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A B S T R A C T

The "Regret Theory" [Loomes & Sugden (1987)] predicts that indifference lines fan out from a point to the southwest of the origin of the Marschak-Machina triangle. This fact is a consequence of *regret aversion.* In this paper we present the results of an experiment which shows that the individuals can change the form of their indifference lines from some triangles to others depending on the central result. Furthermore, we propose an extension to the model of Expanded Utility depending on difference [Sirvent & Tomás (1992)] which explains these changes by means of the attitude regarding success/failure shown by the individuals.

Keywords: Fan out-fan in lines; Regret Theory; Machina triangle.

0.- Introduction

The Regret Theory [Bell (1982) and Loomes & Sugden (1982, 1987)] as with other alternative theories, was proposed in order to accomodate the observed systematic violations to the axioms of the Expected Utility Theory, in particular the independence axiom. Some of these theories have been contrasted by means of laboratory experiments where the agents choose between pairs of lotteries with only three possible results. This allows their preferences to be represented in a simple way in a diagram known as the Marschak-Machina triangle [Marschak (1950), Machina (1982)].

The Regret Theory predicts that the indifference lines in the triangular diagram fan out from a point situated to the south-west, in accordance with the hypothesis of *aversion to regret* or convexity, which establishes that for $x > y > z$, $\psi(x,z) > \psi(x,y) + \psi(y,z)$ for a valuation function $\psi(.,.)$ skew-symmetric and increasing in its first argument.

The analysis of the results of some experiments [Chew & Waller (1986), Loomes (1989), Hey & Di Cagno (1990) and Hey & Orme (1994)]reveals that the individuals can change the form of aperture of their indifference lines in the Marschak-Machina triangle depending on the particular results in each choice problem. In fact, the agent's possibility of presenting mixed fan-in fan-out patterns in their indifference lines was noted by Conlisk (1989), Gul (1991) and more recently by Nielsen (1992) as an explicative hypothesis of this empirical evidence. Along these lines, Loomes (1989) also pointed out the possibility of *aversion to regret* (compatible with fan-out lines) appearing with greater or lesser intensity depending on the relative size of the central result.

The present work is motivated by a twofold idea: on the one hand, to carry out an experiment where the changes in behaviour depending on the central result in the Marschak-Machina triangle are evaluated, and on the other hand, to propose an extension of our model of Expanded Utility [Sirvent & Tomás (1992)] which, taking the Regret Theory of Loomes & Sugden (1987) as the point of reference, generalises it in such a way that its predictions account for this experimental evidence to a greater extent.

The paper is organised in the following way: In section 1 the Marschak-Machina triangle is described and the general model of Expanded Utility is presented. The consideration of two types of agents according to the attitude which is shown regarding success/failure in choices of risk, allows the changes in form of the indifference lines to be explained. In section 2 the design and results are presented with the aim of valuing the Expanded Version of the Regret Theory as opposed to the latter. The work concludes with final comments of section 3 and an appendix with the data from the experiment.

1.- Preliminaries.

1.1.- The Marschak-Machina Triangle

We consider a set of three monetary results ordered: $z < y < x$. In figure 1, the vertical axis represents the probability of receiving the best payment x, whereas the horizontal axis measures the probability of receiving the worst payment, z. As there are only three possible results and the total of the probabilities is one, the third dimension p_y is implicitly defined by $1-p_x-p_y$ and measured by the horizontal or vertical distance from a point to the hypotenuse. The set of feasible lotteries over the results x, y, z is therefore a triangle whose limits are the vertical axis $p_z = 0$, the horizontal axis $p_x = 0$, and the hypotenuse, that is $p_y = 0$.

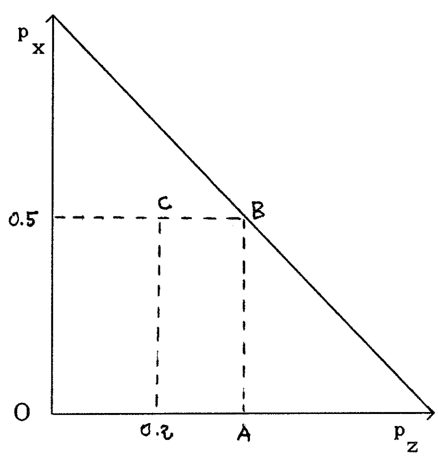

fig. 1

A 50-50 game between x and y is represented by A = (0.50, 0.50, 0); a 50-50 game between x, z by B = (0.50, 0, 0.50); the certainty of y by O = (0, 1, 0) and a game 20-30-50 between z, y, x by C = (0.20, 0.30, 0.50).

The geometric properties of curvature, gradient and aperture of the indifference lines represented in this triangle, are used in order to contrast and compare the different alternative models to the Expected Utility Theory, which as is known, predicts parallel straight lines (with a greater or lesser gradient according to the degree of aversion to risk) as the map of indifference for any type of agent.

1.2.- General Expanded Utility

Consider the problem of choice between two alternatives A_1 and A_2 reflected in the table:

STATES OF THE WORLD		s_1	s_2	s_j	. s_n
PROBABILITIES		p_1	p_2	p_j	. p_n
ACTIONS	A_1	u_{11}	u_{12}	u_{1j}	. u_{1n}
	A_2	u_{21}	u_{22}	u_{2j}	. u_{2n}

Where $u_{ij} = u(x_{ij})$ is the basic utility of the monetary outcomes x_{ij} of the action A_i ($i = 1, 2$) in the state of the world s_j ($j = 1,2,\ldots,n$).

Definicion 1: We will call expanded utility ϵ_{1j} of the choice of A_1 and the rejection of A_2 in the state s_j ($j = 1, 2, \ldots, n$):

$$\epsilon_{1j} = (u_{1j} - u_{2j})\, h(u_{1j}, u_{2j})$$

where h(., .) is a measurement of regret/rejoicing.

Definition 2: We will call expanded utility ϵ_{2j} of the choice of A_2 and the rejection of A_1 in the state s_j ($j = 1, 2, \ldots, n$) :

$$\epsilon_{2j} = (u_{2j} - u_{1j})\, h(u_{2j}, u_{1j})$$

We can observe that in the definition of ϵ_{1j} the basic utility u_{2j} of the result of the action rejected in state s_j figures explicitly, and in the same way u_{1j} figures in ϵ_{2j}. In this way, the valuation is relativized twicw, by means of the difference $u_{ij} - u_{kj}$ and also by means of the function $h(u_{ij}, u_{kj})$ i, k = 1, 2, i ≠ k.

It is natural to impose that $h(u_{ij}, u_{kj}) \geq 0$ (i,k = 1, 2; i≠k), as in any other case the direction of the basic relative valuation would be inverted. According to whether h(.,.) is greater or less that 1, the effect would be an expansion or contraction of the basic relative utility respectively. It could be interpreted as h(.,.) adopting different psychological attitudes of the individual: regret, frustration, joy, responsability...

It is also natural to impose that the expanded utility ϵ_{ij} increases with u_{ij}, that is to say with the result of the chosen action and decreases with u_{kj}, or in other words, with the result of the rejected action.

Parallel to the Loomes & Sugden scheme (1987), our proposal consists of supposing that the choice is carried out as if the agents maximizethe expected value of the expanded utility, that is:

$$A_1 \succsim A_2 \Leftrightarrow \sum_{i=1}^{n} p_j \,(\epsilon_{1j} - \epsilon_{2j}) \geq 0$$

Defining $\psi(u_{1j}, u_{2j}) = \epsilon_{1j} - \epsilon_{2j}$ which represents the balance of expanded utility for the choice of A_1 and the rejection of A_2 in state s_j, the result is:

$$\psi(u_{1j}, u_{2j}) = (u_{1j} - u_{2j}) \left[h(u_{1j}, u_{2j}) + h(u_{2j}, u_{1j}) \right]$$

By calling

$$H(u_{1j}, u_{2j}) = h(u_{1j}, u_{2j}) + h(u_{2j}, u_{1j})$$

expansion function, this is symmetrical and the value function $\psi(.,.)$ is expressed as $\psi(u_{1j}, u_{2j}) = (u_{1j} - u_{2j})\, H(u_{1j}, u_{2j})$ and is skew-symmetric.

The rule for choice is therefore:

$$A_1 \gtrsim A_2 \iff \sum_{i=1}^{n} p_j\, \psi(u_{1j}, u_{2j}) \geq 0 \quad \text{or rather}$$

$$A_1 \gtrsim A_2 \iff \sum_{i=1}^{n} p_j\, (u_{1j} - u_{2j})\, H(u_{1j}, u_{2j}) \geq 0$$

Note that the representation obtained for the preferences between pairs of actions is unique up to a similarity transformation $\alpha\psi(.,.)$ with $\alpha>0$. Note also that when $H(.,.)$ is constant, the previous rule corresponds to that of Von Neumann & Morgenstern according to which, the agents maximize the expected basic utility u_{ij}.

This rule of choice between pairs of alternative actions, will not generally provides a complete ordering of preferences over the set of actions. There are numerous experiments showing systematically cyclic preferences in pairwise choice problems over three or more alternatives under risk [Tversky (1969), Loomes, Starmer & Sugden (1989, 1991)].

Now we formally assume[(1)] (calling $x = u_{1j}$ and $y = u_{2j}$):

A1: $h(x, y) > 0 \;\forall\; x \neq y \;;\; h(x, x) \geq 0 \;\forall x.$

A2: $h(x,y)$ **is a continuous function in** $\mathbb{R}^2$.

A3: $\forall\, z\,,\, x >$ **then** $(x - z)\, h(x, z) > (y - z)\, h(y, z)$

and $(z - x)\, h(z, x) < (z - y)\, h(z, y)$

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1 In Sirvent & Tomás (1992) $h(.,.)$ was assumed to depend only on the difference between basic utilities.

A4: $\forall\ x > y > z$ **we have:**

$$h(x,z) > h(x,y) + h(y,z) \text{ and } h(z,x) > h(y,x) + h(z,y)$$

or $$h(x,z) \leq h(x,y) + h(y,z) \text{ and } h(z,x) \leq h(y,x) + h(z,y)$$

We think that A1 and A2 are natural hypotheses: The expansion of relative utility can not imply a reversal in the sense of basic relative valuation (x - y) and wild changes are forbidden.

By means of A3, we impose that expanded utility increases with result x of the chosen action A_1 and that it decreases with result y of rejected action A_2: $\in(x, z) > \in(y, z)$ and $\in(z, x) < \in(z,y)$.

Assumption A4 is a "regularity" condition which allows us to define two kinds of agents by means of the *expansion function* $H(x, y) = h(x, y) + h(y,x)$:

"Temperamental agents" when $H(x, z) > H(x, y) + H(y, z)\ \forall\ x > y > z$ and

"Calm (or lukewarm) agents" when $H(x, z) \leq H(x, y) + H(y, z)\ \forall\ x > y > z$

Consequences:

C1: $H(x, y) = h(x, y) + h(y, x) > 0\ \forall\ x \neq y$; $H(x, x) \geq 0$

C2: **$H(x, y) = H(y, x)$ is a symmetric function with respect to $y = x$.**

C3: **$H(x,y)$ is a continuous function in $\mathbb{R}^2$**

C4: **$x > y$ then $\psi(x, y) = (x - y) H(x, y) > 0$.** It corresponds to OPC (ordering of pure consequences) hypothesis by Loomes & Sugden (1987).

C5: **$\psi(x, y) = - \psi(y, x)$:** It is skew-symmetric and therefore $\psi(x, x) = 0$.

C6: **$\psi(x, y)$** is a continuos function in $\mathbb{R}^2$.

C7: **$\psi(x, y)$** is an increasing function in its first argument and decreasing in its second argument.

From A3 we have $x > y \Rightarrow (x - z)\, h(x, z) > (y - z)h(y, z)$ and

$$(z - x)h(z, x) < (z - y)h(z, y) \ \forall z$$

The second inequality is equivalent to $(x - z)h(z, x) > (y - z)h(z, y)$ and adding the first one we have:

$$(x - z)H(x, z) > (y - z)H(y, z), \text{ this is}$$

$$\psi(x, z) > \psi(y, z) \quad \forall z$$

And by skew-symmetry: $\psi(z, x) < \psi(z, y)\ \forall z$.

As an inmediate consequence for $x > y > z$: $2\ \psi(x, z) > \psi(x\ y) + \psi(y, z)$ for all types of agents.

C8: The indifference lines for a temperamental agent fan out from a point at southwest of the origin in the Marschak-Machina triangle.

If $x > y > z$ and we consider a temperamental agent $H(x, z) > H(x, y) + H(y, z)$. It implies $H(x, z) > H(y, z)$, $H(x, z) > H(x, y)$ therefore:

$$(y - z)\ H(x, z) > (y - z)\ H(y, z)$$
$$(x - y)\ H(x, z) > (x - y)\ H(x, y)$$

By adding up, $(x - z)\ H(x, z) > (x - y)\ H(x, y) + (y - z)\ H(y, z)$ and

$$\psi(x, z) > \psi(x, y) + \psi(y, z)$$

This inequality implies that the indifference lines fan out from a point situated to the south-west of the triangle in the same way as in the Regret Theory (see fig. 2). Is easy to prove [see for example, Hey (1991)] that the indifference lines pass through the point:

$$(p_z, p_y, p_x) = \left(\frac{-\psi_{xy}}{\psi_{xz} - \psi_{yz} - \psi_{xy}}, \frac{\psi_{xz}}{\psi_{xz} - \psi_{yz} - \psi_{xy}}, \frac{-\psi_{yz}}{\psi_{xz} - \psi_{yz} - \psi_{xy}} \right)$$

where $\psi(x, z) = \psi_{xz}$, $\psi(y, z) = \psi_{yz}$, $\psi(x, y) = \psi_{xy}$ and this point will be situated to the south-west of the triangle as $\psi_{xz} > \psi_{yz} + \psi_{xy}$ and all of them are positive quantities.

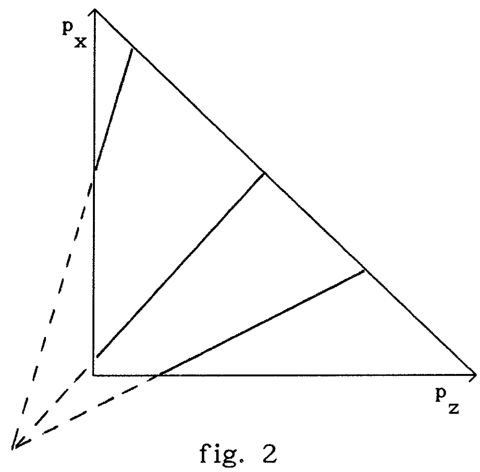

fig. 2

C9: For the calm agents, the indifference lines may be fanning-in or fanning-out in the Marschak-Machina triangle.

If $x > y > z$, from **A4** we have the four possibilities (a), (b), (c) and (d):

(a) $H(x, z) < H(y, z)$ and $H(x, z) < H(x, y)$
(b) $H(x, z) > H(y, z)$ and $H(x, z) > H(x, y)$
(c) $H(x, z) > H(y, z)$ and $H(x, z) < H(x, y)$
(d) $H(x, z) < H(y, z)$ and $H(x, z) > H(x, y)$

In case (a): $H(x, z) < H(y, z)$ and $H(x, z) < H(x, y)$. We have that

$$(y - z)\ H(x, z) < (y - z)\ H(y, z)$$
$$(x - y)\ H(x, z) < (x - y)\ H(x, y)$$

and adding the inequalities:

$$(x - z)\ H(x, z) < (x - y)\ H(x, y) + (y - z)\ H(x, z)$$

$$\psi(x, z) < \psi(x, y) + \psi(y, z)$$

It means the indifference lines are fanning-in (fig. 3).

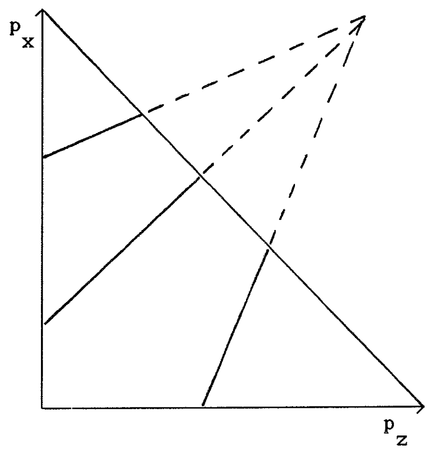

fig. 3

In case (b): $H(x, z) > H(y, z)$ and $H(x, z) > H(x, y)$. The indifference lines are fanning-out as in the temperamental case.

In cases (c) or (d) may be that the indifference lines are fannig-out or fanning-in, depending on the particular results or the particular shape of $H(.,.)$.

C10: For all types of agents we have that:

$$x > y \Rightarrow \frac{y - z}{x - y} \quad \frac{H(x, z) - H(y, z)}{H(x, z)} > -1 \quad \forall z$$

Proof.- The consequence C7 establishes that $\psi(.,.)$ is increasing with respect to his first argument and therefore

$$x > y \Rightarrow (x - z)\, H(x, z) > (y - z)\, H(y, z) \quad \forall z.$$

$x - z = y - z + x - y$ and the last inequality is:

$$(y - z)\, H(x, z) + (x - y)\, H(x, z) > (y - z)\, H(y, z) \quad \forall z.$$

$$(y - z)[H(x, z) - H(y, z)] > - (x - y)\, H(x, z) \quad \forall z.$$

We can write:

$$\frac{y - z}{x - y} \quad \frac{H(x, z) - H(y, z)}{H(x, z)} > -1 \qquad \forall z$$

This condition implies a constraint when H(.,.) is a decreasing function in its first argument for the case of calm agents.

An interesting consequence of this result is that if, in particular, we consider $x > y > z$ when y is close to x, H(,.,) tends to be increasing in its first argument for all types of agents.

Proof.- With $y - z = \alpha (x - y)$ we have:

$$\frac{H(x, z) - H(y^*, z)}{H(x, z)} > - \frac{1}{\alpha}$$

$$H(x, z) > \frac{\alpha}{1 + \alpha} H(y^*, z)$$

Where $y^* = \dfrac{\alpha x + z}{1 + \alpha}$

If α is big (that is, if the intermediate result y^* is close to the greatest value x in the triangle) we can expect that $H(x, z) > H(y^*, z)$. Then, if $\psi(x, z) < \psi(x, y) + \psi(y, z)$ for a calm individual, it is possible that his indifference lines turn from fan-in to fan-out when the result y increases.

1.3.- Temperamental and calm attitudes.

We have seen (C7) that for all kinds of agents $2\psi(x, z) > \psi(x, y) + \psi(y, z)$. In the temperamental case, necessarily $\psi(x, z) > \psi(x, y) + \psi(y, z)$ $\forall\ x > y > z$, but for a calm individual we have only $2\psi(x, z) < \psi(x, y) + \psi(y, z)$ and it is possible that $\psi(x, z) > \psi(x, y) + \psi(y, z)$ or that $\psi(x, z) < \psi(x, y) + \psi(y, z)$ depending on the range of results involved in the particular problem.

"Temperamental attitude" is linked to $\psi(x, z) > \psi(x, y) + \psi(y, z)$ and a "typical calm attitude" is linked to the opposite inequality $\psi(x, z) >$

$\psi(x, y) + \psi(y, z)$ or "concavity", that implies fan-in indifference lines in the M-M triangle. Therefore, temperamental agents maintain their attitude (they are regret-averse agents according to Loomes and Sugden). Calm agents, can keep their typical attitude or change it depending on the particular results.

2.- Expanded Version of the Regret Theory: Experimental Test

The different form and layout of the indifference curves in the Marschak-Machina triangle, has inspired a great number of experiments whose aim is to compare the different alternative models between them and with the Expected Utility model.

Two different approaches can be observed in this type of experiments: One of them consists of establishing questions of direct choice between pairs of alternatives. If the mechanism is easy for the participants to understand, the greatest difficulty is to be found in that a large number of problems are necessary in order to be able to estimate the indifference lines of each individual. In this line, we can look at the works of Camerer (1989); Battalio, Kagel & Jiranyakul (1990); Camerer (1992); Starmer (1992), Sopher & Gigliotti (1993), Harless & Camerer (1994) and Hey & Orme (1994). The second approach consists of establishing indifference type questions [see Hey & Strazzera (1989)]: the individual establishes, for example, the value of the probability which makes the alternatives indifferent which he/she is comparing. Eventhough it is necessary for the participants to make a greater effort in order to understand the mechanism, the level of information obtained from any single question is also greater then before.

The present experiment, tries to combine both approaches. It could be qualified as an indifference type experiment however, the design of a computer program and the use of a personal computer allow the participants to fix their probability of indifference by means of repetitions where the questions are of direct choice.

This type of experiment was used by Loomes in 1989 and with his help, we designed and carried out our experiment with the aim of checking the general model of Expanded Utility. Three main questions are to be answered: What is the rate of individuals whose indifference lines fan out (have a temperamental attitude)?, what is the rate of individuals whose lines fan in (show a calm attitude)? and what is the proportion of individuals that change their attitude depending on the magnitude of the intermediate payment?

2.1.- Experimental Test

We consider the choice problems [1] and [1]' where $0 < x_2 < x_1$ are monetary results are monetary and where p and 1-p are the probabilities of the corresponding states of the world:

[1]

	p	100
N	0	x_1
F	x_2	x_2
	p	100 - p

[1]'

	q	100
N'	0	x_1
M	x_2	0
	q	100-q

For any pair $\{x_1, x_2\}$, problem [1] presents the choice between two alternatives N and F as in figure 4(a) and problem [1]' between the alternatives N' and M as in figure 4(b).

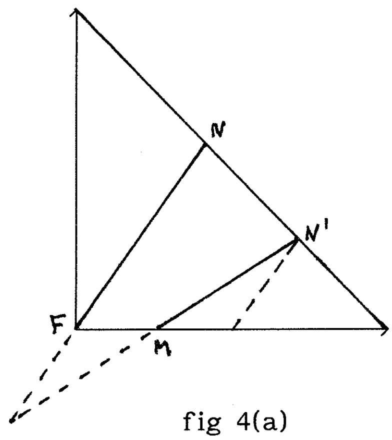

fig 4(a)

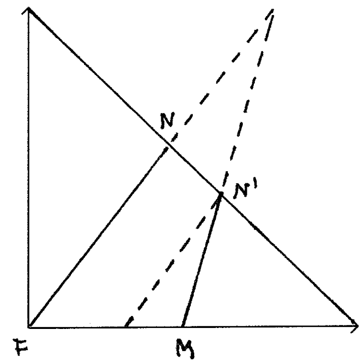

fig. 4(b)

If we consider the probability of indifference in both problems, the Expected Utility Theory implies:

$$(1 - p^*)\ u(x_1) = u(x_2)$$

$$(1 - q^*)\ u(x_1) = q^*\ u(x_2) = (1 - p^*)\ q^*\ u(x_1) \longrightarrow (1 - p^*) = \frac{1 - q^*}{q^*}$$

which means that the lines of indiference NF and N'M are parallel (see figure 4).

The Regret Theory and the Expanded Utility predict:

[1] $$p^*\ \psi(0, x_2) + (1 - p^*)\ \psi(x_1, x_2) = 0$$

$$\Leftrightarrow (1 - p^*)\ \psi(x_1, x_2) - p^*\ \psi(x_2, 0) + \psi(x_2, 0) - \psi(x_2, 0) = 0$$

$$\Leftrightarrow (1 - p^*)\ [\psi(x_1, x_2) + \psi(x_2, 0)] = \psi(x_2, 0)$$

[1]' $$q^*\ \psi(0, x_2) + (1 - q^*)\ \psi(x_1, 0) = 0$$

$$\Leftrightarrow (1 - q^*)\ \psi(x_1, 0) = q^*\ \psi(x_2, 0)$$

$$\Leftrightarrow \psi(x_2, 0) = \frac{1 - q^*}{q^*}\ \psi(x_1, 0)$$

Therefore from [1] and [1]' we have:

$$(1 - p^*)\ [\psi(x_1, x_2) + \psi(x_2, 0)] = \frac{1 - q^*}{q^*}\ \psi(x_1, 0)$$

If the function ψ verifies the condition of convexity:

$$\psi(x_1, x_2) + \psi(x_2, 0) < \psi(x_1, 0) \longrightarrow (1 - p^*) > \frac{1 - q^*}{q^*}$$

If function ψ verifies the condition of concavity:

$$\psi(x_1, x_2) + \psi(x_2, 0) > \psi(x_1, 0) \longrightarrow (1 - p^*) < \frac{1 - q^*}{q^*}$$

In the Marschak-Machina triangle the condition of convexity implies that the gradient of indifference lines is greater in N than in N', which means that these lines open like a fan from a point to the southwest of the origin, see fig. 4(a), [this would be the case of Regret Theory or of the temperamental individual in the Expanded Utility Theory).

The condition of concavity means that the indifference lines have a smaller gradient in N than in N' and this is interpreted as a fan closing towards a point in the north-east of the triangle, see 4(b). The Expanded version of Regret Theory permits this possibility and at the same time as the individuals classified as calm are able to change the form of their indifference lines for different triangles, allowing some triangles to close and others to open in the form of a fan.

2.2.- The Design of the Experiment.

Twelve questions constituting six pairs of problems [1] and [1]' were established where the quantities which appeared for x_1 and x_2, in pesetas, were the same for each pair. The value of x_1 was 10000 in each one and only changed the central result x_2 which took the values 1000, 2000, 3000, 7000, 8000, 9000 depending on the pair.

The experiment was carried out in two stages and a total of 106 students from the final years of degrees in Economics, Sociology and Business Studies took part. The first stage was carried out with real payments and 52 people from the above-mentioned groups participated in three successive sessions, and each individual was paid according to the question drawn out at the end of the session.

In the second stage payments were not generally made. In order to make the individuals participate and think carefully about their answers, two students were drawn out and paid with the same mechanism as in the first stage. Three sessions were also carried out and six of the 54 participants received payments.

At the beginning of each session each individual sat in front of a personal computer and chose an envelope at random from a pile of 100 and kept it until the experiment was finished. Each of the envelopes contained a card with a number from 1 to 100. Each individual had a leaflet at his disposal (see Appendix) where a detailed explanation of the experiment appeared. Furthermore, a verbal explanation was presented at the same time as four practical questions were being solved on the computer, one of each type. The aim of these practical questions was to familiarize each one of the participants with the team and the experimental procedure. The fact that they could ask for as many explanations as they wanted during the development of the session was emphasized. Figure 5 shows the two practical questions proposed in formats (a) and (b).

Problem (a)

	1 – 50	51 – 100
A	0	10.000
B	4.000	4.000
	50	50

Problem (b)

	1 – 50	51 – 100
A	0	10.000
B	4.000	0
	50	50

fig. 5

In problems (a) and (b), the first alternative A offers the possibility of earning 10.000 pesetas if the number of the envelope picked by the individual is between 51 and 100, and 0 pesetas if this number is between 1 and 50. The alternative B in format (a) guarantees a payment of 4.000 pesetas whatever the number contained in the envelope is, and in format (b) it is another game which offers a 50% chance of having 3000 pesetas. The bottom line of the table states the number of possibilities corresponding to each possible payement in each alternative.

Depending on the preferences of the individual, the programme presents a new problem of decision in which the possiblilities of obtaining the different payments are modified. If the initial choice is A, the programme moves the central line (with points) 24 points to the right, in such a way that in the second repetition A offers 26 chances of 10.000 and 74 of zero whereas B, in problem (a) continues offering 10.000 with certainty and in problem (b) offers 74 opportunities of 4.000 as opposed to 26 of nothing. In this new position of the line, the participants must repeat the choice and in this repetition the line moves 12 points to the right or to the left depending on the preference shown. After a third choice the line moves 6 points in the appropriate direction. Finally, a message reminding the individual of his previous decisions appears instead of a new choice which allows a final adjustment of the probability with the cursor key until the point where the two alternatives are equally attractive is reached. The individual is warned of this with the message "if another person decides for you, it wouldn't matter which alternative were chosen and which were rejected".

After the individuals having answered all of the 12 problems presented in each session, the number of the questions for which the payments must be made was drawn from a lot. This is the usual mechanism for this type of experiment. The fact that the payments do not depend on a specific question induces the participants to try each one of the questions as if their premium particularly depended on this.

After the number of the question is known the mechanism for the payment is as follows: each individual is paired up with another and the payments he receives depends on his preferences in his collegue's table, for example, we assume that the question on which the payments are made gives the two individuals the data of the following tables:

	1 90	100
A	0	10.000
B	4.000	4.000
	90	10

Individual 1

	1 80	100
A	0	10.000
B	4.000	4.000
	80	20

Individual 2

Given that the first individual states that he is indifferent between 10 chances of 10000 pesetas and 4000 with certainty, it is clear that 20 chances of 10.000 seem to him to be a better choice. Therefore in these conditions he would prefer A in the table of individual 2, if he now opens his envelope and the number is between 80 and 100 he will receive 10.000 pts. If the number of the envelope is between 1 and 80, he will not receive any payment. As the second individual manifested indifference for 20 chances of 10.000 pesetas, the decision of the first (indifferent to 10 chances of 10.000), to him it will seem worse: whatever number is contained in the envelope, he will receive 4000 pesetas.

This mechanism was widely discussed in each session. It was explained that telling the truth regarding the preferences, guarantees the playing of an alternative which is at least as prefered as the one not played. The act of lying does not guarantee having something more prefered and on the other hand may force the playing of a less prefered alternative. In the experiment's explanatory leaflet (see Appendix) there is a verification. A formal demonstration of this fact can be found in the work of Loomes (1989).

2.3.- Results and Analysis

Eventhough the results of the two stages do not differ greatly, we present them both seperately and together.

Table 1 shows the participants' answers seperately in three blocks: 1(A) for the experiment with real payments (the first stage), 1(B) for the experiment with partial payments and 1(C) for the overall data. Each one of them shows the individuals' answers to the 6 pairs of problems (a) and (b) as follows: The first and second lines show the number of individuals who clearly establish $1-p > (1-q)/q$ or $1-p < (1-q)/q$ in each pair(2), from one pair to another only the central result x_2 changes. As p and q are integer (with values between 1 and 100) it would be almost impossible for individuals with the exact equality to appear and so, the decimals have been adjusted to the nearest integer just above or just below the value of 1-p. Furthermore, all the data whose differences are of one unit in one direction or the other have been considered equal [tables 2(A) and 2(B) of the Appendix illustrate the adjusted results for each individual]. The third line illustrates all the cases where with this adjustment $1-p = (1-q)/q$ has been given. In the final line the cases where dominance has been violated establishing $p > q$ or $q < 50$, appear under the denomination of "others".

There are some authors who think that the observed individuals' behaviour could correspond to agents who maximize the expected utility but make mistakes [see, for example, Hey and Orme (1994)]. Accepting the difficulty which establishing the probability entails, and the fact that the individuals may make mistakes of comprehension as well as in the valuation, it would be extremely difficult for real maximizers of the expected utility to appear in these experimental tests. In place of this, it can be thought that an individual who behaves in accordance with this

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2 p is the indifference probability in problem (a) and q the indifference probability in problem (b).

theory establishes $1-p \geq (1-q)/q$ a number equal to the times that $1-p \leq (1-q)/q$. Taking this hypothesis as the null hypothesis as opposed to the alternative hypothesis of the result $1-p > (1-q)/q$ ocurring more frequently than $p \leq (1-q)/q$ table 1 shows how the null hypothesis can be rejected in 3 of the 6 pairs (in the pairs of problems (a), (b) where the intermediate result x_2 is greater). As the errors of dominance are cases in which it must occur that $1-p < (1-q)/q$, if they are included in the analysis, it is obtained that the null hypothesis can still clearly be rejected in the same three pairs[3].

In the bar graphs I(A) and I(B) of the Appendix the percentages of the results $1-p > (1-q)/q$ and of $1-p < (1-q)/q$ are shown. If the individuals behave according to the Regret theory the probabilities of indifference should always fulfil $1-p > (1-q)/q$, if we admit that the individuals may behave as if they were averse to regret with errors, we would have the same number of deviations in all the pairs. However, the diagrams show that the individuals do not behave in the same way in some triangles as in others. In order to emphasize this fact, observe that if in the three pairs the percentage of individuals which establishes that $1-p > (1-q)/q$ is 35.5% and those who establish that $1-p < (1-q)/q$ are 36.7%, these percentages change to 63% for ">" as opposed to 25% for "<".

These results are consistent with the Expanded version of Regret Theory: the temperamental individuals choose in the Marschak-Machina triangle as do the individuals who are averse to regret, but the calm individuals can change their choice in the temperamental direction. Preferably, this happens when the result x_2 is closest to the greater result x_1. This would be in accordance with the implication of the expanding function $H(.,.)$ of our Expanded version of Regret theory (see section 1., consequence C.10).

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3 Subject number 52 has not been included because all responses in all questions were identical.

Another way of studying the data is that of taking the individual as the unit of analysis. If we consider 7 different classes which go from 6:0 to a 0:6 according to the number of times which it has been established $1-p > (1-q)/q$ or $1-p < (1-q)/q$ in the six pairs of problems. Each individual will be classified in one of them. In the cases where $1-p = (1-q)/q$ half an observation is considered in each one of the adjacent classes. For example an individual who establishes ">" in 3 pairs, "<" in two pairs and "=" in one pair is classified as an average observation in the class 3:3 and average in the class 4:2. Tables 2(A) and 2(B) of the Appendix show the values of $1-p$ and of $(1-q)/q$ for each individual and the class to which he belongs.

If the null hypothesis is that the individuals are really maximizers of the expected utility and that the inequalities between $1-p$ and $(1-q)/q$ are only due to errors, the frequency of the observations in each one of the seven classes could be estimated on the base of the binominal distribution with $p = 0.5$.

Diagrams II(A) (with payments), II(B) (with partial payments) and II(C) (overall data) illustrate the real frequency of each class (lined bars) and the binominal distribribution for $p = 0.5$ (a continuous line). A chi-squared test clearly shows for the overall data that the null hypothesis can be rejected. The probability of the observed behaviour being consistent with the sample of maximizers of the Expected Utility is less than 0.00009.

If we classify the overall data in two samples which on the one hand bring together the individuals' answers to the problems where x_2 takes the values 1000, 2000 and 3000 and on the other hand the answers to the problems where x_2 is 7000, 8000 and 9000, we can observe (see diagrams III(A) and III(B)) the notable difference between both sets. While in the triangles corresponding to the low values of x_2, the observed behaviour could be consistent with a sample of individuals who maximize the Expected Utility with errors, for the values of x_2 which are close to 10.000, the hypothesis that the individuals behave according to the classical theory is clearly rejected.

If it is indeed true that the Regret Theory as well as the Expanded version are generalizations of the Expected Utility, this differentiated behaviour, depending on the central result, would not be explained by the Regret Theory and on the other hand would be compatible with the Expanded Model. This change in the type of answer given by the individuals as a consequence of the relative value of the central result was already noted as as possibility in the work of Loomes (1989). This experiment would confirm the idea that the individual shows his temperamental answer (aversion to regret) just when the differences between "what he has obtained as opposed to what he has lost are great".

3.- Summary and Conclusion

Regret Theory is a generalization of Expected Utility which describes the behaviour of individuals, incorporating in the *a priori* valuation the regret/rejoicing future of the agent when the state of the world is resolved.

As a consequence of the hypothesis of aversion to regret established by Loomes and Sugden (1987), the form of the indifference curves in the Marschak-Machina triangle for an individual who behaves according to this theory, is that of the fan-out type. The results of recent experiments show that the behaviour of a considerable number of agents is not consistent with this hypothesis.

One possible explanation for this fact could be the one that we propose in this study and which we model on what we call the General Expanded Utility. The model predicts the existence of two types of agents: temperamental and calm. For those individuals which we call temperamental, the indifference lines are always of a fan-out kind, and for the calm agents the indifference lines are typically fan-in. However, they may change their attitude showing temperamentability and in this case their lines are also fan-out depending on the results and/or their expansion function.

The test which we have carried out would confirm these predictions and furthermore, as is to be expected, the temperamental attitude appears more frequently when the difference between what can be won and lost is greater. This result can be explained by means of the Expanded model which allows the calm individuals to change their attitude and in these cases increasing the number of observed subjects with fan-out indifference lines.

APPENDIX: RESULTS OF EXPERIMENT

TABLE.- 1(A)

$x_2 \longrightarrow$	1000	2000	3000	7000	8000	9000
$1-p > (1-q)/q$	14	23	22	32	34	33
$1-p < (1-q)/q$	18	17	18	16	14	15
$p = (1-q)/q$	11	6	6	2	3	3
¡others!	8	5	5	1	-	-

TABLE.- 1(B)

$x_2 \longrightarrow$	1000	2000	3000	7000	8000	9000
$1-p > (1-q)/q$	16	18	19	36	29	38
$1-p < (1-q)/q$	18	23	22	12	13	11
$p = (1-q)/q$	13	8	12	6	12	5
¡others!	7	4	1	-	-	-

TABLE.- 1(C)

$x_2 \longrightarrow$	1000	2000	3000	7000	8000	9000
$1-p > (1-q)/q$	30	41	41	68	63	71
$1-p < (1-q)/q$	36	40	40	28	27	26
$p = (1-q)/q$	24	14	18	8	15	8
¡others!	15	10	6	1	-	-

TABLE.- 2(A)

RESULTS OF EXPERIMENT WITH PAYMENTS

PROBLEMS (a) AND (b)

Sujeto	x_2	1000	2000	3000	7000	8000	9000	
1	1-p	14	26	26	74	74	98	
	(1-q)/q	16	35	35	54	81	100	0:6
		<	<	<	<	<	<	
2	1-p	10	38	35	90	95	97	3:3
	(1-q)/q	16	33	33	62	79	62	
		<	<	<	>	>	>	
3	1-p	81	68	81	92	95	95	
	(1-q)/q	27	62	48	73	67	82	6:0
		>	>	>	>	>	>	
4	1-p	26	98	93	98	98	98	
	(1-q)/q	36	62	62	79	79	100	5:1
		<	>	>	>	>	>	
5	1-p	14	26	26	98	98	98	
	(1-q)/q	16	17	35	100	100	100	1:5
		<	>	<	<	<	<	
6	1-p	14	14	26	49	86	98	
	(1-q)/q	16	16	35	100	100	62	1:5
		<	<	<	<	<	>	
7	1-p	44	74	70	86	50	98	4:2
	(1-q)/q	47	43	62	79	69	82	
		<	>	>	>	<	>	

	x_2	1000	2000	3000	7000	8000	9000	
8	1-p	10	25	36	44	74	74	
	(1-q)/q	2	25	37	78	62	82	3:3
		>	=	=	<	>	<	
9	1-p	26	40	50	92	98	98	
	(1-q)/q	17	42	61	62	82	86	4:2
		>	<	<	>	>	>	
10	1-p	8	25	70	92	98	98	$6:0(\frac{1}{2})$
	(1-q)/q	8	9	62	48	79	62	$5:1(\frac{1}{2})$
		=	>	>	>	>	>	
11	1-p	35	68	48	92	95	92	
	(1-q)/q	61	57	69	82	76	62	4:2
		<	>	<	>	>	>	
12	1-p	20	80	38	92	85	97	
	(1-q)/q	31	62	17	96	96	17	3:3
		<	>	>	<	<	>	
13	1-p	50	80	40	80	90	90	
	(1-q)/q	12	12	100	25	34	67	5:1
		>	>	<	>	>	>	
14	1-p	38	50	86	86	98	98	
	(1-q)/q	17	61	62	62	62	62	5:1
		>	<	>	>	>	>	
15	1-p	25	37	44	80	95	96	$5:1(\frac{1}{2})$
	(1-q)/q	25	34	63	62	93	93	
		=	>	<	>	>	>	$4:2(\frac{1}{2})$

	x_2	1000	2000	3000	7000	8000	9000	
16	1-p	38	92	92	92	92	92	
	(1-q)/q	17	62	62	73	62	62	6:0
		>	>	>	>	>	>	
17	1-p	10	15	20	70	80	98	5:1($\frac{1}{2}$)
	(1-q)/q	9	12	44	43	37	82	
		=	>	<	>	>	>	4:2($\frac{1}{2}$)
18	1-p	14	47	50	86	96	97	
	(1-q)/q	96	17	61	62	93	93	4:2
		<	>	<	>	>	>	
19	1-p	14	18	36	73	82	90	
	(1-q)/q	12	23	34	56	70	72	5:1
		>	<	>	>	>	>	
20	1-p	14	38	62	86	98	86	
	(1-q)/q	16	36	96	67	100	100	2:4
		<	>	<	>	<	<	
21	1-p	14	35	50	95	96	96	
	(1-q)/q	33	61	36	82	79	89	4:2
		<	<	>	>	>	>	
22	1-p	1	10	10	38	86	98	
	(1-q)/q	2	11	11	17	100	100	3:3
		=	=	=	>	<	=	
23	1-p	26	38	38	98	98	98	
	(1-q)/q	35	61	61	62	62	86	3:3
		<	<	<	>	>	>	

	x_2	1000	2000	3000	7000	8000	9000	
24	1-p	2	14	13	81	98	98	
	(1-q)/q	2	16	14	122	52	62	3:3
		=	<	=	<	>	>	
25	1-p	50	62	74	96	97	98	
	(1-q)/q	100	62	67	100	100	67	3:3
		<	=	>	<	=	>	
26	1-p	26	38	50	86	74	98	
	(1-q)/q	35	36	35	62	62	100	4:2
		<	>	>	>	>	<	
27	1-p	4	20	67	90	80	93	
	(1-q)/q	5	13	35	54	73	86	6:0($\frac{1}{2}$) 5:1($\frac{1}{2}$)
		=	>	>	>	>	>	
28	1-p	26	49	38	56	58	53	
	(1-q)/q	36	92	67	96	100	36	1:5
		<	<	<	<	<	>	
29	1-p	14	38	38	92	95	98	
	(1-q)/q	16	35	35	79	96	62	5:1($\frac{1}{2}$) 4:2($\frac{1}{2}$)
		<	>	>	>	=	>	
30	1-p	3	14	14	86	97	92	
	(1-q)/q	3	13	14	88	2	96	3:3($\frac{1}{2}$) 2:4($\frac{1}{2}$)
		=	=	=	<	>	<	
31	1-p	14	38	38	98	98	50	
	(1-q)/q	16	36	61	100	100	100	2:4
		<	>	<	=	=	<	

	x_2	1000	2000	3000	7000	8000	9000	
32	1-p	10	20	20	73	95	97	
	(1-q)/q	5	25	12	59	82	70	5:1
		>	<	>	>	>	>	
33	1-p	14	26	26	61	74	98	3:3($\frac{1}{2}$)
	(1-q)/q	13	35	35	59	67	100	
		=	<	<	>	>	<	2:4($\frac{1}{2}$)
34	1-p	2	24	20	88	97	98	3:3($\frac{1}{2}$)
	(1-q)/q	3	31	31	92	39	75	
		=	<	<	<	>	>	2:4($\frac{1}{2}$)
35	1-p	20	62	67	65	90	86	4:2($\frac{1}{2}$)
	(1-q)/q	16	62	100	43	82	92	
		>	=	<	>	>	<	3:3($\frac{1}{2}$)
36	1-p	26	50	50	74	98	86	
	(1-q)/q	61	61	100	100	100	100	0:6
		<	<	<	<	<	<	
37	1-p	50	92	86	98	98	92	0:6($\frac{1}{2}$)
	(1-q)/q	100	100	100	97	112	100	
		<	<	<	=	<	<	1:5($\frac{1}{2}$)
38	1-p	14	26	26	74	90	95	
	(1-q)/q	16	58	16	54	100	54	3:3
		<	<	>	>	<	>	
39	1-p	10	24	26	62	96	70	
	(1-q)/q	16	29	33	82	82	85	1:5
		<	<	<	<	>	<	

	x_2	1000	2000	3000	7000	8000	9000	
40	1-p	10	19	37	82	83	90	$5:1(\frac{1}{2})$
	(1-q)/q	11	11	25	41	39	67	
		=	>	>	>	>	>	$6:0(\frac{1}{2})$
41	1-p	10	61	26	95	95	70	$2:4(\frac{1}{2})$
	(1-q)/q	25	61	61	61	100	79	
		<	=	<	>	<	<	$1:5(\frac{1}{2})$
42	1-p	2	8	10	76	85	98	
	(1-q)/q	2	2	11	20	54	70	5:1
		=	>	=	>	>	>	
43	1-p	14	98	74	85	98	98	
	(1-q)/q	25	36	36	34	34	36	5:1
		<	>	>	>	>	>	
44	1-p	25	37	37	45	60	73	
	(1-q)/q	33	53	66	66	81	59	1:5
		<	<	<	<	<	>	
45	1-p	50	74	74	86	98	98	
	(1-q)/q	36	36	39	100	62	100	4:2
		>	>	>	<	>	<	
46	1-p	85	86	80	98	98	98	
	(1-q)/q	82	82	67	93	82	82	6:0
		>	>	>	>	>	>	
47	1-p	38	62	70	85	98	98	
	(1-q)/q	36	69	61	79	89	89	4:2
		>	<	>	>	>	>	

	x_2	1000	2000	3000	7000	8000	9000	
48	1-p	14	14	41	86	95	98	
	(1-q)/q	7	28	42	70	67	97	4:2
		>	<	=	>	>	=	
49	1-p	98	74	86	86	86	86	
	(1-q)/q	62	614	62	100	100	104	2:4
		>	<	>	<	<	<	
50	1-p	26	26	25	80	74	86	
	(1-q)/q	35	17	17	85	35	73	4:2
		<	>	>	<	>	>	
51	1-p	26	25	38	74	98	98	$1:5(\frac{1}{2})$
	(1-q)/q	35	35	52	89	67	97	
		<	<	<	<	>	=	$2:4(\frac{1}{2})$
52	1-p	25	50	30	65	65	50	
	(1-q)/q	43	43	43	43	43	43	
		?	?	?	?	?	?	

TABLE 2(B)

RESULTS OF EXPERIMENT WITH PARTIAL PAYEMENTS

PROBLEMS (a) y (b)

	x_2	1000	2000	3000	7000	8000	9000	
1	1-p	10	20	25	70	80	90	
	(1-q)/q	11	20	29	70	81	76	3:3
		=	=	<	=	=	>	
2	1-p	10	20	30	70	80	90	
	(1-q)/q	10	20	30	70	79	89	3:3
		=	=	=	=	=	=	
3	1-p	25	20	31	70	86	90	$4:2(\frac{1}{2})$
	(1-q)/q	30	25	30	62	57	79	$3:3(\frac{1}{2})$
		<	<	=	>	>	>	
4	1-p	26	35	35	70	71	83	$5:1(\frac{1}{2})$
	(1-q)/q	31	30	34	59	57	79	$4:2(\frac{1}{2})$
		<	>	=	>	>	>	
5	1-p	10	25	22	60	85	85	$3:3(\frac{1}{2})$
	(1-q)/q	7	12	25	66	67	82	$4:2(\frac{1}{2})$
		>	>	=	<	<	>	
6	1-p	14	49	37	97	97	85	$3:3(\frac{1}{2})$
	(1-q)/q	16	36	58	62	97	95	$2:4(\frac{1}{2})$
		<	>	<	>	=	<	
7	1-p	14	38	50	98	98	98	
	(1-q)/q	14	36	61	43	63	97	4:2
		=	>	<	>	>	=	

	x_2	1000	2000	3000	7000	8000	9000	
8	1-p	26	26	38	74	74	98	$3:3(\frac{1}{2})$
	(1-q)/q	31	17	36	73	82	76	
		<	>	>	=	<	>	$4:2(\frac{1}{2})$
9	1-p	40	38	70	97	98	97	
	(1-q)/q	66	66	67	67	82	82	4:2
		<	<	>	>	>	>	
10	1-p	20	36	81	96	98	98	$6:0(\frac{1}{2})$
	(1-q)/q	20	32	36	62	70	93	
		=	>	>	>	>	>	$5:1(\frac{1}{2})$
11	1-p	38	38	35	74	90	72	
	(1-q)/q	34	42	54	89	17	67	4:2
		>	>	<	<	>	>	
12	1-p	38	38	45	54	65	90	$3:3(\frac{1}{2})$
	(1-q)/q	36	61	61	67	66	67	
		>	<	<	<	=	>	$4:2(\frac{1}{2})$
13	1-p	38	45	45	85	90	95	
	(1-q)/q	34	54	34	57	79	86	5:1
		>	<	>	>	>	>	
14	1-p	14	38	49	85	81	98	
	(1-q)/q	16	36	34	62	54	82	5:1
		<	>	>	>	>	>	
15	1-p	14	38	38	86	86	92	
	(1-q)/q	3	36	36	62	62	100	5:1
		>	>	>	>	>	<	

	x_2	1000	2000	3000	7000	8000	9000	
16	1-p	14	35	61	85	80	85	
	(1-q)/q	14	53	61	67	67	67	4:2
		=	<	=	>	>	>	
17	1-p	26	86	50	98	62	98	
	(1-q)/q	17	36	61	62	85	100	3:3
		>	>	<	>	<	<	
18	1-p	14	26	34	62	74	94	$3:3(\frac{1}{2})$
	(1-q)/q	3	61	53	63	59	79	
		>	<	<	=	>	>	$4:2(\frac{1}{2})$
19	1-p	6	14	25	98	98	97	$3:3(\frac{1}{2})$
	(1-q)/q	3	16	33	93	97	97	
		>	=	<	>	=	=	$4:2(\frac{1}{2})$
20	1-p	26	26	80	97	98	98	
	(1-q)/q	35	35	100	47	62	62	3:3
		<	<	<	>	>	>	
21	1-p	14	35	38	62	60	86	
	(1-q)/q	14	53	53	43	61	82	3:3
		=	<	<	>	=	>	
22	1-p	24	30	62	86	98	86	
	(1-q)/q	17	17	48	36	100	100	3:3
		>	>	>	>	<	<	
23	1-p	14	23	62	86	50	98	
	(1-q)/q	16	25	88	62	78	69	2:4
		<	<	<	>	<	>	

	x_2	1000	2000	3000	7000	8000	9000	
24	1-p	50	62	62	98	98	97	
	(1-q)/q	100	100	100	100	100	100	1:5
		<	<	<	=	=	<	
25	1-p	26	38	50	50	62	86	3:3($\frac{1}{2}$)
	(1-q)/q	17	36	100	100	62	62	
		>	>	<	<	=	>	4:2($\frac{1}{2}$)
26	1-p	14	74	40	90	84	98	
	(1-q)/q	16	64	66	100	100	75	2:4
		<	>	<	<	<	>	
27	1-p	39	74	86	98	98	98	
	(1-q)/q	17	100	70	93	100	76	4:2
		>	<	>	>	<	>	
28	1-p	38	62	74	62	45	53	3:3($\frac{1}{2}$)
	(1-q)/q	100	62	67	100	29	12	2:4($\frac{1}{2}$)
		<	=	<	<	<	>	
29	1-p	14	38	50	86	62	98	1:5($\frac{1}{2}$)
	(1-q)/q	16	61	100	62	62	100	
		<	<	<	>	=	<	2:4($\frac{1}{2}$)
30	1-p	38	50	74	95	98	98	
	(1-q)/q	78	61	62	89	62	67	4:2
		<	<	>	>	>	>	
31	1-p	14	50	62	62	84	86	
	(1-q)/q	16	100	66	81	100	91	0:6
		<	<	<	<	<	<	

	x_2	1000	2000	3000	7000	8000	9000	
32	1-p	26	58	38	85	72	97	2:4($\frac{1}{2}$)
	(1-q)/q	17	69	62	73	72	100	3:3($\frac{1}{2}$)
		>	<	<	>	=	<	
33	1-p	14	38	26	98	98	93	
	(1-q)/q	16	17	35	62	62	82	4:2
		<	>	<	>	>	>	
34	1-p	14	38	90	86	92	50	
	(1-q)/q	32	17	62	62	62	62	4:2
		<	>	>	>	>	<	
35	1-p	2	25	25	98	98	98	4:2($\frac{1}{2}$)
	(1-q)/q	9	25	25	62	62	100	3:3($\frac{1}{2}$)
		<	=	=	>	>	=	
36	1-p	26	48	38	56	70	51	
	(1-q)/q	34	100	53	85	100	36	1:5
		<	<	<	<	<	>	
37	1-p	10	25	35	95	95	98	
	(1-q)/q	10	18	34	54	100	67	4:2
		=	>	=	>	<	>	
38	1-p	14	61	73	86	98	86	2:4($\frac{1}{2}$)
	(1-q)/q	16	61	100	62	93	100	3:3($\frac{1}{2}$)
		<	=	<	>	>	<	
39	1-p	13	20	34	38	80	98	3:3($\frac{1}{2}$)
	(1-q)/q	13	25	30	61	79	100	2:4($\frac{1}{2}$)
		=	<	>	<	=	=	

	x_2	1000	2000	3000	7000	8000	9000	
40	1-p	14	8	38	98	98	98	
	(1-q)/q	16	16	16	17	100	62	3:3
		<	<	>	>	<	>	
41	1-p	5	14	35	38	74	95	5:1($\frac{1}{2}$)
	(1-q)/q	5	16	25	25	36	67	
		=	<	>	>	>	>	4:2($\frac{1}{2}$)
42	1-p	74	50	38	80	98	98	
	(1-q)/q	163	61	61	88	88	86	2:4
		<	<	<	<	>	>	
43	1-p	24	44	65	95	95	92	
	(1-q)/q	12	62	78	79	79	79	4:2
		>	<	<	>	>	>	
44	1-p	35	70	38	71	71	65	
	(1-q)/q	61	100	36	95	100	69	1:5
		<	<	>	<	<	<	
45	1-p	4	14	38	77	97	98	4:2($\frac{1}{2}$)
	(1-q)/q	6	16	38	30	70	67	
		<	<	=	>	>	>	3:3($\frac{1}{2}$)
46	1-p	10	20	31	70	80	90	3:3($\frac{1}{2}$)
	(1-q)/q	10	20	30	70	81	62	
		=	=	=	=	=	>	4:2($\frac{1}{2}$)
47	1-p	21	36	64	80	85	97	
	(1-q)/q	12	56	59	62	79	93	5:1
		>	<	>	>	>	>	

	x_2	1000	2000	3000	7000	8000	9000	
48	1-p	12	31	25	90	96	97	$5:1(\frac{1}{2})$
	(1-q)/q	19	31	15	70	67	62	$4:2(\frac{1}{2})$
		<	=	>	>	>	>	
49	1-p	10	25	22	62	95	95	
	(1-q)/q	4	15	17	90	73	76	5:1
		>	>	>	<	>	>	
50	1-p	10	32	35	90	90	90	$3:3(\frac{1}{2})$
	(1-q)/q	16	42	34	67	67	70	$4:2(\frac{1}{2})$
		<	<	=	>	>	>	
51	1-p	10	57	70	98	95	98	$4:2(\frac{1}{2})$
	(1-q)/q	6	61	70	70	82	79	$5:1(\frac{1}{2})$
		>	<	=	>	>	>	
52	1-p	12	49	71	98	98	98	$5:1(\frac{1}{2})$
	(1-q)/q	12	7	13	67	79	67	$6:0(\frac{1}{2})$
		=	>	>	>	>	>	
53	1-p	5	21	20	84	84	97	
	(1-q)/q	6	33	20	67	82	93	4:2
		=	<	=	>	>	>	
54	1-p	4	32	44	80	94	95	$3:3(\frac{1}{2})$
	(1-q)/q	3	56	47	48	79	76	$2:4(\frac{1}{2})$
		=	<	<	>	>	>	

DIAGRAM OF BARS I(A)

PERCENTAGE OF 1-p > (1-q)/q

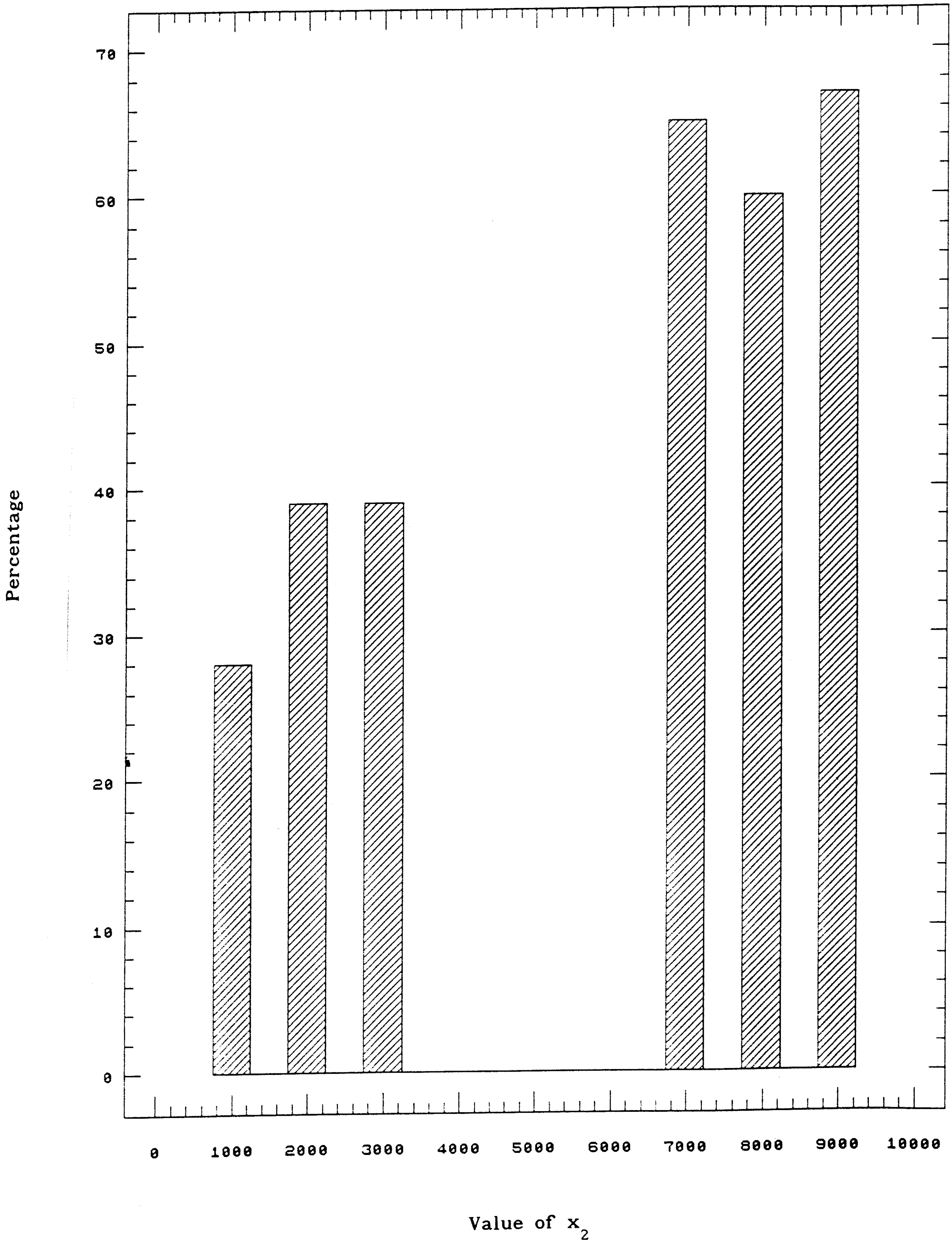


DIAGRAM OF BARS I(B)

PERCENTAGE OF 1-p < (1-q)/q

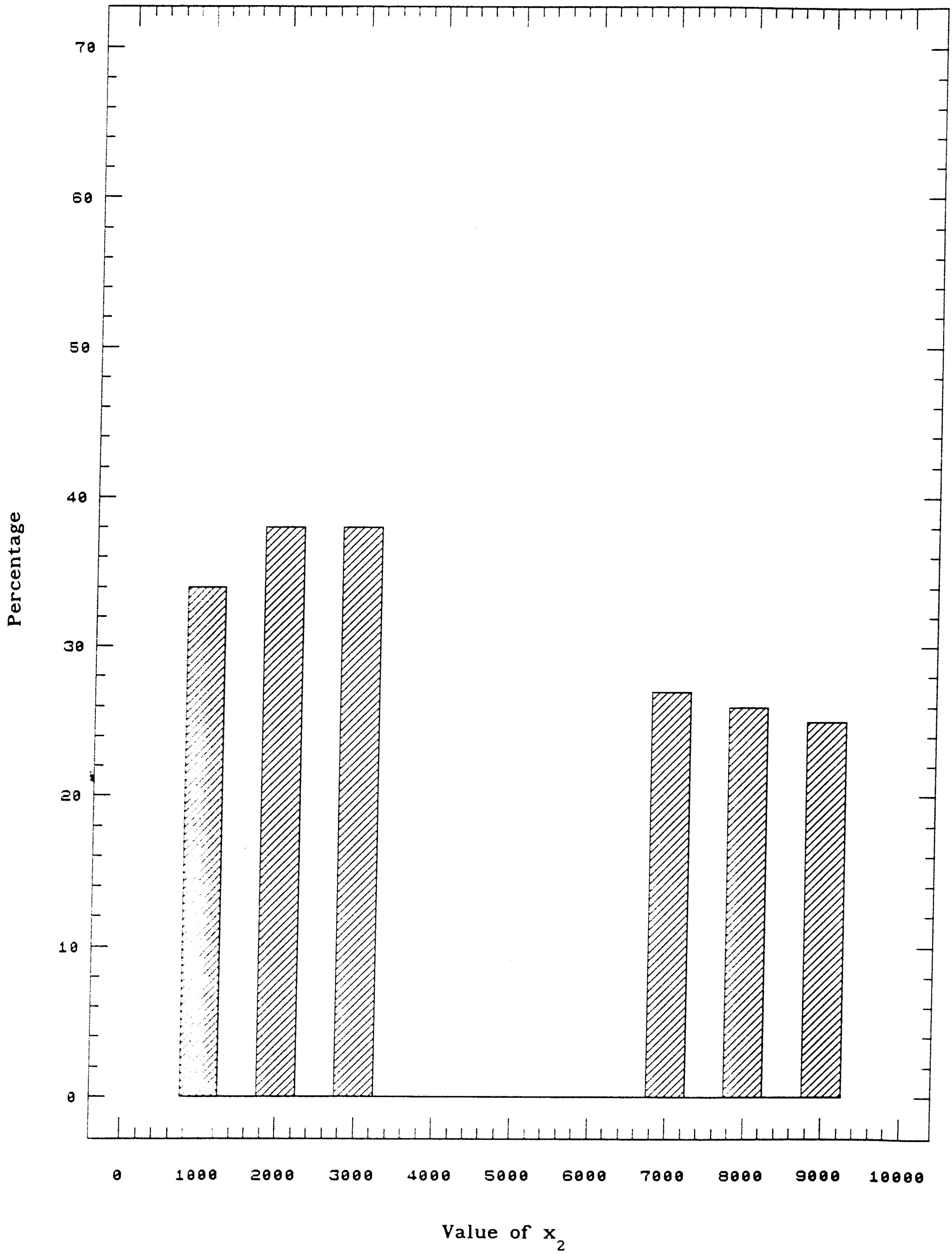


DIAGRAM OF BARS II(A)

EXPERIMENT WITH PAYEMENTS

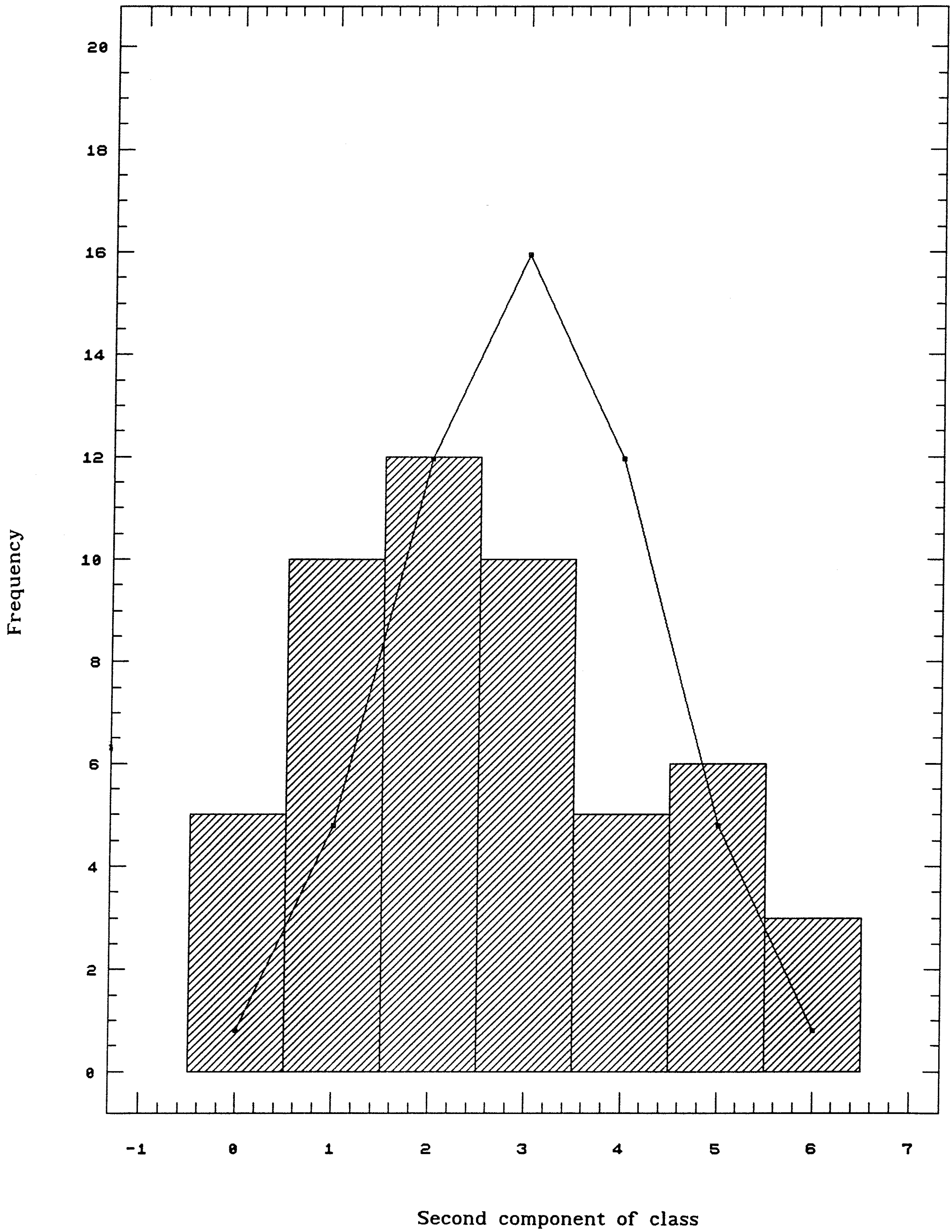


DIAGRAM OF BARS II(B)

EXPERIMENT WITH PARTIAL PAYEMENTS

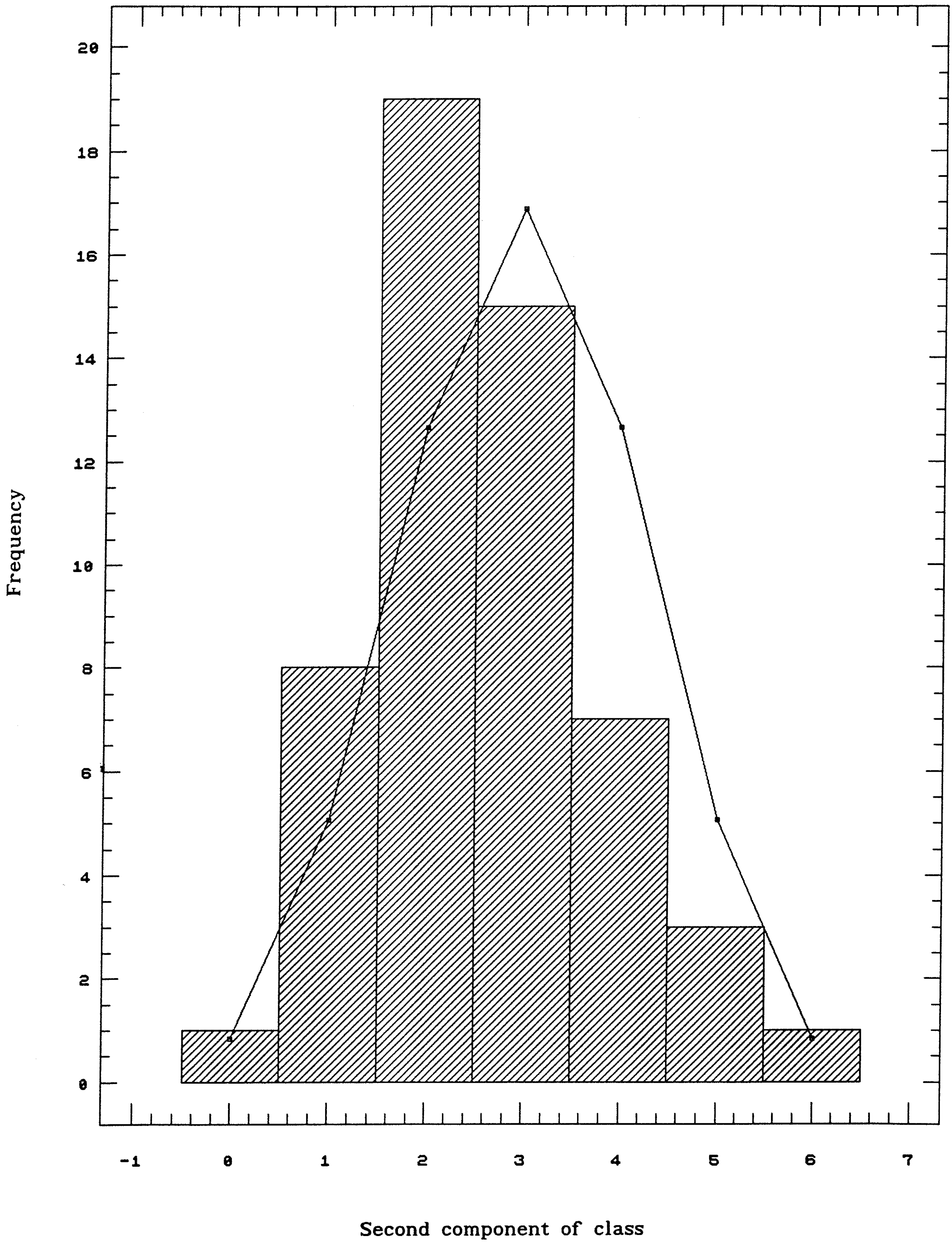


DIAGRAM OF BARS II(C)

GLOBAL DATA

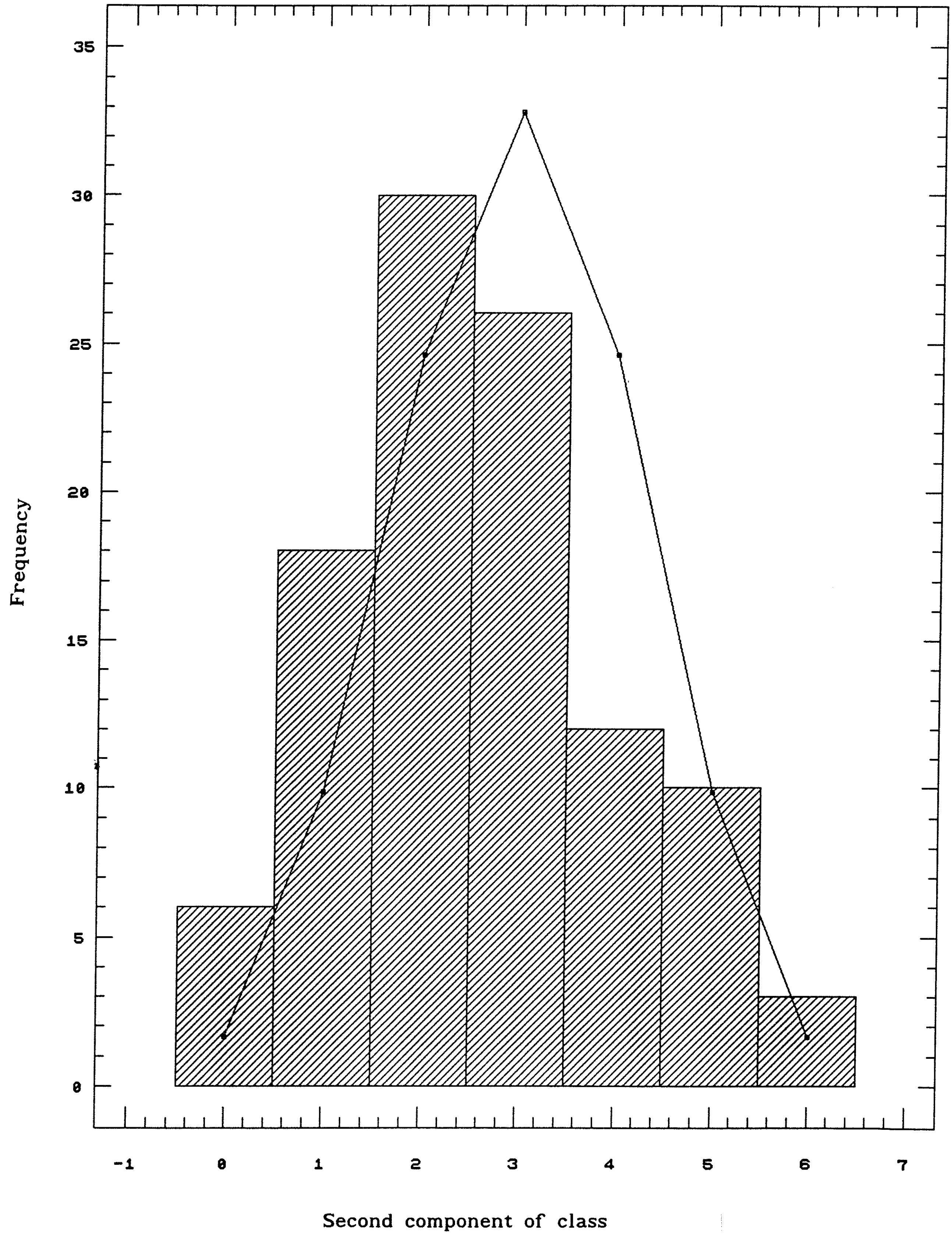


DIAGRAM III(A)

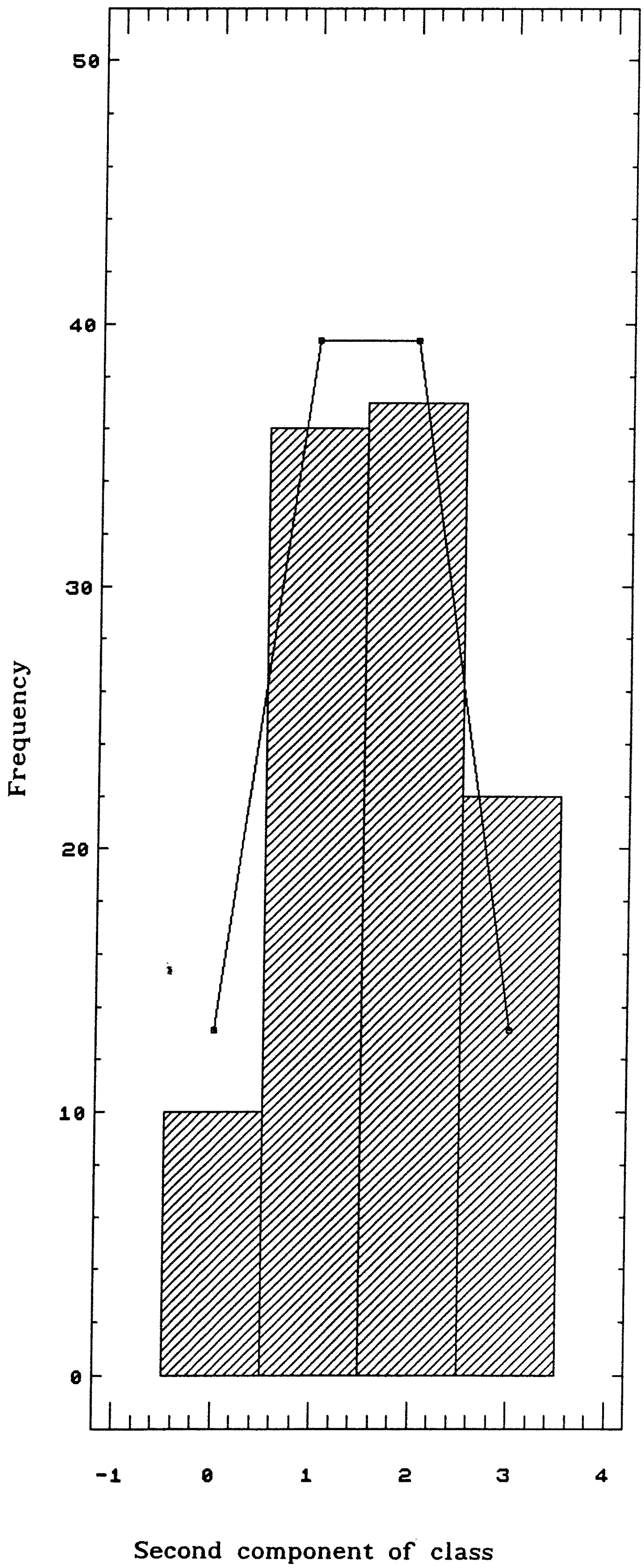
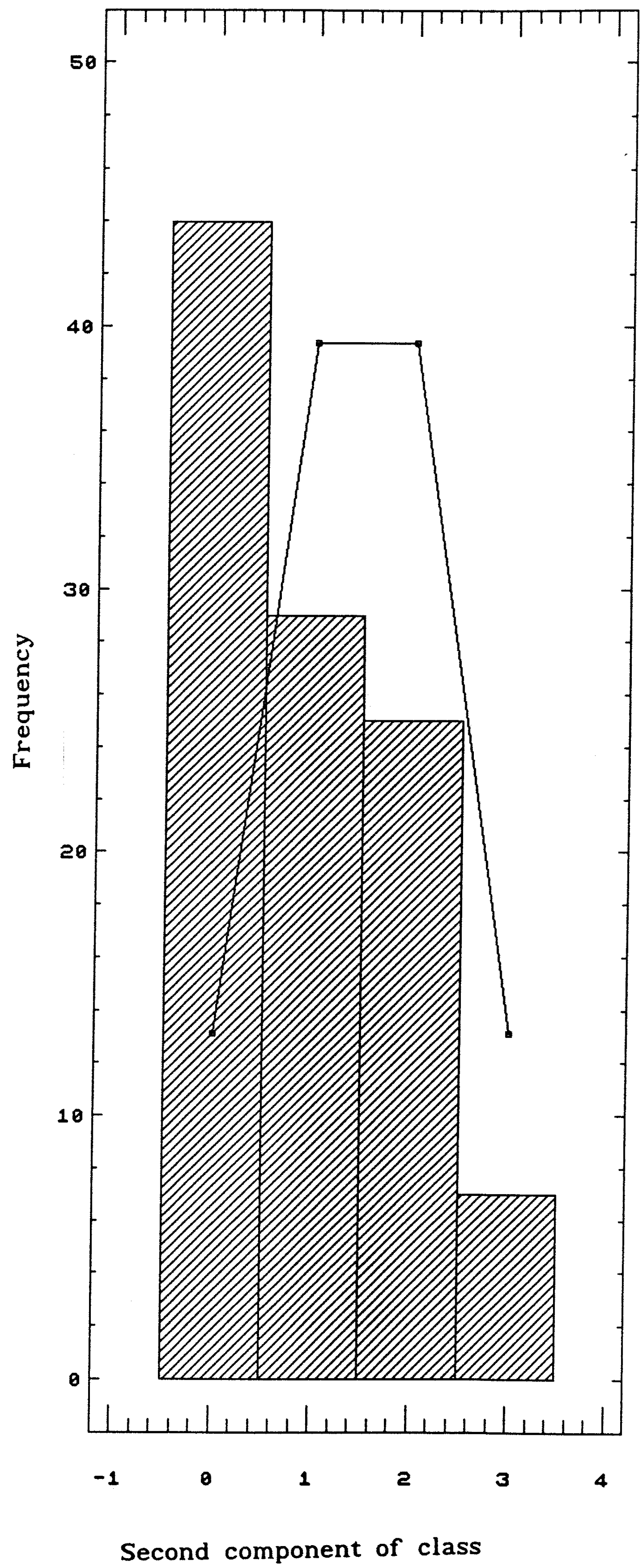


DIAGRAM III(B)



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