Elisabetta Strazzera*
DRES and CRENoS
University of Cagliari, Italy
strazzera@unica.it

OPTION VALUES AND FLEXIBILITY PREFERENCE

Abstract: Preference for flexibility is a behavioral attitude displayed by people that prefer reversible to irreversible actions, and that are willing to pay a premium in order to maintain the possibility of changing their decision. This paper provides a functional characterization of preference for flexibility, based on the notion of option value. The proposed theory is shown to be useful to explain the success of marketing policies that guarantee reimbursement in consumption goods and financial markets. Moreover, it is possible to interpret some "puzzles" about observed economic behavior: for example, choice of apparently inferior solutions when economic, or political, choices involve high degrees of irreversibility.

December 1998

---

* I would like to thank R.Duncan Luce for kind hospitality at the Institute of Mathematical Behavioral Science, UC -Irvine, and Aldo Montesano and Bernie Grofman for useful suggestions on previous drafts. Responsibility for any errors remains mine.

1. Introduction

When choosing about consumption or investment allocations, people make decisions that often constrain their future welfare. Granted that these choices are optimally taken given the individual's current preferences and information, the ranking of alternative solutions may be dramatically changed later, producing *ex-post* suboptimal allocations. These changes may be due to modifications in the physical or socioeconomic environment, or in individuals' tastes. The possibility of a change in the preference ranking[1] introduces uncertainty in the decision making process: individuals must bear the risk of making a decision that eventually could be wrong. They may decide to hedge this type of uncertainty by taking reversible actions: the success of marketing policies that guarantee reimbursement of a purchase if the customer just changes his mind is a clear reflection of this attitude. Similarly, derivatives (or options) are a tool that is increasingly used to entice potential investors in financial markets. Investors that buy the option are able to sell (put option), or to buy (call option) a certain asset at a specified price -within a certain period (expiration time): i.e. they buy the possibility to reverse the present investment decision[2].

Unfortunately, many choices are irreversible, and there is nothing that the individual can do to modify the selected allocation. As we will see more clearly in the next section, when one or more alternatives are irreversible, the decision process often produces suboptimal solutions. In some cases inferior allocations may be selected; in other situations the decision process may even get stuck, i.e. the economic agent prefers not to move from her present position, even if it would be profitable to do so.

---

[1] This paper is only concerned with exogenous changes in preferences: for models dealing with endogenous changes (i.e. determined by the action selected) cfr. Besley and Coate (1998).

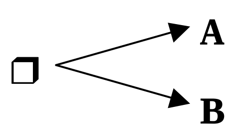
[2] It may be added that these policies can be profitable if in fact most choices are not reversed. Many experimental studies seem to confirm that physical possession has the effect of increasing the value that individuals assign to a good: an example is given by observed differences between willingness to pay to get a good, and willingness to accept for selling it. Even after controlling for strategic behavior, WTA turns out to be substantially higher than WTP (cfr. Adamowicz et.al (1993), Kahneman et al. (1990), Knetsch and Sinden (1984)).

The flexibility preference motive described in this paper may help to interpret such empirically observed patterns in decision making, that, if analysed by means of received theory, may not be explained. Also, it accounts for market success of reimbursement guarantees, or financial derivatives. It will be shown that by relaxing the assumption of neutrality toward mixtures of distributions, we can "rationalize" (i.e. interpret, predict) those choices.

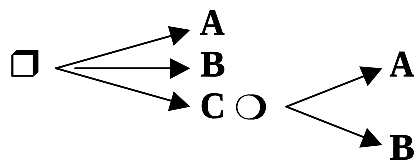
The paper is organized as follows: in section 2 we analyse the decision framing when one or more alternatives object of the choice are irreversible. In section 3 we propose a model for decision makers that prefer flexible solutions. Sections 4 and 5 present a formal characterization of the model, and section 6 concludes the paper.

2. Choice and irreversibility

In this section we describe the structuring of decisions when one or more alternatives are characterized by irreversibility. Suppose first that the decision maker has to choose between alternative ***A*** and alternative ***B***. If the choice is irreversible, the decision process can be described by the following decision tree:



where the square symbol represents a choice node. After the individual takes one of the two alternatives, the decision process ends. Suppose instead that an action allowing reversibility is available. The decision tree can be represented as follows:



where ***C*** represents a choice that produces reversibility: for example, the choice of shopping in a store where reimbursement policies are offered. If alternatives ***A*** or ***B*** are directly selected, the decision process ends; if ***C*** is selected, the final allocation (***A*** or ***B***) is, *ex ante*, an outcome of a probabilistic distribution, stemming from a chance node (the round symbol): whatever alternative should he choose now, there is some chance that it will be reversed later.

In fact, the bundle ***C*** is, *ex ante*, a probability distribution: in particular, it is a binomial distribution with ***A*** and ***B*** as possible outcomes. Moreover, since ***A*** and ***B*** are distributions (that may or may not be degenerate), ***C*** should be regarded as a mixture distribution, i.e. a probability compound of ***A*** and ***B.***

Given a preference ranking of ***A*** and ***B***, the standard microeconomic assumptions about the economic agents' rationality have strong implications about the final choice: if ***A*** is strictly preferred to ***B***, then, for an expected utility maximizer, it will also be preferred to ***C***, so the first choice node is automatically solved. This is necessarily so also for other models of choice that satisfy the so-called betweenness axiom according to this assumption, a linear combination (mixture) of two indifferent probability distributions is also indifferent. If instead betweenness is not satisfied[3]:, individuals may display attraction or aversion toward mixtures of distributions. In the first case it may happen that ***C*** (which is a mixture of ***A*** and ***B***) is preferred to ***A*** (and ***B***, necessarily); in the second instance, it may happen that ***C*** is less preferred than ***B*** (and ***A***, necessarily).

---

[3] As far as we know, the weakest (least restrictive) betweenness model is the Implicit Expected Utility model proposed by Dekel (1986). The most popular model that relaxes the assumption of betweenness is the Rank Dependent Expected Utility model, first proposed by Quiggin (1982), with further developments by the same author and, among others, Chew, Karni, Safra, Segal, Wakker (cfr. Quiggin, 1993). Other non-betweenness models include Machina's Generalized EU model (1982) and Kahneman and Tversky's Prospect Theory (1979).

If a reversal option is not available, the decision maker knows that once her choice has made, she cannot turn back. Suppose that ***A*** is strictly preferred to ***B***; also, suppose that the individual displays preference toward mixtures, so much that ***C*** would be strictly preferred to either of them. Unfortunately, ***C*** is available only as a non choice. In this situation the decision process may get stuck: if for the decision maker the equivalent variation[4] for a change from ***C*** to ***A*** is higher than the opportunity costs deriving from inaction, she will prefer not to choose any alternative. It should be noticed that we are considering a situation where the relevant information about the two distributions is constant, so there is not any gain in waiting[5]. Here, it is the aversion to commitment, or to the risk of making a wrong decision, that motivates the desire of a flexible choice.

When such a behavior is analysed under the expected utility framework, it must be considered irrational: according to that model, ***A*** should be strictly preferred to both ***B*** and ***C***, no compensation would be necessary to move from the status quo to the new allocation, and consideration of opportunity costs would urge to a fast decision. However, this behavior is frequently observed in public choice, and it can be interesting to give an interpretation rather than just marking it as irrational.

Another apparently irrational situation may arise when ***A*** is an irreversible choice, strictly preferred to ***B***, which is reversible; and again the mixture of the two, ***C,*** is strictly preferred to either distribution. For example, suppose that a policy maker strictly prefers land development ***A*** to a conservative project ***B***, but is not willing to bear the risk of a wrong (irreversible) decision. Now, ***C*** is feasible either in the status quo (no choice), or when the reversible alternative is taken: therefore, it may happen that the policy maker will actually choose ***B***, keeping the option of reversing the decision later. While the *revealed* preference is not rational (***A*** is strictly preferred to ***B***, but ***B*** is chosen), the decision can be explained if we think that ***C*** rather than ***B*** is the object of the choice. Again, this result is ruled out if neutrality toward mixtures is assumed.

---

[4] I.e. the variation in individual's income that would lead to the same level of welfare as choosing the bundle A.

[5] A different approach to the theory of flexibility uses the notion of quasi-option value, first introduced by Arrow and Fisher (1974) and Henry (1974). It focuses on the value of information that reduces the variability of the payoff distribution.

3. A model for flexible choices

The very existence of the aforementioned markets for financial derivatives suggests that preference for flexibility implies a willingness to pay some price for it, as it was already pointed out by Strotz (1956). This amount is referred to as the option value, that in the words of Mitchell and Carson (1989) can be defined as "the amount that people will pay for a contract which guarantees them the opportunity to purchase a good for a specified price at a specified point in the future, and may be thought of as a risk premium to compensate for uncertainty about future taste, income or supply".

The research on option values had its first start with a paper by Cicchetti and Freeman (Cicchetti-Freeman, 1971). Their decision model was designed for situations where possible changes in the demand of some specific goods did not depend on changes in the preference functional. This allowed comparisons between the utility of the *ex post* distribution (obtained if the option is exercised) with the utility of the *ex ante* distribution (without the option): the theory predicts that the investor buys the option if that utility differential is positive. In this framework, option value and risk premium are exactly the same. However, this model does not apply to situations where future preferences are uncertain. In such a case, the utility stemming from the *ex post* distribution (after exercising the option) cannot be evaluated according to current preferences, as the Cicchetti-Freeman model does. If the individual knows the probability distribution of his future preference functional, he could use it to evaluate the utility of the ex post distribution. If there is much ambiguity, or even hard uncertainty[6], about future preferences, though, any present evaluation of his future preferences distribution would be very difficult or impossible.

However, the Cicchetti-Freeman model can hardly be seen as the appropriate framework to analyze the individual's decision to buy an option. When the individual evaluates his (present) willingness to pay for the option, he presumably compares the present utility from the two distributions that he faces before knowing if he will exercise the option

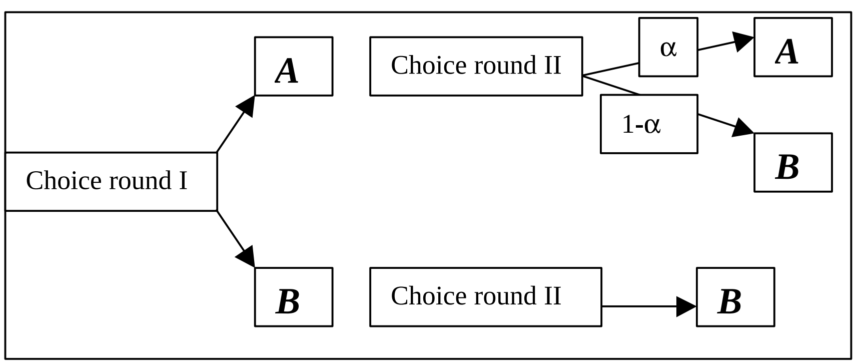
---

[6] Roughly, the term ambiguity refers to situations where vagueness of information about the true probability distribution may induce the formation of different beliefs; the term hard uncertainty refers to situations where lack of information prevents the formation of beliefs about the probability distribution.

or not. One is the degenerate distribution about the irreversible choice. The other is the distribution containing the option that allows reversal of the decision, which is a compound of the two alternatives. For example, suppose that the individual now prefers alternative ***A*** to alternative ***B***, but thinks that a reversal of his preferences in the future is possible. Presumably, he will evaluate both prospects: the first, is ***A***; the second, containing the option, will be a probability mixture of ***A***, weighted by the probability that the individual assigns to maintaining the present choice, say a; and ***B***, weighted by the complementary probability ($1-a$) that he assigns to the action of exercising the option, reversing his decision. The individual then evaluates the distribution ***A*** and the distribution [a,***A***;(1-a),***B***] according to his present preference function. It is important to emphasize that the decision model should take into account the probability that the option will be actually used: for example, the option value for a consumer who is almost certain to return his purchase is presumably higher than that of another consumer who is almost certain to keep it.

The problem can also be framed in game-theoretic terms, as a two stage game[7]:

The problem can also be framed in game-theoretic terms, as a two stage game[8]:



[7] I am grateful to Bernie Grofman for suggesting this framework to help the exposition.

[8] I am grateful to Bernie Grofman for suggesting this framework to help the exposition.

Here, picking A on round one does not foreclose B on round 2: it is equivalent to choosing a distribution C with alternative payoffs A and B, so in a sense it is a mixed strategy. If you pick B on round 1 you certainly get B on round 2: it can be seen as choosing a pure strategy.

The model presented in this paper takes into account the probabilistic nature of the option. It compares probability mixtures of distributions, where the option value, and the decision to buy the option, is dependent on the probability that the individual assigns to the exercise of the option. The option value will be defined, analogously to the risk premium in the theory of risk aversion, as the difference between the expected value of the distribution without the option and the expected value of the distribution containing the option. This notion will serve as an indicator of flexibility. As we will explain in the course of the paper, preference for flexibility is related to the attitude toward mixtures of distributions. The Expected Utility model assumes neutrality toward mixtures; other models allow for aversion or attraction toward mixtures.

4. A Characterization for Option Values

We discuss situations where the decision maker faces two alternatives: one being riskier, and with higher returns, than the other. We choose this setting because it is more general, involving both attitudes toward risk and flexibility. When the relevant distributions have the same degree of risk the framework of this model can be applied as well, with straightforward modifications. For simplicity, the following discussion will be in terms of an investment in a risky financial asset, but it applies to other risky choices as well: for example, decisions about development or preservation of some wilderness area, where the former can be seen as a riskier strategy, and the latter a less risky, but also less profitable, strategy.

Suppose that a decision maker is thinking about investing on an asset that will give returns with distribution $F(x+e)$, where x is some level of base wealth (that may be random itself), and ε is a mean preserving spread (Rothschild and Stiglitz (1970)) type of risk, so that $E(x+e)=E(x)$. Also, suppose that when the investor buys the risky asset, he can also buy an option, which allows him to sell the asset at some predetermined price (the exercise price) before resolution of uncertainty about ε. A number of clauses might be specified to restrict the right of exercising the option solely upon the realization of some specified events. For example, a foreign investor may buy an option that allows refund of the capital invested only if the rate of exchange should rise above a specified level. Now, let *a* be the probability that the investor assigns to the possibility of exercising the option, and *(1-a)* be the probability that he assigns to the possibility of keeping the riskier asset: then he can consider his portfolio as a mixture *(1-a):a* of the riskier and safer distributions: *(1-a)(x+e)Å(x-y(a))*, where the latter term is the exercise price. The expected value of this mixture distribution is lower than the expected value of *F(x+e)*: we define the difference as the option value.

For x ³0; E[e] = 0 ; a Î [0,1];

let y(a) solve

(x+e) ~ (1-a)(x+e)Å(x-y(a))

Define

Y(a) º

$$\int wdF_{x+e}(w) - \left[(1-a)\cdot\int wdF_{x+e}(w) + a\cdot\int wdF_{x-y(a)}(w)\right]$$

as the option value at a of the distribution (x+e).

The path *(1-a)(x+e)Å(x-y(a))* represents a sequence of indifferent distributions characterized by decreasing risk as *a* increases in the interval *[0,1]*. The difference between the expected value of *(x+e)* and the expected value of *(1-a)(x+e)Å(x-y(a))* is the option value at *a*, i.e. the individual's reservation price for the possibility of exercising the option with probability *a*.

For a risk averse individual it must be true that the option value is increasing in *a*; as *a ® 1* it converges to the absolute risk premium, i.e. the amount that the individual would be willing to pay to get full insurance for the risk.

5. Preferences over Mixtures and Option Values

We show in this section that the assumption of neutrality towards mixtures, contained in the Eut model and in Non Eut models satisfying the axiom of betweenness, implies that the option value $Y(a)$ paid to maintain a probability a of changing decision, is exactly a proportion a of the absolute risk premium p that would be paid to get full insurance for the risk. More formally, we have the following

Theorem 1: *Let $V(\cdot)$ be a preference functional linear on mixtures of distributions; for $\alpha \in [0,1]$, let $\psi(\alpha)$ be the amount that solves:*

$$(1) \quad \int V(w)dF_{x+\varepsilon}(w) = \int V(w)dF_{x-\pi}(w) = \int V(w)d[(1-\alpha) F_{x+\varepsilon} + \alpha F_{x-\psi(\alpha)}](w)$$

Then

$$\Psi(\alpha) = \alpha \cdot \pi.$$

Proof: Let $V(\cdot)$ be a preference functional linear on mixtures of distributions; and let π be the absolute risk premium that solves

$$\int V(w)dF_{x+\varepsilon}(w) = \int V(w)dF_{x-\pi}(w).$$

Since the functional is neutral towards mixtures, we have also:

$$(2) \quad \int V(w)dF_{x+\varepsilon}(w) = \int V(w)d[(1-\alpha) F_{x+\varepsilon} + \alpha F_{x-\pi}](w) = \int V(w)dF_{x-\pi}(w).$$

where the middle term is the utility of the mixture of the other two.

Therefore in this case

$$\int V(w)d[(1-\alpha) F_{x+\varepsilon} + \alpha F_{x-\psi(\alpha)}](w) = \int V(w)d[(1-\alpha) F_{x+\varepsilon} + \alpha F_{x-\pi}](w)$$

i.e. when preferences display neutrality toward mixtures of distributions, $\psi(\alpha)$ is equal to π.

The option value for this type of functional is therefore given by the following expression:

$$\Psi(\alpha) = \int w \, dF_{x+\varepsilon}(w) - \int w \, d[(1-\alpha) F_{x+\varepsilon} + \alpha F_{x-\pi}](w)$$

which is the difference between the expected value of the risky asset, and the expected value of the asset with option. From the above equation we have:

$$Y(a) = a^x \int w \, dF_{x+e}(w) - \int w \, dF_{x-p}(w).$$

and since the expected value of the distribution F_{x+e} is $E(x)$, we obtain:

$$Y(a) = a^x p.$$

Corollary 1: If the preference functional is linear on mixtures of distributions, the term $y(a)$ is equal to p for all a.
Proof: Obvious.

Corollary 2: If the preference functional is concave (i.e. the contour curves are convex) on mixture of distributions, the option value $Y(a) \geq a^x p$. If the preference functional is convex (i.e. the contour curves are concave) on mixture of distributions, the option value $Y(a) \leq a^x p$.
Proof: Substitute ≤ (resp. ≥) to the sign = before the mixture in (2).

The amount $Y(a)$ can be considered as an indicator of preference for flexibility: if $Y(a)$ is greater than $a^x p$, then the individual displays preference for flexibility. If the two distributions are characterized by the same degree of risk, so that the risk premium is null, the option value associated to any mixture of the two is to be attributed entirely to the preference for flexibility motive.

The results of this section indicate that an individual with a strong preference for flexibility is also willing to pay a higher price for it than individuals characterized by other types of preferences, in accordance to the aforementioned definitions given by Strotz and Mitchell and Carson.

6. Conclusions

In section 2 we considered a couple of examples where at least one of the alternatives is irreversible. In these situations we have seen that actual choices may differ from stated preferences, because of a preference for flexible solutions. Preference for flexibility can be modeled as a preference for mixtures of distributions: an individual characterized by this type of preferences would require a premium (option value) to move from a mixture distribution to a "pure" distribution. A reversible alternative, or the status quo may be considered as mixture distributions: in both cases either alternative is still available.

Of course, each choice is associated to some opportunity costs. Suppose that the opportunity costs associated to the mixture distribution are higher than those that should be borne if the alternative is chosen. If the option value for the mixture distribution is higher than the opportunity costs, the decision maker will anyway reasonably choose the mixture distribution: i.e. the reversible alternative, or, if not available, the status quo.

However this result holds only if the standard assumptions about decision making under uncertainty are relaxed.[9] If EUT or other models that assume betweenness (i.e. preferences are linear over mixtures of distributions) are used to model the decision process, no option value would arise, and the choice described above must be considered irrational.

We have seen in the course of this paper that taking into account the preference for flexibility motive may help to give a rationale to these choices, and interpret, or predict, the outcome. Of course, even if these choices are given a rationale, they still remain suboptimal. If we consider public choices, this attitude can be considered as a serious cause of political failure: policy makers may feel inclined to hedge uncertainty about their own, or their electors', change of preferences by choosing reversible actions- or, sometimes, not choosing at all, clinging to the status quo[10], even if it would be more profitable to take different actions. An example is the incapacity of many regional governments in European Union to spend their investment allowances. A correction mechanism would be useful.

Many researchers in public choice and political science stress the importance of direct participation of people to public decision. Bohnet

---

[9] Similar results are obtained, under more stringent behavioral assumptions, by Benartzi and Thaler (1995) in their research on the equity premium puzzle observed in financial markets: they assume myopic loss aversion, which is a behavioral hypothesis supported by a particular model implying preference for mixtures of distributions.

[10] Another important form of risk hedging is prudence (see Kimball, 1990, 1993): a typical example is precautionary savings, that in our context may be represented by a decision of developing part of the land, and preserving the remaining part. This strategy is not always feasible.

and Frey (1994) find experimental and empirical evidence (for Switzerland) of the importance of direct democracy instruments for stable and successful policies. Doeleman (1997) suggests use of referenda[11] to correct possible distortions in the political agenda setting. In the light of the results of our work, we can add that by transferring part of the responsibility from the policy maker to the voters, these instruments can help to quicken the decision process when the irreversible nature of the choices involved seems to hamper it. Indeed, in California the use of referenda as a device to decide on the provision of local public goods has increased so much that some researchers (cfr. Schrag (1996)) talk of "referendum madness". Opinion polls, contingent valuation analyses, and other forms of sample surveys may represent, in many cases, a valid and more convenient alternative to general referenda.

[11] Doeleman argues that politicians are generally opposed to referenda, since they can be considered as means of sanction to the politician actions. While this is certainly true for abrogative referenda, the argument does not hold for propositive referenda, here interpreted as a hedge that politicians may use against the risk of wrong irreversible choices.

References

ADAMOWICZ, W.L., V. BHARDWAJ and **B. MACNAB** (1993), “Experiments on the Difference between Willingness to Pay and Willingness to Accept”, *Land Economics*, 69, pp. 416-27.

ARROW, K.J. (1974), Essays in the Theory of Risk-Bearing, North Holland, Amsterdam.

ARROW, K.J. and **A.C. FISHER** (1974), "Environmental Preservation, Uncertainty and Irreversibility", Quarterly Journal of Economics, 88, pp. 312-319.

BENARTZI, S. and **R. THALER** (1995), "Myopic Loss Aversion and the Equity Premium Puzzle", Quarterly Journal of Economics, 110, pp.75-92.

BESLEY, T. and **S. COATE** (1998), "Sources of Inefficiency in a representative Democracy: a Dynamic Analysis", The American Economic Review, 88(1), pp. 139-56.

BOHNET, I. and **B.S. FREY** (1994), "Direct Democracies Rules: the Role of Discussion", Kyklos, 47(3), pp. 341-54.

CICCHETTI, C.J. and **A.M. FREEMAN III** (1971), "Option Demand and Consumer Surplus: Further Comment", Quarterly Journal of Economics, 85, pp.528-539.

DEKEL, E. (1986) "An Axiomatic Characterization of Preferences under Uncertainty: Weakening the Independence Axiom", Journal of Economic Theory, 40, pp.304-18.

DOELEMAN, J.A. (1997) "Democracy and Environment", International Journal of Social Economics, 24, pp.105-27.

HENRY, C. (1974), "Option Values in the Economics of Irreplaceable Assets", Review of Economic Studies, 41, pp.89-104.

KAHNEMAN, D., J.L. KNETSCH, and **R.H. THALER** (1990), "Experimental Tests of the Endowment Effect and the Coase Theorem", *Journal of Political Economy*, 98, pp.1325-48.

KAHNEMAN, D. and **A. TVERSKY** (1979), "Prospect Theory: an Analysis of Decision under Risk", Econometrica, 47, pp.263-91.

KIMBALL, M.S. (1990), "Precautionary Saving in the Small and in the Large", Econometrica, 58, pp.53-73.

KIMBALL, M.S. (1993), "Standard Risk Aversion", Econometrica, 3, pp. 589-611.

KNETSCH, J.L. and **J.A. SINDEN** (1984), "Willingness to Pay and Compensation Demanded: Experimental Evidence of an Unexpected Disparity in Measures of Value", Quarterly Journal of Economics, 99, pp.507-21

MACHINA, M.J. (1982), "Expected Utility Analysis without the Independence Axiom", Econometrica, 50, pp.277-323.

MITCHELL, R.C. and **R. CARSON** (1989), Using Surveys to Value Public Goods: the Contingent Valuation Method, Resources for the Future, Washington D.C.

QUIGGIN, J. (1982), "A Theory of Anticipated Utility", Journal of Economic Behavior and Organization, 3(4), pp. 323-43.

QUIGGIN, J. (1993), Generalized Expected Utility Theory: The Rank-Dependent Model, Kluwer Academic, Norwell, Mass. and Dordrecht.

ROTHSCHILD, M. and **J.E. STIGLITZ** (1970), "Increasing Risk: I. A Definition", Journal of Economic Theory, 2, pp.225-243.

SCHRAG, P. (1996), "Take the Initiative, Please: Referendum Madness in California", American Prospect, 0, pp.61-63.

STROTZ, R.H. (1956), "Myopia and Inconsistency in Dynamic Utility Maximization", Review of Economic Studies, 23, pp.165-80.

Finito di stampare nel dicembre 1998 presso la litografia SOLTER
Via Tolmino 33, Cagliari - Tel 282249

Impianti forniti da CRENoS

Contributi di Ricerca CRENoS

Gli abstract sono disponibili in: **http://www.crenos.unica.it**

95/1 Antonio Sassu, Raffaele Paci, Stefano Usai, "Patenting and the Italian Technological System"

95/2 Rinaldo Brau, "Analisi econometrica della domanda turistica in Europa: implicazioni per lo sviluppo economico delle aree turistiche"

95/3 Sergio Lodde, "Allocation of Talent and Growth in the Italian Regions"

95/4 Stefano Usai, Marco Vannini, "Financial Development and Economic Growth: Evidence from a panel of Italian Regions"

95/5 Raffaele Paci, Stefano Usai, "Innovative Effort, Technological Regimes and Market Structure"

96/1 Rinaldo Brau, Elisabetta Strazzera, "Studio di valutazione monetaria per il parco nazionale del Gennargentu. Indagine preliminare"

96/2 Emanuela Marrocu, "A Cointegration Analysis of W.A. Lewis' Trade Engine Theory"

96/3 Anna Maria Pinna, "Sectoral Composition of Trade and Economic Growth: some New Robust Evidence"

96/4 Riccardo Marselli, Marco Vannini, "La criminalità nelle regioni italiane: il ruolo del sistema sanzionatorio, delle motivazioni economiche e del contesto sociale"

96/5 Raffaele Paci, Riccardo Rovelli, "Do Trade and Technology reduce Asymmetries? Evidence from Manufacturing Industries in the EU"

96/6 Paolo Piacentini, Paolo Pini, "Domanda, produttività e dinamica occupazionale: un'analisi per "moltiplicatori""

96/7 Raffaele Paci, Francesco Pigliaru, "β-Convergence and/or Structural Change? Evidence from the Italian Regions"

96/8 Daniela Sonedda, "Commercio internazionale e crescita economica nei casi della Corea del Sud e delle isole Filippine: un'analisi di causalità"

96/9 Raffaele Paci, "More Similar and Less Equal. Economic Growth in the European Regions"

96/10 Elisabetta Schirru, "Modelli di determinazione del tasso di cambio: un'analisi di cointegrazione"

96/11 Riccardo Contu, "Rapporti scientifico-contrattuali e adattamenti istituzionali nella dinamica impresa-accademia: persistenza delle New Biotechnology Firms nell'industria biotecnologica USA degli anni '90"

96/12 Francesco Pigliaru, "Economia del turismo: note su crescita, qualità ambientale e sostenibilità"