Using ROI to Guide Program Development and Evaluation

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Presented at
2012 Summit on Vocational Rehabilitation Program Evaluation and Quality
San Antonio, TX

September 6, 2012

Einstein's Formula

- If A equals success, then the formula is:
  A = X + Y + Z
  where X = work. Y = play. Z = keep your mouth shut.

  --Albert Einstein

Interest Rate

- Interest rate positively related to
  - Inflation
  - Risk
  - Term

Present Value

An investment *INV* yields a stream of benefits, B_1, B_2, B_3, . . . , B_t.

$$PV(INV) = B_1/(1 + r_1) + B_2/(1 + r_2)^2 + B_3/(1 + r_3)^3 + \ldots + B_t/(1 + r_t)^t$$

where B_t = benefit (or repayment) to be received in period t

r_t = interest rate in time period t

Present Value – Internal Rate of Return (irr)

The interest rate that equilibrates the PV to *INV* is called the ***internal rate of return (irr).***

For a financial or capital investment, the irr is the highest level of interest rate that you would want to pay for your loan.

Mortgage Example

For a mortgage lender, *INV* is the mortgage principal, B_t is the monthly payment, and r_t is the monthly interest rate.

For mortgages, B_t and r_t are the same every month, so formula becomes

$$PV(INV) = B/(1 + r) + B/(1 + r)^2 + B/(1 + r)^3 + \ldots + B/(1 + r)^t$$

$$= B * \Sigma\, 1/(1 + r)^t = B * \text{Factor}$$

Mortgage example ($200,000)

r	Term	Factor	Payment	Total interest
0.06	30	166.79	$1,199.10	$231,676
0.06	15	118.50	1,687.71	103,788
0.09	30	124.28	1,609.25	379,330
0.09	15	98.59	2,081.53	174,675

What about Program Services?

Program services, *SERV,* yield a stream of benefits, B_1, B_2, B_3, . . . , B_t.

$$PV(SERV) = B_1/(1 + d_1) + B_2/(1 + d_2)^2 + B_3/(1 + d_3)^3 + \ldots + B_t/(1 + d_t)^t$$

where B_t = benefit received in period t minus costs incurred in t *(e.g., assistive technology)*

d_t = discount rate in time period t

Benefits in a Human Services Program

How do we measure the B_1, B_2, B_3, . . . , B_t in a VR program?

Monetary Benefits	Nonmonetary Benefits
Earnings	Health
Transfer income	Knowledge and skills
Taxes paid	Confidence/self-esteem
Unemployment compensation	Family stability
	Noncognitive skills

Present Value -- Discounting

The division of the future benefit terms, i.e., the B_t, by the $(1 + d_t)^t$ terms is called ***discounting***. The d_t are like interest rates because they adjust for the fact that future dollars are not worth as much as today's. Furthermore, they are usually in the range of 0.00 to 0.10, like an interest rate.

Because they are in the denominator, a higher discount rate will lower the PV of the services. (Note: we often say that youth make poor decisions because they have very high discount rates – they don't value highly the future.)

Net Present Value

$$NPV = PV(INV) - INV$$

$$NPV(SERV) = PV(SERV) - SERV$$

- Negatively related to *r, d*
- Explains why we want the Fed to reduce interest rates in a recession (show demand for Investment)

Benefit-Cost Ratio

$$\frac{PV(SERV)}{SERV} \text{ or } \frac{PV(INV)}{INV} = \text{Benefit-Cost Ratio}$$

- Rational to invest/offer services if Benefit-Cost Ratio > 1, which means NPV > 0
- Usually express as $1 invested today will return (benefit-cost ratio – 1) dollars in the future

Return on Investment (ROI)

ROI = [*PV*(*SERV*) – *SERV*] / *SERV*

= *NPV* / *SERV*

Reported as

--percentage terms (multiply by 100)

--payback period (careful about period of analysis)
--invest $1 and get back a net gain of $ROI

--annual rate of return

Examples

Example: Each dollar spent in a program returns $6.50 in 8 years.

Note: This statement is ambiguous about whether this is a benefit-cost ratio of 6.50 in which case the ROI is 5.50, or if this is an ROI of 6.50, in which case the benefit-cost ratio is 7.50. Assume that is an ROI of 6.50. Then,

--This program has a return of 650%.

--This program has a payback period of 8/6.50 = 1.231 years (14.769 months).

--This program has an annual return of 126.36 percent.

Two Key Ingredients to an ROI Study

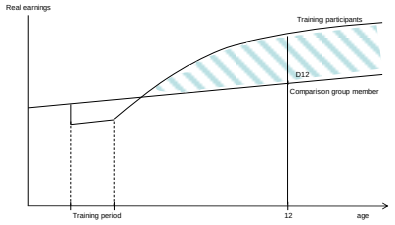
- Counterfactual
- Time Period for Outcomes

Counterfactual

Counterfactual: circumstances that would occur if investment was not made (action was not taken)

Example: Did ARRA work or not work?

Mincer Model



Net Impact Estimation

Method 1: Random assignment

Method 2: Quasi-experimental

Method 3: Regression

Method 4: Post-Pre

Outcome Period

- Issues (Refer to Mincer Model):
  - Takes time to obtain benefits (PPV study; pre-school)
  - Longer time frame will typically increase B-C ratio
  - Longer time frame may mean extrapolation, which is very uncertain
  - Short time frame more useful in program improvement and budgetary considerations

Washington State DVR Example

	First 2.5 Years	Lifetime (age 65)
Earnings increment	$9,034	$52,812
Fringe benefits	1,806	10,562
Taxes	-1,559	- 9,110
Unemployment comp.	410	1,072
TANF/FS/Medicaid	- 892	- 2,158
Foregone earnings	-707	
Program cost	9,347	

$ in 2010$; estimated with data from Washington state; comparison group is applicants who were not served (program participants deleted); discount rate is 0.03; average age at exit = 39.4

ROIs

	First 2.5 years	Lifetime
Individual	--	--
Taxpayers	-54.40%	0.34%
Society (annual)	2.69%	6.32%
$1 invested earns	$1.24	$6.86

Data Needs

- For customers who received services in a cohort (applicants or exiters):
  --Application date (or first date of service)
  --Demographic characteristics (age, education, sex, marital status, disability status, veteran status, public assistance status, etc.)
  --Pre-program labor market experience (earnings, work experience, employment and unemployment spells, turnover, industry, for at least 3 years)
  --Exit date
  --Post-program labor market experience (earnings, work experience, employment and unemployment spells, turnover, industry, for at least 3 years)
  --Post-program participation in public assistance or unemployment compensation

Data Needs (Continued)

- For entire caseload:
  --Program expenditures for services
  --Pro-rated share of overhead and administrative costs for the entire caseload

Data Needs (Continued)

- For individuals in a comparison group cohort (e.g., non-served applicants in a given time period or randomly assigned control group):
  --Application date (or first date of service)
  --Demographic characteristics (age, education, sex, marital status, disability status, veteran status, public assistance status, etc.)
  --Pre-***application*** labor market experience (earnings, work experience, employment and unemployment spells, turnover, industry, for at least 3 years)
  --Exit date (may be same as application date)
  --Post-***encounter*** labor market experience (earnings, work experience, employment and unemployment spells, turnover, industry, for at least 3 years)
  --Post-***encounter*** participation in public assistance or unemployment compensation

Bottom Line

- What Good are ROIs?
  - Need them for the "marketing game."
  - More important: program improvement

    --Calculate for subgroups - - different areas, client types, services

    --Do "what if" simulations
  - Hypothesis: will not and should not be used for accountability because they are "gameable"

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Audience Participation

Scenario: Congress passes a law that all establishments engaged in interstate commerce must employ a full-time doorperson at $10.00/hour

Voc. Rehab agencies give two-week training programs at cost of $500/customer (includes administrative overhead)

Outcomes: 80 percent placement; no displacement

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ROI

- Agency with 1000 VR customers:
  Cost = $500,000

Earnings:	Year 1:	$16,000,000
	Year 2:	16,000,000
		o
		o
	Year 5:	$16,000,000
	Total:	$80,000,000

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ROI

- Counterfactual: 1000 unserved applicants; 60 percent employment; $9.50/hour ave.
- Net impact:

	Year 1:	$4,600,000
	Year 2:	4,600,000
		o
		o
	Year 5:	$4,600,000
	Total:	$23,000,000

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ROI

- Assume 5% Discount rate, then
  PV (Serv) = $19.916 million
  NPV (Serv) = $19.416 million
  Benefit-Cost ratio = 19.92
  --ROI = 1,942 %
  --Invest 1$ and get back $19.42 in 5 years
  --Payback period = 5/19.42 years = 3.09 months

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Example

- What's Wrong?

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