The Economic Journal, **97** (*September* 1987), 666–684
Printed in Great Britain

ANTICIPATION AND THE VALUATION OF DELAYED CONSUMPTION*

George Loewenstein

> 'When calculating the rate at which a future benefit is discounted, we must be careful to make allowance for the pleasures of expectation.' (Marshall, 1891, p. 178)

Of the various assumptions underlying analyses of intertemporal choice, perhaps the assumption of positive discounting is the most widespread and noncontroversial. Empirical work which has sought to estimate individual discount rates (Hausman, 1979; Landsberger, 1971) has provided no grounds for questioning this assumption. In fact, a recent study which explicitly questioned the general applicability of positive discounting concluded that 'the case for positive time preference is absolutely compelling' (Olson and Bailey, 1981).

Yet it requires little effort to think of examples of behaviour in which negative discounting is apparent. The pleasurable deferral of a vacation, the speeding up of a dental appointment, the prolonged storage of a bottle of expensive champagne are all instances of this phenomenon. Indeed, if R. H. Strotz had begun his work thirty years ago with behaviour such as this in mind, he might have developed a critique of Discounted Utility theory (DU) equally as compelling as his work on myopia but pointing towards research very different from what has actually ensued from his work. Instead, in introducing the broad concept of 'time inconsistency', Strotz devoted his attention exclusively to a subdomain of instances in which the economic actor behaves more myopically in the present than he previously had planned. While the focus on impulsivity has offered important theoretical insights it may have impeded recognition of the existence and interest of other phenomena, such as low or negative discounting. A more inclusive theory of intertemporal choice should be able to account for both extremes of behaviour — myopic and far-sighted. Such a model is proposed here.

The model modifies DU by introducing an insight once recognised by economists: that anticipation of the future has an impact on immediate well-being.[1] This observation can be traced to Bentham (1789), who included among the ingredients of utility, pleasures and pains that derive from anticipation. For Bentham, anticipation, like consumption itself, was an important source of pleasure and pain.

* I thank Robert Abelson, Richard Levin, Sidney Winter, John Geanakoplos, Howard Kunreuther, Colin Camerer, Mark Machina and Robin Pope for their helpful suggestions. The support of the Institute for Advanced Study, in Princeton, is gratefully acknowledged.

[1] In exploring the relationship between anticipation and time discounting, the current paper is akin to the recent work of Pope (1983), who examined the role of anticipation in risk aversion, and Wolf (1970), who discussed the implications for intertemporal choice of utility from memory.

Jevons who was one of the first to apply the Benthamite concept of utility to understanding intertemporal trade-offs, wrote: 'Three distinct ways are recognisable in which pleasurable or painful feelings are caused:

(1) By the memory of past events;
(2) By the sensation of present events;
(3) By anticipation of future events.' (1905, p. 3)

The latter, which Jevons termed 'anticipal pleasure' and 'anticipal pain' were, if anything, the most important for understanding economic behaviour: 'The science of economics is very largely occupied in studying man's efforts to obtain anticipal pleasure by the provision of stocks of goods for future use: almost all the complicated practices of production and exchange resolve themselves ultimately into manifestations of these efforts' (1905, p. 65). In what follows, the term 'savouring' refers to positive utility derived from anticipation of future consumption; 'dread' refers to negative utility resulting from contemplation of the future.

I. AN ILLUSTRATIVE STUDY

Fig. 1 summarises results from a survey in which 30 undergraduates were asked to specify the 'most you would pay now' to obtain (avoid) each of five outcomes, immediately, and following five different time delays. The outcomes were: (1) obtain four dollars; (2) avoid losing four dollars; (3) avoid losing one thousand

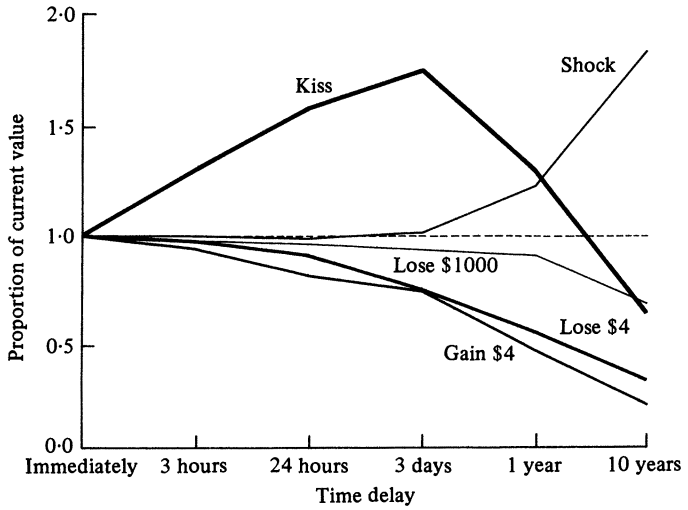

Fig. 1. Maximum payment to obtain/avoid outcomes at selected times. Proportion of current value ($N = 30$).

dollars; (4) avoid receiving a (non-lethal) one hundred and ten volt shock, and (5) obtain a kiss from the movie star of your choice. Time delays were: (1) immediately (no delay); (2) in twenty-four hours; (3) in three days; (4) in one year; (5) in ten years. Subjects were asked to specify the most they would pay

for every combination of outcome and time delay. They were told to assume that all outcomes were certain to occur at the designated time. Summary statistics for the study are presented in Appendix 1.

It can be seen that the two non-monetary items, the kiss and the shock, both exhibit unusual patterns of devaluation. DU, with positive discounting, predicts that people will prefer to consume desired outcomes as soon as possible. This prediction is contradicted by the kiss item. Subjects on average were willing to pay more to experience a kiss delayed by 3 days than an immediate kiss or one delayed by three hours or one day. Data presented later in this paper show that the hump-shaped pattern of devaluation evident in Fig. 1 is common for desirable consumption that is fleeting.

Likewise, DU asserts that people prefer to delay undesirable outcomes whenever possible. The shock item contrasts sharply with this prediction. Subjects were, on average, willing to pay slightly more to avoid a shock that was delayed for 3 hours to 3 days than to avoid an immediate shock. They were willing to pay substantially more to avoid a shock delayed by one or ten years. In contrast to the patterns of responses for the kiss and shock, the money amounts included in the survey appear to be discounted in the normal fashion.

Why haven't patterns of intertemporal preference such as those exhibited towards the kiss and shock appeared in earlier empirical work on intertemporal choice? Several answers are possible. In some cases, economists have attempted to infer intertemporal preferences from behaviour in which such preferences were irrelevant to behaviour. Hausman's attempt to estimate individual discount rates from air-conditioner purchases provides an example. Air conditioners vary in purchase price and energy efficiency, thus creating a choice between immediate versus deferred payments. Hausman, by observing the price/efficiency rating of a purchased air-conditioner, attempted to impute the discount rate of the purchaser. The problem with this approach is that individual discount rates should be irrelevant to what model is purchased. If consumers are able to save and dissave (or borrow) at established interest rates, they should logically purchase the model of air conditioner that minimises, at the desired level of cooling capacity, the net present value of the time stream of payments.[2] Similar considerations may have caused subjects in the current experiment to discount the money amounts in a conventional manner, in contrast to their behaviour towards the kiss and shock.

In other cases, economists have attempted to estimate discount rate from individual saving behaviour, but such attempts are even more problematic since individuals have little influence on interest rates. The interest rate at which an individual saves or borrows gives no information about his or her own discount rate and hence it is necessary to infer discount rates from level or rate of saving, a process that is extremely sensitive to the specification of the model used to represent the savings decision. Furthermore, savings behaviour depends on so many factors other than discount rates (e.g. expected future income streams,

[2] His finding of substantial differences in discounting between different income groups suggests either that unobserved economic factors such as liquidity constraints were operative, or that consumers were failing to behave rationally.

projected needs) that it is exceedingly difficult to isolate the effect of time preference on saving.

In this paper it is argued that patterns of preference such as those exhibited towards the kiss and shock, and other DU anomalies discussed below, can be explained by incorporating Jevons' anticipal pleasure and pain into an otherwise standard model of intertemporal choice. In what follows, such a model is developed in the simplest possible terms, and its implications are discussed.

II. THE MODEL

The following model explores the question of how an individual values a single future act of consumption under conditions of certainty. The model depicts a consumer at time t_0 who anticipates consuming x at time $T \geqslant t_0$. Consumption is assumed to yield a constant stream of utility, $U(x)$, beginning at time T and continuing for duration L, after which it drops to zero. Formally:

$$U_t^c(x, T, L) = U(x) \quad \text{for} \quad T \leqslant t \leqslant T+L, \qquad (1)$$
$$= 0 \quad \text{otherwise}$$

where U_t^c indicates utility experienced at time t from consumption.

At any time t between t_0 and T (when consumption begins) the individual derives utility from anticipation, U_t^A. Utility from anticipation is assumed to be proportional to the integral of utility from consumption discounted at a rate of δ. δ is not the conventional discount rate, but a measure of the degree to which the individual derives immediate utility from anticipated consumption. Thus savouring or dread at each point t is equal to:

$$U_t^A(x, T, L) = \alpha \int_T^{T+L} e^{-\delta(\tau - t)}\, U(x)\, d\tau \qquad (2)$$

$$= \frac{\alpha}{\delta} U(x)\, e^{-\delta(T-t)}\, (1 - e^{-\delta L}). \qquad (3)$$

This formulation has four desirable properties discussed by Jevons in his enumeration of the laws of anticipal pleasure and pain. Referring to anticipation of a planned vacation, Jevons wrote:

> The intensity of the anticipation will be greater the longer the holiday; greater also, the more intensely one expects to enjoy it when the time comes. In other words the amount of pleasure expected is one factor determining the intensity of anticipal pleasure. Again, the nearer the date fixed for leaving home approaches, the greater does the intensity of anticipal pleasure become: at first when the holiday is still many weeks ahead, the intensity increases slowly; then, as the time grows closer, it increases faster and faster, until it culminates on the eve of departure (1905, p. 64).

In the current formulation, as Jevons proposed, utility from anticipation, U_t^A, is a positive function of L, the duration of consumption, a positive function

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS
Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS
Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS
Sync your system to PACER to automate legal marketing.