Measuring Offender Discount Rates: An Overview of the Issues and a Suggested Methodology

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Criminologists assert that some offenders exhibit impulsive behaviour. If this is correct then this impulsiveness will manifest itself through high discount rates. However discount rates are difficult to observe and measure. In this paper a methodology is proposed, which considerably reduces the complexity of this task, through observing the offender's actual plea decision. This is a valuable exercise because the results can be usefully utilised in formulating policy as well as providing insights into offender psychology.

Introduction

It is a well accepted principle in economic and finance theory that a dollar received now is not equivalent to a dollar received one year subsequently because the former can be invested for a period of time at the market interest rate. If the dollar is invested it cannot be consumed now and conversely, if it is consumed now it cannot be invested. Current and future consumption are like two commodities and differences in preferences for these are therefore reflected in differences in relative prices. The relative price of the present in terms of future consumption is equal to (1 + r); i.e. giving up one dollar of present consumption yields a future return of (1 + r) units of future consumption where 'r' is the interest rate paid on foregone present consumption. Interest rates prevailing in an economy reflect social rates of time preference or the social discount rate. The two latter terms have the same meaning and will be used interchangeably in this article. High interest rates imply a low level or relative scarcity of total savings and high social time preference or social discount rates. The converse applies to low interest rates.

Differences in time preference between nations is the basis for capital inflows into, and capital outflows from, countries and the source of potential gains from inter-temporal trade in monetary capital. If the interest rate is higher in country A than B, then A has a higher rate of time preference as domestic saving is relatively scarce, indicating that it places a higher value on present as opposed to future

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consumption, and conversely in B. In the absence of capital flows, in A the last dollar of consumption is worth more than the last dollar of investment in machines and other productive capacity. On the other hand, in B, consumption is valued less than investment at the margin. The different social discount rates provide the opportunity for mutually beneficial gains from trade in monetary capital. The existence of an international capital market enables A to buy savings to turn into immediate consumption from B at the lower interest rate. Consequently, A can finance and undertake a higher level of investment and future consumption and at a lower price, without cutting back on present consumption than it could have in the absence of such a market. B also gains because it can sell some of its excess saving at a higher return and consume at a higher level now without cutting back on future investment.

The social rate of time preference or discount rate, and therefore the domestic interest rate, is partly the outcome of thousands of individual rates of time preference and private discount rates reflected in individual choices between consumption now or in the future (saving). The other determinant is the demand for this saving by borrowers to finance investment.

People who commit crime also exhibit implicit discount rates because, like decision makers who choose between consuming now or saving, they are forced to make value comparisons between immediate and delayed consequences. While in the case of the consumption and saving decision, the delayed consequence is a certain interest rate, in the crime decision it is expected punishment upon being caught and successfully prosecuted. Criminologists argue that offenders invariably exhibit high private discount rates at the time of committing the offence, as short term advantages are chosen over expected long term costs (Gottfredson and Hirschi 1990; Wilson and Hernstein 1985).

At the moment, nothing is known about the value of offender private discount rates. It would be useful to those concerned with the administration of criminal justice to have plausible estimates of these because they are capable of providing important clues about the likely deterrent effect of criminal sanctions such as incarceration. In addition, they are a direct test of the link between impulsive behaviour and crime. This ignorance about discount rates is not surprising since, unlike the quantity of cars bought, for example, discount rates are not directly observable. One solution to this problem, which has been utilised in assessing time preference in other contexts, is to ask decision makers hypothetical questions to reveal their private discount rates. For example, the researcher might ask subjects

how much they would be willing to pay to delay having to pay a bill of one dollar by one year, or how much compensation they would require to delay receiving a dollar by one year. If a subject reported 10 cents to the former question and 15 cents to the latter, then the inferred rates of time preference or discount rates would be 10 per cent and 15 per cent respectively. Often incentives such as monetary payments are made to subjects to encourage them to answer these hypothetical questions as truthfully as possible. In order to minimise the risk of untruthful revelation of dollar amounts, the second and more preferable technique utilised is to infer discount rates from actual decisions. In the context of crime, this is virtually impossible to do from the crime decision itself. However, a good proxy is available for those offenders who are caught, prosecuted and convicted; their plea decision.

When defendants plead guilty or not guilty they reveal an implicit discount rate because the consequences of their choice are not immediate due to court delay, which can be defined as the time elapsing from the entering of the plea until the final disposition of the case. In this article, a methodology for ascertaining discount rates from the plea is described as informally as possible. Interpretations using hypothetical estimates are then provided and this is followed by an extended discussion of how the estimates can inform criminal justice and enforcement policy.

Methodology

A defendant will compare the cost of a certain penalty following a guilty plea with the expected cost of a penalty following a trial. The latter is expected because there is only a probability of conviction or acquittal rather than it being a certain outcome. In order to simplify the exposition without any loss of generality, assume that the defendant is not granted bail and that the only sentence available is a period of incarceration, which would usually be the case for most serious offences. In such a case, the cost of a certain jail sentence to the defendant would be equal to the time spent on remand, the sentence length, the income foregone and other psychological costs from remand until release and the defendant's private discount rate. The cost of an expected jail sentence would include an additional variable; the probability of conviction following a trial. The discount rate enters both the cost and expected cost expressions because, irrespective of which plea is chosen, the costs are not all incurred at the same time. Rather, time elapses between remand in custody or release on bail until the passing of sentence following conviction. Often this period is quite substantial due to court delays. For example, according to the ABS (2001), in

1999-2000 the median wait in weeks from initiation of the case until its finalisation for a guilty plea ranged from 10.8 weeks in Tasmania to 27 weeks in NSW. In the case of a not guilty plea followed by acquittal the range was from 27.8 weeks in SA to 52.90 weeks in the NT, and for a not guilty plea followed by a conviction it varied from 29.8 weeks in SA to 67.4 weeks in NSW.

The key to inferring offenders' discount rates from information about their costs is to focus on the relationship between different values of the discount rate and the corresponding variable's cost and expected cost. If a graph is drawn plotting different values of r on the horizontal and cost and expected cost on the vertical axis, the curve joining the different points will be negatively sloped. This is because the expression for computing the present or discounted value of future (expected) costs or income is equal to: $PV = \dfrac{C}{(1+r)^{T}}$, where PV = present or discounted value of costs or income; C = costs; r is the private discount rate; and T = time. Since r appears in the denominator, PV will fall as r increases. There will be two such expressions for each defendant; one for a guilty plea and one for a trial. Since r appears in the denominator of both of them, there is likely to be a value of r called r* that equates them in dollar value. At this r*, the defendant will be indifferent between pleading guilty or going to trial, since the discounted cost of the guilty plea will equal the expected discounted cost of the trial. This is based on the reasonable assumption that the defendant will choose the alternative that has the lower cost (jail sentence). This means that if both costs are equal either choice is acceptable.

Being able to observe in some sense the defendant's indifference point enables estimates of the offender's actual private r to be obtained. For example, if r* is estimated to be 0.10, the defendant chooses a trial, and to the right of r* the expected cost of a trial curve is consistently below the cost of a guilty plea curve, then the defendant's private discount rate must be ≥ 0.10. Alternatively, if the defendant chooses a guilty plea, the discount rate must be ≤ 0.10. This scenario is illustrated in Figure 1a below. The other possibility is that, to the right of r*, the discounted cost of a guilty plea is always less than the discounted expected cost of a trial. The converse applies to the left of r*. In this instance, if the guilty plea is chosen, r must be ≥ 0.10 and ≤ 0.10 if the trial is chosen. This scenario is illustrated in Figure 1b below.
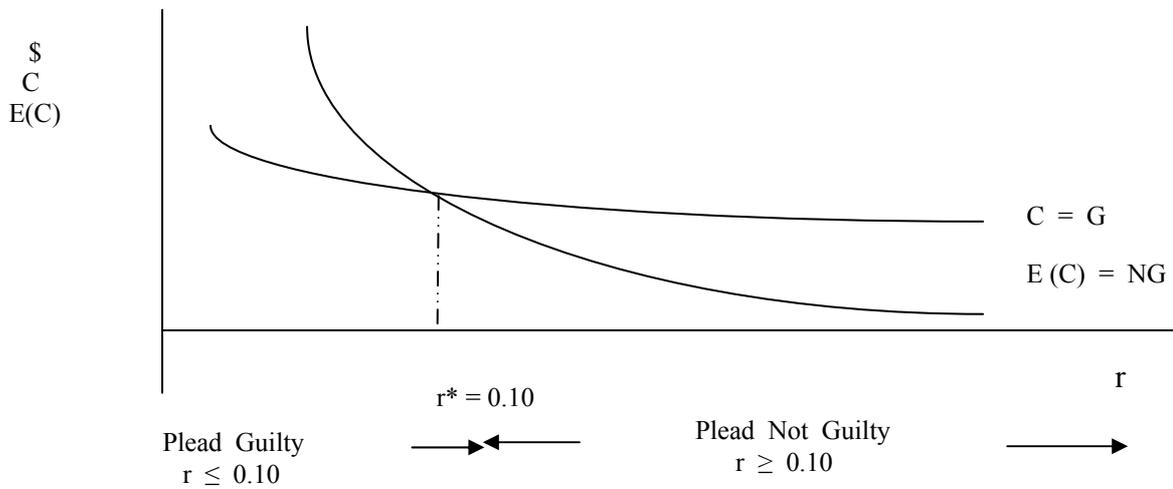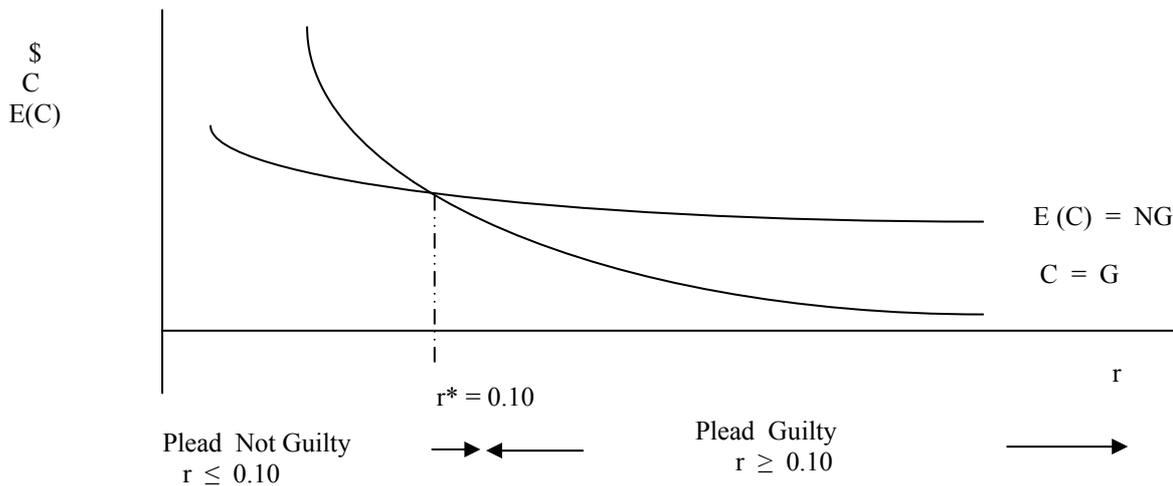
Figure 1a

Figure 1b

Figure 1B

C = Discounted cost of a guilty plea.
G = Guilty plea.
E(C) = Discounted expected cost of a not guilty plea.
NG = Not guilty plea.
r* = Indifference point where both costs are equal.
r = Defendant's actual private discount rate.

When formulating the plea decision a defendant will confront a value of r* that depends on the exact sentence length, waiting time, psychic costs, foregone income and conviction probability, which he or she confronts. Before confronting the court, most of these are unknown. However, a range of plausible values for each of these variables can be estimated. Likely waiting times and sentence lengths can be obtained from actual published data, such as that detailed in the NSW Bureau of Crime Statistics and Research Criminal Courts Statistics Annual Reports (1997-2006) . Conviction probabilities range from 0 to 1, so that it is possible to specify a low, medium and a high value. Foregone income and psychological cost estimates are more difficult to obtain. Nevertheless, sensible assumptions and the use of accepted empirical conventions mean that this task is far from insurmountable.

Suppose that for the offence of assault occasioning grievous bodily harm, there were only three possible sentences (1, 3 or 5 years in jail); three possible waiting times (0.5, 1 or 1.5 years); three possible values of foregone income and psychological costs ($10,000, $20,000 or $30,000) for both pleas; and three possible conviction probabilities (0.3, 0.5 and 0.8) following a trial. Each defendant would, as a consequence, confront 3^4 or 81 possible combinations of values of sentence lengths, waits, foregone income and psychological costs for a guilty plea and 3^5 or 243 possible combinations of sentence lengths, waits, foregone income, psychic costs and conviction probabilities for a trial. Using a simple simulation computer program, these combinations would then be fed into the mathematical expressions for the discounted cost of a guilty plea and discounted expected cost of a trial, with the objective of searching for all of the intersection points where the two discounted costs are equal. This would be the distribution of possible r* values and combinations of curves that the defendant confronted. Some variable combinations will yield curves where at r > r*, E(C) < C (NG < G) and at r < r*, E(C) > C (NG > G) as in Figure 1a or where at r > r* E(C) > C (NG > G) and at r < r* E(C) < C (NG < G) as in Figure 1b. The most likely discount rate for the offence would be the median value of this distribution of r* values.

Policy and Enforcement Implications

Suppose, for illustrative purposes, that the simulation exercise produces the following results (median values of r*) for the offence of assault occasioning actual bodily harm:

P = 0.3	P = 0.5	P = 0.8	
NG < G	NG < G	NG < G	NG > G
0.2	0.35	0.48	0.05

The second line in the table refers to the outcome to the right of the estimated median value of r*. Consequently, NG < G means that the trial is the cheaper alternative and if it is chosen, the discount rate is the lower bound estimate. If the guilty plea is chosen, it is the upper bound estimate (Figure 1a). NG > G means that the guilty plea is the cheaper option and if it is chosen, the estimated discount rate is the lower bound estimate. However, if the defendant elects a trial, it is an upper bound estimate (Figure 1b).

Since they are generated from cost information, these inferred discount rates have a neat interpretation. They can be construed as the defendant's willingness to pay to defer the cost or expected cost of punishment following a guilty and not guilty plea respectively by a year per dollar of the defendant's income. In this instance, at a probability of conviction of 0.3, the median defendant is willing to pay a minimum of 20 cents/dollar/income to delay expected punishment (jail) following a trial. At a value of P = 0.5 and 0.8, this figure increases to 35 cents/dollar/income and 48 cents/dollar/income respectively. Alternatively, the median defendant is prepared to pay a maximum of 20 cents/dollar/income to delay certain punishment if a guilty plea is chosen, given a probability of conviction after a trial of 0.3. For probabilities of 0.5 and 0.8, this figure rises to 35 cents and 48 cents respectively. Therefore, from the above results, it is possible to place a lower and upper bound on the median willingness to pay to delay certain jail time after a guilty plea of 0.05 cents to 0.48 cents/dollar/income for this offence.

If estimates of median discount rates interpreted as willingness to pay values are obtained for a series of offences, then legislatures, criminal justice policy makers, researchers and enforcement agencies can be provided with clues about the deterrent impact of prison sentences on the crime rate, a topic that has spawned a large and controversial literature.

According to Nagin (1998), evidence for a substantial deterrent effect of sanctions on criminal behaviour was much firmer at the end of the 1990s than it had been two decades earlier. In his review of research into the link between crime and punishment, Nagin identified three main empirical approaches adopted by

researchers; interrupted time series, ecological and perceptual studies. The first examines the effect of targeted and specific policy interventions such as police crackdowns on open-air drug markets; the second uses natural variation in crime rates and sanction levels across time and space to examine deterrence effects, while the third focuses on the links between perceptions of sanction risk and severity to self-reported crime and delinquency.

The approach suggested in this article is novel in that offenders' attitudes toward sanctions can be discerned from actual plea behaviour when confronting actual or expected punishment. This obviates the need to ask hypothetical questions. Presumably, a high (low) willingness to pay to delay imprisonment - either certain or expected - will reflect the relatively high (low) disutility of prison to the defendant.

The source of this disutility will be psychological or financial, or most probably, some combination of both of these factors. In effect, discount rates for different offences as they are interpreted in this article are implicit premiums over and above the median offender's wage or salary in his or her most suitable activity in the legal labour market. This premium will reflect the offender's skill and education levels as well as the relative profitability or monetary returns from the offence. In relation to the latter, criminologists are increasingly documenting very high illegal profits from some offences against property. For example, according to Stevenson, Forsythe and Weatherburn (2001), the estimated median value of weekly earnings for burglars in NSW is $2,000, yielding an annual tax free income of $104,000.

In a provocative paper, Weatherburn and Grabosky (1999) make a plea to criminal justice policy makers and enforcement authorities to adopt strategic thinking to control property crime rather than relying on the usual formula of more police and tougher penalties. Examples of this new way of thinking, which the authors espouse, include using health policy effectively to treat people dependent on illegal drugs; regulating second hand goods markets to make it less profitable to sell stolen goods; and the use of housing policy to limit the extent to which young people susceptible to crime grow up in delinquent-prone neighbourhoods.

While the methodology adopted here cannot separate psychological from pure monetary effects in driving willingness-to-pay values, this does not diminish the likely usefulness of such an exercise. It is suggested that plausible estimates of offender discount rates for a wide variety of crimes will perform an important function, not only for the usually given reason of detecting the role of impulsive

behaviour in explaining criminal activity, but perhaps more importantly by providing another way of examining and estimating the deterrent impact of imprisonment for different offences.

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