

# Difficult Valuations

Neville R. Norman, University of Melbourne

## Abstract:

A significant professional function in many economies consists of placing values on objects, property and legal claims that are contentious or speculative. Economics is seldom involved. Yet economic analysis can both assist the process of valuation and assess the results, not least in assessing the damage done to the public interest by faulty valuation processes. In some cases, economics can produce credible values where other professions contend that no value solution is possible. Sometimes, economics can assist in the valuation process more fully than it is currently invoked, at least as a cross-check. Sometimes, economics can suggest systemic changes to the valuation process itself. This paper is designed to bring the essence of many valuation processes to the fore, to evaluate them, and to suggest fuller uses of economics or changes in the valuation systems currently applied.

## Notation:

$V_{it}$  is a value placed on an object  $i$  at time  $t$ ;  $j$  is another such object

$L_j$  is the sales value of a “last comparable” property ( $j$  valued at time  $<t$ )

$A_{it}$  is an assertion of  $V_{it}$

NR – net revenue of a business =  $R - E$

$R$  – business sales revenue

$E$  – business expenses

$k$  – multiple of net revenue of a business

$p$  – price index (growth factor)

$h$  – health cost inflation factor

$r$  – interest or discount rate (per period)

$n$  – number of time periods for a compensation exercise

Valuations are “difficult” because:

- a. The concept of the object being valued is ill-defined or contentious;
- b. Data are missing or of dubious value;
- c. The valuations rely on projections of future events that are capable of a wide range of credible values;
- d. they are subject to litigation involving vigorous representations from parties with diametrically opposed interests; and /or
- e. the subjects whose actions are being valued seek to conceal relevant information from the authorities and the valuers or researchers

## Examples:

1. **Commercial Property Valuation.** The valuer is required to place a monetary value on a commercial property subject to sale or valuation as at a particular date.
2. **Business Valuation** – For the purpose of sale or valuation for takeover or marital disputes, the net assets of a business (including goodwill) must be assessed.

3. **Personal Injury Compensation** – A court is required to strike a once-and-for-all “lump sum” that compensates for prospective medical costs, pain and suffering and (opportunity) loss of earnings.
4. **Commercial litigation damages** – A court is required Eg medical malpractice (Posner p. 157-8)
5. **Tax evasion losses/black economy** – the economist is required to estimate the monetary size of the informal/illegal part of an economy and the magnitude of potential taxation collections that are not received by the authorities.

### Summary of Valuation Issues and Role of Economics

Valuation of:	Standard Method	Econ. in the Process	Econ. in Appraisal
Commercial Property	Last comparable sale	PV of rents, cap gain	Prop mkt distortions
Business Valuation	Multiple of profits	IO assessment; risk	Capl mkt distortion; marital settlmt errors
Injury Compensation	Lump sum	Disc rate; health cost factor	Inequities of variance in survival; insurance
Penalties and commercial damages	Arbitrary power play or statutes	Opportunity costs; optimal penalty lit.	Goal based compensation system
Black economy tax losses	Tax Commissioner GDP ratios	Gutmann; A-Sandmo theory; survey evidece	Optimal penalty structures
Value of Life	QALYs, profiles	Subjective utility; opportunity costs	Inadequate public policy appraisal

#### 1. Commercial Property Valuation..

The valuer is constrained by legal and statutory requirements, such as Spence’s Rule: a “last comparable sale” must be found: a property of similar characteristics, if not size, so that values per m<sup>2</sup>, or rental ratios or return ratios. The difficult arises when no property is remotely comparable, or when a comparable property is separated from the subject property by a different phase in the valuation cycle. Speculative behaviour in property markets, especially by funds managers, exacerbates swings in the “market” values attributed by valuers, causing economists to argue for a dual valuation system, the “fundamental” value being assessed from the present value of earnings under normal market conditions.

**Proposal:** publicize the investment value of properties sanctioned by Directors’ valuations instead of market values to reduce the temporal variability of property values and thus the risk component of property in investment portfolios.

#### 2. Business Valuation –

Almost every business has unique or distinct characteristics, not least the property rights associated with technologies and products or business key personnel. Seldom can businesses thus be valued

according to “comparable last sale” principles as for commercial property.

The standard technique used by accountants for legal, marital and regulatory purposes, prospectuses and company reporting, is as follows. Take the net profit of the subject business ( $NR = R - E$ ) and apply to it a multiple ( $k$ ) to produce the value of the business, so that:

$$V_{it} = k.NR = k(R-E)$$

In principle, the multiple  $k$  is designed to represent the inverse of a rental or interest rate, though in small-business valuations the conventional range of “ $k$ ” ( $1/i$ ) is typically in the range  $k[4,8]$ , in other words 12 to 25% implied discount or interest rate.

The scope for error arises from contentions over expected future values, the temptation of experts to assist the parties calling them, the failure of lower courts to adopt stringent guidelines for experts or proper cross-examination or judicial cognizance. The midway from a contested dispute is not necessarily correct. Dispassionate industrial economic analysis of future revenue streams and cost of capital would be a huge contribution here.

### 3. Personal Injury Compensation —

Posner sets this out succinctly: “A nonfatal accident may have three economic consequences for the victim” – medical outlays, earnings impairment and pain and suffering. All three kinds of loss are economic (the first obviously so) in that they impose opportunity costs.” Posner refers to the difficulty the Courts have had in valuing housewife’s services. In any event there is a clear need to impute “probable market earnings”. What happens when an injured child is denied a career that could span the range from mega-dollar earning to indolence? [Posner identifies the problems in valuing a child’s life at p. 150.]

The legal solution of this problem is found by taking evidence as to the exact finite residual life of the injured party ( $n$ ), rates of interest and accumulation ( $r$ ), and the base period value of compensation ( $C$ ) and its prospective growth ( $p$ ). Once known, these four conditions are sufficient to determine the lump sum in the base period at judgment ( $V_{0t}$ ) that will have a future accumulated value that extinguishes precisely at period  $n$  ( $FV_{nt} = 0$ ). This arises if the valuation problem at base period 0 is solved as  $C(1+p)^n / \ln B [1/e^{r(n-t)} - 1/(1+p)^{(n-t)}]$ ,

So  $V_{0t} = C / \ln B [ \{ (1+p)/e^r \}^n - 1 ]$ , with  $B = (1+p)/e^r$ .  $\{dV_{0t}/dn = CB^n\}$ .

The extreme sensitivity of the settled lump sum to parametric variations is not, in general in my experience, well understood by some professional groups giving evidence or Court propounding judgments. Economic analysis can contribute by suggesting the following:

- a. warning on extrapolating current (real) earning trends into long-term (60+ years) computations – Fisher’s Law etc.
- b. warning on the persistently higher growth in health costs than CPI ( $h > p$ ). Attached are demonstrations in the addendum where health costs are 1.5%pts annually greater than cpi. The simulated date of fund extinction is advanced considerably by what less-numerate professional colleagues may see as a relatively minor change: the Fund goes grossly deficient well before the expected demise of the injured party;
- c. extreme warning on the sensitivity of the fund value around the expected date of demise – differentiate the base-value function with respect to “ $n$ ” to show this. If the plaintiff dies

earlier than expected (even 5 years) the beneficiaries in an exact-to-assumption managed fund gain handsomely; if the injured party lives longer, the funds is quickly into severe deficiency

- d. when my liberal thinking is possible propose annuity alternatives which are market efficient and overcome the inter-personal equity offences as in c. Innovative financial instruments can do the same, and with broad coverage the risk is spread according to population survival characteristics.

There is little evidence of public or legal awakening in respect on any of these proposals.

#### **4. Commercial litigation damages**

Posner states as a general rule that “a negligence victim is entitled only to compensatory damages, while the victim of an intentional tort may sometimes obtain punitive damages as well.” (Posner 142-3). One justification given for this is the difficulty of valuing the damage: “the problem of concealment is especially acute with regard to intentional torts that overlap with common law crimes, such and theft and battery, (where) punitive damages (are) commonly allowed.” (143) One proposal considers sending a convicted person to jail for a period determined by the opportunity cost to them of incarceration. (Posner E A of Law, p 23n). However, murder may not have a finite fine (justifying capital punishment, so it is argued).

In general, “the optimal penalty is simply the social cost of the unlawful act divided by the desired probability that the penalty will in fact be imposed.” (Posner p. 171)  
Optimal criminal sanctions set out on section 7.2 of Posner. The probability of punishment imposed and the value of the punishment (assumes risk neutral offender) equals the expected accident cost. Expected crime costs include outlays for guns and the opportunity cost of a burglar’s time. Expected benefits are defined as being both tangible and intangible, as in “value of life” exercises. (Jones-Lee)

Risk aversion among criminals “reinforces the argument for combining low probabilities of apprehension and conviction with high levels of severity – (imposing a) greater risk on the criminal than would a less severe and more certain punishment.” (Posner p. 170)

#### **5. Tax evasion losses/black economy –**

Tax evasion is the concealment of taxable activity contrary to law. It is distortionary, inequitable and causes tax rates on non-evading taxpayers to be higher. Analysts and policy makers seek estimates of the hidden/black/illicit/shadow economy

These estimates are central to many debates about the effects of taxes and the relative merits of alternative tax structures. In principle, the properties and dimension of the informal/black economy are concealed from authorities and economists studying it. Participants have a vested interest in ensuring the data base for these estimates are never available. The estimates must therefore be made by statistical inference.

Non-economists tend either to argue that (i) tax evasions cannot in principle be measured, because it is unobservable; or (ii) the informal sector is a stable and predictable small percentage of the regular/reported economy (like 5%)(Inland Revenue Commissioner, evidence to House of Commons Select Committee.)

Several estimation methods are available, each of them devised by economists:

- a. Gutmann's ("monetary") method of inferring illegal transactions from the change in the currency ratio, akin to perpetual inventory methods assuming in some base period illegal transactions did not exist;
- b. Inference based on decision theory in the face of risk (of detection) following Allingham & Sandmo;
- c. Statistical inferences extending full knowledge of detected evader tax and income positions to the balance of society.

Each method is heroic and subject to stringent speculative assumptions

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### **Addendum: Illustration of the Extreme Sensitivity of Once-and-for All Lump-sum Compensation Principles: Injured parties.**

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This is an application of economics and related disciplines to some fundamental questions concerning

legal compensation effected through lump sums. Our central claim is that economic analysis can provide the relevant framework for debate and within it many of the answers to difficult questions that have been posed for decades about lump-sum compensation systems. We are concerned especially with the role of the taxation system, the development of health costs, questions of fairness (equity) and the numerical implications of legal procedures and alternatives to the present system. The style of this paper reflects the training of an economist, the experience of an expert witness, and the language of economics constrained by a determined attempt to make it accessible to other professionals.

## 1. THE BASIC ASSUMPTIONS

1. There exists a widespread **legal system that provides "once-and-for-all-time" (lump sum) monies in compensation for damages** and which is described in its detail by Professor Harold Luntz's *Assessment of Damages for Personal Injury and Death*<sup>1</sup>, most directly at section 2 thereof. This system is most commonly applied in Australia in relation to damages concerning personal injuries. The legal imperative is to determine a single sum of money, which we shall denote as "**\$\$**" which is paid once and for all to a claimant plaintiff. On its details, this sum may variously be said to compensate for the expected remaining life of the plaintiff for pain and suffering, loss of earnings, medical and other costs of caring and/or legal and administrative costs associated with the legal cause, most commonly an injury or death. We use the shorthand "**LSS**" to describe this system, which we further assume is well known to the legal profession in general.

2. **Injuries and death** provide relevant actions such as to generate valid legal claims for significant \$\$\$. There is an important side issue here: we could do much more to reduce the risk of avoidable death and injury, as I have argued and documented elsewhere<sup>2</sup>. That is not the subject of this paper. We simply assume that whatever preventive measures are taken are not sufficient to prevent significant rates of death and injury.

3. **Inflation** (of consumer prices including health and medical and related caring services) proceeds at a positive rate (designated "**p**" per centum per annum), labour earnings before income taxation for any relevant job category increase in nominal terms over long periods at rate "**r**" (per centum per annum), which is no less than "**p**"; interest rates representing pre-tax earnings yields on securities have an expected value greater than "**p**".

4. **The sum \$\$** is generated under the LSS by determining in the legal process (a) a contemporary ('current') value of periodical expenses and earnings (forgone) and such other costs of caring (collectively, "**\$\$C**") that the courts deem claimable in compensation; (b) the number of periods (which we can call "**N**" years) from the date of injury, death or determination during which the plaintiff is expected to survive; and (c) a periodic "rate of discount" ("**d**") to reflect the "real" (that is, after an allowance for expected inflation) earnings rate available through the investment process during the next "**N**" years. The LSS procedure is to determine \$\$ as  $$$C$  multiplied by  $N$  and adjusted for  $d$ . (I am deliberately avoiding the algebra here to maximise the chances that readers regarding mathematics as distasteful will not be deterred at an early stage. Others may be more moved by the Mathematical Appendix.)

5. **The policy objective** is to strike \$\$ to enable the injured plaintiff to just exactly be compensated for their expected lifetime for the sums the subject of compensation, *in all the circumstances*.

## 2. SPECIFIC OR ILLUSTRATIVE ASSUMPTIONS

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<sup>1</sup> Butterworths, Sydney, 1990.

<sup>2</sup> N. R. Norman: An Economic Evaluation of the Victorian Health Promotion Foundation, VHPF, August, 1993.

Economists like to produce results or theorems for the general case, describing the propositions adduced as "weak" , which is meant to be taken as "impressive" and "widely applicable". Some of our results will fall into this category, in which case we shall call them "general (results, implications, conclusions or inferences)"; but general results do not easily relate to the specific cases that lawyers and other practitioners might have in their minds. Accordingly, we propose to illustrate many of the propositions for precise examples that are designed to highlight the features of the LSS that cause most controversy and concern.

**Our specific assumptions are as follows:**

A. The injured plaintiff is 8 years of age exactly at the date of the determination, and was three years of age exactly at the date of the accident.

B. The plaintiff's life expectancy is as if the accident did not occur, giving exactly 70 years of life expectancy from the date of determination.<sup>3</sup>

C. The Court supposes an earnings stream of "average" dimension equal to current rates of about \$675 per week<sup>4</sup> or about \$35,000 (\$35k) per year in 1996 values, with earnings growing at a regular 5% p.a. for the seventy years to be considered. The plaintiff would have earned at years 20-65 of life in the absence of the relevant accident.

D. Inflation is 4% p.a. throughout the exercise.

E. The discount rate is (perhaps arbitrarily) set by the Courts and may be 3% p.a. unless specified otherwise.

F. Caring costs including vigilant attendants, medications, annual-equivalent costs of lifting equipment, wheelchairs, learning aids, property adaptations, and the like is \$65k and inflates at the earnings rate of 5% p.a.

G. Cost of caring and compensation for pain and suffering have been paid to the injured plaintiff before the amount \$S is determined.

In terms of our notation we can summarise these assumptions as:

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**$N = 70$  years,  $p = 4\%$  p.a.,  $e = 5\%$  p.a.,  $SC = \$35k$  in 1996 (the plaintiff's year eight of life), rising to \$100k at today's rates in years 20-65,  $d = 3\%$  p.a.**

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### **3. SOME NUMERICAL RESULTS**

It is instructive to consider the numerical implications of various assumptions and procedures relevant to lump-sum legal determinations. In the context of the examples specified above we shall on some occasions determine the lump sum to achieve a particular purpose, and on other occasions check how long and with what impact a given lump sum will keep a positive balance in the fund.

In the **standard case** a lump sum of \$1.57 million (m) will just exactly provided until the 78th year (70 of the fund). A spreadsheet is attached, giving at the left-hand column the ages of the plaintiff and the fund, associating with them the costs of caring, treated here as a separate matter. Those costs inflate

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<sup>3</sup>The Australian Government Actuary puts "expected" life expectancy at eight years at 66 further years for males and 73 further years for females (Australian Life Tables), so we are gender-neutral here!

<sup>4</sup>ABS, reported in the *Reserve Bank Bulletin* for early 1996.

at the CPI assumed rate of 4% annually, being just over \$1m at year 70 (of the fund), and just over \$2m, if the plaintiff lives to 96 years. The balance of the fund is invested to earn 8%, from which are deducted the caring costs, to give the closing balance for each period (the opening balance for the next), and so on. The general features of these funds become apparent from studying the behaviour of the main variables: The fund reaches a maximum value (of \$6.4m in year 52) when the interest earnings just balance the caring costs. If the plaintiff dies at this point, the beneficiaries would receive this large capital sum. If the plaintiff lived until 85 years (just 7 more than expected) the capital deficiency would be over \$10m.

In a second experiment, we allow for **health and caring costs to rise** 1.5% annually more than CPI. The fund that was sufficient before now extinguishes in year 37, and by year 70 there is a \$140m deficiency. This shows the extreme sensitivity of the fund position to such an apparently small change in circumstances. It is a relevant one, because health care costs in Australia tend to rise faster than CPI.<sup>5</sup> The sum to compensate is \$2.21m, instead of \$1.6, a 38% boost in the sum awarded. There needs to be closer attention paid to this factor, in my view.

We now allow for **income tax** being applied to the earnings of the fund, assuming as is standard practice that the sum itself bears no such tax.<sup>6</sup> Supposing the plaintiff's other taxable income (for the earnings compensation fund, for instance) places the earnings from this fund in the top marginal tax rate, presently 48.5%<sup>7</sup>, the nominal earnings rate of 8% becomes on 4.12% after tax. The sum \$4.37m will be required, showing the severe impact of income tax. Note that we are still considering only health and caring cost compensation. (There is an arguable point in relation to less of earnings compensation: if the person were not injured they would have paid income tax, so for consistency the awarded sum here would be reduced. The notion that ignoring income tax at both sides of this calculation will somehow compensate is quite fallacious.)

Now consider the prospect of higher fund earnings, say at 10%, perhaps through a 6% guaranteed real return. A fund of just \$3.16m will now perform the task of holding the fund in surplus until year 70. To show the severe impact of higher inflation, we shall hold this real return constant (at 6%, above the CPI growth rate) and increase inflation to 8%, the same growth factor for health and caring costs. The same fund of \$3.16m last only until year 38; by age 78 (the expected age of death) the injured person will owe \$380 million! The lump sum which we avoid this prospect will need to be \$7.22m, showing the inadequacy of fixed real returns in the context of inflation risk and the type of taxation system we have.

**Some general conclusions can be derived from these exercises:**

- 1. The viability of an injured plaintiff's monetary fund is extremely sensitive to small variations in the person's expected life span, inflation rates, income tax and health costs.**
- 2. The injured person will almost certainly die at a time other than the Court has estimated. If they die earlier, beneficiaries receive an undeserved windfall; otherwise the plaintiff's fund becomes insolvent during the lifetime. This is inequitable.**
- 3. The assumption that health and caring costs for disabled persons inflates at the cpi rate is untenable.**
- 4. Fixed real-income securities do not provide immunity against inflation when taxation is allowed for.**
- 5. The failure to reduce earnings on account of income tax does not in general compensate for the failure of any compensation system to allow for income tax on the earning of funds such as those considered here.**

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<sup>5</sup>Also plaintiffs might require improved facilities, such a better lifting and carriage equipment.

<sup>6</sup>H. Luntz, op. cit., section 3 of chapter 6.

<sup>7</sup>Including the Medicare Levy, which is set to rise to 1.7% in 1996/97, albeit temporarily (sic!).



#### 4. SOME ALTERNATIVES CONSIDERED AND ANALYSED

A radical alternative is to replace the present lump-sum system with a system of annual payments - a pension or annuity system. The advantage is that the inequities caused by premature death or long-lived subjects would disappear: in the former case, no residual fund would pass undeservingly to beneficiaries; in the latter case, the payments continue while the injured person remains alive. The disadvantage is that the full payments would be subject to income tax as they are no longer capital sums. Before we are troubled by this, we should return to the numerical demonstration. In the early years, the pre-tax annuities that would cover health and caring expenses will be similar to the flow of nominal earnings under the lump-sum system. Later the payments would have to be advanced in greater proportion. The system has the added advantage that the progression of payments can be geared to relevant inflation factors. If the rate of inflation increases, so too does the increment in nominal payments; insurers would correspondingly experience and increase in nominal earnings expectations, so again the system seems more equitable. The disadvantage is the lack of certainty as compared with the lump-sum traditional procedure.

If we are to hold to the lump-sum system, the equity problems to which it gives rise can be addressed another way. The Courts could make an order that the successful plaintiff acquires compensation rights during their lifetime, and on their death those rights cease. This would cause any positive balance in a plaintiff's fund to be ceded to a national compensation fund, which would finance payments to plaintiffs who lives longer than the expectations suggested. This would seem to be a more workable way of overcoming some of the severe limitations of lump-sum compensation systems in the face of predictive uncertainty, income tax and disparately rising health costs. Insurance bonds and innovative financial instruments could be devised which would ensure both more efficient financial market results and greater equity as compared with injured plaintiffs with differential actual survival experiences.

The proposals made here require more economists/economic input to be used and more economists to be involved in the operation and change of these valuation procedures.