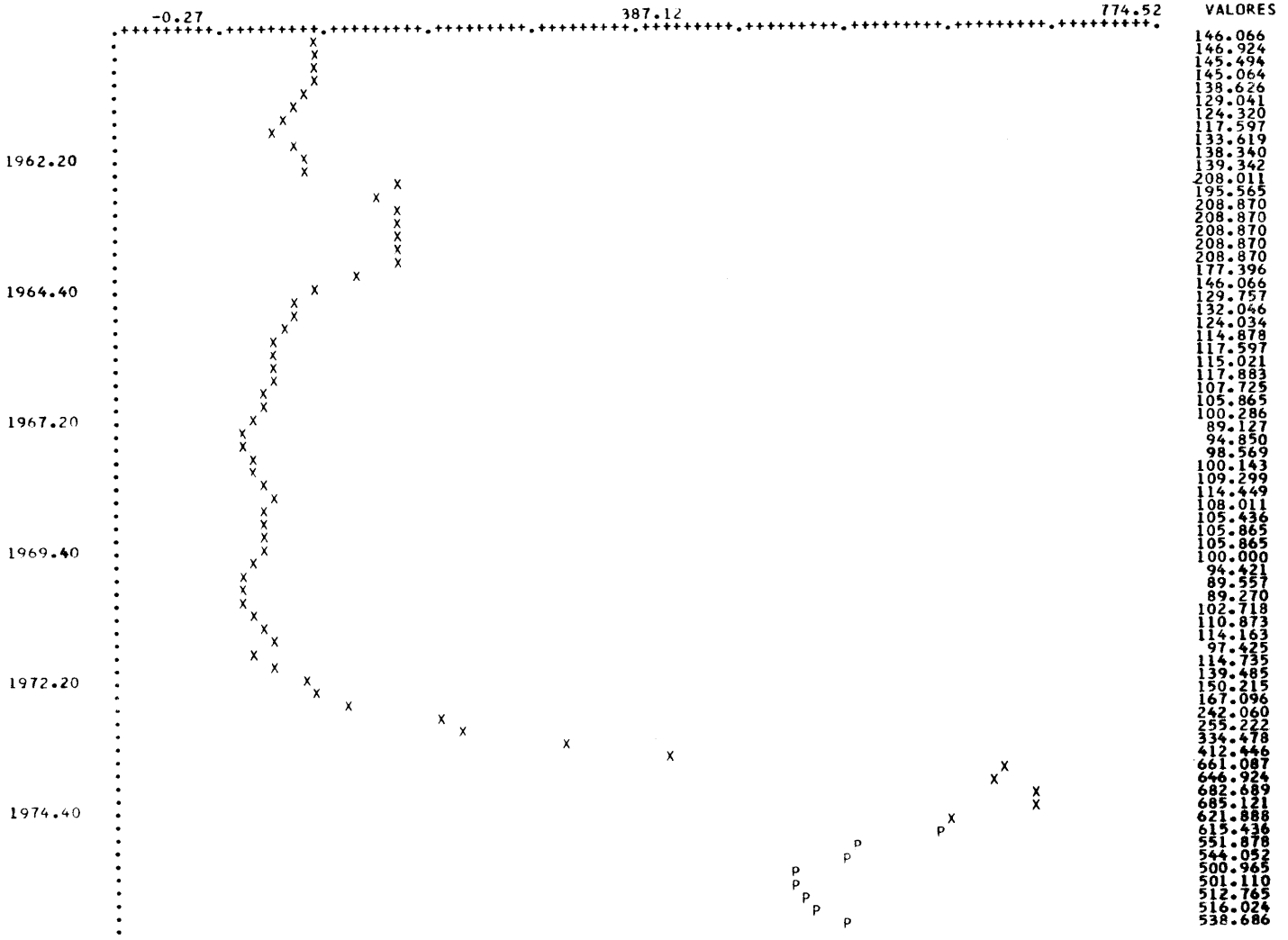


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

SISAL INDICE EXPORTACION DE BRASIL,MEXICO

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION I TRIMESTRE,1960 AL IV TRIMESTRE, 1974



INTERVALO ABSCISA ES 7.748

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - SISAL INDICE EXPORTACION DE BRASIL,MEXICO 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	2	0.29930
2	AUTOREGRESIVO REGULAR	4	-0.43750
3	PROMEDIO MOVIL REGULAR	4	-0.69680

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	48.332	76.010	110.611	136.230	165.794
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.145	0.227	0.331	0.408	0.496

PREDICCIONES PARA EL PERIODO I TRIMESTRE,1960 AL IV TRIMESTRE, 1974
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

BASE DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	535.3237	615.4358	707.5359	1.0000
1975.30	453.0959	551.8782	672.1963	1.2993
1975.40	416.2229	544.0520	711.1394	1.2993
1976.10	362.5547	500.9648	692.2151	1.6482
1976.20	337.0042	501.1099	745.1262	1.6482
1976.30	324.1851	512.7654	811.0432	1.6217
1976.40	309.4846	516.0242	860.3999	1.6217
1977.10	308.0005	538.6858	942.1487	1.4611

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA SISAL INDICE EXPORTACION DE BRASIL,MEXICO

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	94.8498	0.0	0.0	0.0	0.0	0.0
1968.10	98.5693	88.8623	0.0	0.0	0.0	0.0
1968.20	100.1430	100.2798	90.4043	0.0	0.0	0.0
1968.30	109.2990	101.0170	101.1550	88.4072	0.0	0.0
1968.40	114.4492	112.8189	104.2703	104.4553	91.2916	0.0
1969.10	108.0113	124.1792	122.4102	110.4979	110.6940	93.3075
1969.20	105.4362	108.6504	124.9139	122.6070	110.6755	110.9248
1969.30	105.8655	105.3626	108.5746	130.1485	127.7448	112.1865
1969.40	105.8655	104.0423	103.5482	107.6682	129.0619	126.0461
1970.10	99.9999	98.6440	96.9452	96.3474	100.1808	126.0755
1970.20	94.4205	98.9685	97.6265	95.4477	94.8591	99.6722
1970.30	89.5565	92.9662	97.4442	95.7308	93.5944	92.8629
1970.40	89.2703	89.1027	92.4952	98.3251	96.5963	93.8700
1971.10	102.7181	90.9482	90.7774	95.2934	101.2997	99.0459
1971.20	110.8727	101.8362	90.1674	89.9474	94.4223	102.0347
1971.30	114.1630	115.2935	105.8968	90.4088	90.1883	95.9174
1971.40	97.4248	117.1202	118.2799	105.9103	90.4203	90.1409
1972.10	114.7353	100.6092	120.9483	122.5067	109.6950	89.7585
1972.20	139.4849	112.2794	98.4557	125.0648	126.6763	110.1137
1972.30	150.2145	143.6305	115.6165	97.4725	123.8160	125.8433
1972.40	167.0957	150.1442	143.5632	108.2963	91.3012	123.6712
1973.10	242.0601	174.2940	156.6122	147.7522	111.4564	89.7554
1973.20	255.2218	266.8762	192.1627	167.2276	157.7671	110.3353
1973.30	334.4775	284.8230	297.8293	194.3723	169.1503	157.1051
1973.40	412.4460	349.4495	297.5723	315.3469	205.8047	172.5388
1974.10	661.0874	478.0706	405.0508	328.7222	348.3574	202.7344
1974.20	646.9241	666.6865	482.1201	388.7124	315.4624	339.5547
1974.30	682.6895	740.3269	762.9426	500.7190	514.0854	309.7693
1974.40	685.1213	694.6296	753.2751	783.3088	403.7075	391.1970
1975.10	621.8879	709.9175	719.7698	799.7043	831.5901	487.4170

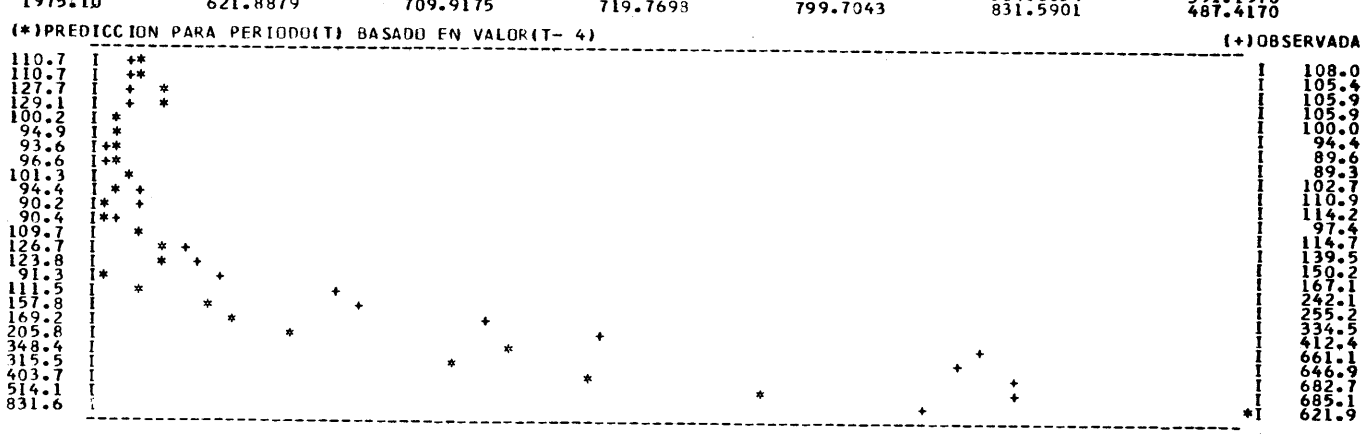
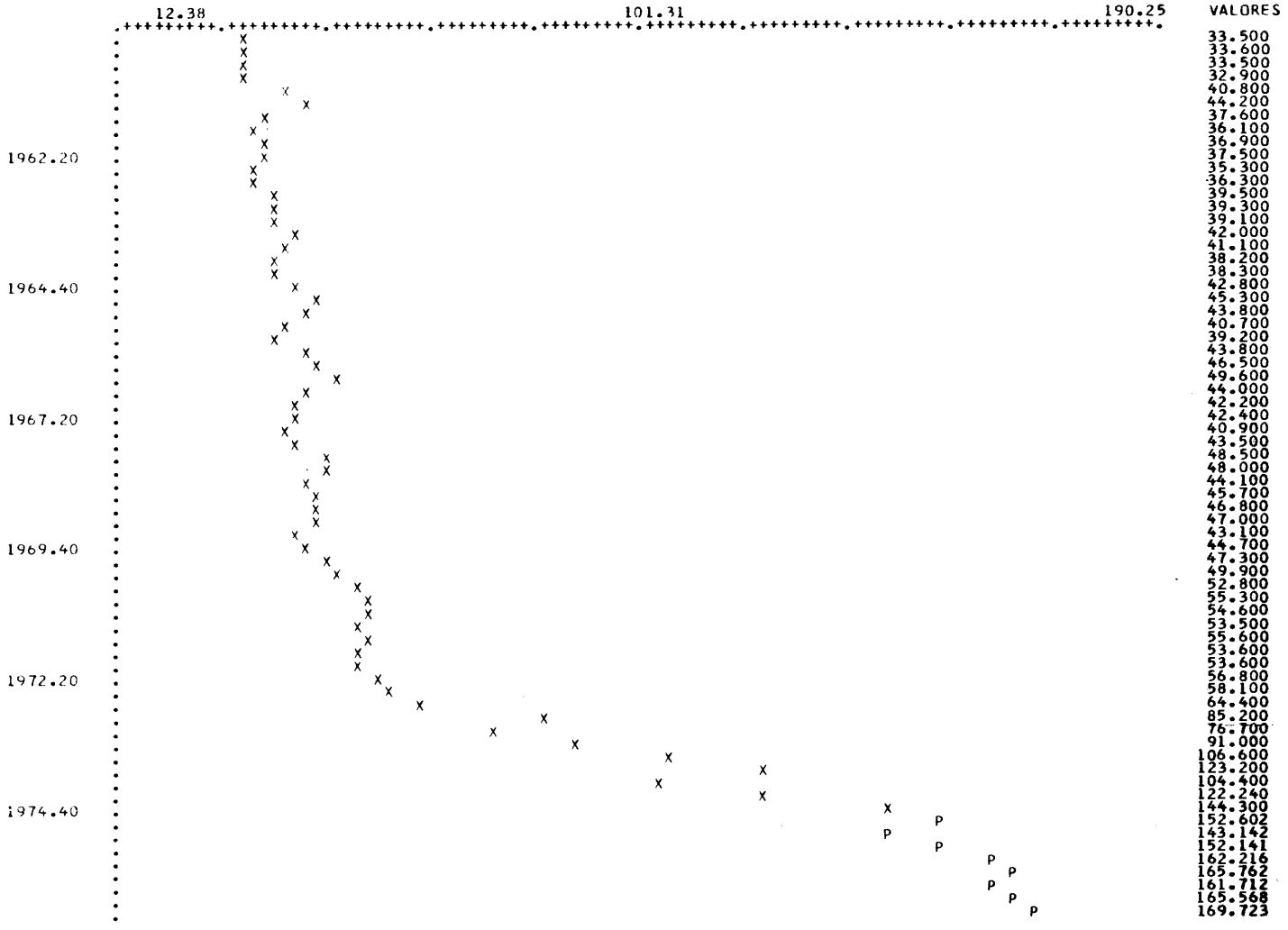


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

SOYA IMPORT.CIF UK FUT USA GRANEL LB/TLARGAS EXPORTACION DE BRASIL

PERIODO DE MUESTRA I TRIMESTRE,1960 AL IV TRIMESTRE, 1974

PERIODO DE PREDICCION I TRIMESTRE,1975 AL IV TRIMESTRE, 1976



INTERVALO ABSCISA ES 1.779

Anexo I.25.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - SOYA IMPORT CIF UK FUT USA GRANEL LB/TLARGAS EXPORTACION DE BRASIL 60 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	4	0.38650

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	7.817	10.823	12.049	14.863	20.973
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.104	0.144	0.160	0.198	0.279

PREDICCIONES PARA EL PERIODO I TRIMESTRE,1975 AL IV TRIMESTRE, 1976
CON PERIODO BASE =1974.40 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.10	138.7382	152.6017	167.8503	1.0000
1975.20	125.1035	143.1417	163.7805	1.0000
1975.30	129.0040	152.1410	179.4276	1.0000
1975.40	134.0813	162.2164	196.2551	1.3865
1976.10	131.4687	165.7616	208.9995	1.3865
1976.20	123.8481	161.7117	211.1512	1.3865
1976.30	122.9436	165.5679	222.9699	1.3865
1976.40	122.5517	169.7227	235.0499	1.5359

Anexo I.25.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA SOYA IMPORT CIF UK FUT USA GRANEL LB/TLARGAS EXPORTACION DE BRASIL

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.30	40.9000	0.0	0.0	0.0	0.0	0.0
1967.40	43.5000	39.0494	0.0	0.0	0.0	0.0
1968.10	48.5000	42.8034	38.4240	0.0	0.0	0.0
1968.20	48.0000	48.5887	42.8816	38.4943	0.0	0.0
1968.30	44.1000	47.3364	47.9170	42.2888	37.9621	0.0
1968.40	45.7000	45.1631	48.4775	49.0721	43.3082	37.2888
1969.10	46.8000	47.6628	47.1028	50.5596	51.1797	43.0389
1969.20	47.0000	46.6129	47.4723	46.9145	50.3575	51.2159
1969.30	43.1000	45.4855	45.1109	45.9426	45.4028	50.0873
1969.40	44.7000	43.6978	46.1164	45.7366	46.5798	45.8228
1970.10	47.3000	45.1128	44.1013	46.5423	46.1590	47.3431
1970.20	49.9000	47.3780	45.1872	44.1741	46.6191	46.0876
1970.30	52.8000	48.2570	45.8181	43.6994	42.7196	46.0326
1970.40	55.3000	53.5491	48.9417	46.4681	44.3194	42.9477
1971.10	54.6000	56.5217	54.7321	50.0229	47.4947	44.4771
1971.20	53.5000	55.7409	57.7028	55.8758	51.0682	47.5249
1971.30	55.6000	54.6810	56.9713	58.9765	57.1092	50.4117
1971.40	53.6000	56.6031	55.6675	57.9992	60.0405	57.4210
1972.10	53.6000	53.3367	56.3250	55.3940	57.7143	60.5497
1972.20	56.8000	53.1801	52.9189	55.8837	[illegible].9600	58.1775
1972.30	58.1000	57.6516	53.9774	53.7122	[illegible].7216	55.4258
1972.40	64.4000	57.2831	56.8410	53.2185	[illegible].9571	57.1149
1973.10	85.2000	64.4000	57.2831	56.8410	53.2185	52.8564
1973.20	76.7000	87.1311	65.8596	58.5815	58.1293	53.0569
1973.30	91.0000	77.3738	87.8965	66.4382	59.0961	58.4646
1973.40	106.6000	94.6938	80.5145	91.4643	69.1350	58.7735
1974.10	123.1999	118.7785	105.5121	89.7129	101.9137	69.1350
1974.20	104.4000	118.2956	114.0502	101.3119	86.1416	102.8003
1974.30	122.2400	111.5313	126.3761	121.8407	108.2323	86.4333
1974.40	144.3000	129.9487	118.5647	134.3456	129.5242	109.9096

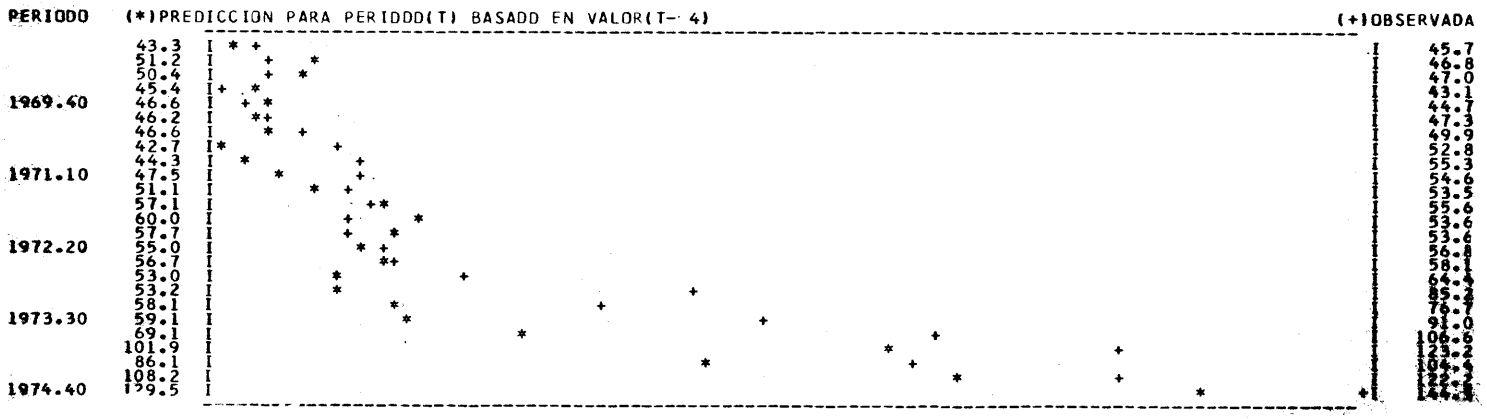
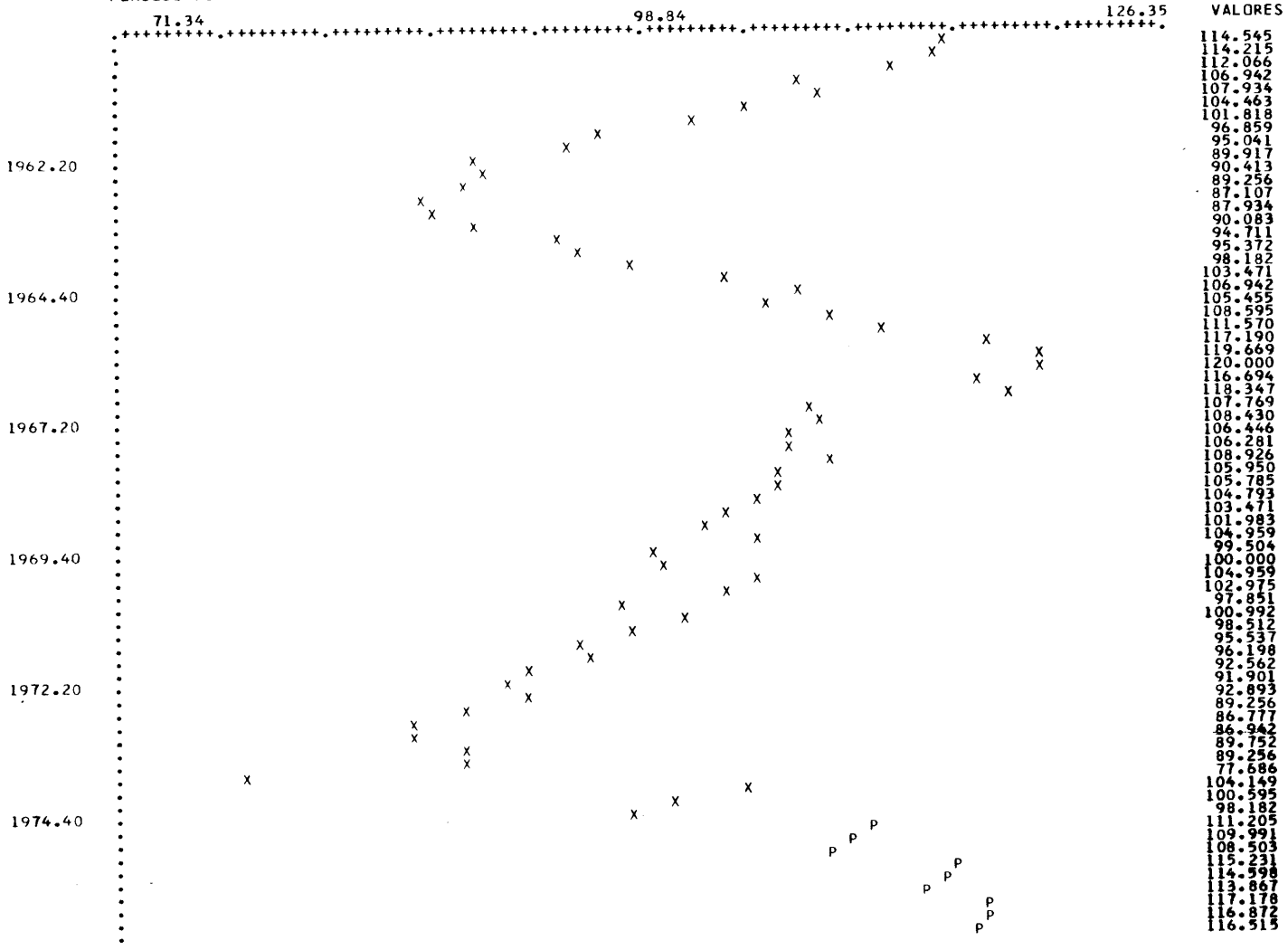


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

TABACO INDICE EXPORTACION DE BRASIL,REP.DOMINICANA

PERIODO DE MUESTRA I TRIMESTRE,1960 AL IV TRIMESTRE, 1974

PERIODO DE PREDICCION I TRIMESTRE,1975 AL I TRIMESTRE, 1977



INTERVALO ABSCISA FS 0.550

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - TABACO INDICE EXPORTACION DE BRASIL,REP.DOMINICANA — 60 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 — MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	-0.36470
2	AUTOREGRESIVO ESTACIONAL	3	0.47710

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	5.503	5.991	6.499	6.372	7.416
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.057	0.062	0.067	0.066	0.077

PREDICCIONES PARA EL PERIODO I TRIMESTRE,1975 AL I TRIMESTRE, 1977
CON PERIODO BASE =1974.40 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

BASE DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.10	105.1360	111.2053	117.6250	0.6353
1975.20	102.9151	109.9906	117.5525	0.7683
1975.30	100.2357	108.5025	117.4511	1.1969
1975.40	103.8609	115.2312	127.8463	1.0406
1976.10	101.7228	114.5978	129.1024	1.0976
1976.20	99.5712	113.8667	130.2146	1.3044
1976.30	100.5712	117.1785	136.5279	1.2290
1976.40	98.8304	116.8721	138.2072	1.2565
1977.10	97.1368	116.5151	139.7592	1.3551

Anexo I.26.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA TABACO INDICE EXPORTACION DE BRASIL,REP.DOMINICANA

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.30	106.4462	0.0	0.0	0.0	0.0	0.0
1967.40	106.2809	102.7343	0.0	0.0	0.0	0.0
1968.10	108.9256	104.9282	102.6900	0.0	0.0	0.0
1968.20	105.9504	107.1206	104.6061	101.9138	0.0	0.0
1968.30	105.7851	106.6034	107.3499	104.3101	100.1576	0.0
1968.40	104.7934	107.0648	107.5902	108.5020	103.7535	100.1532
1969.10	103.4711	104.2183	105.6478	106.2751	107.6816	103.5725
1969.20	101.9834	103.3745	103.8482	105.5732	106.5515	107.7764
1969.30	104.9587	102.0360	102.9180	103.4885	106.1791	107.0339
1969.40	99.5042	103.0672	101.2345	102.2937	103.1785	105.5067
1970.10	100.0000	100.5387	102.8110	100.6043	102.2491	103.0176
1970.20	104.9587	100.9429	101.2880	104.0633	100.6046	102.0329
1970.30	102.9752	101.0340	98.5607	98.9684	103.2249	100.2355
1970.40	97.8512	102.9795	101.7419	98.7377	99.3747	103.0803
1971.10	100.9917	102.1064	105.4743	103.9433	99.2016	99.7576
1971.20	98.5123	99.7669	100.4650	104.4863	102.1331	98.0701
1971.30	95.5372	96.6962	97.4768	98.3023	104.5000	102.4509
1971.40	96.1983	97.2115	97.9592	99.9162	100.2243	105.6958
1972.10	92.5619	95.3478	95.9843	96.8782	98.3567	99.4866
1972.20	91.9008	92.1091	93.8604	94.6195	95.9951	97.2676
1972.30	92.8925	91.9530	92.0854	94.2075	95.3965	96.6009
1972.40	89.2562	90.9529	90.3674	90.5248	93.7955	94.8238
1973.10	86.7769	89.6532	90.7321	90.0262	90.2706	93.0995
1973.20	86.9422	88.0131	89.8554	91.1649	90.0623	90.2749
1973.30	89.7520	85.4015	86.0683	88.2518	90.2635	89.3137
1973.40	89.2562	86.9263	84.2252	85.0212	88.4050	90.1545
1974.10	77.6859	89.0803	87.5959	84.3149	85.5595	88.5125
1974.20	104.1487	82.9976	90.5373	88.7159	83.5938	84.6656
1974.30	100.5950	93.8596	81.2542	90.2637	87.4508	83.0442
1974.40	98.1318	95.2552	91.1523	76.5634	90.1913	87.7427

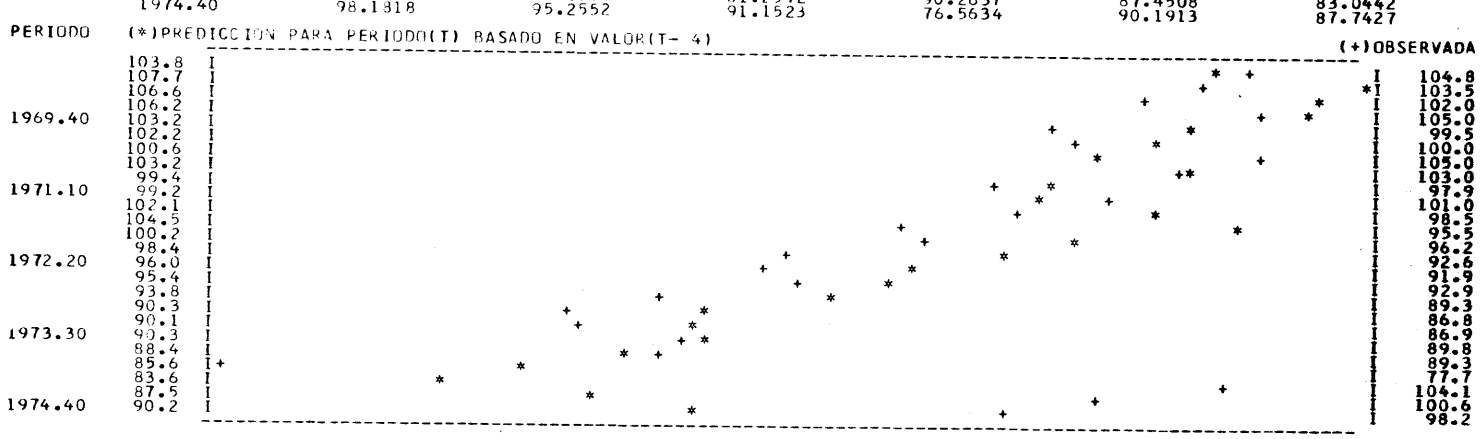
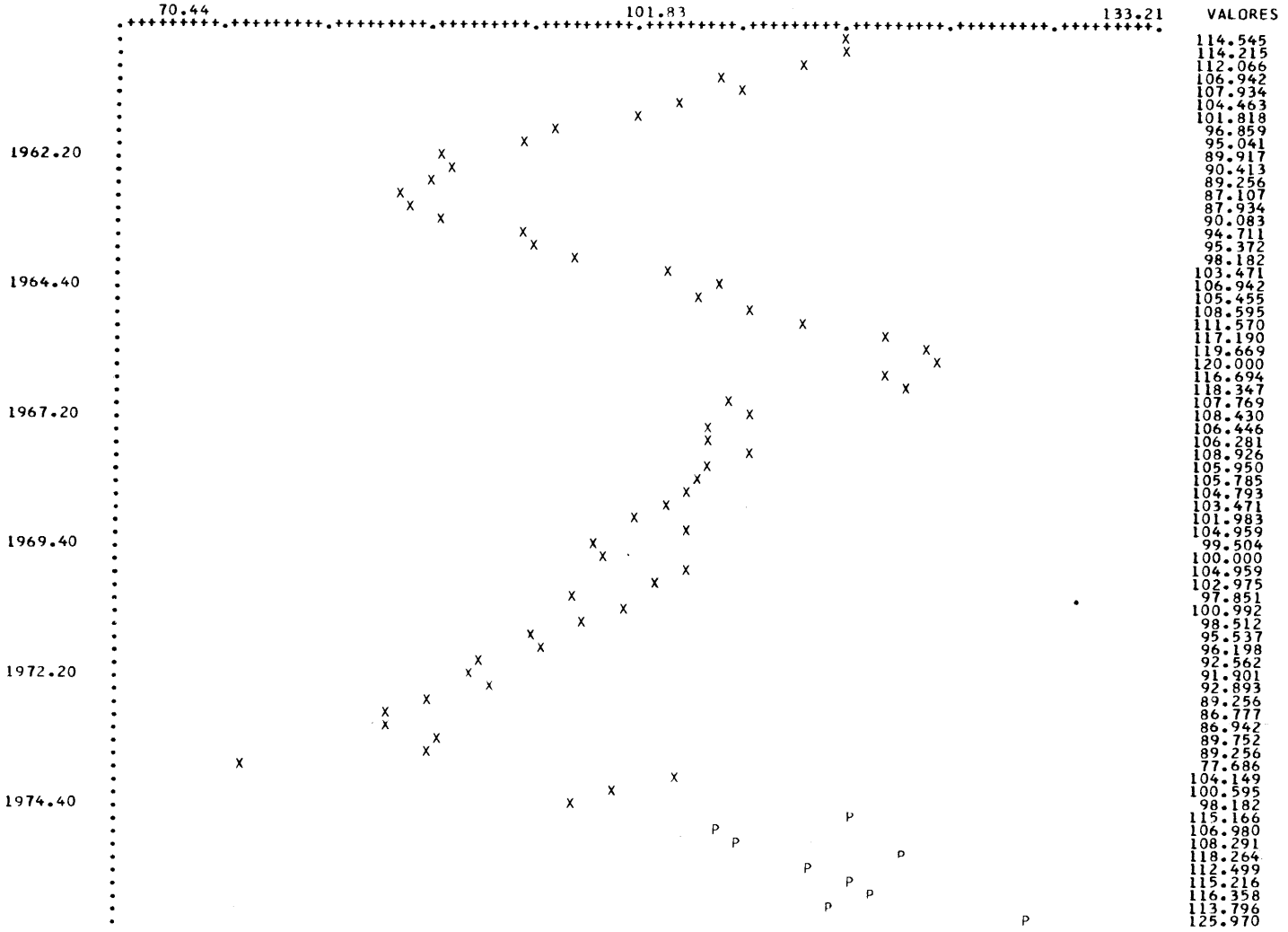


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

TABACO INDICE EXPORTACION DE BRASIL,REP.DOMINICANA

PERIODO DE MUESTRA I TRIMESTRE,1960 AL IV TRIMESTRE, 1974

PERIODO DE PREDICCION I TRIMESTRE,1975 AL I TRIMESTRE, 1977



INTERVALO ABSCISA ES 0.628

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - TABACO INDICE EXPORTACION DE BRASIL,REP.DOMINICANA — 60 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 — MODELO LOGARITMICO

NUMERO	PARAMETROS DEL MODELO CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	-0.39450
2	AUTOREGRESIVO REGULAR	3	0.43350
3	AUTOREGRESIVO REGULAR	12	-0.59430

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	5.417	6.012	6.347	6.654	7.714
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.056	0.062	0.066	0.069	0.080

PREDICCIONES PARA EL PERIODO I TRIMESTRE,1975 AL I TRIMESTRE, 1977
CON PERIODO BASE =1974.40 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

BASE DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.10	108.8262	115.1662	121.8755	0.6055
1975.20	100.1277	106.9801	114.3012	0.7611
1975.30	100.0665	108.2913	117.1918	1.1332
1975.40	106.8204	118.2638	130.9329	0.8154
1976.10	100.6037	112.4987	125.8001	1.0083
1976.20	101.6274	115.2157	130.6206	1.0935
1976.30	101.1636	116.3584	133.8354	0.9221
1976.40	98.0081	113.7962	132.1277	1.0733
1977.10	107.2105	125.9704	148.0126	1.0506

Anexo I.26.2.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA TABACO INDICE EXPORTACION DE BRASIL,REP.DOMINICANA

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.30	106.4462	0.0	0.0	0.0	0.0	0.0
1967.40	106.2809	100.9597	0.0	0.0	0.0	0.0
1968.10	108.9256	107.5197	104.2272	0.0	0.0	0.0
1968.20	105.9504	105.1644	104.3404	100.3400	0.0	0.0
1968.30	105.7851	105.3362	104.8624	103.8306	97.9594	0.0
1968.40	104.7934	103.9048	103.6376	103.0519	101.5459	97.3806
1969.10	103.4711	102.6430	102.1151	101.7851	100.9299	99.8664
1969.20	101.9834	103.7502	103.2466	102.5796	102.0865	101.4684
1969.30	104.9587	103.8596	104.9454	104.3055	103.3037	102.9463
1969.40	99.5042	102.3459	101.6956	103.0338	102.0998	101.3934
1970.10	100.0000	106.7640	108.6000	107.7333	109.8509	109.1334
1970.20	104.9587	100.6893	104.7599	107.0293	105.7602	107.2518
1970.30	102.9752	101.7288	99.2027	104.2698	107.6509	106.7308
1970.40	97.8512	104.0728	103.3084	100.0941	107.8006	110.3044
1971.10	100.9917	100.4797	104.3010	103.3387	98.5883	103.9929
1971.20	98.5123	100.5608	100.2518	105.0676	103.6276	100.1773
1971.30	95.5372	97.3964	98.6177	98.2370	105.3447	104.3040
1971.40	96.1983	98.5836	99.7403	101.3154	100.7336	105.9265
1972.10	92.5619	95.6276	97.0564	98.4907	100.8147	100.3978
1972.20	91.9008	93.5401	95.4039	97.1991	99.3455	101.0267
1972.30	92.8925	90.8706	91.8486	94.1550	96.8050	98.3384
1972.40	89.2562	93.8990	92.6561	93.9114	97.4438	99.4096
1973.10	86.7769	90.1254	92.9355	91.3917	93.2414	95.7520
1973.20	86.9422	85.6563	87.6426	91.0914	88.8478	90.1381
1973.30	89.7520	86.3596	85.5840	88.0862	93.2963	91.6370
1973.40	89.2562	90.2535	88.1723	87.1780	90.9998	94.8414
1974.10	77.6859	87.8602	88.4532	85.8968	84.4586	87.1068
1974.20	104.1487	84.4369	90.9696	91.7422	87.8226	86.7619
1974.30	100.5950	94.2543	83.0094	91.1610	92.3161	89.4608
1974.40	98.1818	95.6326	91.9360	78.3664	90.0951	90.9150

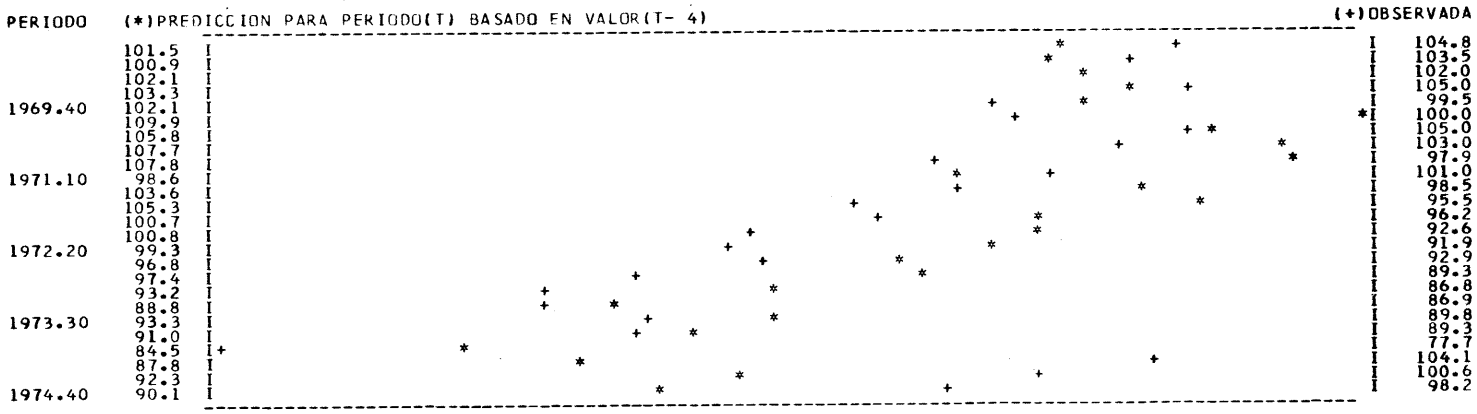
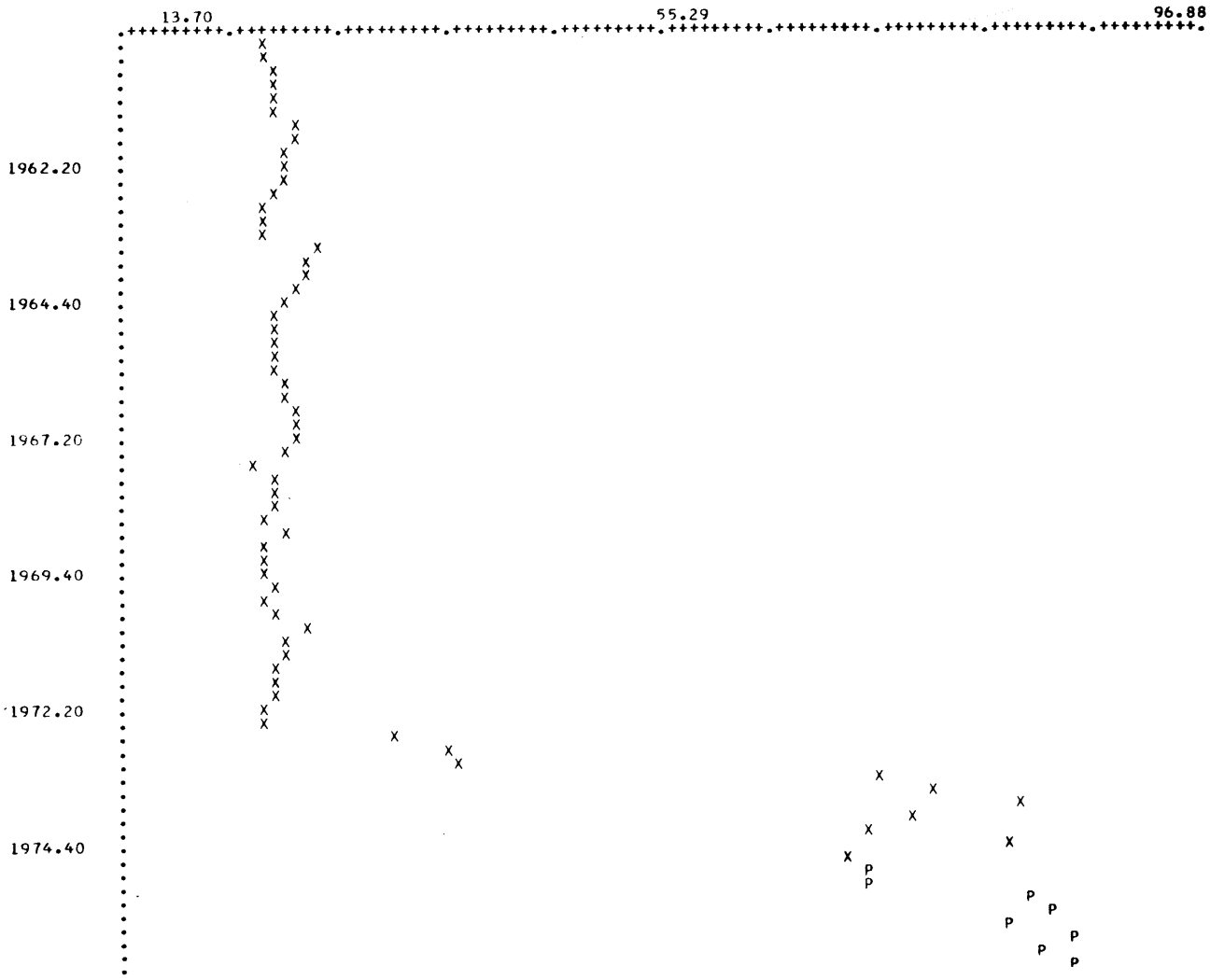


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

TRIGO UK USO INTERNO CIF ARGENTINA LB/TLARGAS AJUSTADAS

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



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71.900
74.500
70.900
82.200
69.500
70.798
71.014
83.160
85.575
82.228
87.284
84.396
86.684

INTERVALO ABSCISA ES 0.832

Anexo I.27.1,b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - TRIGO UK USO INTERNO CIF ARGENTINA LB/TLARGAS AJUSTADAS 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0DIFERENCIAS ESTACIONALES DE ORDEN , 0 MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	3	-0.72350
2	AUTOREGRESIVO REGULAR	6	-0.69830
3	PROMEDIO MOVIL REGULAR	3	-1.18230
4	PROMEDIO MOVIL REGULAR	6	-0.71390

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	6.738	9.556	12.158	15.754	18.852
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.145	0.206	0.262	0.339	0.406

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	63.2034	70.7984	79.3059	1.0000
1975.30	60.4848	71.0138	83.3755	1.0000
1975.40	68.3209	83.1598	101.2215	1.4588
1976.10	66.1829	85.5751	110.6494	1.4588
1976.20	60.5712	82.2281	111.6282	1.4588
1976.30	61.6541	87.2836	123.5672	1.1425
1976.40	58.2366	84.3963	122.3071	1.1425
1977.10	58.5136	86.6840	128.4164	1.1425

Anexo I.27.1,c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA TRIGO UK USO INTERNO CIF ARGENTINA LB/TLARGAS AJUSTADAS

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	23.3000	0.0	0.0	0.0	0.0	0.0
1968.10	25.5000	23.2667	0.0	0.0	0.0	0.0
1968.20	25.7000	26.1214	23.8337	0.0	0.0	0.0
1968.30	25.5000	24.2997	24.6982	22.5351	0.0	0.0
1968.40	24.8000	26.7650	25.5052	25.9235	22.6791	0.0
1969.10	26.0000	24.6943	26.6510	25.3965	26.0065	22.7517
1969.20	24.8000	27.6272	26.2398	28.3189	26.3956	27.0295
1969.30	24.5000	23.1791	25.8215	24.5248	27.4105	25.5489
1969.40	24.2000	24.7377	23.4040	26.0720	24.1843	27.0299
1970.10	25.0000	22.9375	23.4472	22.1831	25.9668	24.0867
1970.20	24.8000	26.0027	23.8576	24.3877	22.4936	26.3303
1970.30	25.7000	24.4726	25.6595	23.5426	24.3097	22.4217
1970.40	27.9000	26.5938	25.3233	26.5519	23.4179	24.1809
1971.10	26.5000	27.8409	26.5375	25.2701	27.0778	23.8817
1971.20	26.0000	27.1702	28.5450	27.2087	25.3341	27.1463
1971.30	25.5000	26.9534	28.1665	29.5917	27.5927	25.6917
1971.40	25.0000	24.2729	25.6564	26.8111	28.8130	26.8667
1972.10	25.0000	24.3041	23.5972	24.9422	26.5967	28.5826
1972.20	24.5000	23.2025	22.5566	21.9006	23.7451	25.3202
1972.30	24.4000	25.7543	24.3903	23.7114	22.7122	24.6252
1972.40	34.7000	24.7748	26.1499	24.7650	23.7659	22.7644
1973.10	38.9000	36.5863	26.1216	27.5715	25.4675	24.4400
1973.20	39.3000	37.9011	35.6469	25.4508	27.5377	25.4363
1973.30	71.9000	46.2897	44.6421	41.9868	25.6841	27.7900
1973.40	76.2000	75.0430	48.3132	46.5936	42.6067	26.0632
1974.10	82.5999	76.1800	75.0234	48.3006	45.8133	41.8932
1974.20	74.5000	89.3193	82.3771	81.1263	42.6752	40.4776
1974.30	70.9000	70.1651	84.1221	77.5339	75.8716	39.9111
1974.40	82.2000	74.9865	74.2092	88.9706	79.0656	77.3207
1975.10	69.5000	64.1929	58.5596	57.9526	75.5112	67.1047

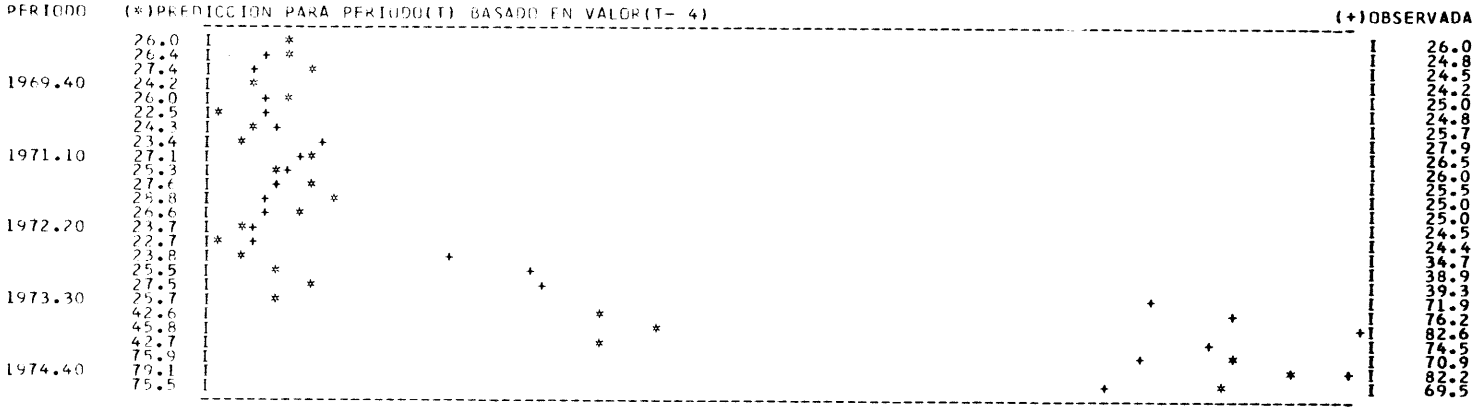
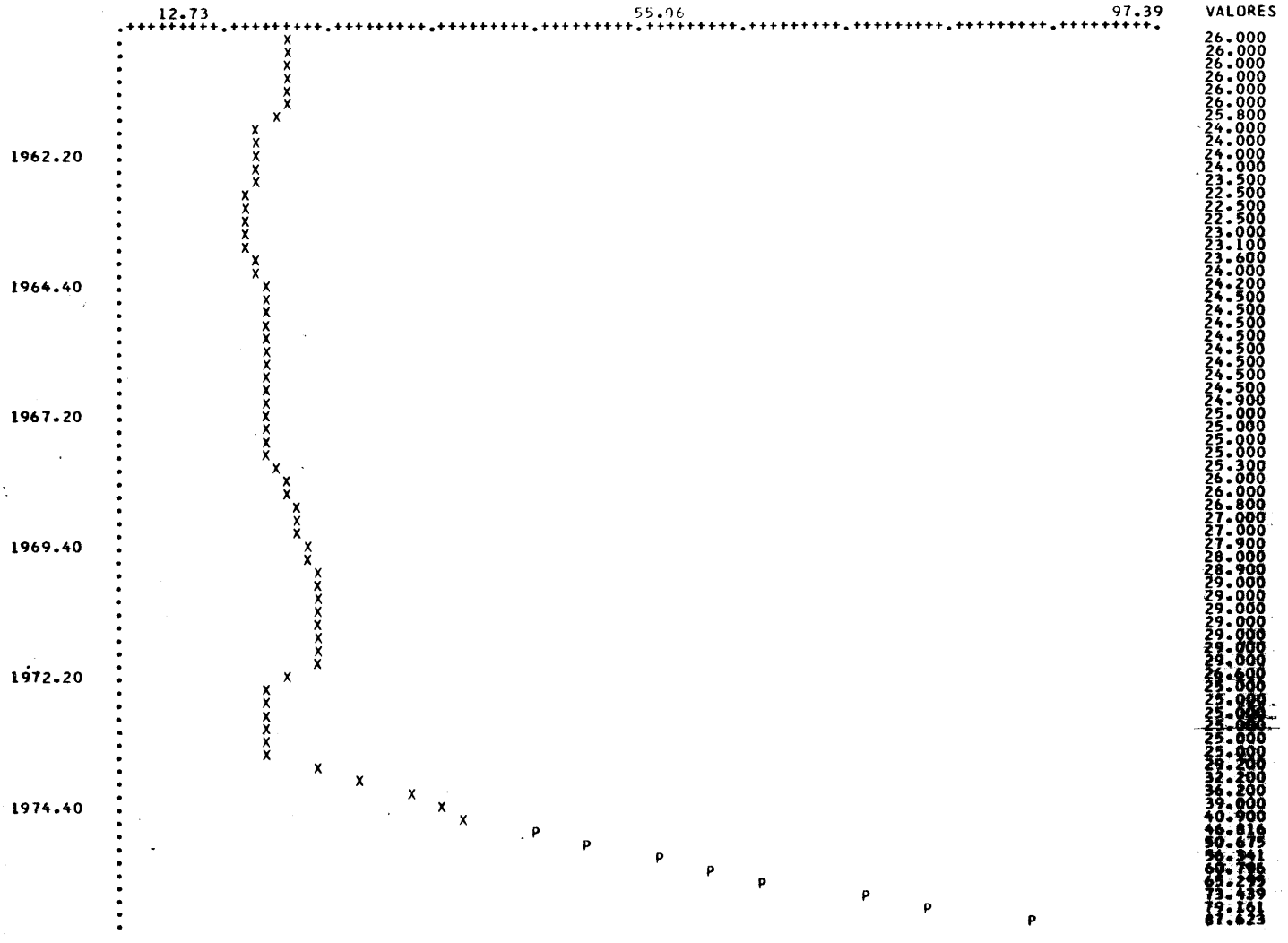


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

ALUMINIO PRECIO INTERNO USA LINGOTES PUROS CENTS/LB

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 0.847

Anexo II.1.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - ALUMINIO PRECIO INTERNO USA LINGOTES PUROS CENTS/LB 61 OBSERVACIONES

DIFERENCIAS - 2 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	-0.30260
2	AUTOREGRESIVO REGULAR	5	0.51110

PERIODO DE PREDICCION

	1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	1.072	2.067	3.134	4.354	5.451
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.037	0.071	0.107	0.149	0.187

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	45.2182	46.8156	48.4694	1.6974
1975.30	47.3251	50.6751	54.2622	2.4864
1975.40	50.4654	56.3407	62.9000	3.2476
1976.10	51.9314	60.7965	71.1747	4.0173
1976.20	52.9032	65.2950	80.5895	5.2954
1976.30	55.5353	73.4393	97.1153	6.2651
1976.40	55.5547	79.1606	112.7967	7.3749
1977.10	56.6034	87.6228	135.6412	8.4281

Anexo II.1.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA ALUMINIO PRECIO INTERNO USA LINGOTES PUROS CENTS/LB

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	25.0000	0.0	0.0	0.0	0.0	0.0
1968.10	25.0000	24.9999	0.0	0.0	0.0	0.0
1968.20	25.3000	25.2077	25.2075	0.0	0.0	0.0
1968.30	26.0000	25.3528	25.1961	25.1958	0.0	0.0
1968.40	26.0000	26.5409	25.4294	25.1993	25.1990	0.0
1969.10	26.8000	26.2156	27.1481	25.4989	25.1981	25.1977
1969.20	27.0000	27.3724	26.3670	27.7521	25.5708	25.1982
1969.30	27.0000	27.5578	28.2062	26.7016	28.5483	25.7990
1969.40	27.9000	27.2741	28.2375	29.2159	27.1971	29.5426
1970.10	28.0000	28.1499	27.0864	28.4993	29.7959	27.2702
1970.20	28.9000	28.7923	29.0544	27.4607	29.3465	31.0068
1970.30	29.0000	29.2330	29.0483	29.4364	27.3454	29.6869
1970.40	29.0000	29.2382	29.6380	29.3641	29.8777	27.2748
1971.10	29.0000	29.5209	29.9337	30.5351	30.1670	30.8210
1971.20	29.0000	28.5702	29.4467	30.0518	30.8429	30.3836
1971.30	29.0000	29.4188	28.6826	29.9807	30.7878	31.7935
1971.40	29.0000	28.5852	29.2895	28.2221	29.9019	30.9007
1972.10	29.0000	28.9488	28.2495	29.2749	27.8891	29.9568
1972.20	26.6000	29.0000	28.9132	27.8959	29.2257	27.5241
1972.30	25.0000	25.0448	29.0000	28.8729	27.5532	29.1871
1972.40	25.0000	23.3237	23.3947	29.0000	28.8340	27.2127
1973.10	25.0000	24.5350	21.8084	21.9057	29.0000	28.7948
1973.20	25.0000	25.0000	24.2159	20.3778	20.4966	29.0000
1973.30	25.0000	23.9202	23.9201	22.8293	18.2224	18.3538
1973.40	25.0000	25.3130	23.4853	23.4852	22.0961	16.7198
1974.10	29.2000	25.8053	26.3561	23.6159	23.6158	21.9003
1974.20	32.2000	32.5399	26.3822	27.2111	23.5761	23.5760
1974.30	36.2000	36.1313	36.7811	27.0503	28.1658	23.5879
1974.40	39.0000	40.4599	40.3297	41.3967	27.7110	29.1313
1975.10	40.9000	42.5616	45.3011	45.0878	46.6520	28.3954

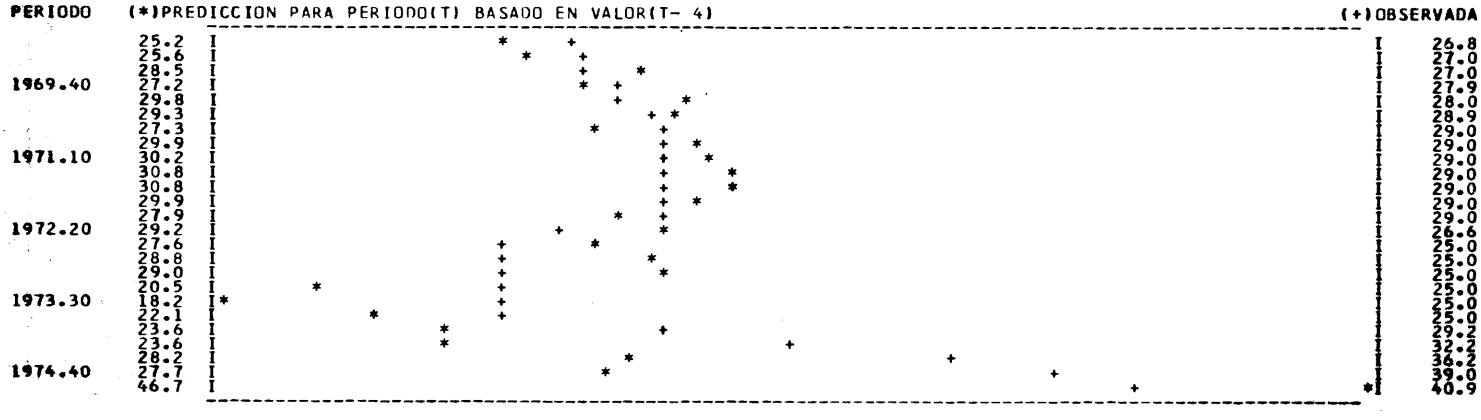
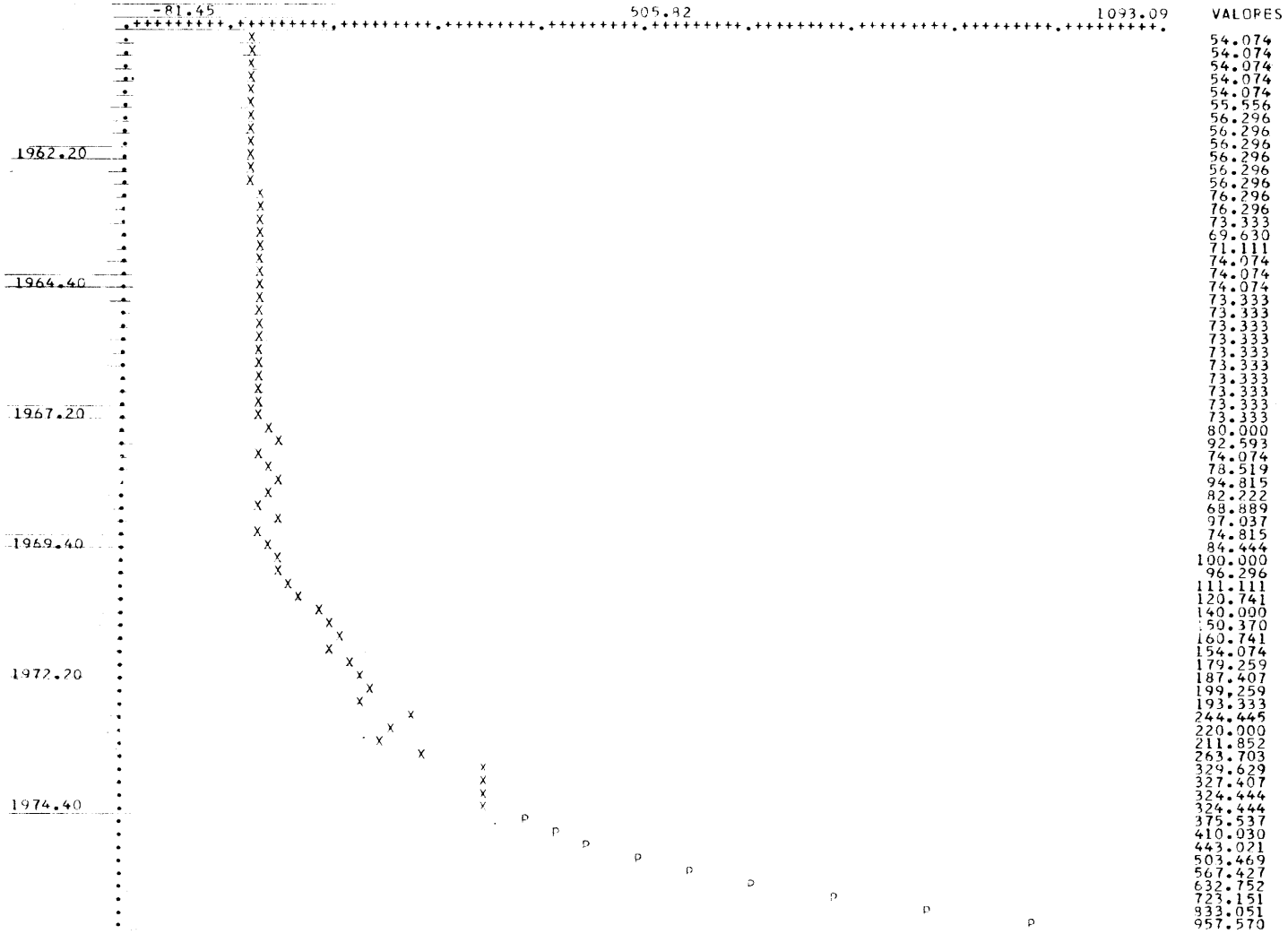


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

BAUXITA INDICE EXPORTACION DE JAMAICA, GUYANA

PERIODO DE MUESTRA I TRIMESTRE,1960 AL IV TRIMESTRE, 1974

PERIODO DE PREDICCION I TRIMESTRE,1975 AL I TRIMESTRE, 1977



CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - BAUXITA **INDICE DE EXPORTACION DE JAMAICA, GUYANA** 60 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

NUMERO	PARAMETROS DEL MODELO CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	0.52500
2	AUTOREGRESIVO REGULAR	3	0.59680
3	PROMEDIO MOVIL REGULAR	1	0.87270
4	PROMEDIO MOVIL REGULAR	3	0.17360

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	23.366	28.372	27.432	22.644	26.196
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.119	0.144	0.140	0.115	0.133

PREDICCIONES PARA EL PERIODO I TRIMESTRE,1975 AL I TRIMESTRE, 1977
CON PERIODO BASE =1974.40 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

BASE DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.10	333.8313	375.5374	422.4529	0.6523
1975.20	356.2656	410.0295	471.9065	0.4698
1975.30	380.9155	443.0208	515.2520	0.7971
1975.40	421.4521	503.4685	601.4463	0.7615
1976.10	464.9724	567.4265	692.4556	0.6338
1976.20	511.5393	632.7520	782.6853	0.7622
1976.30	574.1038	723.1506	910.8918	0.8083
1976.40	649.0061	833.0505	1069.2849	0.7563
1977.10	734.6145	957.5696	1248.1907	0.8056

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA BAUXITA **INDICE DE EXPORTACION DE JAMAICA, GUYANA**

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.30	80.0000	0.0	0.0	0.0	0.0	0.0
1967.40	82.5926	79.2692	0.0	0.0	0.0	0.0
1968.10	74.0741	87.6007	79.1582	0.0	0.0	0.0
1968.20	78.5185	79.4116	88.5929	82.3576	0.0	0.0
1968.30	84.8149	86.8398	87.4829	94.6545	83.6293	0.0
1968.40	82.2222	87.3745	82.5077	82.9472	94.8125	84.2341
1969.10	68.8889	83.4617	86.8370	83.3259	84.0807	95.5354
1969.20	87.0371	81.8074	92.7159	95.4012	88.9483	89.7179
1969.30	74.8148	92.8950	83.1051	90.9444	95.4591	89.2815
1969.40	84.4445	73.3389	84.4606	77.9515	90.8354	95.1384
1970.10	100.0000	94.7678	86.4403	95.6922	83.5169	96.6574
1970.20	96.2963	92.7024	89.5091	83.7724	99.5488	87.4130
1970.30	111.1111	95.7942	93.4467	91.1174	81.4308	96.0226
1970.40	120.7407	115.3285	104.6928	102.8389	98.5266	88.4961
1971.10	140.0000	117.6988	114.2300	106.5417	103.3601	99.2160
1971.20	150.3704	138.0432	123.2708	120.6436	107.1902	104.1304
1971.30	160.7407	151.0496	142.8528	131.6708	126.9445	113.3865
1971.40	154.0741	167.1241	160.4808	154.1605	134.2473	129.6404
1972.10	179.2593	166.3248	175.3840	170.3349	159.1084	139.4156
1972.20	187.4074	187.1602	178.2369	185.1761	176.2213	165.1095
1972.30	199.2593	189.4832	189.3203	182.7758	195.0140	185.9951
1972.40	193.3334	212.7782	205.9093	205.7818	193.8571	206.2388
1973.10	244.4445	212.4055	226.1076	220.8271	220.5950	208.3672
1973.20	220.0001	251.4875	229.4653	240.0319	230.5970	230.3657
1973.30	211.8519	233.6130	254.9129	238.6331	257.5771	247.8970
1973.40	263.7034	253.9163	270.6387	288.1912	257.6594	277.1658
1974.10	329.6294	275.0908	268.3872	281.0024	312.6216	280.9050
1974.20	327.4072	314.7324	279.7070	274.7817	297.0559	328.9099
1974.30	324.4443	356.8418	347.7683	319.4417	309.9548	333.9150
1974.40	324.4443	388.4539	413.3352	405.7397	351.2637	341.2927

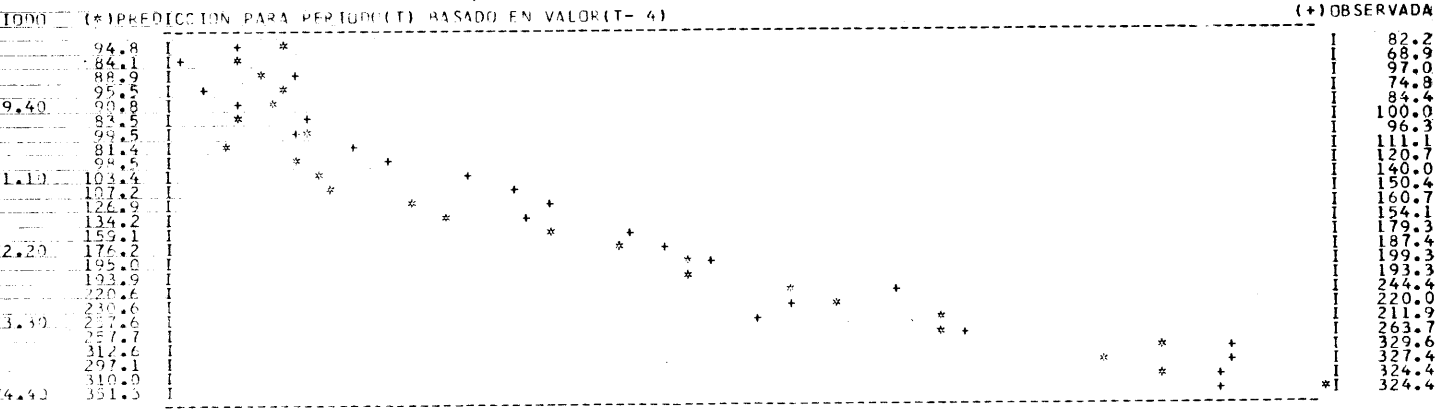
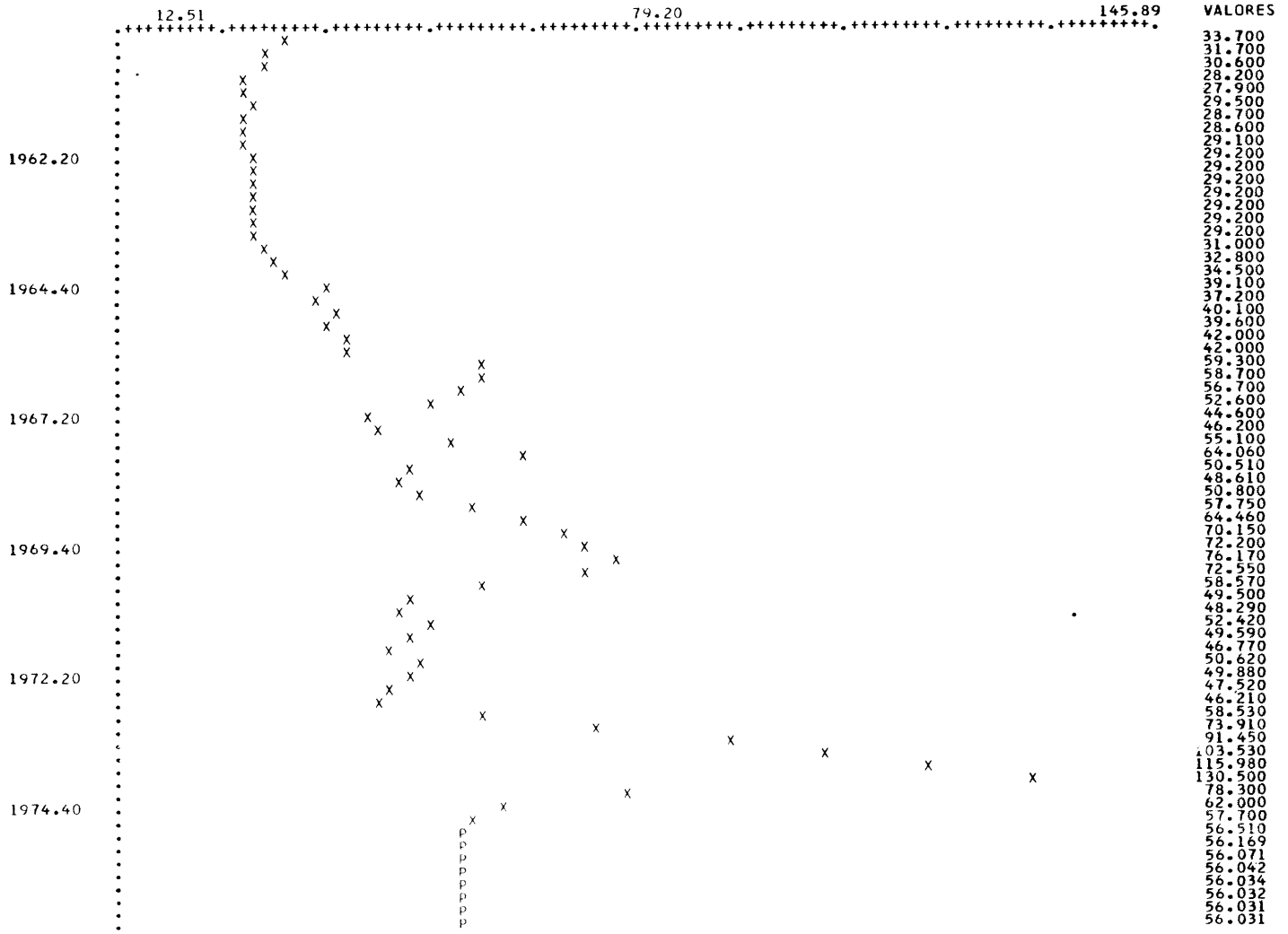


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

COBRE LME CASH WIRE BARS SPOT CENTS/LB

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 1.334

Anexo II.3.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - COBRE LME CASH WIRE BARS SPOT CENTS/LB 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

NUMERO	PARAMETROS DEL MODELO CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	0.29000

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	13.109	21.730	28.214	29.286	30.580
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.185	0.307	0.398	0.413	0.432

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	49.0749	56.5097	65.0709	1.2900
1975.30	44.6172	56.1692	70.7119	1.3741
1975.40	41.4977	56.0708	75.7616	1.3985
1976.10	39.1046	56.0423	80.3164	1.4056
1976.20	37.1544	56.0340	84.5069	1.4076
1976.30	35.5015	56.0316	88.4339	1.4082
1976.40	34.0627	56.0309	92.1672	1.4084
1977.10	32.7863	56.0307	95.7546	1.4084

Anexo II.3.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA COBRE LME CASH WIRE BARS SPOT CENTS/LB

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	55.1000	0.0	0.0	0.0	0.0	0.0
1968.10	64.0600	57.9882	0.0	0.0	0.0	0.0
1968.20	50.5100	66.9211	58.8537	0.0	0.0	0.0
1968.30	48.6100	47.1462	67.7744	59.1071	0.0	0.0
1968.40	50.8000	48.0724	46.2133	68.0239	59.1808	0.0
1969.10	57.7500	51.4534	47.9177	45.9462	68.0965	59.2022
1969.20	64.4600	59.9379	51.6444	47.8729	45.8690	68.1175
1969.30	70.1499	66.5478	60.5877	51.7000	47.8599	45.8467
1969.40	72.2000	71.8921	67.1659	60.7775	51.7161	47.8562
1970.10	76.1700	72.8057	72.4054	67.3462	60.8326	51.7208
1970.20	72.5500	77.3616	72.9823	72.5549	67.3986	60.8486
1970.30	58.5700	71.5327	77.7106	73.0336	72.5984	67.4137
1970.40	49.5000	55.0448	71.2404	77.8121	73.0484	72.6110
1971.10	48.2900	47.1428	54.0628	71.1559	77.8416	73.0527
1971.20	52.4200	47.9446	46.4804	53.7813	71.1314	77.8502
1971.30	49.5900	53.6824	47.8449	46.2901	53.6999	71.1242
1971.40	46.7700	48.7982	54.0542	47.8160	46.2350	53.6763
1972.10	50.6200	45.9826	48.5710	54.1625	47.8077	46.2191
1972.20	49.8800	51.7947	45.7567	48.5053	54.1940	47.8053
1972.30	47.5200	49.6674	52.1404	45.6914	48.4863	54.2031
1972.40	46.2100	46.8567	49.6060	52.2411	45.6725	48.4808
1973.10	59.5300	45.8369	46.6661	49.5882	52.2704	45.6670
1973.20	73.9100	62.6823	45.7292	46.6110	49.5830	52.2788
1973.30	91.4500	79.0838	63.9406	45.6981	46.5950	49.5815
1973.40	103.5300	97.2753	80.6508	64.3103	45.6890	46.5904
1974.10	115.9800	107.3228	99.0330	81.1111	64.4179	45.6864
1974.20	130.5000	119.8630	106.4485	99.5487	81.2450	64.4491
1974.30	78.3000	135.0413	121.0132	108.7772	99.6987	81.2839
1974.40	62.0000	67.5189	136.3876	121.3488	108.8727	99.7423
1975.10	57.7000	57.9421	64.6797	136.7804	121.4463	108.9004

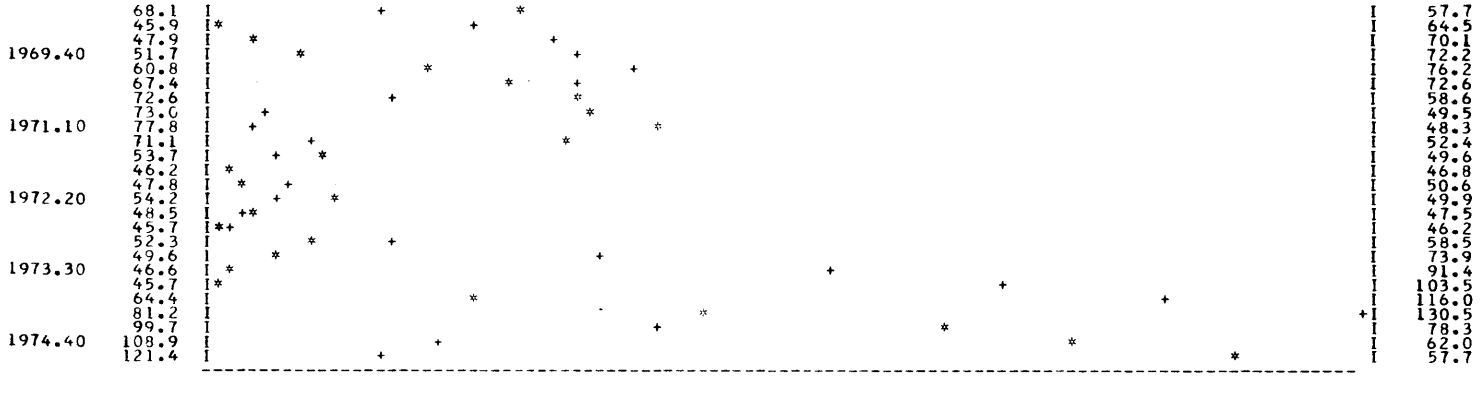
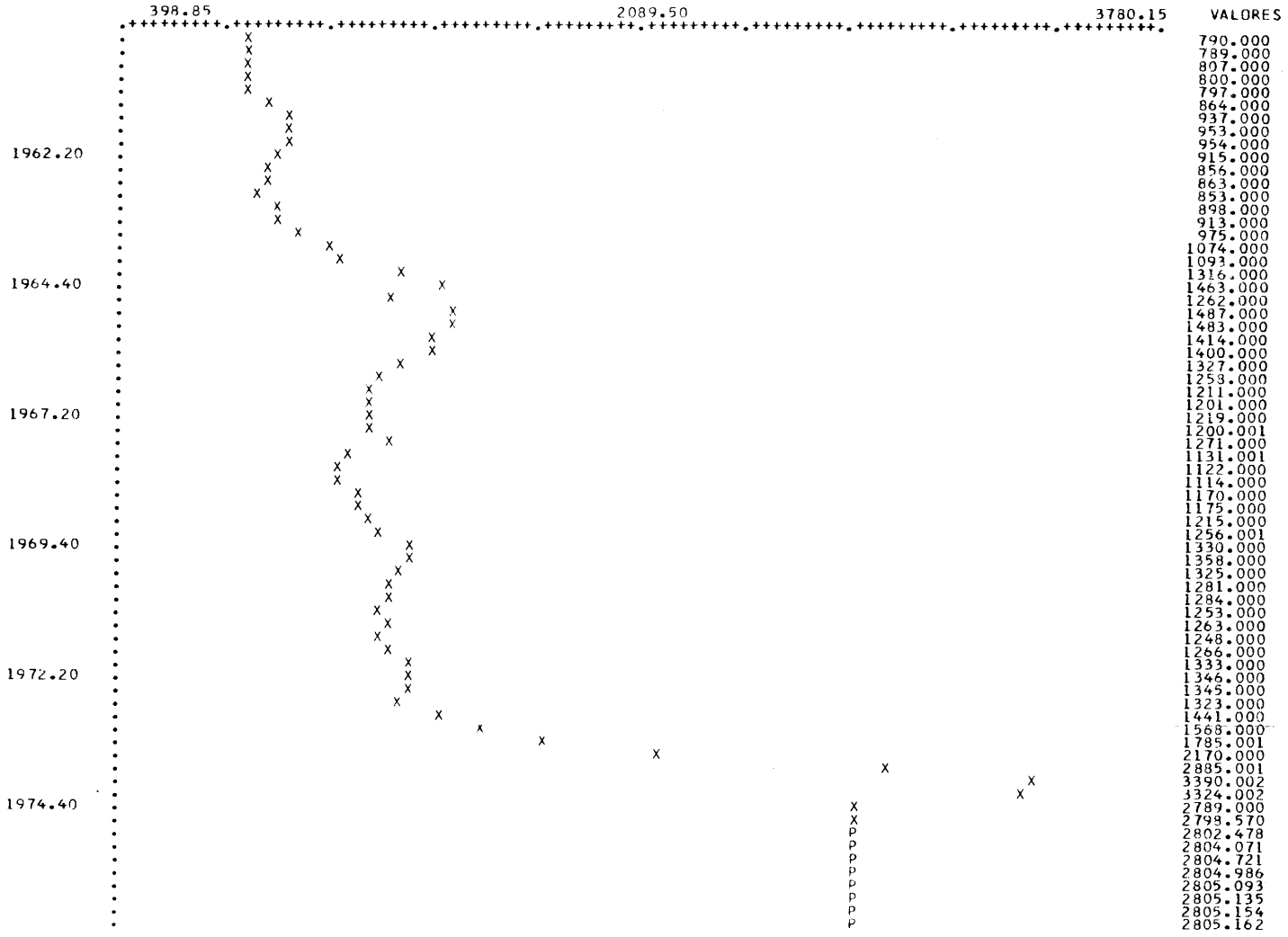


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

ESTANO UK DOM IMPORT SPOT LB/TON AJUSTADA EXPORTACION DE BOLIVIA

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 33.813

Anexo II.41.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - ESTANO UK DOM IMPORT SPOT LB/TON AJUSTADA EXPORTACION DE BOLIVIA 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

NUMERO	CARACTERISTICAS	PARAMETROS DEL MODELO ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	0.40730

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	183.651	370.811	511.707	581.831	653.745
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.099	0.201	0.277	0.315	0.354

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	2572.2915	2802.4775	3053.2622	1.4073
1975.30	2418.4016	2804.0708	3251.2407	1.5732
1975.40	2295.8867	2804.7207	3426.3237	1.6408
1976.10	2196.2646	2804.9856	3582.4172	1.6683
1976.20	2112.9309	2805.0925	3723.9915	1.6795
1976.30	2041.3809	2805.1355	3854.6345	1.6841
1976.40	1978.6101	2805.1541	3976.9746	1.6859
1977.10	1922.5911	2805.1621	4092.8762	1.6867

Anexo II.41.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA ESTANO UK DOM IMPORT SPOT LB/TON AJUSTADA EXPORTACION DE BOLIVIA

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	1270.9998	0.0	0.0	0.0	0.0	0.0
1968.10	1131.0007	1301.1084	0.0	0.0	0.0	0.0
1968.20	1122.0000	1078.4995	1313.5750	0.0	0.0	0.0
1968.30	1114.0002	1118.3540	1057.8201	1318.6873	0.0	0.0
1968.40	1170.0002	1110.7583	1116.3726	1049.5120	1320.7751	0.0
1969.10	1174.9998	1193.6079	1109.4404	1116.2698	1046.1462	1321.6257
1969.20	1214.9995	1177.0420	1203.3596	1108.9041	1116.0239	1044.7783
1969.30	1256.0007	1231.6792	1177.8752	1207.3542	1108.6863	1115.9238
1969.40	1329.9998	1273.0950	1236.5381	1178.2144	1208.9846	1108.5974
1970.10	1357.9995	1361.3750	1280.1233	1241.3428	1178.3528	1209.6501
1970.20	1325.0002	1369.5723	1374.3650	1282.9980	1242.4871	1178.4089
1970.30	1281.0002	1311.7898	1374.3140	1379.6914	1284.1707	1242.9539
1970.40	1284.0005	1263.5010	1306.4475	1376.2498	1381.8669	1284.6484
1971.10	1253.0000	1285.2244	1256.4426	1304.2778	1377.0388	1382.7542
1971.20	1262.9998	1240.5891	1285.7231	1253.5786	1303.3948	1377.3606
1971.30	1247.9998	1267.0955	1235.5698	1285.9268	1252.4136	1303.0356
1971.40	1266.0000	1241.9409	1268.7678	1233.5305	1286.0090	1251.9395
1972.10	1333.0002	1273.4058	1239.4822	1269.4492	1232.7014	1286.0435
1972.20	1345.9995	1361.2957	1276.4346	1238.4824	1269.7266	1232.3643
1972.30	1345.0000	1351.3308	1372.9922	1277.6707	1238.0752	1269.8403
1972.40	1323.0002	1344.5935	1353.5073	1377.7949	1278.1741	1237.9099
1973.10	1440.9995	1314.1426	1344.4268	1354.3962	1379.7415	1278.3799
1973.20	1568.0002	1492.0256	1310.5518	1344.3601	1354.7581	1380.5391
1973.30	1785.0007	1622.8811	1513.3235	1309.0928	1344.3318	1354.9053
1973.40	2170.0005	1881.7690	1645.7815	1522.0345	1308.4988	1344.3203
1974.10	2885.0007	2349.6755	1922.6715	1655.2004	1525.6667	1308.2566
1974.20	3390.0022	3239.8350	2427.0520	1939.5835	1659.0532	1527.1284
1974.30	3324.0024	3620.2065	3396.5773	2459.2939	1946.5159	1660.6252
1974.40	2788.9998	3297.4900	3718.3879	3462.5720	2472.5481	1949.3450
1975.10	2798.5701	2596.6108	3286.7527	3759.1384	3489.8191	2477.9680

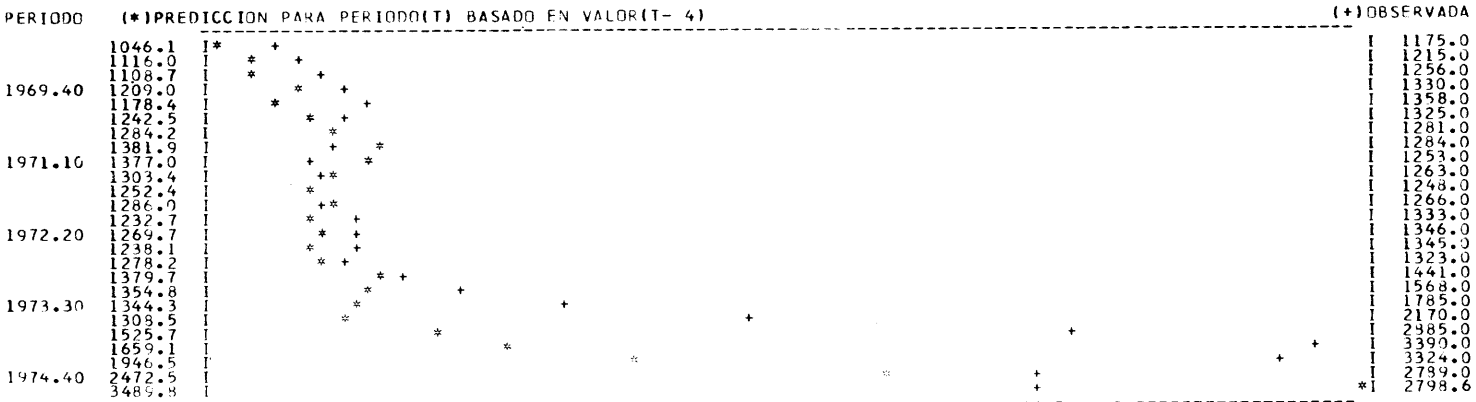
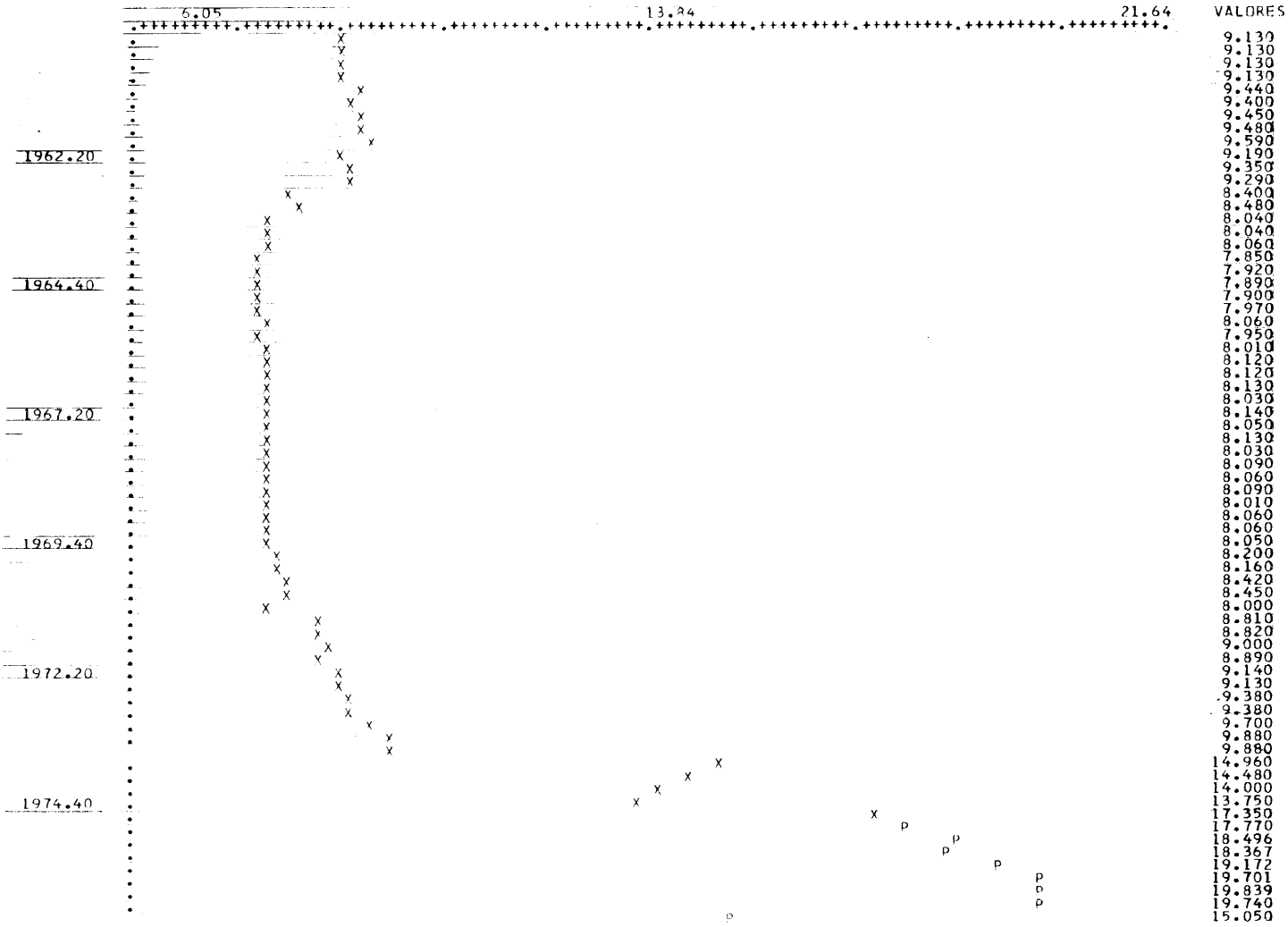


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

HIERRO USA PRECIO UNITARIO IMPORT VENEZUELA 64% FOB EN DOL/TLARGAS

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 0.156

Anexo II.5.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - HIERRO USA PRECIO UNITARIO IMPORT VENEZUELA 64% FOB EN DOL/TLARGAS 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	PROMEDIO MOVIL REGULAR	4	0.44170
2	PROMEDIO MOVIL REGULAR	12	1.02400

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	1.068	1.354	1.559	1.727	1.927
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.103	0.131	0.151	0.167	0.187

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	16.5696	17.7696	19.0566	1.0000
1975.30	16.7544	18.4958	20.4182	1.0000
1975.40	16.2722	18.3672	20.7319	1.0000
1976.10	16.6702	19.1723	22.0499	0.5583
1976.20	17.0387	19.7012	22.7796	0.5583
1976.30	17.0699	19.8392	23.0578	0.5583
1976.40	16.8997	19.7396	23.0567	0.5583
1977.10	12.8229	15.0503	17.6645	0.5583

Anexo II.5.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA HIERRO USA PRECIO UNITARIO IMPORT VENEZUELA 64% FOB EN DOL/TLARGAS

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	8.1300	0.0	0.0	0.0	0.0	0.0
1968.10	8.0300	8.0736	0.0	0.0	0.0	0.0
1968.20	8.0900	8.5895	8.6361	0.0	0.0	0.0
1968.30	8.0600	7.9629	8.4545	8.5004	0.0	0.0
1968.40	8.0900	8.2086	8.1097	8.6103	8.6570	0.0
1969.10	8.0100	8.7280	8.8559	8.7492	9.2893	9.3174
1969.20	8.0630	8.3939	8.1462	9.2302	9.1684	9.4802
1969.30	8.0600	8.2918	8.6352	9.4092	9.5471	9.4827
1969.40	8.0500	8.1929	8.4285	8.7776	9.5644	9.6424
1970.10	8.2000	8.7118	8.9275	9.1842	9.5646	10.0342
1970.20	8.1600	8.6168	9.2209	9.3346	9.6545	9.8757
1970.30	8.4200	8.5310	9.0117	9.6401	9.8112	9.9678
1970.40	8.4500	8.4507	8.5621	9.0446	9.6752	9.7707
1971.10	8.0000	8.7537	8.7544	8.8698	9.3697	9.7290
1971.20	8.8100	8.7146	9.5357	9.5364	9.6622	9.9625
1971.30	8.8200	8.7518	8.6570	9.4727	9.4734	9.5430
1971.40	9.0000	8.9527	8.8835	8.7873	9.6152	9.6156
1972.10	8.8900	10.2256	10.1719	10.0332	9.9839	10.4986
1972.20	9.1400	9.2223	10.6084	10.5526	10.4710	10.4076
1972.30	9.1300	9.3771	9.4620	10.8836	10.8264	10.7795
1972.40	9.3800	9.2744	9.5254	9.6116	11.0557	11.0232
1973.10	9.3800	10.6913	10.5709	10.8569	10.9553	11.8457
1973.20	9.7000	9.9612	11.3537	11.2259	11.5297	11.5879
1973.30	9.3800	9.9476	10.2155	11.6435	11.5124	11.6853
1973.40	9.8800	9.8315	9.8983	10.1654	11.5864	11.5134
1974.10	14.9600	11.4788	11.4225	11.5007	11.8104	12.7055
1974.20	14.4900	14.9688	11.4855	11.4293	11.5075	11.6795
1974.30	14.0000	14.4087	14.8951	11.4291	11.3730	11.4164
1974.40	13.7200	13.8945	14.3001	14.7329	11.3429	11.3118
1975.10	17.3500	14.1169	14.2652	14.6817	15.1773	13.0910

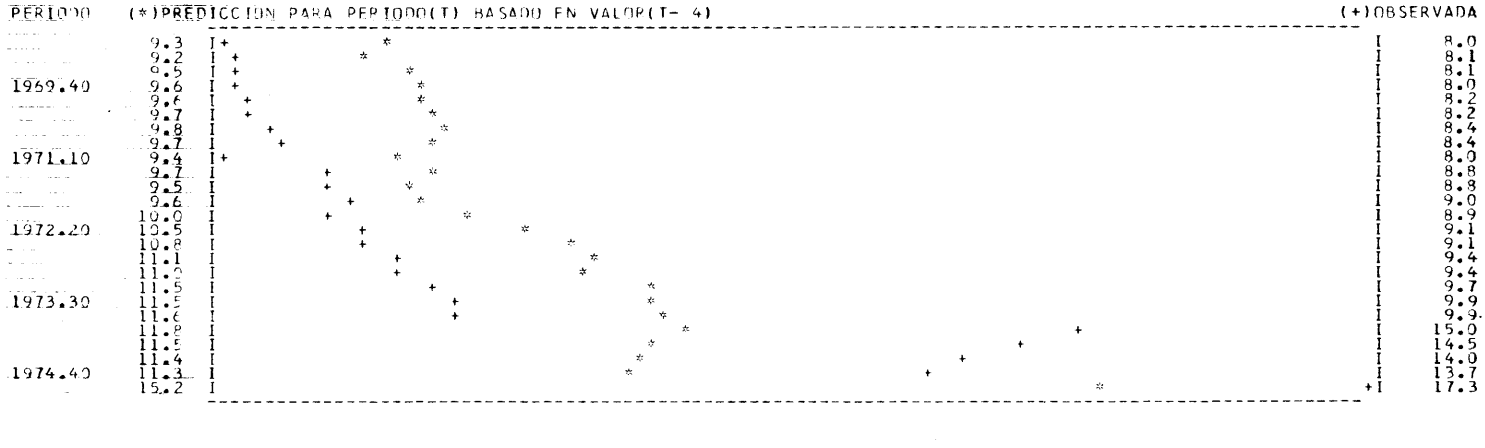
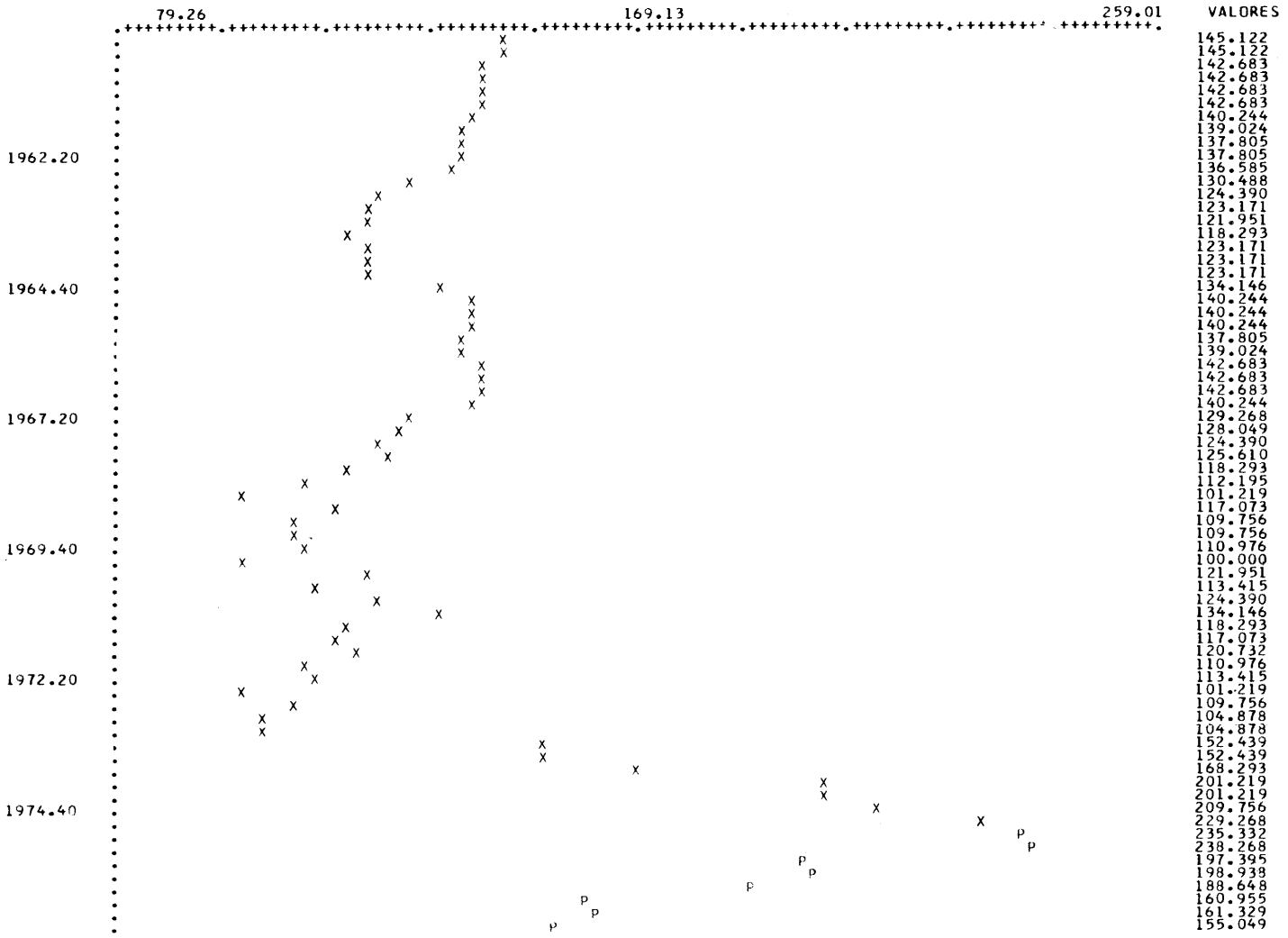


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

MANGANESO INDICE EXPORTACION DE BRAZIL,MEXICO

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 1.797

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - MANGANESO INDICE EXPORTACION DE BRAZIL,MEXICO 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

PARAMETROS DEL MODELO

NUMERO	CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	3	0.29340
2	AUTOREGRESIVO REGULAR	9	-0.57420

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	12.254	15.500	20.999	28.720	35.034
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.088	0.111	0.151	0.206	0.251

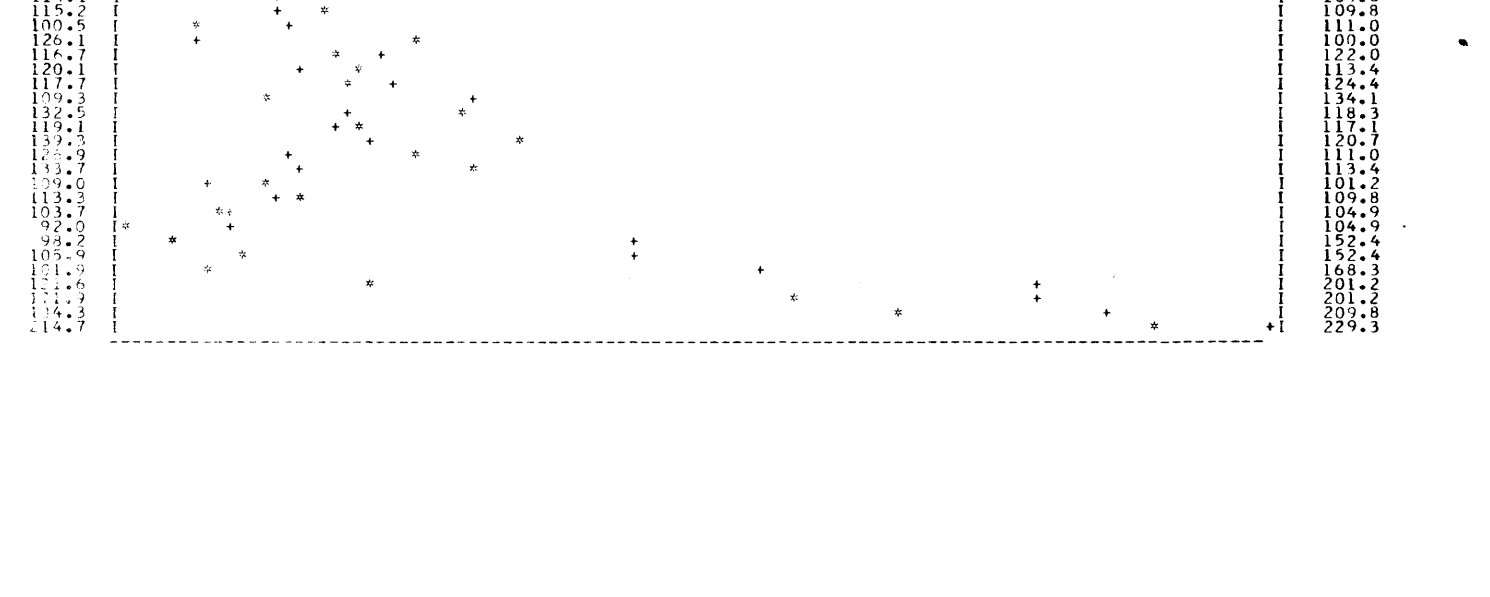
PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

BASE DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	216.2776	235.3318	256.0642	1.0000
1975.30	211.4496	238.2675	268.4863	1.0000
1975.40	170.5386	197.3946	228.4798	1.2984
1976.10	165.7072	198.9382	238.8333	1.2984
1976.20	152.4373	188.6479	233.4599	1.2984
1976.30	126.6529	160.9545	204.5460	1.3874
1976.40	123.5538	161.3291	210.6535	1.3874
1977.10	115.8601	155.0490	207.4929	1.3874

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA MANGANESO INDICE EXPORTACION DE BRAZIL,MEXICO

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	124.3901	0.0	0.0	0.0	0.0	0.0
1968.10	125.6096	122.6310	0.0	0.0	0.0	0.0
1968.20	118.2926	124.6229	121.6675	0.0	0.0	0.0
1968.30	112.1951	115.5370	121.7205	118.8340	0.0	0.0
1968.40	101.2195	112.5221	115.8744	122.0752	118.3300	0.0
1969.10	117.0732	99.4229	110.5249	113.8177	121.7882	118.0518
1969.20	109.7560	116.3554	98.8383	109.8756	114.1445	122.1381
1969.30	109.7560	111.5345	118.2713	100.4404	115.2394	119.7167
1969.40	110.9756	115.2521	117.1197	124.1939	100.4503	115.2507
1970.10	100.0000	110.6859	114.9513	116.8140	126.0564	101.9568
1970.20	121.9512	99.4413	110.0675	114.3092	116.7198	125.9550
1970.30	113.4146	126.6440	103.2679	114.3031	120.0548	122.5868
1970.40	124.3901	113.3366	126.5569	103.1969	117.7379	123.6626
1971.10	134.1463	140.9158	127.5737	142.4547	109.2983	124.6990
1971.20	118.2926	126.7503	126.0336	114.8340	132.5209	101.6767
1971.30	117.0732	126.1895	128.8112	134.4472	119.1450	137.4958
1971.40	120.7317	119.7409	129.0650	131.7464	139.2793	123.4272
1972.10	110.9756	115.5491	114.6009	123.5247	126.8671	134.1210
1972.20	113.4146	117.4503	122.2907	121.2372	133.6897	137.3072
1972.30	101.2195	102.1336	105.7679	110.1268	108.9549	120.0964
1972.40	109.7560	102.9061	103.8354	107.5303	113.3194	112.1134
1973.10	104.8780	104.7636	98.2253	99.1123	103.7157	109.2993
1973.20	104.8780	97.0762	96.9703	90.9183	91.9858	96.2581
1973.30	152.4390	115.4891	106.8979	106.7813	98.2102	99.3633
1973.40	152.4390	151.2826	114.6130	106.0870	105.9367	97.4334
1974.10	168.2927	149.7691	148.6329	112.6057	101.8522	101.7079
1974.20	201.2195	197.4881	175.7511	174.4179	121.6361	110.0203
1974.30	201.2195	198.7232	195.0381	173.5708	171.8630	119.8544
1974.40	209.7560	221.2385	218.4933	214.4421	184.3126	182.4994
1975.10	229.2682	211.1934	222.7546	219.9910	214.7090	184.5420



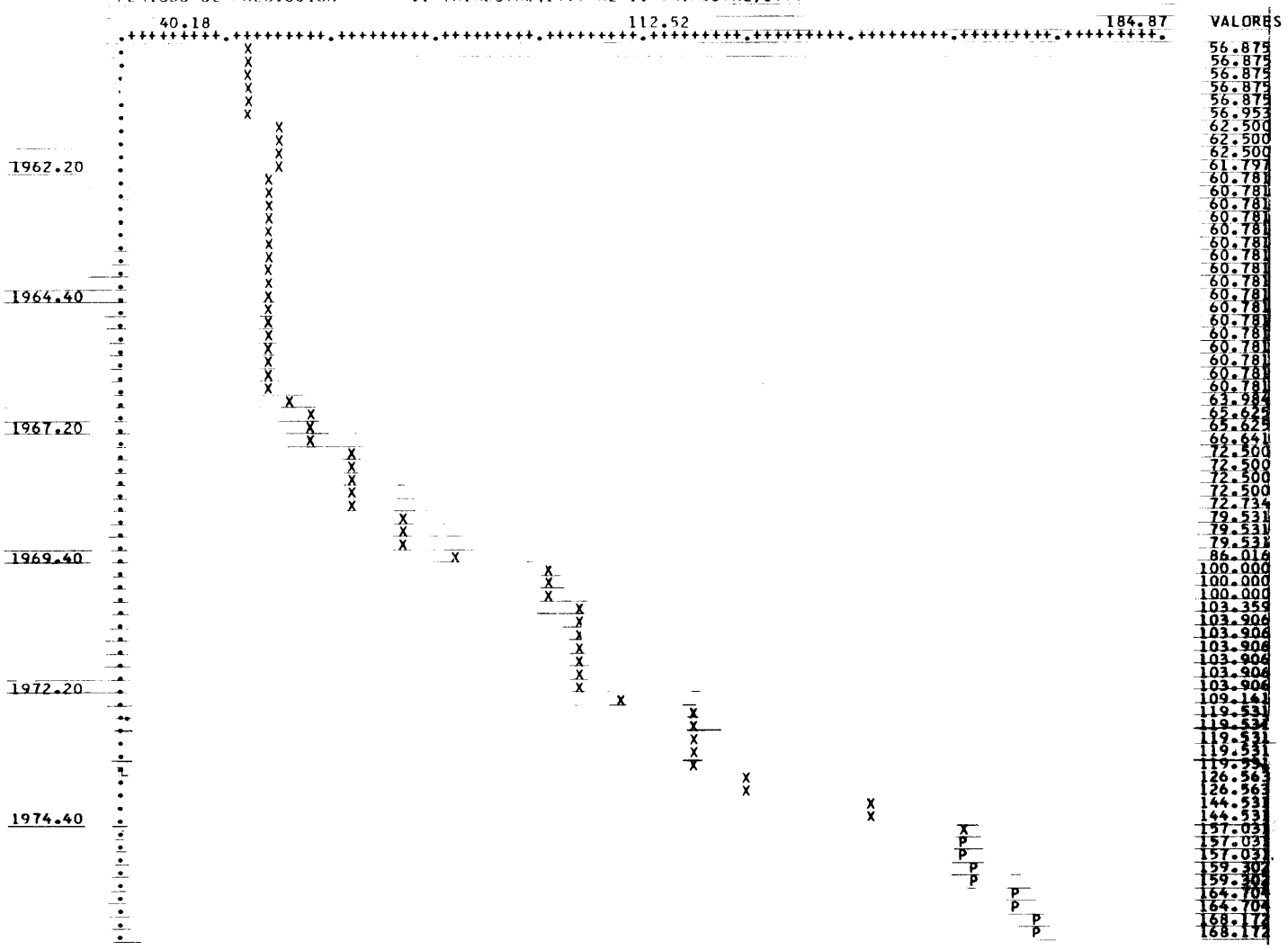
Anexo II.7.1.a

GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

NIQUEL INDICE PRECIO NACIONAL USA + ARANCEL POR CANADA 99

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 1.447

Anexo II.7.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - NIQUEL INDICE PRECIO NACIONAL USA + ARANCEL POR CANADA 99 — 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 — MODELO LOGARITMICO

NUMERO	PARAMETROS DEL MODELO CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	7	0.25120

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	5.890	8.415	11.280	12.691	14.512
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.053	0.075	0.101	0.113	0.130

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

BASE DEL INDICE =1970.10

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	149.9760	157.0311	164.4180	1.0000
1975.30	147.1473	157.0311	167.5787	1.0000
1975.40	147.1102	159.3021	172.5043	1.0000
1976.10	145.3093	159.3021	174.6422	1.0000
1976.20	148.6155	164.7043	182.5347	1.0000
1976.30	147.1645	164.7043	184.3343	1.0000
1976.40	148.9136	168.1722	189.9213	1.2512
1977.10	147.0028	168.1722	192.3899	1.2512

Anexo II.7.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA NIQUEL INDICE PRECIO NACIONAL USA + ARANCEL POR CANADA 99

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	72.4999	0.0	0.0	0.0	0.0	0.0
1968.10	72.4999	72.4999	0.0	0.0	0.0	0.0
1968.20	72.4999	72.4999	72.4999	0.0	0.0	0.0
1968.30	72.4999	73.4413	73.4413	73.4413	0.0	0.0
1968.40	72.7343	72.9625	73.9099	73.9099	73.9099	0.0
1969.10	79.5311	72.7343	72.9625	73.9099	73.9099	73.9099
1969.20	79.5311	79.8385	73.0154	73.2445	74.1955	74.1955
1969.30	79.5311	81.2327	81.5466	74.5776	74.8115	75.7829
1969.40	86.0155	79.5311	81.2327	81.5466	74.5776	74.8115
1970.10	100.0000	86.0155	79.5311	81.2327	81.5466	74.5776
1970.20	100.0000	100.0000	86.0155	79.5311	81.2327	81.5466
1970.30	100.0000	100.0811	100.0811	86.0853	79.5957	81.2985
1970.40	103.3593	102.2695	102.3525	102.3525	88.0390	81.4021
1971.10	103.9062	103.3593	102.2695	102.3525	102.3525	88.0390
1971.20	103.9062	103.9062	103.3593	102.2695	102.3525	102.3525
1971.30	103.9062	105.9722	105.9722	105.4144	104.3030	104.3876
1971.40	103.9062	107.9135	110.0592	110.0592	109.4798	108.3256
1972.10	103.9062	103.9062	107.9135	110.0592	110.0592	109.4798
1972.20	103.9062	103.9062	103.9062	107.9135	110.0592	110.0592
1972.30	109.1405	104.7722	104.7722	104.7722	108.8128	110.9764
1972.40	119.5312	109.2854	104.9113	104.9113	104.9113	108.9573
1973.10	119.5312	119.5312	109.2854	104.9113	104.9113	104.9113
1973.20	119.5312	119.5312	119.5312	109.2854	104.9113	104.9113
1973.30	119.5312	119.5312	119.5312	119.5312	109.2854	104.9113
1973.40	119.5312	119.5312	119.5312	119.5312	119.5312	109.2854
1974.10	126.5625	119.5312	119.5312	119.5312	119.5312	119.5312
1974.20	126.5625	128.1346	121.0160	121.0160	121.0160	121.0160
1974.30	144.5312	129.4870	131.0955	123.8124	123.8124	123.8124
1974.40	144.5312	144.5312	129.4870	131.0955	123.8124	123.8124
1975.10	157.0311	144.5312	144.5312	129.4870	131.0955	123.8124

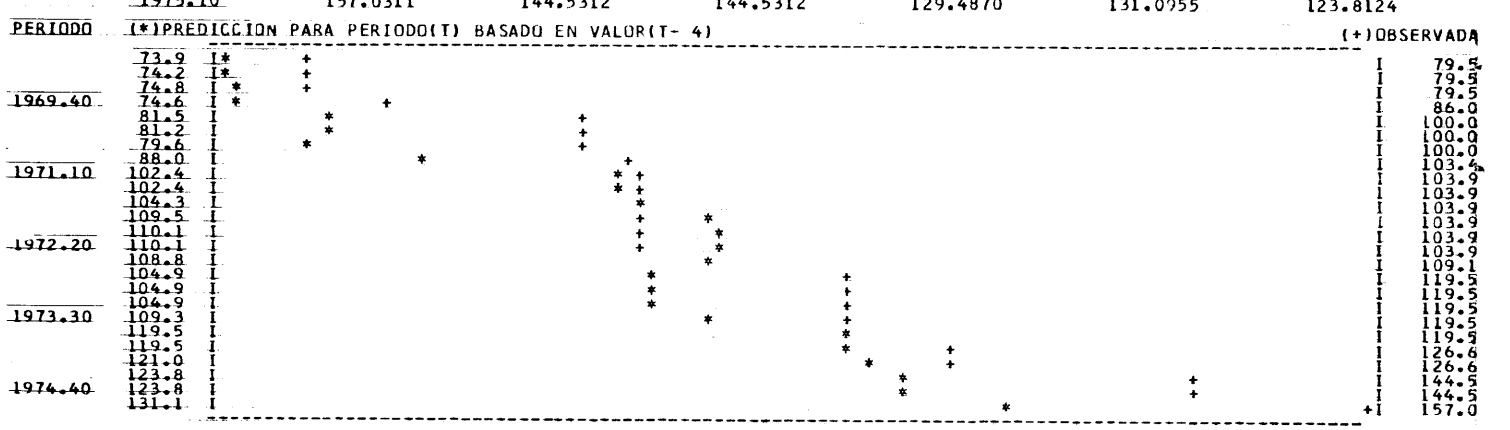
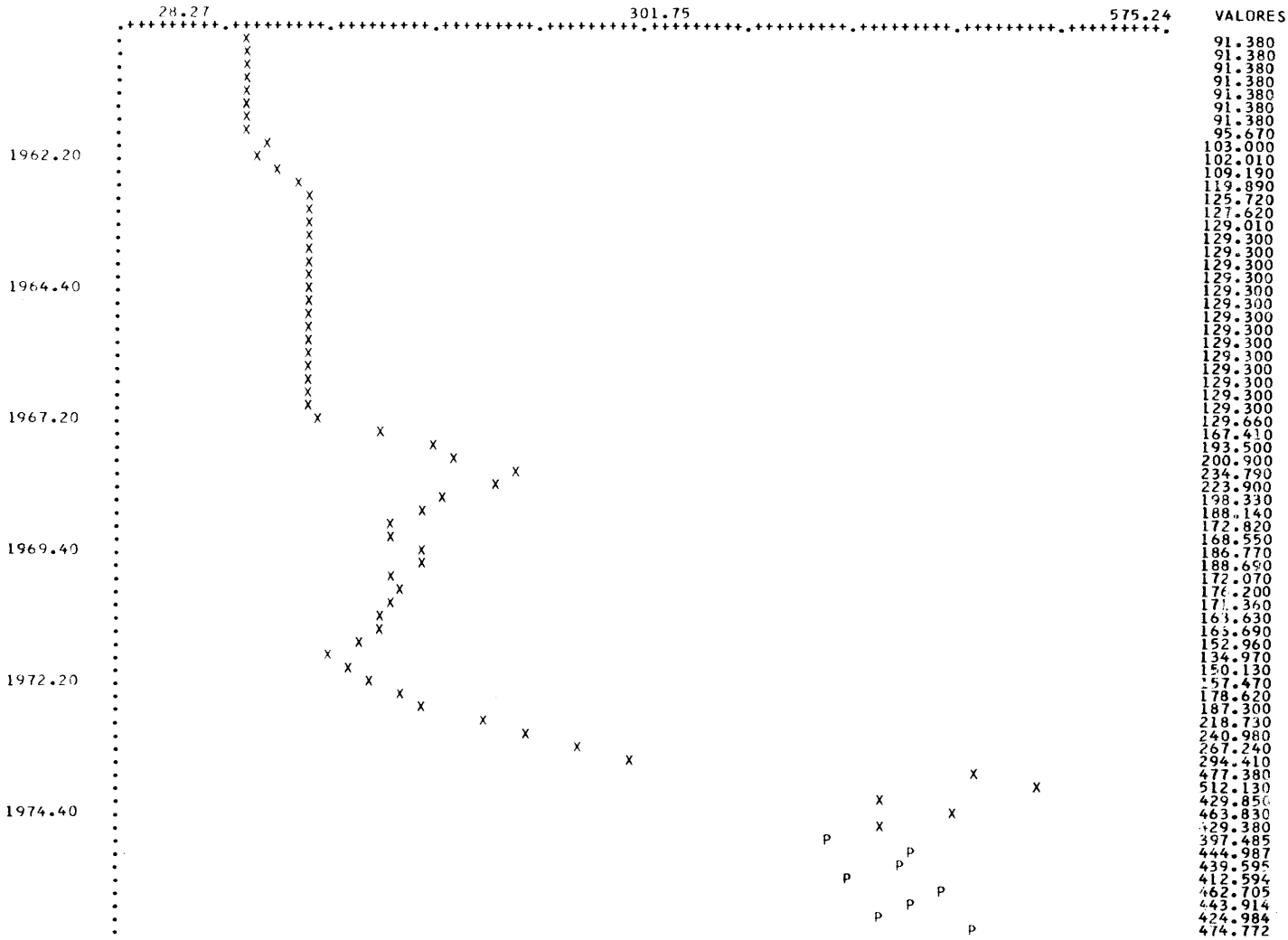


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

PLATA NY CENTS TROY 999 HANDYHARMAN METALS WEEK

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 5.470

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - PLATA NY CENTS TROY 999 HANDYHARMAN METALS WEEK — 61 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 00IFERENCIAS ESTACIONALES DE ORDEN , 0 — MODELO LOGARITMICO

NUMERO	PARAMETROS DEL MODELO CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	-0.26980
2	AUTOREGRESIVO REGULAR	3	0.86390
3	PROMEDIO MOVIL REGULAR	1	-0.54520
4	PROMEDIO MOVIL REGULAR	3	0.77510

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	36.487	65.933	85.401	95.048	104.176
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.136	0.246	0.318	0.354	0.388

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	358.4829	397.4849	440.7300	1.2754
1975.30	376.4050	444.9871	526.0645	1.2011
1975.40	356.9236	439.5952	541.4153	1.3099
1976.10	321.8413	412.5935	528.9360	1.5185
1976.20	344.9238	462.7051	620.7043	1.3980
1976.30	319.9937	443.9143	615.8240	1.5246
1976.40	295.5449	424.9836	611.1116	1.6706
1977.10	317.5742	474.7722	709.7817	1.5271

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA PLATA NY CENTS TROY 999 HANDYHARMAN METALS WEEK

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	193.5001	0.0	0.0	0.0	0.0	0.0
1968.10	200.8999	189.5243	0.0	0.0	0.0	0.0
1968.20	234.7900	211.9608	196.7747	0.0	0.0	0.0
1968.30	223.9000	256.3782	225.0211	209.8059	0.0	0.0
1968.40	198.3300	207.9720	247.1910	218.6127	202.5420	0.0
1969.10	188.1400	211.0620	224.2355	263.8525	230.7643	211.2168
1969.20	172.8199	191.0809	221.2571	234.2392	279.7178	239.4766
1969.30	168.5500	156.4025	177.7795	204.1039	217.1991	266.8003
1969.40	186.7699	184.6209	167.8223	189.3417	220.1153	236.5683
1970.10	188.6900	183.6388	180.9484	165.4007	188.6611	224.6465
1970.20	172.0700	176.3639	170.3649	168.0134	152.3315	177.4324
1970.30	176.2000	188.4899	194.5093	188.2721	185.4397	165.5291
1970.40	171.3600	166.7110	181.6817	187.1406	180.6058	177.4598
1971.10	163.6300	164.9634	159.2771	172.7127	178.3803	171.1798
1971.20	166.6900	177.3962	179.2422	173.4176	189.4313	196.6556
1971.30	152.9600	153.2109	165.8709	167.4960	161.5685	178.9873
1971.40	134.9700	151.2430	151.5596	163.3260	165.0716	158.3195
1972.10	150.1300	139.9102	161.7719	162.0910	175.8625	178.0435
1972.20	157.4699	140.9250	128.8067	147.6790	147.9964	162.6686
1972.30	178.6200	161.9057	140.5322	129.1223	149.8866	150.2602
1972.40	187.3000	189.0739	166.8067	145.9853	133.1073	158.2244
1973.10	218.7301	175.9085	178.0363	158.2196	136.8072	122.9183
1973.20	240.9799	244.0787	184.8630	186.9679	164.3898	138.8895
1973.30	267.2400	244.6693	248.6897	191.4291	193.8076	166.9477
1973.40	294.4099	263.3508	235.3202	238.9596	179.6286	182.2189
1974.10	477.3796	334.6960	290.3352	261.1387	265.5469	190.7477
1974.20	512.1301	519.2900	330.1614	288.7837	257.2607	262.3018
1974.30	429.8496	497.3455	506.2307	330.4639	285.5618	249.7518
1974.40	463.8298	479.8613	577.9656	587.6846	369.0913	311.6113
1975.10	429.3796	479.1091	500.3291	596.1223	607.0640	354.0481

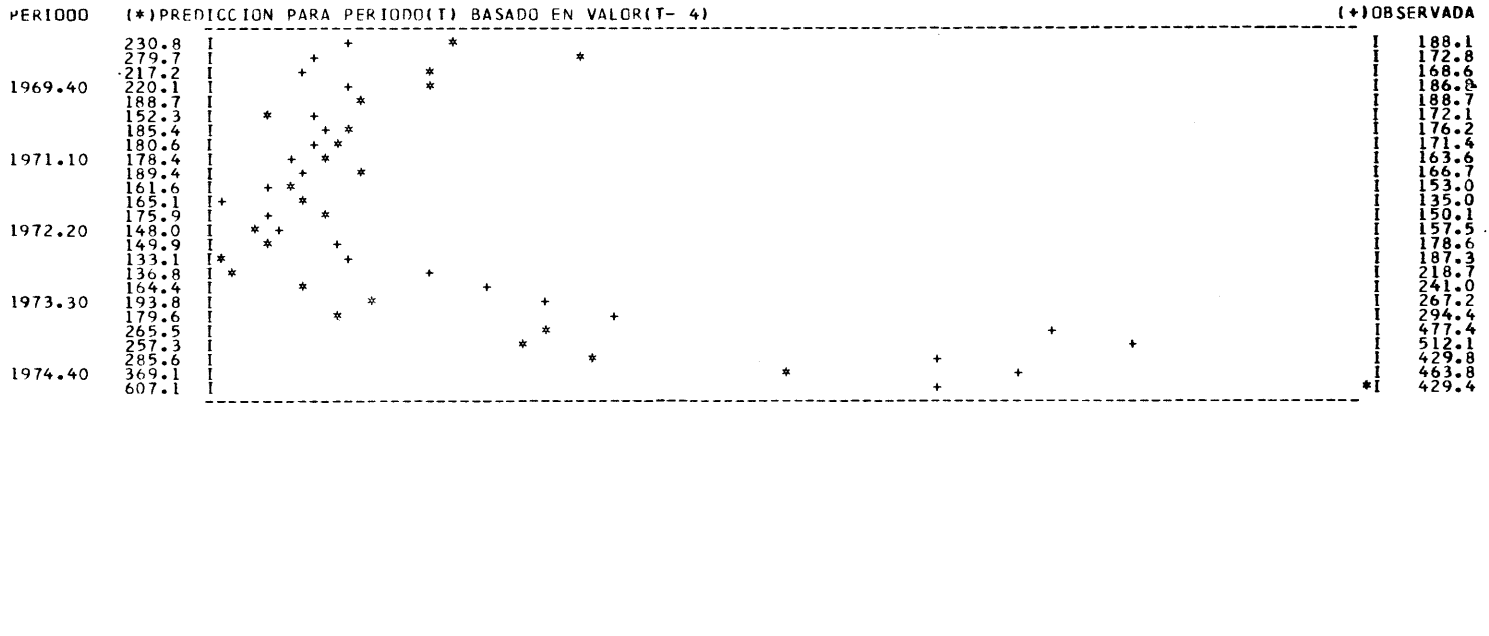
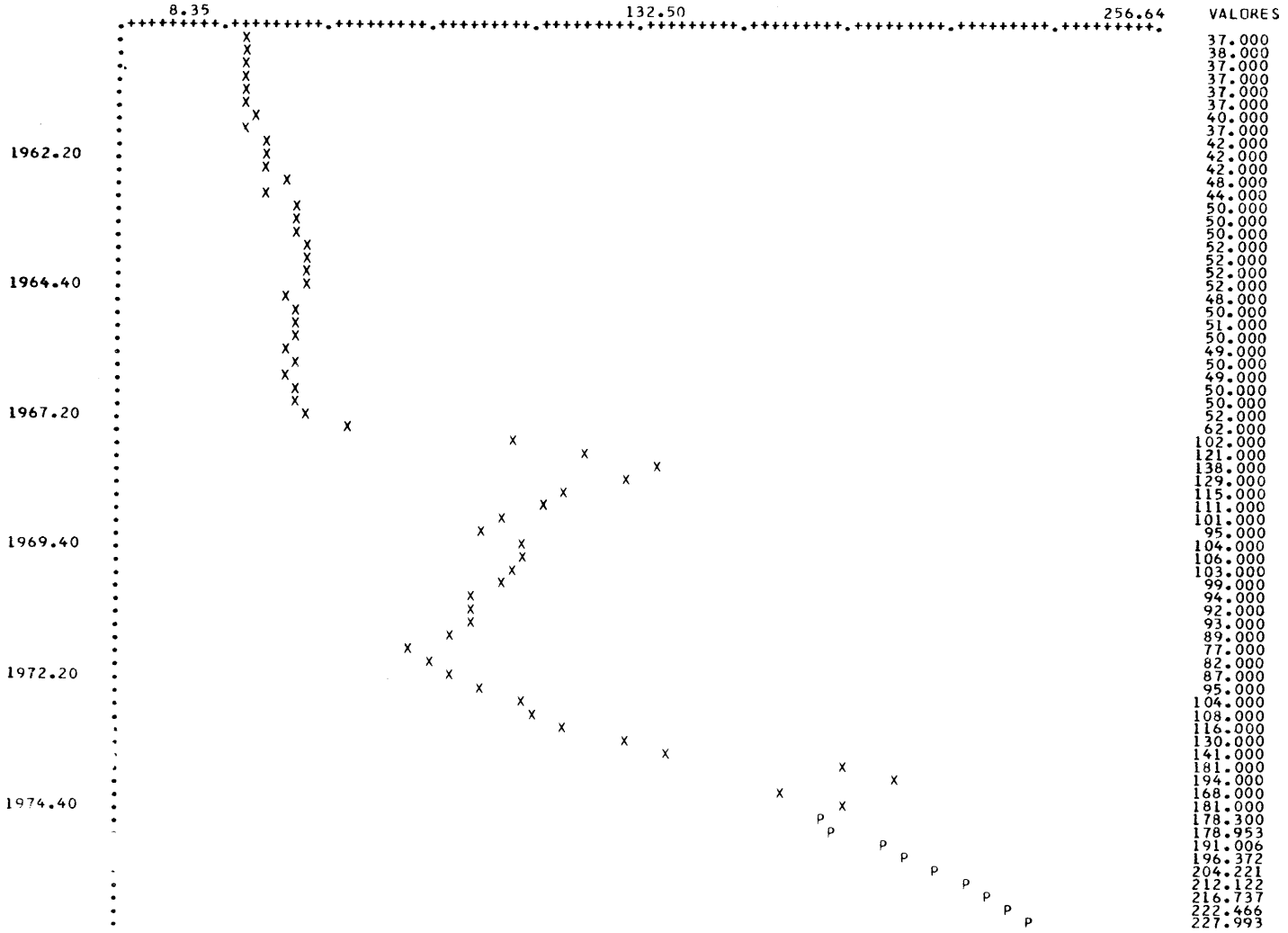


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

PLATA PERU PRECIO DE EXPORTACION INDICE 1970 IQUAL 100 IMF

PERIODO DE MUESTRA I TRIMESTRE,1960 AL IV TRIMESTRE, 1974

PERIODO DE PREDICCION I TRIMESTRE,1975 AL I TRIMESTRE, 1977



INTERVALO ABSCISA ES 2.483

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - PLATA PERU PRECIO DE EXPORTACION INDICE 1970 IQUAL 100 IMF 60 OBSERVACIONES

DIFERENCIAS - 1 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

NUMERO	PARAMETROS DEL MODELO CARACTERISTICAS	ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	1	0.31670
2	AUTOREGRESIVO REGULAR	4	-0.26080
3	TENDENCIA CONSTANTE	0	0.02650

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	11.432	18.480	22.791	28.340	33.426
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.096	0.155	0.191	0.238	0.281

PREDICCIONES PARA EL PERIODO I TRIMESTRE,1975 AL I TRIMESTRE, 1977
CON PERIODO BASE =1974.40 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.10	159.5901	178.3004	199.2040	1.3167
1975.20	148.9819	178.9527	214.9524	1.4170
1975.30	150.0404	191.0060	243.1564	1.4488
1975.40	146.9455	196.3719	262.4231	1.1980
1976.10	148.4552	204.2209	280.9343	1.0360
1976.20	151.1381	212.1224	297.7136	0.9585
1976.30	151.9344	216.7371	309.1790	0.9257
1976.40	153.7015	222.4663	321.9956	0.9807
1977.10	155.0737	227.9934	335.2014	1.0404

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA PLATA PERU PRECIO DE EXPORTACION INDICE 1970 IQUAL 100 IMF

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.30	62.0000	0.0	0.0	0.0	0.0	0.0
1967.40	102.0000	66.9583	0.0	0.0	0.0	0.0
1968.10	121.0000	122.6258	70.4523	0.0	0.0	0.0
1968.20	138.0000	129.8215	132.1231	72.7708	0.0	0.0
1968.30	129.0000	141.1066	130.2003	132.6860	72.1103	0.0
1968.40	115.0000	113.8769	128.1535	117.5260	119.8206	72.3665
1969.10	111.0000	108.9077	107.5093	122.0811	111.7401	113.5412
1969.20	100.9999	108.9111	106.2161	104.7491	119.2863	110.8674
1969.30	95.0000	102.4431	113.1373	110.1273	108.5726	120.8905
1969.40	104.0000	98.5873	108.8813	121.1611	117.8663	116.4886
1970.10	106.0000	110.9177	103.3802	115.0422	128.3233	125.4309
1970.20	102.9999	112.2348	119.1408	110.4507	123.2051	134.8545
1970.30	99.0000	106.4961	119.2433	127.1576	117.6828	128.8128
1970.40	94.0000	98.0492	107.9397	121.9052	130.1835	122.1088
1971.10	92.0000	94.4825	99.8775	110.7605	125.4325	132.4358
1971.20	93.0000	94.5345	97.9074	103.9369	115.5296	128.0467
1971.30	89.0000	96.8199	98.9289	102.7326	109.2054	119.1844
1971.40	77.0000	91.3528	102.0657	104.4603	108.5685	114.1949
1972.10	82.0000	75.9478	95.1163	107.1721	109.7434	113.3005
1972.20	87.0000	85.6547	77.4295	98.6488	111.4501	113.6568
1972.30	95.0000	92.0764	90.2064	80.9194	103.6563	114.6604
1972.40	104.0000	104.1683	99.9681	97.7847	87.5042	107.3889
1973.10	108.0000	108.1099	108.3403	103.6464	101.3326	92.4392
1973.20	115.9999	110.5145	110.6627	110.9165	106.0057	104.0450
1973.30	130.0000	119.0780	111.7197	111.8809	112.1432	108.0215
1973.40	141.0000	135.1676	120.4176	112.4291	112.5949	112.8131
1974.10	181.0000	147.1042	139.1451	122.8749	114.5469	114.6867
1974.20	194.0001	197.4432	150.2683	141.5376	124.6397	117.6120
1974.30	168.0001	197.6719	202.3042	150.7994	141.8467	127.6910
1974.40	181.0000	161.3714	199.9091	204.9551	151.7724	144.2824

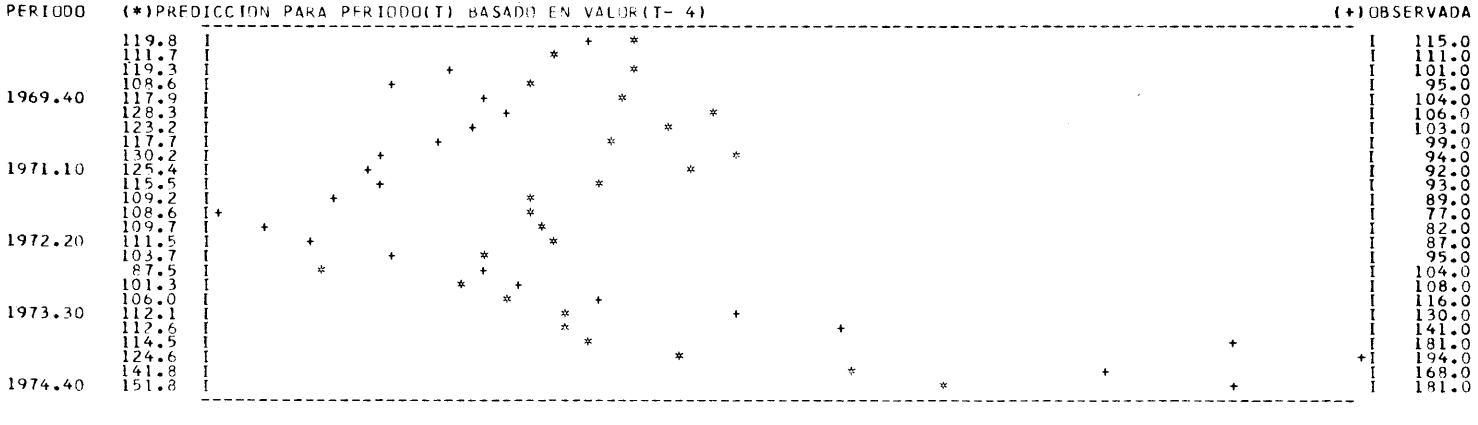
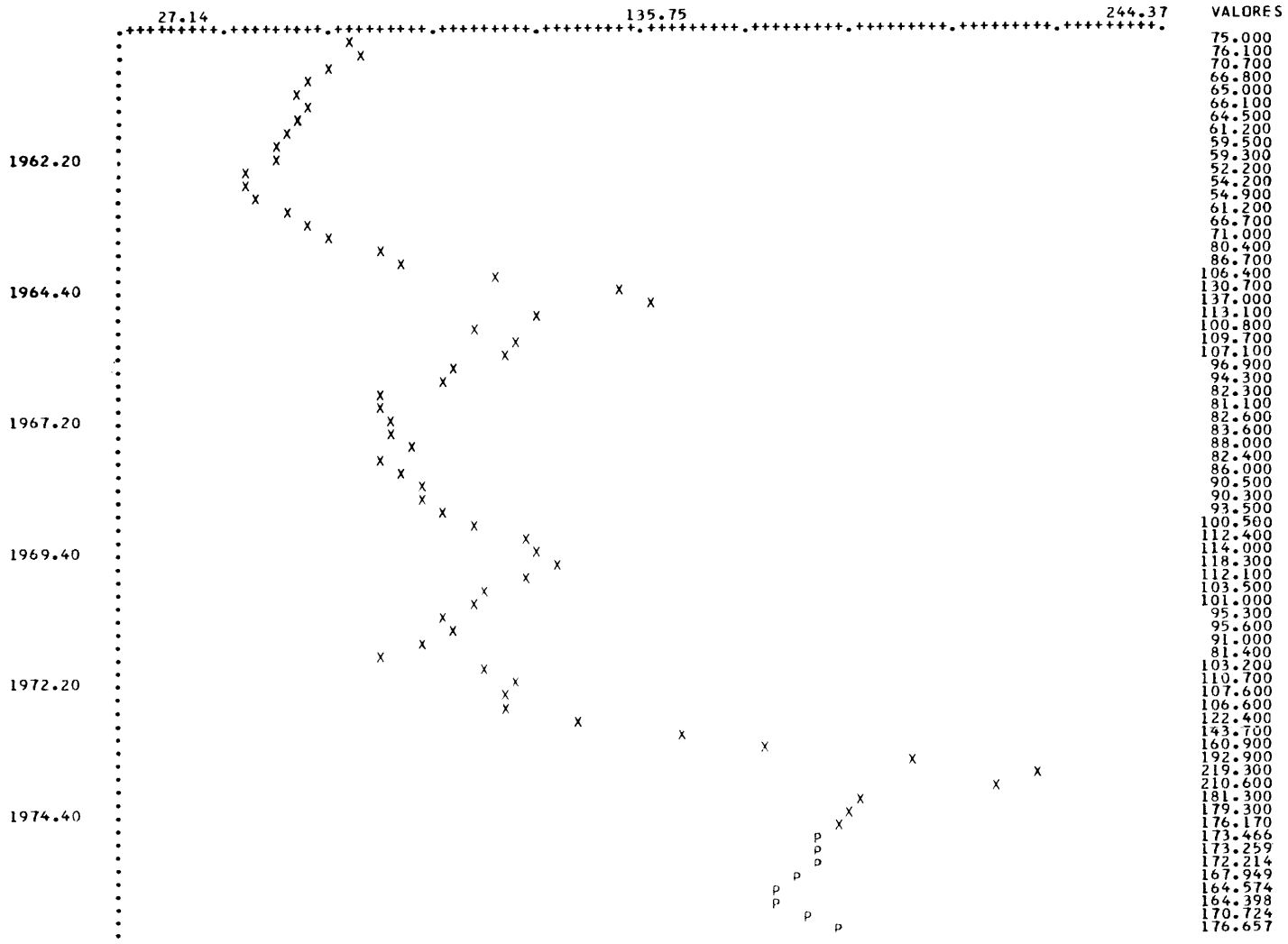


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

PLOMO UK SPOT LB/TM AJUSTADA EXPORTACION DE PERU,MEXICO

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES 2.172

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - PLOMO UK SPOT LB/TM AJUSTADA EXPORTACION DE PERU,MEXICO 61 OBSERVACIONES

DIFERENCIAS - 2 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 MODELO LOGARITMICO

NUMERO	CARACTERISTICAS	PARAMETROS DEL MODELO ORDEN	VALOR
1	PROMEDIO MOVIL EST.	1	0.48690
2	PROMEDIO MOVIL EST.	2	0.36770
3	PROMEDIO MOVIL EST.	9	0.23030

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	11.425	22.180	32.145	38.137	39.660
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.084	0.164	0.237	0.282	0.293

PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	157.5946	173.4659	190.9354	1.5131
1975.30	145.5842	173.2589	206.1942	1.6585
1975.40	136.0350	172.2138	218.0143	1.8039
1976.10	125.3522	167.9486	225.0198	1.9493
1976.20	116.2966	164.5740	232.8925	2.0947
1976.30	110.0671	164.3975	245.5459	2.2401
1976.40	108.2991	170.7238	269.1306	2.3855
1977.10	106.1380	176.6566	294.0276	2.5309

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA PLOMO UK SPOT LB/TM AJUSTADA EXPORTACION DE PERU,MEXICO

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	88.0000	0.0	0.0	0.0	0.0	0.0
1968.10	32.3999	69.8912	0.0	0.0	0.0	0.0
1968.20	86.0000	80.9725	92.3672	0.0	0.0	0.0
1968.30	90.5000	91.3338	83.3772	96.3212	0.0	0.0
1968.40	90.3000	93.3105	94.6143	85.6189	100.1702	0.0
1969.10	93.5000	93.8031	98.5752	100.0860	89.7806	106.3766
1969.20	100.5000	96.0808	96.5525	101.9494	103.6501	92.1670
1969.30	112.4000	105.0574	98.1463	98.6750	104.6885	106.5770
1969.40	114.0000	120.1052	108.4345	100.6415	101.2307	107.9134
1970.10	118.3000	114.8331	124.2652	111.0937	102.4375	103.0856
1970.20	112.0999	125.8371	120.2993	131.1718	116.1219	106.3760
1970.30	103.5000	109.6214	130.5744	124.2894	136.5546	119.7055
1970.40	100.9999	102.7549	112.0888	135.7764	128.6833	142.4587
1971.10	95.3000	102.2823	104.9834	115.4806	142.2560	134.2425
1971.20	95.5995	93.7327	104.3170	107.3402	119.0638	149.1560
1971.30	91.0000	96.4817	93.6447	105.2960	108.6193	121.4934
1971.40	81.4000	87.1138	95.1755	92.1125	104.6434	108.2168
1972.10	103.2000	77.8236	86.2365	95.0217	91.7004	105.2518
1972.20	110.7000	116.1222	75.7629	84.7853	94.2206	90.6670
1972.30	107.5995	112.5174	120.9607	75.7467	85.6075	95.9468
1972.40	106.6000	110.2325	117.9439	127.6792	76.7394	87.5891
1973.10	122.3999	109.5588	115.2563	124.1236	135.3066	78.0541
1973.20	143.7000	137.0224	115.8672	122.4886	132.7715	145.7437
1973.30	160.9000	157.5426	146.5985	121.9832	129.5840	141.3783
1973.40	192.9000	177.6021	172.0249	158.9710	130.1638	138.9496
1974.10	219.3001	223.9000	197.5867	190.7961	175.1021	141.0799
1974.20	210.5999	228.9350	236.2401	205.9870	198.2988	180.7328
1974.30	181.3000	214.5991	243.4915	252.0205	217.1225	208.3788
1974.40	179.3000	176.5197	227.8230	261.6523	271.6362	231.2273
1975.10	176.1700	188.6843	184.2749	243.7354	293.3459	295.0466

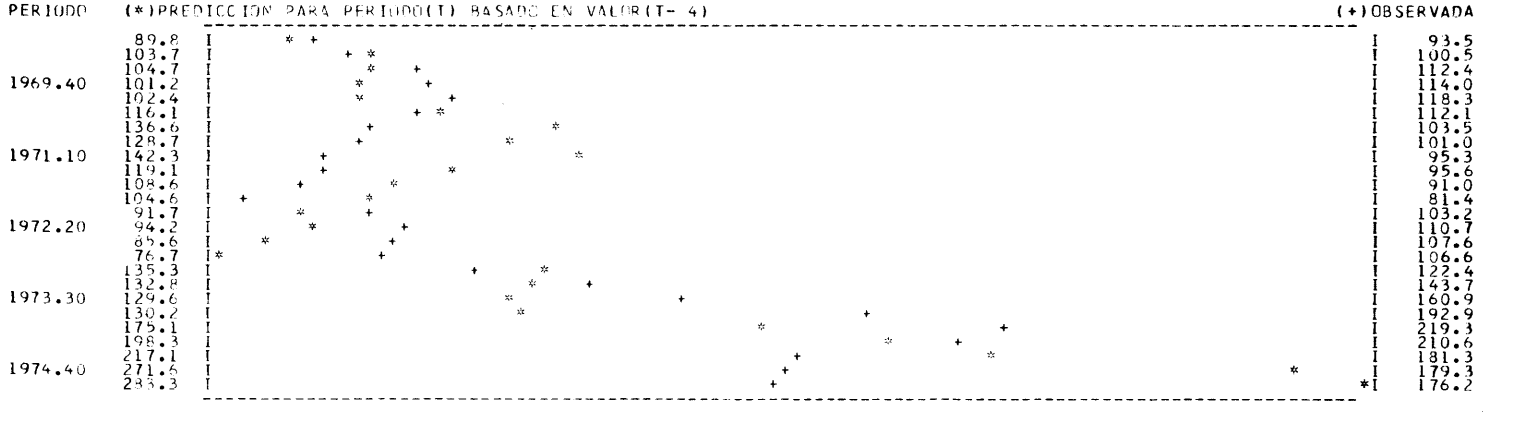
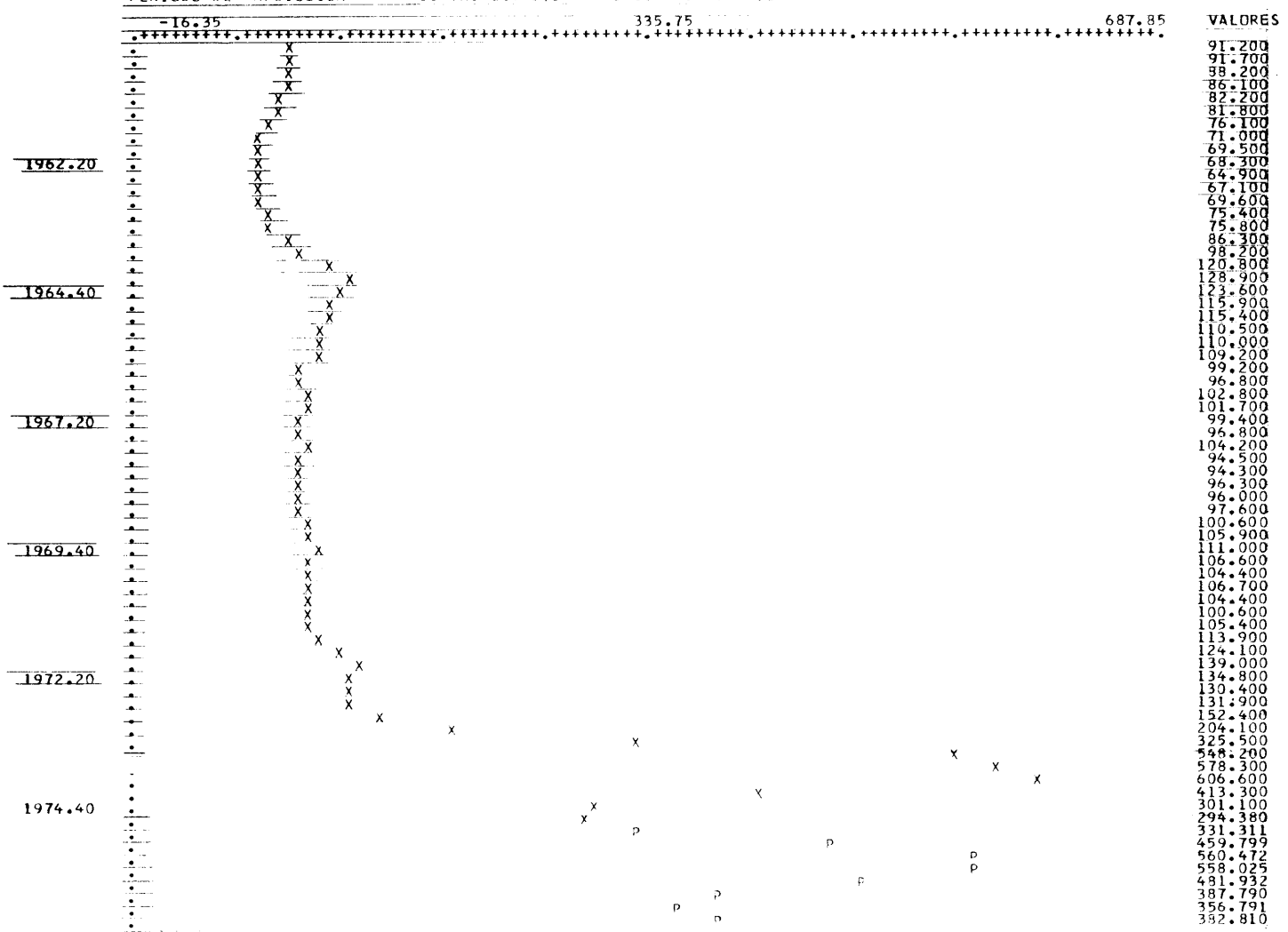


GRAFICO I-- MUESTRA (X) Y PREDICCION (P)

ZINC 12 UK IMPORT USD INTERNO SPOT LB/TM AJUSTADAS 166

PERIODO DE MUESTRA I TRIMESTRE,1960 AL I TRIMESTRE,1975

PERIODO DE PREDICCION II TRIMESTRE,1975 AL II TRIMESTRE,1977



INTERVALO ABSCISA ES . 7.042

Anexo II.11.1.b

CUADRO I-- MODELO Y PREDICCIONES

LA SERIE - ZINC 12 UK IMPORT USO INTERNO SPOT LB/TM AJUSTADAS 166 — 61 OBSERVACIONES

DIFERENCIAS - 2 DIFERENCIAS REGULARES 0 DIFERENCIAS ESTACIONALES DE ORDEN 0 — MODELO LOGARITMICO

NUMERO	CARACTERISTICAS	PARAMETROS DEL MODELO ORDEN	VALOR
1	AUTOREGRESIVO REGULAR	3	-0.31920
2	AUTOREGRESIVO REGULAR	4	-0.53520

	PERIODO DE PREDICCION 1	2	3	4	5
RAIZ ERROR MEDIO CUADRATICO	62.234	122.274	216.719	276.661	378.709
RAIZ ERROR MEDIO CUADRATICO RELATIVO	0.237	0.465	0.824	1.051	1.439

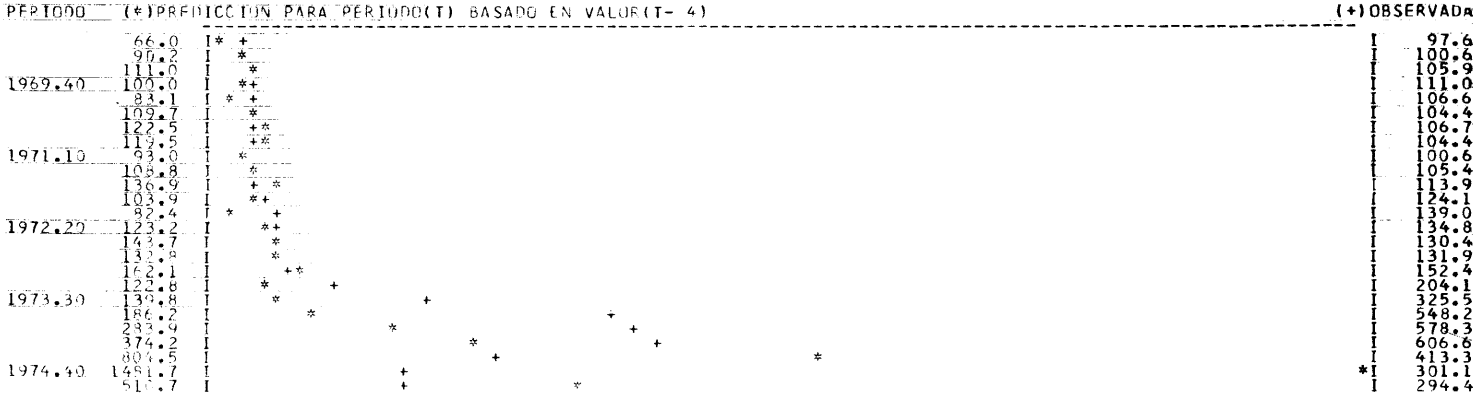
PREDICCIONES PARA EL PERIODO II TRIMESTRE,1975 AL II TRIMESTRE,1977
CON PERIODO BASE =1975.10 RANGO DE CONFIANZA IGUAL 75 POR CIENTO

PERIODOS	LIMITE CONF. INF.	PREDICCION	LIMITE CONF. SUP.	PESOS DE CORRECCION
1975.20	293.5901	331.3110	373.8782	2.0000
1975.30	350.9026	459.7988	602.4880	3.0000
1975.40	356.5647	560.4724	880.9880	3.6808
1976.10	295.8892	558.0249	1052.3923	3.8264
1976.20	219.7942	481.9319	1056.7078	3.9720
1976.30	154.4993	387.7896	973.3411	4.2195
1976.40	124.5864	356.7910	1021.7798	4.8087
1977.10	115.0674	382.8103	1273.5466	5.6842

Anexo II.11.1.c

CUADRO II-- PREDICCIONES DENTRO DE LA MUESTRA ZINC 12 UK IMPORT USO INTERNO SPOT LB/TM AJUSTADAS 166

BASE	VALOR ACTUAL	UN PERIODO	DOS PERIODOS	TRES PERIODOS	CUATRO PERIODOS	CINCO PERIODOS
1967.40	104.2000	0.0	0.0	0.0	0.0	0.0
1968.10	94.4999	116.9545	0.0	0.0	0.0	0.0
1968.20	94.3000	86.3602	132.2769	0.0	0.0	0.0
1968.30	96.2999	91.3162	76.5864	145.1801	0.0	0.0
1968.40	96.0000	98.4495	88.5232	67.9928	149.0219	0.0
1969.10	97.6000	101.7413	106.9997	91.2321	66.0005	149.2159
1969.20	100.5999	93.5846	101.6951	109.6800	90.1947	64.4197
1969.30	105.8999	103.2085	89.3159	101.1747	111.0067	90.5820
1969.40	111.0000	112.2203	106.5886	85.8087	99.9910	110.1113
1970.10	106.6000	114.6241	117.1583	108.4507	83.1151	97.4401
1970.20	104.4000	100.9426	116.7111	120.6029	109.6998	83.1921
1970.30	106.7000	101.2377	94.6435	117.6650	122.4971	111.0059
1970.40	104.4000	112.3972	101.1843	91.4607	119.4672	124.5715
1971.10	100.5999	106.3782	123.3000	105.3167	93.0385	122.8191
1971.20	105.4000	94.6297	105.8126	132.0392	108.8178	95.6612
1971.30	113.9000	109.4489	88.2237	104.3158	136.8795	111.9472
1971.40	124.1000	126.6061	116.9041	84.6039	103.9126	137.8236
1972.10	139.0000	132.7303	138.1451	122.5739	82.4306	102.0699
1972.20	134.7999	147.4057	134.4079	142.7161	123.2392	81.5875
1972.30	130.4000	128.2424	153.3491	133.5201	143.7163	123.3846
1972.40	131.9000	124.4879	120.4024	157.4380	132.8399	143.4008
1973.10	152.3999	137.6456	122.6104	116.6243	162.0673	135.8302
1973.20	204.1000	190.3516	155.2787	130.5446	122.7687	172.8410
1973.30	325.5000	269.9333	234.7050	172.9240	139.7662	131.1221
1973.40	548.2002	485.7852	333.8359	270.8154	186.1656	149.2072
1974.10	578.2996	820.2373	644.0942	366.9297	283.8599	192.2608
1974.20	606.5999	533.1357	1072.5339	746.3213	374.2007	286.5601
1974.30	413.2996	569.5039	439.9141	1255.2427	804.4585	392.4844
1974.40	301.0999	317.5452	602.9329	409.3320	1481.7395	933.0493
1975.10	294.3799	282.2800	313.9563	821.4194	510.7434	1945.3577



The MA model may be written economically as

(2) $\tilde{z}_t = \theta^q (B)\, a_t.$

It can be shown that (1) is equivalent to the finite autoregressive model (3)

(3) $\phi (B)\tilde{z}_t = a_t$

or

$\tilde{z}_t = a_t + \phi_1 \tilde{z}_{t-1} + \phi_2 \tilde{z}_{t-2} \cdots$

where ϕ (B) is an autoregressive operator

$\phi (B) = 1-\phi_1 B-\phi_2 B^2 - \cdots$

and $\phi^{-1}(B) = \quad (B)$

The autoregressive and moving average models can be combined to achieve greater flexibility in fitting actual time series. This results in a mixed autoregressive-moving average model of order (p,q).

(4) $\tilde{z}_t = \phi_1 \tilde{z}_{t-1} + \phi_2 \tilde{z}_{t-2} + \cdots + \phi_{t-p} z_t + \theta_{00} + a_t - \theta_1 a_{t-1} - \cdots \theta\, a_{t-q}$

(4') $\phi (B)\, \tilde{z}_t = \theta_{00} + \theta (B)\, a_t$

with $p + q + 2$ unknown parameters u; $\phi_1, \phi_2, \ldots \phi_p$; $\theta_1, \theta_2, \ldots \theta_q; \theta_{00}$. A key advantage of the ARMA model over other models is that in representing actual time series, p and q are infrequently greater than 2 and often less.

The ARMA model can be applied to a time series having

1) constant mean; $E(\tilde{z}) = \bar{u}$;
2) constant variance; $E(\tilde{z}-\bar{u})^2 = \sigma^2$
3) constant autocovariance of order k; $E(\tilde{z}_t-\bar{u})(\tilde{z}_{t+k}-\bar{u}) = \gamma_k$
4) converging autocorrelations defined as

$\gamma_k / \gamma^2 = \rho_k$ such that $\lim_{N \to \infty} \frac{1}{N} \sum^{N} \rho_\gamma = 0$

Many economic series which follow some linear trend do not exhibit such homogeneous behavior. But on taking first difference or even differences of larger order on z_t, one may usually find a series which does exhibit such homogeneous behavior. That is instead of estimating

$$\phi (B)\, \tilde{z}_t = \phi (B)\, a_t$$

/ it may be

it may be necessary to estimate

$$\phi(B)\, w_t = \phi(B)\, a_t$$

where

$$w_t = \nabla^d \tilde{z}_t = (1-B)^d \tilde{z}_t$$

and ∇^d is a backwards shift operator, d representing the number of differences necessary before a stationary homogeneous time series is found. Equation (5) defines the complete ARMA model or order (p,d,q)

$$(5)\quad W_t = \phi_1 W_{t-1} + \cdots + \phi_p W_{t-p} + \theta_{00} + a_t - \phi_1 a_{t-1} - \cdots - \theta_q a_{t-a}$$

where

$$W_t = \nabla^d \tilde{z}_t$$

and includes the stationary mixed model (d=0), the pure autoregressive model ($\theta_1 = \theta_2 = \theta_p = 0$) and the pure moving average model ($\phi_1 = \phi_2 = \phi_q = 0$) as well as trend and random walk models as special cases.

Any ARMA model can be identified by making use of its theoretical autocorrelation function if the conditions on the time series mentioned above are satisfied. That is to say, there is a correspondence between the theoretical autocorrelations of the models and their parameters. To show this result we may take two simple cases. The more simple is the Markiff first order autoregressive model

$$(6)\quad W_t = \alpha_1 W_{t-1} + a_t$$

where a_t is an independent error term. If we let $\alpha_1 = \rho$ and for simplicity let u the mean of the series equal zero, then

$$(6')\quad W_t = \rho W_{t-1} + a_t$$

Multiplying both sides of (6') by W_{t-1} and taking expected values then

$$E(W_{t-1}W_t) = \rho E(W_{t-1}W_{t-1}) + E(W_{t-1}a_t)$$

The first term $E(W_{t-1}W_t)$ is the autocovariance term for $\bar{u} = 0$ and k = 1 while the second term by condition (2) is equal to the variance of the series. The last term reduces to zero since W_{t-1} and a_t are independent so that

/ (7) Cov

(7) $\text{Cov}\ (W_{t-1}W_t) = \rho\ \text{Var}\ W + 0$

or

(7') $$\frac{\text{Cov}(W_{t-1}W_t)}{\text{Var}\ W} = \rho_1 \alpha_1$$

which is the definition of the first order autocorrelation as defined in condition (4). It is easily shown, moreover, that any of the autocorrelations of order k can be expressed in terms of the first. For K=2, one can form the expression (8) by multiplying (6') by W_{t-2} and dividing by Var W.

(8) $$\frac{\text{Cov}\ (W_t W_{t-2})}{\text{Var}\ u} = \rho \frac{\text{Cov}\ (W_{t-1}W_{t-2})}{\text{Var}\ u}$$

or

(8') $$\rho_2 = \rho \frac{\text{Cov}\ (W_{t-2}W_{t-2})}{\text{Var}\ W}$$

But since

$$\text{Cov}\ (W_{t-1}W_{t-2})$$

is a first order autocovariance and by condition (3) is assumed constant we have

$$\rho_2 = \rho^2$$

It is straight forward then to derive the result

$$\rho_k = \rho_{k-1}\rho = \rho_{k-2}\rho = \ldots = \rho^k$$

It should be noted moreover that if and only if $\rho < 1$ will condition (4) be fulfilled for the Markoff model. This corresponds to the condition of stationarity defined above.

A more complex model is the Yule second order autoregressive process (9)

(9) $W_t = \alpha_1 W_{t-1} \alpha_2 W_{t-2} + a_t$

as in the previous case, we multiply by W_{t-1} and W_{t-2} and take expected values obtaining the result

$$\rho_1 - \alpha_1 - \alpha_2 \rho_2 = 0$$
$$\rho_2 - \alpha_1 \rho_1 - \alpha_2 = 0$$

Again we can define the parameters in terms of the autocorrelations

$$/\alpha_1 = \frac{\rho_1 (1-\rho_2)}{1 - \rho_1^2}$$

$$1 = \frac{1\,(1- \quad 2)}{1 - \quad 1^2}$$

$$2 = \frac{2 - \quad 1^2}{1 - \quad 1^2}$$

All other autocorrelations can then be defined in terms of the first two as

$$\rho_{k-1} \alpha_1 \rho_{k-2} \alpha_2 \rho_{k-2} = 0$$

and the conditions for stationarity are

$$1 < \alpha_2 < 1$$

$$\alpha_2 + \alpha_1 < 1$$

$$\alpha_2 - \alpha_1 < 1$$

The derivation of the autocorrelation function could theoretically be obtained for autoregressive models of higher order as well as for moving average models or mixed models as defined above although the results are extremely complex.

From a practical point of view the autocorrelations are useful in obtaining initial estimates of complicated models. For non-linear estimation techniques such initial estimates are necessary in the search for global maxima and allow for the efficient estimation of the true parameters of the model. More important, however, is that by comparing estimates of autocorrelations derived from actual time series with their theoretical counterparts, we can approximately identify the structure from which the time series has arisen.

Once the form of the ARMA model is identified, and its coefficients estimated, the model may be used for forecasting purposes simply by replacing z_t by $\hat{z}_{t+M}$ where M is some lead time M>t. A situation may occur for which a forecast of $\hat{z}_{t+M}$ will require observations on $\hat{z}_{t+M-n}$ which lies somewhere between z_t and $\hat{z}_{t+M}$. In this case the forecast of $\hat{z}_{t+M}$ is made iteratively, by forecasting $\hat{z}_{t+M-n}$ first and $\hat{z}_{t+M}$ afterwards. If the model also includes moving average terms, a_i, the model might require predictions as to their future value as well. But since each a_i is assumed to have an expected value of zero, then it may be assumed that for all a_i's beyond a_t, the best prediction of the a_i's will be zero, as well.

/ The correction

The correction weights used to update the ARMA forecasts can be derived easily from the forecast function

$$\hat{z}_{t+m}=\phi_1 z_{t+m-1}+\ldots+\phi_{p+d} z_{t+m-p-d}-\theta_1 a_{t+m-1}-\ldots-\theta_q a_{t+m-q}+a_{t+m}$$

where

$\hat{z}_{t+m}$ is the forecast of z in period m conditional on base period t;

p is the number of autoregressive parameters estimated

d is the number of differences of the model taken to achieve stationarity;

q is the number of moving average parameters.

This function can be transformed so that $\hat{z}_{t+m}$ is expressed as an infinite sum of current and previous errors a_i

$$\hat{z}_{t+m}=\sum_{j=0}^{\infty}\psi_j a_{t+m-j}$$

where the ψ_j weights are obtained from the solution of the identity

$$\phi(B)\,(1+\psi B+\psi B^2+\ldots)=\theta(B)$$

and the p+d autoregressive and q moving average parameters are assumed known.

Let the eventual forecast fot the period t+m from base period t be designated $\hat{z}_{t+m}$ and from a different base say t 1 be z_{t+m}. Then

$$\hat{z}_{t+m}=\psi_{m+1}a_t+\psi_{m+2}a_{t-1}+\ldots$$

and

$$\hat{z}_{t+m}=\psi_m a_{t+1}+\psi_{m+1}a_t+\psi_{m+2}a_{t-1}+\ldots$$

which on substraction leaves

$$\hat{z}_{t+m}=\hat{z}_{t+m}+\psi_m a_{t+1}$$

That is, the revised prediction for any period t+m conditional on base t+1 can be calculated from the original predictions for period t+m conditional on base t plus the error in prediction in period t+1 multiplied by the mth correction weight ψ_m. This is the result which has been used in the text to revise predictions directly without returning to the original ARMA model.

It can be proved that the minimum mean square error forecast $z_{t\ m}$ is identical to the expected value of the ARMA forecast of $z_{t\ m}$

/ conditional on

conditional on knowledge of the series up to time t. (This result is, however, difficult to demonstrate and we will not work it out here). If the first period ahead prediction is a minimum mean square error prediction, moreover, then any linear set of forecasts for all periods ahead will also be minimum mean square error forecasts. To see this, suppose we work with a simple Markoff model. Then we have

$$\hat{z}_{t+1} = \phi_1 z_t + a_{t+1}$$

and

$$\hat{z}_{t+2} = \phi_1 z_{t+1} + a_{t+2}$$

$$\vdots \qquad \vdots \qquad \vdots$$

$$\hat{z}_{t+m} = \phi_1 z_{t+m-1} + a_{t+m}$$

But the forecast for $\hat{z}_{t+2}$ and $\hat{z}_{t+m}$ can be written in terms of the original base value z_t so that

$$\hat{z}_{t+2} = \phi^2_1 z_t \; \phi_1 a_{t+1} + a_{t+2}$$

and

$$\hat{z}_{t+m} = \phi_1^m z_t + \phi_1^{m-1} a_{t+1} + \phi_1^{m-2} a_{t+2} + \ldots + \phi_1 a_{t+m-1} + a_{t+m}.$$

But since all the values a_{t+1} through a_{t+m} have expected values equal to zero, we have the expected value of the forecast conditional on z in time t

$$E\,(\hat{z}_{t+2}) = \phi_1^2 z_t = \phi_1 E\,(\hat{z}_{t+1})$$

and

$$E\,(\hat{z}_{t+m}) = \phi_1^m\, z_t = \phi_1 E\,(\hat{z}_{t+m-1}).$$

/ APPENDIX III

APPENDIX III

THE SPECIFICATION OF THE ARMA MODEL

Unlike econometric models, the ARMA model is designed specifically to predict future price movements rather than to explain past price movements. From a statistical point of view, moreover, the ARMA predictions are the best possible conditional on information up to the period prior to the first prediction period and are commonly known as minimum square error forecasts. They are forecasts which are both unbaised and have minimum variance. This is true, however, if and only if these models are correctly specified with respect to the lag structure. The ARMA models as developed by Box and Jenkins can be correctly specified by making use of the correlations between the different lags. It is this process of identification which distinguishes the ARMA models from the so-called naive autoregressive model where the lag structure is generally assumed.

We could not compare the structure of the ARMA price models with any independently made studies but have found generally that a non-differenced model with only one or two lags performed less well than did differenced models with correctly specified lags. For example, for the series of iron ore the following model was estimated:

$$(1-.2\ 78-.71B^2)P_t-u=a_t$$

and was found to produce prediction errors almost twice as large as the model

$$\nabla^2 P_t = (1-.44B^4-1.028^{12})a_t.$$

The RMSE is, however, not the most adequate measure of specification and we have used the residual variance criterion to

/ distinguish

distinguish among different models. 15/ The residual variance is simply the sum of squarred residual errors corrected for degrees of freedom available 16/ where degrees of freedom is defined as

$$df = n-1-p$$

and

n equals the number of observations used in estimation

p equals the number of parameters estimated

A smaller residual variance would then indicate a more nearly correct specification of the model in question. For the iron ore series the residual variance of the non-differenced series was .006 while for the differenced series it was .003 indicating the clear superiority of the latter.

In many cases that we have studied the gain (decrease in residual variance) was not nearly as large as in the case of iron ore but the model with the lower residual variances typically resulted in smaller prediction errors than any other estimated. There were, however, certain complications which had to be considered before a model was rejected out of hand. To indicate some of the problems considered we have presented three different models for wood pulp (Annex 1.22). The first model is a first differenced, first order autoregressive model with a residual variance of .00052. The second is a second differenced first order autoregressive model with a residual variance of ..00048. When written out these models appear to

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15/ See Theil, Principles of Econometrics, pp. 543-545.

16/ If the residual sum of squares were not corrected for degrees of freedom then a model with fewer observations (longer lags) would generally produce a smaller error.

/ be very similar.

be very similar. For the first differenced model

$$P_t = 1.79P_{t-1} - .79P_{t-2} + a_t$$

and for the second difference

$$P_t = 1.70P_{t-1} - .40P_{t-2} - .30P_{t-3} + a_t.$$

The third model is somewhat different in that it is a second differenced autoregressive model with an eighth period lag only. Written out in full this model becomes

$$P_t = 2P_{t-1} - P_{t-2} - .56P_{t-B} + 1.12P_{t-9} - .56P_{t-10}.$$

The residual variance of this model was .0007 which is somewhat higher than for either of the other models and would normally result in its rejection. But the eighth period lag for this model proved to be highly significant and by rejecting this model we might lose some important information about the cyclical nature of wood pulp. A simple combination of the first and eighth period lags was not successful, however, and an integrated solution has not yet been found. There may be many reasons for our lack of success in finding a better solution but with respect to prediction ability these models appear to give the same results. A careful examination of the within sample period predictions indicates, however, that for the first differenced model, turning point errors are not large relative to the other models but the model is not as capable of following upswings or downswings as well as the others. The second differenced eight period lag model is also poor in this respect but its tracking ability during the upswings and downswings is much better. It should be noted especially how quickly it begins to track the latest long cycle.

The specification of the autoregressive model is of such importance that we have felt it worthwhile to look at some other independently made studies in order to gain further insight into the nature

/of the ARMA

of the ARMA model. Jorgenson, Hunter and Nadiri in an excellent paper on investment 17/ remark:

> A comparison of alternative econometric models of investment behaviour is essential to provide an appropriate basis for further empirical research. Many theoretical points of view about investment behavior are already represented in the econometric literature. A number of statistical treatments of the time structure of the investment process have been proposed. Only systematic comparisons among the available alternatives can lead to accumulation of knowledge on the econometric research on investment will continue to characterized by a proliferation of still further alternatives, with no means of discrimination between explanations that are inferior to those already available and those that represent a genuine advance in the explanation of investment behavior.

They go on to say:

> A minimum standard for the performance of an econometric model for economic time series is that it should provide a better explanation of time series behavior than a purely mechanical (autoregressive) forecasting scheme.

In their study, Jorgenson, et al. make a comparison between four econometric models, an anticipation model and a fourth order autoregressive model, comparing the different models on the basis of standard measures of goodness of fit including the residual variance criterion. The use of the fourth order autoregressive model is significant since the lag structure of the investment equation is of special theoretical importance. We suspected, however, that the arbitrary choice of a fourth order autoregressive model was inappropriate and that using the ARMA model one could specify a better model

17/ Dale Jorgenson, Jerald Hunter and M. Ishag Nadiri, " A Comparison of Alternative Econometric Models of Quarterly Investment Behavior" Econometric A. Vol 38 #2, March 1970.

/to be used

to be used in comparison with the others included in Jorgenson's study. We therefore reestimated the fourth order autoregressive model for each industry groupings for the United States as Jorgenson suggested in his paper and based on the identification process used in conjunction with the ARMA model estimated a second model with a lag structure suggested by the correlations between the different observations. The results are indicated in Table XI.

In only three cases out of thirteen were the mechanically specified models better than the ARMA models and in two of these cases the lag structure of the ARMA model was very similar to that of the mechanically specified model. Typically where the lag structure was 6 periods or greater did the ARMA perform better than the mechanical autoregressive model. Only in the case of investments in petroleum did the results appear poorer for the longer specified lag model. However, in this case we suspect that an even longer lag would have been appropriate. Significant correlations were found for the 25th lag but on estimating an autoregressive equation of this order, the coefficients were insignificant and residual variance high. It may be, however, that we have lost too many observations (degrees of freedom) in this model and better results might be obtained by including more observations. In any case the results are impressive and it would be interesting to compare the properly specified ARMA model to the econometric studies of investment with respect to their forecasting ability but this was not possible using Jorgenson's study.

A comparison, however, was possible for predictions of gross national product of the United States based on the excellent works by Ray Fair and Fromm and Klein 18/. The comparison is of two sorts: using the Root Mean Square Error of predictions for one to five

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18/ Ray Fair "A comparison of alternative estimators of macroeconomic models" International Economic Review, Autumn, 1972 and G. Fromm and L. Klein, "A comparison of eleven econometric models of the United States", American Economic Review, Papers and proceedings May, 1973.

/period ahead

period ahead predictions, Ray Fair evaluated his own eight equation model for various estimation techniques with and without corrections for autocorrelated errors. The techniques include ordinary least squares, two stage least squares and full information maximum likelyhood (FIML). These results are compared to the results for the ARMA model in Table XII and indicate that for one quarter ahead predictions, the ARMA model performed better than any other without corrections for autocorrelated errors. For the two through five period ahead predictions the ARMA model performed considerably worse than Fair's for all techniques with corrections of autocorrelated errors.

However, Fair s model is unusual in that it includes anticipations as an explanatory variable and antications models are generally superior to others. 19/ Furthermore, the comparison is for within sample predictions where independent variables are assumed known. This is not a proper comparison for the ARMA model since in a true forecasting situation the independent variables are not known beforehand. Fortunately, in the article by Fromm andKleine, outside prediction RMSE's are calculated for various models including Fair's. The methodology for making predictions is not clear but as Table XIII makes obvious the Fair model outperforms the rest. More important, however, is that the RMSE's for all the models except Fair s were higher for the econometric models over all five periods than for the ARMA except in one instance. Since the sample periods were not equivalent here the results are tentative but leave a rather favorable impression regarding the ARMA model's prediction ability.

19/ Jorgenson's comparison also includes a "modified" mechanical anticipation model which outperforms all the econometric and autoregressive models in almost all industrial groupings.

TABLE XI

Comparison of Jorgenson, Hunter and Nadiri Fourth Order Autoregressive Model with ARMA model for industrial investments [1]

Investment sector		Model	Residual variance	One period ahead root mean square error
Primary metals				
	JHN	$(1-1.13^{*}B-.03B^{2}+.19B^{3}+.17B^{4})P_t-1.52^{*}=a_t$	.0226	.1439
	ARMA	$(1+.46^{*}B)(1+.32B^{4})\nabla^{2}P_t=a_t$	.0309	.1726
Electrical equipment & machinery				
	JHN	$(1-1.05^{*}B-.06B^{2}+.07B^{3}+.12B^{4})P_t-.74^{*}=a_t$	.0024	.0466
	ARMA	$(1+.50^{*}B)(1+.39^{*}B^{4})\nabla^{2}P_t=a_t$	.0027	.0513
Non electrical machinery				
	JHN	$(1-1.46^{*}B+.56^{*}B^{2}-.07B^{3}-.01B^{4})P_t-2.15^{*}=a_t$	.0054	.0705
	ARMA	$(1-.34^{*}B+.23^{*}B^{5}-.41^{*}B^{18})\nabla P_t=a_t$	.0049	.0679
Transportation				
	JHN	$(1-1.26^{*}B-.06B^{2}+.52^{*}B^{3}-.12B^{4})P_t-1.39^{*}=a_t$	.0121	.1056
	ARMA	$(1+.45^{*}B+.21^{*}B^{6}+.23^{*}B^{20})\nabla^{2}P_t=a_t$	.0102	.0973
Stone, clay and glass				
	JHN	$(1-.86^{*}B-.06B^{2}+.03B^{3}+.03B^{4})P_t-.67^{*}=a_t$	.0063	.0759
	ARMA	$\nabla^{2}P_t=(1-.86^{*}B)(1-.29^{*}B^{8}+.55^{*}B^{24})a_t$	.0057	.0737
Other durables				
	JHR	$(1-.78^{*}B-.098B^{2}-.15B^{3}+.07B^{4})P_t-1.67^{*}=a_t$	.0088	.0900
	ARMA	$(1+.53^{*}B^{8})\nabla P_t=.025^{*}+a_t$	.0068	.0807
Food and beverages				
	JHN	$(1-.69^{*}B-.29^{*}B^{2}-.11B^{3}+.11B^{4})P_t-2.34^{*}=a_t$	.0069	.0715
	ARMA	$(1+.29^{*}B+.25^{*}B^{4}+.32^{*}B^{6})\nabla P_t=.026^{*}+a_t$	.0057	.0727

* An asteric indicates significances at the 95% confidence level.

/ Textiles

Textiles

JHN	$(1-1.03^{*}B-.17B^{2}+.21B^{3}+.59B^{4})P_t-.42^{*}=a_t$	.0013	.0339
ARMA	$(1-.21^{*}B-.53^{*}B^{2}+.29^{*}B^{4}+.10B^{8})\nabla P_t=a_t$	.0007	.0252

Paper

JHN	$(1-1.11^{*}B-.23B^{2}+.16B^{3}+.22B^{4})P_t-.74^{*}=a_t$	.0026	.0489
ARMA	$(1+.56^{*}B-.37^{*}B^{3}+.23^{*}B^{8}+.49^{*}B^{16})\nabla^{2}P_t=a_t$	.0022	.0449

Chemicals

JHN	$(1-1.42^{*}B\ .30B^{2}+.28B^{3}-.098^{4})P_t-1.61^{*}=a_t$	.0086	.0891
ARMA	$(1+.29^{*}B^{8}+.53^{*}B^{24})\nabla^{2}P_t=(1-.38^{*}B^{4})a_t$	.0083	.0874

Petroleum

JHN	$(1-.84^{*}B-.35^{*}B^{2}+.24B^{3}+.06B^{4})P_t-3.13^{*}=a_t$	.0374	.1853
ARMA	$(1-.26^{*}B^{2}+.20^{*}B^{8})\nabla P_t=a_t$	.0416	.2003

Rubber

JHN	$(1-.68^{*}B-.35^{*}B^{2}+.06\ B^{3}-.01B^{4})P_t-.57^{*}=a_t$	.0009	.0293
ARMA	$(1+.23^{*}B+.227^{*}B^{4}+.54^{*}B^{8})\nabla P_t=.009^{*}+a_t$	.0007	.0262

Other non-durables

JHN	$(1-.65^{*}B-.06B^{2}-.05B^{3}-.20^{*}B^{4})P_t-.868^{*}=a_t$	.0042	.0624
ARMA	$(1+.44^{*}B+.42^{*}B^{12})\nabla=0.014+a_t$	.0033	.0557

* An asterisc indicates significances at the 95% confidence level.

TABLE XIII

US GROSS NATIONAL PRODUCT: OUTSIDE SAMPLE PERIOD PREDICTIONS

Model	Root Mean Square Errors				
	One Quarter Ahead	Two Quarters Ahead	Three Quarters Ahead	Four Quarters Ahead	Five Quarters Ahead
Fair Model	2.91	4.35	4.52	6.77	9.89
Bureau of Economic Analysis	6.01	11.01	18.42	23.63	28.08
Brookings	6.74	11.36	16.08	20.94	25.69
University of Michigan	6.04	9.88	12.45	16.49	-
Data Resources Inc.	8.9	14.89	23.10	26.88	-
Federal Reserve Bank of St. Louis	10.29	14.88	13.88	11.69	11.15
Wharton Mark III	9.90	19.46	27.16	31.09	35.60
Wharton Mark III - Anticipations N.S.	8.04	18.96	26.00	28.52	33.74
ARMA	4.25	7.02	9.09	11.59	13.29

Source : Fromm and Klein, op.cit. for all except ARMA model.

TABLE XII

US GROSS NATIONAL PRODUCT: WITHIN SAMPLE PERIOD PREDICTIONS

Estimator	Root Mean Square Errors				
	One Quarter Ahead	Two Quarters Ahead	Three Quarters Ahead	Four Quarters Ahead	Five Quarters Ahead
Ordinary Least squares (OLS)	6.54	6.90	7.18	7.51	7.69
Two stage Least squares (TSLS)	6.92	6.56	6.81	7.21	7.43
Full information max likehood (FIML)	4.97	4.84	5.13	5.34	5.62
OLS corrected for one autocorrelation	3.19	4.82	5.80	6.44	6.94
TSLS corrected for one autocorrelation	3.27	4.95	5.86	6.42	6.75
FIML corrected for one autocorrelation	2.48	3.10	3.96	4.79	5.87
OLS corrected for two autocorrelation	3.08	4.62	5.54	6.14	6.61
TSLS corrected for two autocorrelation	3.03	4.53	5.37	5.40	6.28
FIML corrected for two autocorrelation	2.30	3.01	4.02	4.95	6.99
ARMA	4.25	7.02	9.09	11.59	13.29

Source: Ray Fair, op.cit.,for all except ARMA model

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