



Calculating Economic Damages

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Objectives

- To introduce a general framework for calculating economic losses
 - Application to personal injury
- To introduce specific techniques:
 - Contingency analysis
 - Event study
 - Options
 - Supply/demand analysis

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Presentation outline

- **General framework**
- Personal injury
- Contingency analysis
- Event study
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- Supply/demand analysis

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Harm

- personal injury
- unfair dismissal
- breach of a contract or duty
- misrepresentation/fraud
- infringement of intellectual property
- anti-competitive behaviour
- interference

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Damages framework

- Harm causes
 - lower revenues/asset values
 - higher costs/liabilities
- To redress the wrong, compensate injured party so that income/wealth restored to same level as if harmful event had *not* occurred

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Damages framework

- Compare cash flows/property value
 - if the harmful event had *not* occurred
 - with occurrence of harm
- Cash flow = income – cost
- Time period
 - from time that harm commenced
 - until end of harm on cash flows

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Example

- Manufacturer entered into 3-year agreement with Distributor for new beer.
- Distributor failed to advertise as specified.
 - Manufacturer sued Distributor.
 - What is Manufacturer's economic loss?



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Income

- Demand for Manufacturer's product depends on both
 - Aggregate demand factors –consumer population, income, complements/substitutes
 - Business-level factors – product, distribution, *advertising*, prices

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Example: Income

- How would Distributor's breach affect Manufacturer's
 - Sales
 - Price?

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Costs

- “any award of loss of profits should not be on the basis of gross but of net profits”, Tay, JC
- Fixed/variable cost – do/do not vary with scale of operations
 - Direct production expenses
 - Selling expenses
 - General and administrative expenses
 - Research and development expenses
- Hidden (opportunity) costs
- Sunk costs

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Example: Costs

- How would Distributor's breach affect Manufacturer's costs?
 - Cost of local oversight is fixed
 - May not be sunk – can be avoided if Manufacturer withdraws from Singapore.
 - Cost of product and freight is variable.
 - Cost of capital may be hidden (retained earnings, no cash outflow).

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Fixed/sunk cost – Afro-Asia

- Valuation of Sumatra rubber plantation:
 - “Factory, Building And Installation ... I am of the view that there should be no relevance for the period 1990 to 1994 as capital for this period is part of sunk cost.” Choo, JC (2001) Singapore.

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Example: Income statement

In millions (except price)	Year 1	Year 2	Year 3
With harm:			
sales	40	60	60
price	1	1	1
revenue (\$)	40	60	60
cost (\$)	40	50	50
cash flow (\$)			
Absent harm:			
sales	80	90	100
price	1	1.10	1.20
revenue (\$)	80	99	120
cost (\$)	60	65	65
cash flow (\$)			



Time value of money

- One dollar tomorrow worth less than one dollar today
- Adjust through interest/discount rate:
 - If interest rate = 6% per annum, then \$1 now worth \$1.06 in twelve months' time.
 - If discount rate = 6% per annum, \$1 in twelve months' time worth $\$1/[1.06] = 94$ cents now.



Example: Present value

In \$ millions	Year 1	Year 2	Year 3
With harm:			
cash flow	0	10	10
Absent harm:			
cash flow	20	34	55
Difference	20	24	45
Discounted at 6%	20	21.4	37.8



Present value – General

- Cash flow in year t must be discounted t times.
- Present value

$$= \frac{CF_1}{[1+r]} + \frac{CF_2}{[1+r]^2} + \dots + \frac{CF_t}{[1+r]^t}$$

- where r represents discount rate.

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Adjustment for time value

- Discount cash flows received in future.
- Add interest to cash flows received in past.

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Discount rate

- Market conditions
 - “In my view, therefore, when reviewing the multipliers used in the earlier cases, one needs to bear in mind the current lower rates of investment return and therefore not discount as much as in the past. The aim should be to achieve restitutio in integrum to the extent that this is possible.” Ang, J (2005) Singapore.

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Discount rate

- ❑ Borrowing rate > lending rate
- ❑ Cash flows with higher risk must be subject to higher discount rate
 - “use of an inadequate discount rate and inadequate allowance for risk to assess the present value of the alleged loss of future ... sales” Lockhart, J. (1994) Australia.

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Taxes

- ❑ Sales taxes, duties – measure income net of taxes and duties.
- ❑ Income taxes
 - Was lost income subject to tax?
 - Will compensation be subject to tax?

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Inflation

- ❑ Expectations of inflation affect
 - estimated future cash flows
 - discount rate
- ❑ Either adjust *all* variables for inflation or *none*.



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Present value – Afro-Asia

- Valuation of Sumatra rubber plantation:
 - “both experts had used the discounted cash flow method. ... Mr. Fernandez used a discount factor of 20% whereas Dr. Wijesekera used a discount factor of 10%. ... The subjectivity of applying the discount rate may itself be a cause of concern to the potential investor, and that is something that cannot be ignored.” Choo, JC (2001) Singapore.

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Personal injury

- Multiplicand
 - Income
 - Cash
 - Benefits – taxable, non-taxable
 - Consumption

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Personal injury

- Multiplier – life expectancy
 - “Plaintiffs’ counsel also submitted that some reliance should be placed on actuarial tables as suggested in *Wells v Wells* [1999] 1 AC 345. ... For Singapore, they relied on a *Straits Times* article dated 15 April 2000 entitled “Longer life, healthier life”. However, that was not an actuarial table as such.” *Woo Bih Li, J* (2004) Singapore.

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Personal injury

- Multiplier – work-life expectancy
 - Life tables – *unconditional* life expectancy

<i>Hong Kong: Life expectancy at birth</i>		
<i>Year</i>	<i>Males</i>	<i>Females</i>
1983	72.3	78.4
2003	78.6	84.3
2033	82.5	88.0

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Personal injury

- Multiplier – work-life expectancy
 - Life tables – *conditional* life expectancy

Age	Males	Females
20	56.6	60.5
40	37.3	40.9
60	19.4	22.3

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Personal injury

- Multiplier
 - Work-life expectancy
 - Cohort participation rates
 - Discount rate
 - Riskiness of future income – compare small business owner with civil servant.

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Scenario A

- Bajumi and Tan families jointly invested in Afro-Asia Shipping Co Pte Ltd
 - 22% of shares of Ssangyong Cement, listed on Singapore Exchange
 - Afro-Asia Building
 - Rubber plantation in Sumatra
- At various times over 4-year period, Bajumis wanted to sell but Tans objected.
- Termination of joint investment – how to value the shares, building and plantation?

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Contingency analysis

- Contingency – sale
 - probability
 - value

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Scenario A: Contingency analysis

- Ssangyong Cement shares
 - At each of six dates, consider market price.
 - "Where the market value is freely available it is certainly reasonable to use that as a guide unless there are sufficiently compelling reasons against its use." Choo, JC (2001)
 - Using equal probabilities and weighted by volume, estimated sale price = S\$3.34 per share.

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Scenario A: Contingency analysis

- Afro-Asia Building
 - At each of four dates, consider valuation.
 - Using equal probabilities, estimated valuation = S\$66.26 million.

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Scenario B

- Enterprise's action affected Manufacturer's business.
- Manufacturer's sales and profits fell, 1997-98.
- Manufacturer claimed:
 - Loss of profit, S\$ 7.5 million;
 - Loss of share value, 42.8–71.4%;
 - Loss of business opportunities

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Event study methodology

- Capital Asset Pricing Model:
 - expected return = risk-free rate + beta x market risk premium
- Use pre-harm period to estimate model parameters.
- Substitute market return over period of harm to estimate return on share absent harm.

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Event study methodology

- “Use of an event study or similar analysis is necessary more accurately to isolate the influences of information specific to Oracle which defendants allegedly have distorted.”

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Scenario B: Damages

- Loss of market value
 - 0.3–3.3% (equivalent to S\$0.19 – 2.11 million)
- Key economic issue – when action and remedial action fully worked out.

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Event study: Limitations

- ❑ Only for listed companies
- ❑ Only for *unanticipated* events
- ❑ Depends on pricing model
 - Capital Asset Pricing Model (CAPM)
 - Fama-French model
- ❑ Market for some shares may be illiquid

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Application of event study to non-listed company ...

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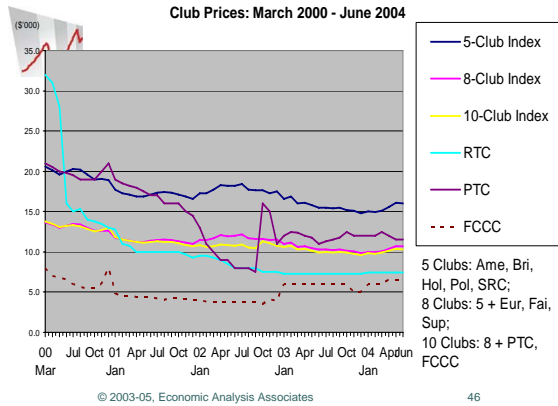


Raffles Town Club

- ❑ Court of Appeal, 11 August 2003:
 - Found defendant in breach of contract to provide premium club.
 - How to measure damages?
 - “the depreciation in the price of RTC membership which is due to the dip in the general market condition will not be recoverable against [the Defendant]”.

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Raffles Town Club

- Plaintiff's expert – see chart
 - Depends on breach date
 - Depends on index composition
- Defendant's experts
 - Compared to Pinetree, Fort Canning, Singapore Recreation Club
 - Zero damages

Raffles Town Club

- Court of Appeal, 23 August 2005 (para. 36):
 - "The eight-club index adopted by Dr Png has the advantage of being more representative and thus it seems to us that the calculations obtained therefrom are more likely to be accurate."
 - "Taking \$28,000 at December 1996 and \$10,800 at March 2001, ... in percentage terms this would be about 61.4%. Of the eight-club index worked out by Dr Png, the average decline over the corresponding period was approximately 50%."



Raffles Town Club

- Court of Appeal, 23 August 2005 (para. 36):
 - “Thus, for RTC there was an enhanced decline of 11.4%, which one could reasonably assume to be attributable to the breach, namely that there were just too many members in RTC.”
 - “We think this is as fair and rational a method to work out the probable loss due to the defendant’s breach as any.”



Raffles Town Club

- Significance of Court of Appeal judgment – accepted *indirect* evidence on economic damages:
 - “Ideally, if it is possible to have direct evidence of what a run-of-the-mill social club was worth as at March 2001 and what a premier social club would then be worth, that would probably be the best estimate of the loss suffered...” (para. 30)



Raffles Town Club

- Significance of Court of Appeal judgment – accepted *indirect* evidence on economic damages:
 - “So between December 1996 and March 2001, the depreciation amounted to \$17,200. Next, one must determine how much of that decline was due to the general weakened market condition or demand for club memberships over the same period. Once that is established, it would be fair to assume that the difference represented the decline due to the breach.” (para. 32)



Block sale of shares

- Premium or discount?
 - “opposing experts held widely differing views as to how much discount ought to be given to take into account the liquidity (or lack of it) when such a large block of shares is put on the open market. However, neither had considered the counter-balance of the power of control that the holder of this block of shares can wield.” Choo, JC (2001) Singapore.

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Block sale of shares

- Investor bought block of Profit.com shares under condition not to sell before specified date and only with prior agreement.
- Investor sold shares over one-month period (in breach of agreement):
 - Profit.com share price = \$1.50 at beginning and end of month
 - Investor claimed that there was no damage.
- Your view?

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Scenario C

- ❑ Investor agreed to buy block of 100 million shares in listed company at S\$8 per share from Vendor.
- ❑ Market price of share at that time was S\$7 (S\$1 lower).
- ❑ Investor failed to complete purchase.



Scenario C

- ❑ Five months afterward
 - Vendor still held the block of shares
 - Market price had risen to around S\$7.50
- ❑ Vendor claimed:
 - Loss of profit = S\$1 x 100 = S\$100 million
 - 10% discount on block sale = S\$70 million
- ❑ What was Vendor's loss?



Scenario C: Economics

- ❑ By declaring that Investor had breached while continuing to hold shares, Vendor had effectively written itself a *call option*.
 - If, subsequently, another bidder offers more than S\$8 per share or market price exceeds S\$8 per share, Vendor could drop claim against Investor and sell to new bidder or market.



Scenario C: Option analysis

- ❑ Value of the option (Black Scholes formula) = S\$0.40 per share.
- ❑ Sensitivity
 - Duration – assumed to be 6 months
 - Implied volatility – measured over preceding 5 years

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Scenario C: With harm

- ❑ S\$7 per share
- ❑ Option
- ❑ Block sales can be at a *premium* as well as discount
 - Study history of block sales in the listed company

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Scenario C: Without harm

- ❑ S\$8 per share
- ❑ No option

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Scenario C: Damages

- Direct loss *net* of value of call option: S\$1 – 0.40 = S\$0.60 per share.
- Premium/discount for block sale.

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Scenario D

- Investor set up joint venture with Agribusiness to produce commodity for Japanese market.
- Planned production = 11–13% of Japanese imports.
- Agribusiness failed to meet various targets.
- Investor claimed damages of US\$ 98 million.

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Scenario D: Economics

- Increase in supply would affect market price – *even if production according to plan*, profit would be less than forecast
 - “allow for the price elasticity of demand ... in calculating the alleged potential sales revenue and profitability”, Lockhart, J.

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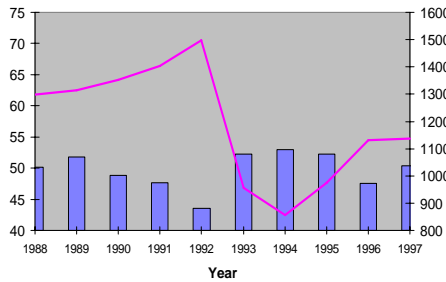
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Japan: Commodity Imports, 1988-97

million units

CIF price
(Yen/unit)



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Scenario D: With harm

- Estimate impact of actual production on Japanese market price.
- Calculate year-by-year revenue from actual production.
- Calculate year-by-year cost from actual production.

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Scenario D: Without harm

- ❑ Estimate impact of planned production on Japanese market price.
- ❑ Calculate year-by-year revenue from planned production.
- ❑ Calculate year-by-year cost from planned production.



Scenario D: Damages

- ❑ Estimated loss: US\$13.0–55.1 million
- ❑ Key economic issue – demand and supply elasticities.



Summary

- ❑ Begin with a clear statement of harmful event caused by defendant and effect on plaintiff.
- ❑ Direct method:
 - Identify incremental cash flows: cash flow if harm had not occurred *less* actual cash flow.
 - Account for time value of money, risk, taxes, contingencies, options, elasticities.
- ❑ Indirect method – event study.
- ❑ Similar principles whether harm reduces plaintiff's cash flow or wealth.



References

- Damages estimation: Robert E. Hall and Victoria A. Lazear, "Reference Guide on Estimation of Economic Losses in Damages Awards", in *Reference Manual on Scientific Evidence*, 2d ed, Federal Judicial Center, 2000.
- Event Study: David Tabak and Frederick Dunbar, "Materiality and Magnitude: Event Studies in the Courtroom", NERA (undated)
- <http://www.econaa.com/resources.htm>
