

Rate of Return of PPI Projects

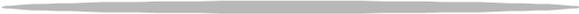
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Rate of Return of PPI Projects



.





2001-37

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 · 2-22 / · 2001 12 28 / · 2001 12 31
 · 1591-6 (431-712)
 · 031-380-0426() 031-380-0114() / · 031-380-0474
 · 6,000 / ISBN · 89-8182- 184- 4-93300
<http://www.krihs.re.kr>

© 2001,

*



가

가

.

가

가

,

가

.

SOC

'99 4 ' ,

가

가

.

가

가

가

.

가

,

가

, PFI(Private Finance Initiative)

PSC(Public Sector Comparator)

가

가

가

가

가

(The University of

Birmingham)

(Peter A. Watt)

2001 12



가

SOC

가

가

가

가

SOC

가

SOC

가

5

1 “ ”

2 “ ”

3 "IBRD" (IBRD)
Squire-Van der Tak(1975)

. IBRD

“ 가 ”

가

ST (accounting rate of interest
: ARI)

(,)

가

Cobb-Douglas

, 1 1

가

가 . ,

가 가
가 가
1998 2000 가
1981 1997 가

ST
1980 11.74%, 1990
8.38%
2 (1999 2000) 7.3%
1990

(가)

가

, SOC
7% 8%

7.5%

2% 가 5.5%

가

4 “

”

가

,

, SOC

,

가

()

()

가

(1998)

ρ

.

ρ

Cobb-Douglas

Burgess(1989)

가

‘ ,

1.5%, 2.0%, 2.5%

,

2.5%

가

가

25% 가

가

'80

11.4% 12.5%, '90

9.9% 11.1%

. 가

2000

8.1% 9.9%

,

9.0%

,

,

9%(가

5% 가

14.5%)

(reference rate)

가

9% 가

5 “ ”



.....
.....

1

1. 1
2. 3
 1) 3
 2) 4
3. 4
 1) 4
 2) 6

2

1. 7
2. 10
 1) 10
 2) 11

3.	.....	22
1)	.....	22
2)	.....	23
3)	.....	29
4)	.....	32
4.	.....	39
1)	.....	39
2)	.....	45
3)	.....	48
5.	.....	52
1)	.....	52
2)	.....	58

3 IBRD

1.	.....	63
1)	.....	63
2)	.....	65
2.	.....	66
1)	.....	66
2)	.....	69
3)	가	84
3.	88

4

1.	95
2.	97
1)	97

2)	(ρ)	98
3)	101
3.	104
1)	104
2) SOC	108
3) 가	110
4.	가	113
1)	113
2)	가	115
5.	116
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< 3-6>	(s)	80
< 3-7>	(i)	85
< 3-8> 가	86
< 3-9>	92
< 4-1>	98

< 4-2>		(ρ)	100
< 4-3>	SOC		103
< 4-4>			107
< 4-5>	SOC		109
< 4-6>	가		112
< 4-7>			114
< 4-8>		(2000 )	.....	119



< 2-1> 가 33

CHAPTER 1

1.

가 가 . 가 가
가 가 , , , , ,

. 1999 300
가 500

가

,

가

가 가

가

가

가

SOC

가

가가

가

가

가

SOC

2.

1)

가

SOC

SOC

1980

2000

1980

2000

2001

가

2)

UNIDO

IBRD

가

Birmingham

PSC(Public Sector Comparator)

가

IBRD, OECD,
1960

PFI(Private Finance Initiative)

PFI

3.

1)

5
·
2
· 1
2
· 3
, 4
5

·
3 IBRD Squire-van der Tak(1975)

· 1 IBRD
2

가 · 3

4 SOC

· 1
, 2 1981 2000
· 3
4
가 · 5

SOC

·
5

2)

가

가

가

가

SOC

가

CHAPTER 2

1.

(discount rate)
(cost) (benefit) 가
가
(') (')
(')
“ 가
가?”

1).

가 (net present value)가

가

가

2).

가 가 가 “가?”

()

가

()

가

가

가

3).

가

1)

가

가

2)

3)

(cut-off rate)

가

가

가

1960

, 1970

20

가가

. Lind(1982)

가

(social rate of time preference) 4).

가

(consumption rate of interest)

가

가

5).

(marginal rate of return on private investment)

6).

가

가

-
- 4) S.A. Marglin(1963a, 1963b) Feldstein(1964),
 Dasgupta-Sen-Marglin UNIDO Guidelines(1972) Lind(1964),
 Diamond(1968)
 , Kay(1972), Ahsan(1983) Mendelsohn(1981, 1983)
- 5) Sassone & Schaffer(1978)

- 6) Baumol(1968), Diamond & Mirrlees(1971a, b)

(opportunity cost of public investment)

7).

가

8).

2.

1)

가 가

가

가

가

가

가

가

가

7) Mirlees OECD Manual(1968, 1974), W.J. Baumol OECD Manual Little & Squire & Van der Tak IBRD Manual(1975)

8) Ramsey(1969), Usher(1969), Sandmo & Dréze(1971), Harberger(1972), Schmalensee(1976)

가
가
가
가

2)

(1)

1930
가
가 1960 . OECD
Manual⁹⁾ UNIDO Guidelines¹⁰⁾가
(2000:
143-147) '60
가
가
1930 1950

9) Ian M. D. Little James A. Mirrlees
Countries, Vol. 1 (1968)
Planning for Developing Countries)

10) Dasgupta, Sen & Maglin

「Manual of Industrial Project Analysis in Developing
가 (Project Appraisal and

가 (Guidelines for Project Evaluation)」 (1972)

1960 가 가 가

(social opportunity cost)

Baumol(1968)

11),

1970 가 Baumol

1980 ‘ 가 가 ’

가 가 가

12).

11)

가

12) Squire-van der Tak(1975), Dreze-Stern(1987)

(2)

가

가
가
가

(opportunity cost)

, ()

가

(social time preference rate)

13)

가

Marglin(1963), Baumol(1968), Burgess(1989)

S.A. Marglin

Marglin

가 , 가

13) Ogura-Yoche(1977), Burgess(1989)

가 k 가
 αk $dU_i = -1 + \alpha k$ 가 $dU \geq 0$
 $-1 + k \geq 0$ (3) 17).

$$\alpha k \geq 1 \tag{3}$$

가 n 1
 $dU_i = -1 + \alpha kn - \beta(n-1)$ 0
 가
 (4)

$$dU_i = -1 + \alpha kn - \beta(n-1) \geq 0 \tag{4}$$

(4) 가
 가가 가
 (4) $\alpha kn \geq 1 + \beta(n-1)$,
 n , 1
 $(n-1) n$ (4) (5)

$$\alpha k \geq \beta \tag{5}$$

17) 가(k)가
 ()

$$r_{soc} = \frac{1 + \beta(n-1)}{n\alpha} - 1 \quad (6)$$

$$r_{soc} \cong \frac{\beta}{\alpha} - 1 \quad (7)$$

W.J. Baumol

Baumol(1968)

(social opportunity cost)

. Baumol

(

)

18).

Baumol

가,

가

가

.

()

()

18)

Fisher

, 가 19).
Baumol

가 .

D.F. Burgess
Burgess(1989) 가

20).

가
(opportunity set) 가
21).

가

가

Burgess

22),

가

19) Baumol
OECD IBRD

20) (crowd-out effect)
(crowd-in effect)가

21) Burgess

22) 가

가

가 (-)

가 가()

(3)

UNIDO

UNIDO(United Nations Industrial Development Organization)

"Guidelines for Project Evaluation" Dasgupta-Sen-Marglin UNIDO
가

가 가

가

OECD Manual

UNIDO

UNIDO

(numeraire) 가

23).

가

(numeraire)

UNIDO

23) “ 가
market prices)”

(aggregate consumption measured at domestic

가
. UNIDO

2

가

OECD
OECD UNIDO

가

()

()

가

24).

()

가

가 .

- 가 OECD

가

. 가 1) 가
가 . 2)

가

. 3)

. 1)

, 가 (border price),

(conversion factor)

가 (shadow price)

. 2)

(shadow wage rate) , 3)

가

24) “ 가

가 (present uncommitted social income measured in terms of convertible foreign exchange of constant purchasing power)” (numeraire) .

OECD

$$ARI = r + \frac{1}{s_0}(c - m)n \quad (8)$$

r () , $1/s_0(c - m)n$
가 . ARI

IBRD

Squire-van der Tak

IBRD Manual OECD

. IBRD 가
가

OECD

IBRD

가

q

s

sq

25).

IBRD

“

” () 가 ”

25)

가

가

IBRD ARI “ 가 v ”
 ARI .

$$ARI = sq + \frac{1}{v\beta}(1-s)q \quad (9)$$

가 sq 가
 가 $\frac{1}{v\beta}(1-s)q$ 가

:

UNIDO
 OECD IBRD .
 () ()
 가 . 가
 가
 가 . UNIDO
 , OECD IBRD

가 가 . UNIDO
 . 가 가

. OECD
(shadow exchange rate)

가
가

. OECD

가 .

3.

1)

가 가 () ‘ (financial)’
 가 가 . () 가
 가
 가
 가 가
 () () 가 가
 가
 가
 가 가 .

가 . 가

가 가

가 .

2)

(1)

(Discounted Cash Flow

Method: DCF) 가

가 가 . ,

가 가 .

, ,

,

가 .

DCF 가 26),

,

()

가

가 ,

가 가 .

26)

MM 가
 (Modigliani and Miller, 1958)
 가

가 가

(2) 가 가 가

(+) 30 , 50 ,
15 20 , 15
가 가 가 /
가 가 가 27).
(가 가

)가
가 .
KDI “ (2000)”
2 30%, 70%가 가 5
5%, 15%, 25%, 35%, 20%가 가 .

(3) 가 가

27) 가 .

가

가

가

가

가

가

(4)

(

)

가

가

가

가

가

10

가

가 28).

(5) 가 가

가 가

가

(負)

가

가

가 가

가

BOT

가, BTO

가 BOO

가

가

BOT

BTO

가

가 가

가

가

BOO

가

가

가

가

가

28)

가

가

(6) 가
가

가
가

가

가

가

가

가

가

가
가
가

20

가

가가

가

가

3)

가

(Discounted Cash Flow Method: DCF) . DCF

가

. DCF

가 (Net Present Value Method: NPV),
Return:IRR), (Payback Period Method)

(Internal Rate of

가

(1)

가

가

가

가

가

가

가

가

(Free Cash Flow)

(FCF) = - 가

= (1-)+ 가 - 가

가

가

가

가

가

가

가 29).

()

가
(sunk cost)

(2) 가 (NPV)
가 가
가 가 0
가

$$NPV = \sum_{t=0}^n \frac{R_t}{(1+r)^t} - \sum_{t=0}^n \frac{C_t}{(1+r)^t} \quad (10)$$

, R_t :

C_t :

r :

n :

r

가

r

29)

가

(3) (IRR)

가 r 가 .
가 가 가 .
(IRR) ()
가 .

$$\sum_{t=0}^n \frac{R_t}{(1+r)^t} - \sum_{t=0}^n \frac{C_t}{(1+r)^t} = 0 \quad (11)$$

, R :

C :

r : IRR

n :

(4)

가 가 가

가

4)

(1)

()

()

가

Risk Premium

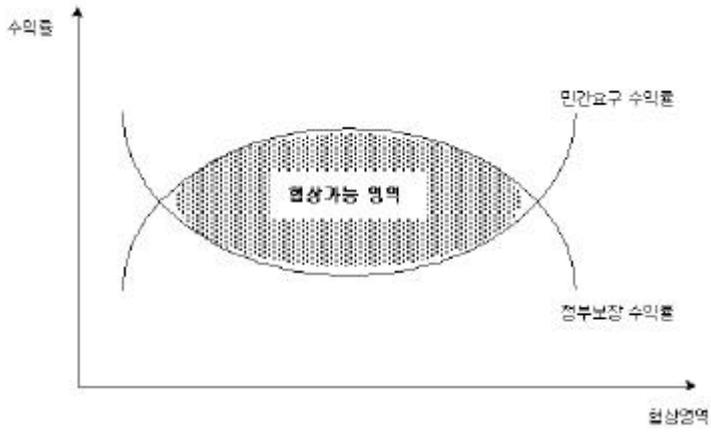
DCF

가

()

가 .
 30).
 가 가 .
 가 가 .
 가 가 .
 가 가 .
 가 가 .
 가 가 .
 가 가 .

< 2-1> 가



30) SOC

가

가

가

가

가

가

(adjusted cost of capital)

, = + Risk Premium

+ 31).

$$31) = + \{ \text{Risk Premium}(1)^* + \text{Risk Premium}(2)** \} +$$

* Risk premium for current business risk of the investors

** Risk premium for additional risk related to Project Undertaking

(2)

가
가 (capital asset pricing model: CAPM)

가
가 가

,
가2 가) , (

,
가 () , 가

,
가

가 CAPM

가 가 ,

, 가

가 가

가

$$K_e = E(R_i) = R_f + \beta_i(E[R_m] - R_f) \quad (12)$$

, K_e :

$E(R_i)$: i

β_i : i

R_f :

$E(R_m)$:

$E[R_m] - R_f$:

,

1

CAPM

가

가

가

()

3가

. CAPM

가

가

가

가
 가 (arbitrage pricing model: APM) 1976 Ross 가
 가 . 가 가 . ,
 . ,
 . , 가 가
 .
 APM 가
 (CAPM) 가 가 .
 CAPM 2 가 APM
 가
 , CAPM ,
 가 가
 가
 APM .

$$K_e = E(R_i) = R_f + \sum_{j=1}^k \beta_j (E[R_j] - R_f) \quad (13)$$

, K_e :

R_f :

β_j : j

$E[R_j] - R_f$: j

k :

APM CAPM 가

. APM

APM 가

가 .

가

가

. APM 가

가

. Chen, Roll and Ross(1986)

, , 가 ,

가 .

$$E(R_i) = R_f + \beta_{GNP}(E[R_{GNP}] - R_f) + \beta_l(E[R_l] - R_f) + \dots + \beta_\delta(E[R_\delta] - R_f) \tag{14}$$

, $E(R_i)$: i

R_f :

β_{GNP} : (GNP)

$E[R_{GNP}]$: 가 1

가 0

β_I :

$E(R_I)$: 가 1

가 0

δ :

APM

French(1992)

가

가

가

. Fama and

4.

1)

(1)

(1981)

Baumol(1968)

1980

12 14%

32).

가

가 .

가

가

가 .

가

가

가

가

가

(gross rate of

return)

가가

1977

가

(1981)

가

가 .

가

Baumol

33),

32) (1981), , pp. 96 97 .

33) Baumol 가

. Baumol

1960

가 , 1980

Baumol

(gross rate of return) 가 가

(2) (1987) 가 UNIDO, OECD, IBRD

1 (CD) 1

가 12% 가 12% (1981) 가가 가

+ +) (13.5%), 1970 1985

(7.5%) 1985

10.3% 25

8.2%

10% 가 UNIDO, OECD, IBRD 6.9% 13.5% (1987)

가 .

가

(1981)

IBRD

1981

1985

5

2

(1985 , 1986)

(3)

(1999)

1988

가

“

”

가

가

가

IBRD Squire & van der Tak

(ST) Ward & Deren (WD)

가 .

1991

1997

7

(GDP)

, 1

가

. 2010

2010

가

ST 13.0%, *WD*

18.2% ,

ST 8.5%, *WD* 8.8% .

1998 2000

ST 5.9%, *WD* 6.9% ,

2001 2010

ST *WD* 7.1%

34).

GDP

35).

(1999)

가

가

,

가

가

가

.

(*q*)

가

(GDP) 가

純GDP

,

“

”

t 純GDP 가 *t-1* (

)

. IBRD

q

純GDP

q

.

,

가

“

”

“

34)

(1998 2010)

35)

가

가

,

” 가 가 .

(q) 純GDP “

”

가 .

(4)

(2000) 1999 1 『

』 , 2000

(2000) 가

$$y = \frac{(1-s)r}{(1-s) + sM_i} + sq$$

. y ‘

’ 가 , s

. r , q , M_i i

가 가 . i- 1

가 ‘ ’ 가 가 i

가 가 y가 .

7.5%, 13 14%,

가 1.5 2.0 가

9 10% . 1990 가

5% 가

10% 7.5%

(2000) 가 가

가

7.5%

가

2)

가

가

가

『

가

』가

가

1980

(1)

가

1969

-

(Ammann & Whitney)

“

()”

가

15%

가

1990

10%

13%

< 2-1> 1990

12%

< 2-1>

	(%)		(%)
-	13	-	11
-	13	-	13
-	13	- ()	12
-	12	-	13
2	12	- ()	12
-	12	-	10
	10	-	10
- ()	12	-가	10
-	11	-	10

: (1998), 3 (1999), (1999)

(2)

가

< 2-2>

1994 12% 13%, 1998 8.5% 10%, 1999 7.5%

< 2-2 >

	(%)	
1.	13%	1989
2.	13%	1990
3.	13%	1993
4. 1 (2)	12%	1993
5.	12%	1993
6. 4	13%	1993
7.	12%	1994
8. 가	10%	1996
9. 가	8.48%	1996
10. 2	8.89%	1998
11.	7.53%	1999
12. (1)	7.5%	2000

:

(3)

1999

12% 13%

1999

7.5%

. 1990

10%

8%

< 2-3>

		(%)	
	1. -	12%	1990
	2.	13%	1992
	3. ()	13%	1994
	4.	12%	1996
	5.	7.5%	1999
	6. -	7.5%	2001
	1.	10%	1989
	2.	10%	1990
	3.	8%,10%	1992
	4.	8%	1992

:

3)

SOC

36).

36)

30 가

1994 8 “ ”
1995

가 1997
가

1999 2001
9%
9.5% < 2-4> < 2-5> 가 2,000
가 2,000

< 2-4> 가

										()
	14,766	4,342	29%	10,424	71%	1,096	9.70%	15.19%	13%	00.12
2 (1)	1,816	543	30%	1,273	70%		9.34%	14.81%	11.20%	00.12
A	1,764	353	20%	1,411	80%		7.24%	12.60%		97. 2
B							9.55%	15.00%		
C							5.90%	10.50%		
D							9.95%	15.40%		
-	16,567	4,326	36%	7,634	64%	4,607	9.24%	14.70%	11%	00.12
(1)	23,886	4,777	27%	13,022	73%	6,087	9.50%	14.97%	13.26%	00.12
(1)	1,013	238	41%	344	59%	431	9.62%	15.10%	13%	00.12
	1,882	565	30%	1,317	70%		6.42%	11.74%	12.25%	98. 5
-	25,473	6,000	33%	12,415	67%	7,058	9.30%	14.85%	12% ()	00.12
	46,354	9,038	30%	21,088	70%	11,364	10.43%	15.95%		01. 3
(-)	19,251	4,191	30%	9,825	70%	5,235	9.52%	15.00%	12.75%	00.12
	3,105	621	20%	2,484	80%	1,048				00.12
(2)	1,102	275	33%	563	67%	264	9.00%	14.45%	12.50%	01. 9
(1)	533	133	35%	242	65%	158	8.90%	14.34%	12.66%	01. 9

< 2-5>

										()
	663	180	27%	483	73%		9.70%	15.20%	13.06%	01.12
	936	257	27%	679	73%		9.05%	14.50%	10%	00.10
	530	159	30%	371	70%	394	8.57%	14.00%		00.10
	1,675	65	4%	1,610	96%		8.10%	12.00%		01. 2
2 3-1	1,494	390	30%	906	70%	198	7.27%	12.64%		01. 6

가

가

가 가

가

가

가 100% 가

가

가

가

가

5.

1)

(1)

가

1967

가

(white paper)

8%

가

8%

8%

1

1968

10%

37)

가

가

37)

Baumol

,
 .
 1978
 (required rate of return) 5% .
 1988 가 5
 8%() .
 4 6%
 38).
 가
 가 가 .
 가 .
 가 .
 가 .
 () .
 (long-term value) 1% .
 . (-) 1.5 가 .
 38) 가 가
 , , , , , 가
 , .

2% 가 $r = 1 + \beta g$, $1\% + (1.5\% \times 2) = 4\%$

3% 1% 4%가

(variability risk) 가 . Variability Risk
 Variability가 GDP (+)
 가가
 Variability Risk 0.5% 가 가

6%() 6%
 PFI(private finance initiative)

5% 4%
 . PFI

가

PSC(public sector comparator)

VFM(value for money) Test

가

. PFI

PFI가

가

가

가

가

가

(brainstorming)

(2)

OMB(Office of Management

and Budget)가

. OMB

1972

1992 10

10%,

7%

OMB가

7%

가

7%

7%

가

(3)

(Commissariat General du Plan)

()

逆

(inverse optimum method)

가

1970

10%

, 1980

1%

9%, 1990

7%

가

(4)

가
 (,)
 가
 1981 Burgess가 () 10%가 7%
 가 7% 10%

(5)

가
 가 가 가
 가 가

< 2-6 >

가		.			
	6%	7%	3%	4%	5%

: (1999), 4 (1999) P.A. Watt "The UK Private Finance Initiative", Birmingham University, , 2001.10.

가

. 4% 6%(1997 8%)
 , 7%, 3%, 4%(
 1997 6%) .
 가
 . IBRD ADB 가
 (IRR) 가

가

2)

가 가

(ROE)
 (ROI)

가

(1) PFI

PFI (undiversifiable risk)

PFI

PFI National

Audit Office Select Committee Work

Fazakerley Fazakerley Prison Service Limited

(ROE) 13%

16% 가 , Refinancing

20 26 39%

15% 17%

, DBFO(Design-Build-Finance-Operate)

(ROE) 9.5%

DBFO 3

, 15 20

120 140bps(1.2 1.4%) 가

25 (5 20)

가 AMBAC Indemnity Corp.

AAA 가 9.18%

(2)

(ROE)

20% 25%

15% 18%

< 2-7>

		()
1-1	()	AIG Infrastructure Fund = 25%+ AIG-GE, Capital Latin American Infra = 18%+ Asia Infrastructure Fund = 29%+ Int'l Energy Infrastructure Fund = 20%+ Scudder Latin America Power Fund = 25%+
1-2	Infrastructure Finance (1994/7)	20%+
1-3	Project Finance International Yearbook 1997	20%
1-4	Project Finance International Yearbook 1997	(US\$) 18 25%
1-5	Infrastructure Finance (1997 7/8)	AIGAF : 25%+, AIF : 29% Telecom Fund : 32%, Scudder : 25% AIG-GE : 18% International Energy Infrastructure Fund : 20%+ US Boilermaker National Pension Trust : 31% Taiwan Far East Transport : 20%
1-6	Aqua International Partners L.P (1998/6)	20 30%
1-7	Bankers Trust Company Presentation	20% - Tata Electric : 17% ROE - East Water : 20% - Lyonnaise Asia Water Limited : 20 25%
1-8	Hills Motorway Trust	IRR : 17.5% ()

: +

1-9	Reuters (1999/1/28)	20%
1-10	Economic Times(1998/10/18)	20%
1-11	Broker Report(1998/8/7)	96 (17%), 97 (18%), 98 (16%), 99 (15%)
1-12	South China Morning Post(1998/4/12)	ROE : 18.5%
1-13	Broker Report on Railtrack PLC	12.3%
1-14	Broker Report(1998/7/15)	/ : 17.7%() , , , : 20.1%()
1-15	Project Finance International(1995/5/11)	: ROE 16% ()
1-16	Project Finance International(1995/7/19) " "	: 15.18%
1-17	Pakistan's Private Power Programme	18%
1-18		17%
1-19	PTT Project in the pipeline	1 : 18%, 2 : 16%
1-20	Private Power gets welcome()	20 25%
1-21	San Roque makes quiet calls ()	15%
1-22	Barclays Capital paper on Private Equity Focusing on Asia	25 35%
1-23	EHC ()	ROE : 16% 4%(13 14%)

(ROI)

12% 15%

14% 17%

< 2-8 >

2-1	Economic Times(1998/ 10/ 18)	Project IRR : 18%
2-2	(4	SR57 : 20.25% I-80 Mid-State Tollway : 21.25% SR125 : 18.5% SR91 : 17%
2-3	World Bank (1994)	1974 1992 :15 17% : 20 29%
2-4	Toll Road Facility, Hong Kong	: 12 14%
2-5	Airport Infrastructure, Hong Kong	: 13 15%
2-6	Power Station. Philippines	: 14 16%
2-7	Expressway Project, China	: 14 17%
2-8	Power Project, Thailand	: 14 16%
2-9	BOT Light Rail Project, Malaysia	: 14 16%

CHAPTER 3

IBRD

1.

1)

IBRD

van der Tak(1975) (IBRD) Lyn. Squire & Herman G.
 (“ S T ”)
 (accounting rate of interest : $A R I$)

$$A R I = sq + \frac{1}{v\beta}(1 - s)q \quad (15)$$

- , $A R I$: (accounting rate of interest)
- s : (marginal propensity to reinvest)
- q : (marginal product of capital)
- v : 가 (value of public income)

: (consumption conversion factor)

ST

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 , 2
 “ 가 가 ”
 ,
 가 ST
 , 가
 . 가
 UNIDO, OECD, IBRD . 가 UNIDO

39). ,

OECD IBRD

IBRD

, 가
 가 . 가 ST
 (1999) 가 .

39) UNIDO . 가

가 , 가

2)

1980 2000

가

i

*q*가

,

.

CD-ROM

.

(1996)

1997

(CD-ROM)

, .

.

가

'95

가

40).

가

가

.

ST

가

가

가

(9)

ST

40)

가

가가

가

2.

1)

Squire-van der Tak(1975)

(15)

(accounting rate of interest : $A R I$)

$s q$

가

가

$$\cdot \frac{1}{v\beta} (1 - s)q$$

가

가

가

IBRD

“

가 (social value

of public income)”가

가

가

. IBRD

가 (가) v

$$v = \frac{\sum_{t=0}^{\infty} (1 - s_t)q_t \frac{1}{\beta} \cdot \prod_{t=1}^T (1 + s_t q_t)}{\prod_{t=0}^T (1 + i_t)} \quad (16)$$

, q_t : t

s_t : q_t “ (marginal

propensity to reinvest)

$i_t : t$

$\beta :$ (consumption conversion factor)⁴¹⁾

가 $(1 - s_t)q_t \frac{1}{\beta}$ t
 가 (가
 가) . q_t 가
 v 가 $\prod_{t=1}^T (1 + s_t q_t)$
 가 $s_t q_t$ 가
 T . $\prod_{t=0}^T (1 + i_t)$ 가
 가
 s_t, q_t, i_t, β ()
 $i - sq$ 가 ,
 가 가 (16)

(17)

$$v = \frac{(1 - s)q}{i - sq} \cdot \frac{1}{\beta} \quad (17)$$

v s, q, i, β . i 가

41) $\beta = \frac{X + M}{X(1 - t_x) + M(1 + t_m)}$

$X :$ (f.ob 가)

$M :$ (cif 가)

$t_x :$ (負)

$t_m :$

2)

(1) (GDP)

(GDP) ST

1998

1999 IMF

가 (-)

1998 1999

2

(2000) 43)

GDP

< 3-1 >

(2)

ST

(q)

(

)

10

「 가

가

(2000)

(1996) 44)

「'97 가 CD-ROM

1981 2000

(2000)

(1996)

43) . 2000.1. “ GDP

44) . 1996.12. “

「 11 2 . :

(2000)

가

가 가

< 3-1 >

(: , 1995 가)

	GDP	GDP	GDP
1980	114,859	118,275	114,859
1981	122,436	126,808	122,436
1982	131,160	136,163	131,160
1983	145,461	147,220	145,461
1984	157,335	160,496	157,335
1985	167,654	174,884	167,654
1986	186,003	190,132	186,003
1987	206,304	205,581	206,304
1988	227,779	221,267	227,779
1989	241,757	236,365	241,757
1990	263,324	253,366	263,324
1991	287,913	273,976	287,913
1992	303,333	295,582	303,333
1993	320,065	317,587	320,065
1994	346,631	342,324	346,631
1995	377,350	368,439	377,350
1996	402,771	393,492	402,771
1997	422,832	414,935	422,832
1998	394,642	432,953	432,953
1999	437,665	451,667	451,667
2000	476,148	-	476,148

: “ ” (2000).

(1996)

1993

「97」 1997
1994 1996
1993

1997

1998 2000 1997
가

< 3-2 >

< 3-2 >

(1981 2000)

(: , 1995 가)

1981	170,652	34,048	204,700
1982	189,242	35,758	225,000
1983	212,405	37,595	250,000
1984	237,301	40,699	278,000
1985	263,433	43,067	306,500
1986	294,597	44,203	338,800
1987	330,206	47,094	377,300
1988	370,260	51,640	421,900
1989	417,315	58,185	475,500
1990	476,924	67,576	544,500
1991	541,928	78,572	620,500
1992	605,381	89,619	695,000
1993	674,984	98,516	773,500
1994	746,233	116,067	862,300
1995	823,549	136,051	959,600
1996	904,552	158,248	1,062,800
1997	979,428	180,972	1,160,400
1998	951,659	175,841	1,127,500
1999	1,094,134	202,166	1,296,300
2000	1,154,821	213,379	1,368,200

(3) ()
 ST 41)
 . (2000) 가
 . 41)
 가
 가 .
 , 가 .
 CD-ROM
 . (t_x) 1986 가

. WTO가
 1995 0% 가 .
 가 1987 1994 1986
 (extrapolation)

41) .

$$t_x = 0.0315t^{(-1.1758)} \quad (R^2 = 0.917) \quad (19)$$
 , t : (1980 : $t = 1$)

β < 3-3> .

< 3-3>

()

(:)

	X	M	t_x	t_m	β
1981	21,254	26,131	-0.0217	0.0496	0.9642
1982	21,853	24,251	-0.0085	0.0569	0.9672
1983	24,445	26,192	-0.0045	0.0717	0.9622
1984	29,245	30,631	-0.0043	0.0644	0.9661
1985	30,283	31,136	-0.0040	0.0577	0.9697
1986	34,715	31,584	-0.0036	0.0695	0.9662
1987	47,281	41,020	-0.0027	0.0797	0.9629
1988	60,696	51,811	-0.0024	0.0678	0.9685
1989	62,377	61,465	-0.0021	0.0512	0.9742
1990	65,016	69,844	-0.0019	0.0557	0.9711
1991	71,870	81,525	-0.0017	0.0573	0.9697
1992	76,632	81,775	-0.0015	0.0492	0.9745
1993	82,236	83,800	-0.0014	0.0428	0.9782
1994	96,013	102,348	-0.0013	0.0418	0.9783
1995	125,058	135,119	0.0000	0.0443	0.9775
1996	129,715	150,339	0.0000	0.0438	0.9770
1997	136,164	144,616	0.0000	0.0429	0.9784
1998	132,313	93,282	0.0000	0.0287	0.9883
1999	143,686	119,752	0.0000	0.0326	0.9854
2000	172,268	160,481	0.0000	0.0317	0.9849
80	-	-	-	-	0.9672
90	-	-	-	-	0.9792

: ‘ ’ t_x (-) .

: CD-ROM .

, (2000) ,
 1980 1997 가 < 3-4> 45).

1980 가 가 1.0419 , 1990 1997
1.0272 .

< 3-4> 가

			/ (%)	/
1980	17245.3	21858.5	7.637	1.043
1981	20747.3	24596.1	7.098	1.039
1982	20934.4	23761.6	7.581	1.040
1983	23271.6	25120.1	9.232	1.048
1984	26486.1	27575.2	8.643	1.044
1985	26632.6	26652.8	8.409	1.042
1986	34128.3	29829.2	8.934	1.042
1987	46559.9	39030.5	9.983	1.046
1988	59973.0	48689.7	8.895	1.040
1989	61831.9	57470.5	7.183	1.035
1990	63658.5	66108.7	7.876	1.040
1991	70540.9	77344.3	5.807	1.030
1992	76198.9	77953.6	5.140	1.026
1993	82089.4	79770.9	4.504	1.022
1994	94964.3	97824.2	4.393	1.022
1995	124632.2	129076.4	4.654	1.024
1996	129968.0	144932.7	4.553	1.024
1997	138619.1	141798.2	4.298	1.022

: (2000), pp. 242 .

< 3-4> 가 Balassa(1974)가

45) (2000 : 242) ‘ ’ / 가

SCF = 1/ 가 46. 가
 1980 가 0.9598 , 1990
 0.9735 . < 3-3>
 < 3-3> .

(4) (q)
 (marginal product of capital)
 .
 (marginal rate of transformation) 47).

가
 가 .
 q .
 q 가
 가 .
 , q
 . q
 q . q
 48).

46) Balassa Squire-van der Tak ,

47) (consumption rate of interest : CRI)
 (marginal rate of substitution) , 가 .

48) Squire-van der Tak(1975). pp. 111 Lind(1982). pp. 78 .

가 .
(1999)

q
가 .

가

($\Delta NGDP$)

가

Cobb-Douglas

q

가 .

가

가

가

,

가

가

49).

q

가

Cobb-Douglas

50).

49)

가

1990

1995

가

가

가

가

50)

가

$$\delta + (1 - \delta) = 1$$

1

$$Y_t = BN_{t-1}^\delta L_t^{1-\delta} \quad (20)$$

, Y_t : t

N_{t-1} : $t-1$

L_t : t

B, δ :

(log transformation)

(21)

$$\delta \quad (22) \quad q \quad \delta$$

$$\text{Ln } N_{t-1} \quad \delta = 0.4299$$

$$\text{Ln } Y_t = -0.7880 + 0.4299 \text{Ln } N_{t-1} + 0.5701 \text{Ln } L_t \quad (adj. R^2 = 0.996)$$

(-132.13) (28.37) (37.62) (21)

$$q = \frac{\partial Y_t}{\partial N_{t-1}} = \delta \frac{Y_t}{N_{t-1}} \quad (22)$$

(22) (Y) (N) <

3-3>

β

가

q

q

< 3-5>

< 3-5>

(q)

(: , 1995 가)

	δ	Y (가)	Y (가)	N (가)	N (가)	q
1981	0.4299	122,436	118,057	204,700	197,380	0.2571
1982		131,160	126,852	225,000	217,610	0.2506
1983		145,461	139,966	250,000	240,556	0.2501
1984		157,335	152,008	278,000	268,587	0.2433
1985		167,654	162,578	306,500	297,220	0.2352
1986		186,003	179,714	338,800	327,345	0.2360
1987		206,304	198,658	377,300	363,317	0.2351
1988		227,779	220,608	421,900	408,618	0.2321
1989		241,757	235,523	475,500	463,238	0.2186
1990		263,324	255,715	544,500	528,768	0.2079
1991		287,913	279,189	620,500	601,698	0.1995
1992		303,333	295,604	695,000	677,292	0.1876
1993		320,065	313,083	773,500	756,625	0.1779
1994		346,631	339,104	862,300	843,574	0.1728
1995		377,350	368,864	959,600	938,019	0.1691
1996		402,771	393,518	1,062,800	1,038,385	0.1629
1997		422,832	413,692	1,160,400	1,135,314	0.1567
1998		432,953	427,875	1,127,500	1,114,277	0.1651
1999		451,667	445,072	1,296,300	1,277,370	0.1498
2000		476,148	468,978	1,368,200	1,347,597	0.1496
80						0.2366
90						0.1691

(5)

(s)

(marginal propensity to reinvest) s

q가

q가

(1-s)

s

q

가

q

가

“ ”

(marginal propensity to consume)

s 逆

(1-

s) q

가

가

1

가

1 GDP

s

1

(ΔP CONS) 1

(ΔP GDP)

, ΔP CONS ΔP GDP

(1- s)

(23)

s

< 3-6 >

(15)

s

‘80

‘90

가

$$1 - s = \frac{\Delta P CONS_{t-1:t}}{\Delta P GDP_{t-1:t}} = \frac{P CONS_t - P CONS_{t-1}}{P GDP_t - P GDP_{t-1}} \quad (23)$$

, ΔP CONS_{t-1:t} : t 1

$$\Delta P GDP_{t-1:t} : t$$

1

< 3-6 >

(s)

(: , 1995 가)

	CONS	ΔCONS	GDP	ΔGDP	1 - s	s	
1980	1,910	-	3,013	-	-	-	-
1981	1,994	83	3,162	149	0.5587	0.4413	0.2330
1982	2,077	84	3,335	173	0.4835	0.5165	0.2550
1983	2,171	94	3,645	310	0.3027	0.6973	0.2750
1984	2,261	89	3,894	249	0.3591	0.6409	0.2930
1985	2,362	101	4,109	215	0.4701	0.5299	0.2970
1986	2,445	84	4,513	405	0.2067	0.7933	0.3380
1987	2,561	116	4,957	443	0.2605	0.7395	0.3760
1988	2,711	150	5,419	463	0.3238	0.6762	0.3910
1989	2,964	254	5,695	276	0.9192	0.0808	0.3620
1990	3,212	248	6,142	447	0.5548	0.4452	0.3680
1991	3,478	265	6,650	507	0.5228	0.4772	0.3700
1992	3,669	192	6,934	284	0.6760	0.3240	0.3600
1993	3,869	200	7,242	309	0.6484	0.3516	0.3560
1994	4,225	355	7,765	523	0.6802	0.3198	0.3550
1995	4,577	352	8,368	603	0.5840	0.4160	0.3550
1996	4,937	360	8,843	475	0.7579	0.2421	0.3360
1997	5,172	234	9,194	350	0.6691	0.3309	0.3300
1998	4,645	- 527	9,325	131	-4.0189	5.0189	0.3420
1999	5,246	601	9,639	314	1.9137	-0.9137	0.3320
2000	5,770	524	10,072	433	1.2094	-0.2094	0.3320
80						0.5561	0.3188
90						0.3551	0.3468

: (s)

1998 2000 1990

: ‘ ’

Web-site

(6) (i)

가

가 1 2

1

2

가

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‘ 가

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가

가 ,

가

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가

가

가

가 가

가

가

가 가

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가

가

가

IBRD

1)

2)

i

IBRD

$$i = ng + \quad (24)$$

, n :

$g : 1$ 가

:

n 가 가

가 .

n 가 n 0 2

가 1

n 0 2

51). g 1 가

52).

g

n

53).

ST i (15)

54).

가

가

(i)

가

51) (1999). pp. 82.

52) 가 가

53) n ρ

, i

54) UNIDO OECD

$$i \quad (15) \quad .$$

$$i_t = \text{TaxRealRA TE}_t = \frac{1 + \text{TaxRA TE}_t}{1 + g_t} - 1 \quad (26)$$

$$, \text{TaxRA TE}_t = \text{RA TE} \times (1 - \text{Tax}_t) \quad \text{가}$$

$$\text{Tax}_t : t$$

$$g_t : t \quad \text{가}$$

3) 가

(1) 가

(15) 가

v ARI . 가 v

$$v = \frac{q}{i} \cdot \frac{1}{\beta} \quad . \quad (15)$$

< 3-8 > .

< 3-7>

(i)

	<i>BOND</i>	<i>RATE</i>	<i>Tax</i>	<i>TaxRATE</i>	<i>g</i>	<i>i</i>
1981	0.2690	0.2241	0.1000	0.2017	0.2130	-0.0093
1982	0.1590	0.1325	0.1000	0.1192	0.0710	0.0450
1983	0.1420	0.1183	0.1000	0.1065	0.0340	0.0701
1984	0.1500	0.1250	0.1000	0.1125	0.0220	0.0885
1985	0.1360	0.1133	0.1000	0.1020	0.0230	0.0772
1986	0.1280	0.1067	0.1000	0.0960	0.0280	0.0661
1987	0.1274	0.1062	0.1000	0.0955	0.0310	0.0626
1988	0.1358	0.1132	0.1000	0.1018	0.0710	0.0288
1989	0.1538	0.1282	0.1000	0.1153	0.0570	0.0552
1990	0.1851	0.1542	0.1000	0.1388	0.0850	0.0496
1991	0.1898	0.1582	0.2000	0.1265	0.0930	0.0307
1992	0.1400	0.1167	0.2000	0.0933	0.0630	0.0285
1993	0.1221	0.1017	0.2000	0.0814	0.0480	0.0319
1994	0.1422	0.1185	0.2000	0.0948	0.0620	0.0309
1995	0.1165	0.0971	0.2000	0.0777	0.0450	0.0313
1996	0.1257	0.1047	0.1500	0.0890	0.0190	0.0687
1997	0.2431	0.2026	0.1500	0.1722	0.0450	0.1217
1998	0.0830	0.0891	0.2000	0.0713	0.0750	-0.0035
1999	0.0985	0.0651	0.2200	0.0508	0.0080	0.0424
2000	0.0812	0.0647	0.2200	0.0505	0.0230	0.0268
80						0.0604
90						0.0364

: 1980

(-)

1981

1997

1998

.

	q	s	β	i	v	ARI
1981	0.2571	0.2330	0.9642	-0.0093	-28.7150	0.0528
1982	0.2506	0.2550	0.9672	0.0450	5.7528	0.0975
1983	0.2501	0.2750	0.9622	0.0701	3.7081	0.1196
1984	0.2433	0.2930	0.9661	0.0885	2.8443	0.1339
1985	0.2352	0.2970	0.9697	0.0772	3.1406	0.1241
1986	0.2360	0.3380	0.9662	0.0661	3.6935	0.1236
1987	0.2351	0.3760	0.9629	0.0626	3.8996	0.1275
1988	0.2321	0.3910	0.9685	0.0288	8.3220	0.1083
1989	0.2186	0.3620	0.9742	0.0552	4.0650	0.1143
1990	0.2079	0.3680	0.9711	0.0496	4.3166	0.1079
1991	0.1995	0.3700	0.9697	0.0307	6.7072	0.0931
1992	0.1876	0.3600	0.9745	0.0285	6.7491	0.0858
1993	0.1779	0.3560	0.9782	0.0319	5.7074	0.0839
1994	0.1728	0.3550	0.9783	0.0309	5.7211	0.0813
1995	0.1691	0.3550	0.9775	0.0313	5.5336	0.0802
1996	0.1629	0.3360	0.9770	0.0687	2.4265	0.1004
1997	0.1567	0.3300	0.9784	0.1217	1.3156	0.1332
1998	0.1651	0.3420	0.9883	-0.0035	-48.2726	0.0542
1999	0.1498	0.3320	0.9854	0.0424	3.5820	0.0781
2000	0.1496	0.3320	0.9849	0.0268	5.6578	0.0676
80	0.2366	0.3188	0.9672	0.0604	4.4158	0.1174
90	0.1691	0.3468	0.9792	0.0364	5.2606	0.0838

: 가 1981

1997 , 1998

(2) 가 (15)
 < 3-8> ST

q 1980 0.2366
 1990 0.1691 7% 가 (s) 1980
 0.3188 1990 0.3468 2.8% 가 가 .
 1980 0.9672 1990
 0.9792 1 가
 가 v
 1980 1990 4.4158 5.2606 .
 1980 9.7% 13.4%
 , 10 11.74% .
 1990 5% 10% 1990 8.38%
 .
 q i .
 . 1980 (1981)
 13% . (1987) 10%
 . 1990 (1999) ST 1991
 1997 13.0%
 , 가 (2000) 7.5%
 . 1980 11.74%, 1990 8.38%가 .
 1980 가 . 가
 가 1980 13% ,
 1980 11% 12%

가 가 . 1990

가

가 .

*i*가

8.11%

8% 13% 14%

가 1.5 가

가

(15)

1980

1990

가

가

가

3.

ST

1981

2000

20

?

가 ,

가
가

가

1990
가

가

가

가가
가

가

. Squire-van der Tak

가

가 5
8.67%가 1990 8.38%가
2000 6.76%가 가
가 10 가
1990 가
가
56)
(2001)
1990
1.6%() 가
1.6%가
1990
8.38%
< 3-8>
가
가
ST 가 i

56) (2001.12,)

q 가
 < 3-9> 가 i 가
 57). q 가 i
 $\pm 1\%$, $\pm 1.5\%$ $\pm 2\%$ 가 가
 q $\pm 0.5\%$ $\pm 1\%$
 4가 가 24가
 i 가 1% ()
 0.65% 가 () , 2% ()
 1.3% 가 ()
 q 0.5% ()
 0.17%가 () 1% () 0.35% 가
 () i 가 1%
 q 가 0.5% 0.82%
 가 , i 가 1%
 q 가 0.5% 0.82%
 가
 ST

가 .

57)

1990

< 3-9>

(: %)

$i \backslash q$	1%P	0.5%P	'90	0.5%P	1%P
2%P	6.73	6.90	7.08	7.25	7.43
15%P	7.05	7.23	7.40	7.58	7.75
1%P	7.38	7.55	7.73	7.90	8.08
'90	8.03	8.20	8.38	8.55	8.73
1%P	8.68	8.85	9.03	9.20	9.38
15%P	9.01	9.18	9.35	9.53	9.70
2%P	9.33	9.51	9.68	9.85	10.03

'90

3.64% ± 1%

q

0.5%

7.90%

(2001)

6%

7%

8% 가가 .

2% 3% .

가

2

. SOC

가

2

1)

2)

3)

가

(Adjusted Cost of Capital) 4)

가

2.

1)

(1998) 58) (27)
 1991 2000 10
 「 」

$$R = NOPAT / CAP \quad (27)$$

, NOPAT : = × (1 -)
 CAP :

< 4-1 > (R)

가

1991 2000 10 1998 1999
 5% 10 4.99%
 0.2%

58) . 1998. 「 」 .

0 가

< 4-1 >

	R	
	()	()
1991	0.0563	-0.0336
1992	0.0502	-0.0121
1993	0.0534	0.0052
1994	0.0578	-0.0040
1995	0.0595	0.0139
1996	0.0488	0.0293
1997	0.0503	0.0050
1998	0.0373	-0.0351
1999	0.0322	0.0240
2000	0.0534	0.0297
	0.0499	0.0022

2) (ρ)

가 가 가

ρ 가

Cobb-Douglas

59) transformation) (log .

$$Y_t = B' K_{t-1}^\gamma L_t^{1-\gamma} \quad (28)$$

, Y_t : t
 K_{t-1} : $t-1$
 L_t : t
 B', γ :

(28) γ (29) $\text{Ln } K_{t-1}$
 $\gamma = 0.4509$. γ (30)
 ρ .

$$\text{Ln } Y_t = -0.8200 + 0.4509 \text{Ln } K_{t-1} + 0.5492 \text{Ln } L_t \quad (adj. R^2 = 0.996)$$

(-109.06) (29.22) (35.59) (29)

$$\rho = \frac{\partial Y_t}{\partial K_{t-1}} = \gamma \frac{Y_t}{K_{t-1}} \quad (30)$$

< 4-2> (30)

1980	37.03%	1990	26.37%
가		1980	28.82%,
1990	20.54%	20	24.68%
59)	$\gamma + (1 - \gamma) = 1$	1	- 가 .

< 4-2>

(ρ)

	(ρ)	
	()	()
1981	0.3173	0.5978
1982	0.3021	0.3946
1983	0.3041	0.3485
1984	0.2963	0.3249
1985	0.2853	0.3149
1986	0.2860	0.3220
1987	0.2837	0.3234
1988	0.2823	0.3734
1989	0.2679	0.3402
1990	0.2569	0.3638
1991	0.2471	0.3631
1992	0.2300	0.3074
1993	0.2167	0.2751
1994	0.2105	0.2856
1995	0.2078	0.2622
1996	0.2001	0.2229
1997	0.1908	0.2444
1998	0.1804	0.2690
1999	0.1938	0.2034
2000	0.1768	0.2038
80	0.2882	0.3703
90	0.2054	0.2637
	0.2468	0.3170

가 .
가 . (28)

가
가
가 가

가

가

'90

20.54%

가

3)

Burgess(1989)

(crowd-out effect)

(crowd-in effect)

가

$(F_z - 1)$ Harberger(1972)가

(r_{soc})

가

가

$r_{soc} - (F_z - 1)$

60).

60) harberger $r_{soc} = \left[r \left(\frac{\partial C_1}{\partial r} \right)_{U+} + \rho \left(\frac{\partial K}{\partial r} \right) \right] \left[\left(\frac{\partial C_1}{\partial r} \right)_{U+} + \frac{\partial K}{\partial r} \right]$,

가

$$[r_{soc} - (F_z - 1)]$$

.

()

$$r_{soc} - (F_z - 1)$$

가

.

< 4-3 >

r_{soc}

1980

15.37%, 1990

9.05%

$F_z - 1$

1980

13.59%, 1990

7.47%

가 1980

1.78%, 1990

1.58%

61).

가

가

(2001)

가가

,

가

가

가

.

$$F_z - 1 = \left[r \left(\frac{\partial C_1}{\partial r} \right)_U + \rho \left(\frac{\partial K}{\partial r} \right)_U + (\rho - r) \left(\frac{F_{KZ}}{F_{KK}} \right) \left(\frac{\partial C_1}{\partial r} \right)_U \right] \left[\left(\frac{\partial C_1}{\partial r} \right)_U + \left(\frac{\partial K}{\partial r} \right)_U \right]$$

61) (2001)

< 4-3> SOC

	r_{soc}		$F_z - 1$		$r_{soc} - (F_z - 1)$	
	()	()	()	()	()	()
1981	0.1424	0.3857	0.1193	0.3577	0.0231	0.0280
1982	0.1630	0.2456	0.1447	0.2259	0.0184	0.0197
1983	0.1736	0.2135	0.1564	0.1957	0.0173	0.0178
1984	0.1800	0.2060	0.1647	0.1903	0.0154	0.0157
1985	0.1647	0.1915	0.1488	0.1752	0.0159	0.0163
1986	0.1549	0.1872	0.1376	0.1694	0.0173	0.0178
1987	0.1545	0.1903	0.1374	0.1727	0.0171	0.0176
1988	0.1305	0.2108	0.1104	0.1893	0.0201	0.0215
1989	0.1404	0.2054	0.1235	0.1875	0.0169	0.0178
1990	0.1331	0.2294	0.1167	0.2116	0.0164	0.0178
1991	0.1082	0.2113	0.0899	0.1912	0.0184	0.0201
1992	0.0913	0.1600	0.0730	0.1406	0.0183	0.0195
1993	0.0861	0.1382	0.0688	0.1201	0.0173	0.0181
1994	0.0858	0.1531	0.0693	0.1356	0.0165	0.0175
1995	0.0821	0.1308	0.0655	0.1134	0.0166	0.0174
1996	0.1109	0.1320	0.0991	0.1200	0.0118	0.0120
1997	0.1617	0.2140	0.1579	0.2100	0.0038	0.0040
1998	0.0261	0.1031	0.0057	0.0812	0.0204	0.0219
1999	0.0942	0.1030	0.0810	0.0897	0.0132	0.0133
2000	0.0657	0.0903	0.0511	0.0752	0.0147	0.0150
80	0.1537	0.2265	0.1359	0.2075	0.0178	0.0190
90	0.0905	0.1398	0.0747	0.1232	0.0158	0.0166
	0.1256	0.1880	0.1087	0.1701	0.0169	0.0179

: 가 1997 1998

3.

1)

(adjusted cost of capital)

(opportunity cost of capital)

(project's financing side effects)

가

가 (value contributed by investment decision)

가 (value contributed by financing

decision)

()

62) 가

()

가

가

가

63).

()
of capital)

(adjusted cost

62) (financial side effects)
financing by government, lease financing)

issue costs, interest tax shields, special financing(subsidized

63) 가

(good investment decision)

가

= + +

(1998) 5 6%

1.5%, 2%, 2.5% 가 (1998)

5 6%가

6%

()

0.7 SOC

() 0.25 가

SOC (1/3)

2% 가 가

1.5%, 2%, 2.5% 가

. SOC 2%

가

, , , 가 (

90%, 80%)

가

가
가 64).

가
가

4% 2.6% 2.5% SOC 가 2.

가 가
4-4> 2%
12.54%, 1990 10.81% 1980
9.03% 2000

가 가

64) 가

< 4-4 >

	(A)	(B)	(C)	(A+B1+C)		(A+B2+C)		(A+B3+C)	
	()	()	()	()	()	()	()	()	()
1981	0.2440	Case1(B1) : 0.0150 Case2(B2) : 0.0200 Case3(B3) : 0.0250	0.0250	0.2840	0.0585	0.2890	0.0627	0.2940	0.0668
1982	0.1580			0.1980	0.1186	0.2030	0.1232	0.2080	0.1279
1983	0.1330			0.1730	0.1344	0.1780	0.1393	0.1830	0.1441
1984	0.1560			0.1960	0.1703	0.2010	0.1751	0.2060	0.1800
1985	0.1387			0.1787	0.1522	0.1837	0.1570	0.1887	0.1619
1986	0.1213			0.1613	0.1297	0.1663	0.1345	0.1713	0.1394
1987	0.1232			0.1632	0.1282	0.1682	0.1331	0.1732	0.1379
1988	0.1221			0.1621	0.0851	0.1671	0.0897	0.1721	0.0944
1989	0.1476			0.1876	0.1236	0.1926	0.1283	0.1976	0.1330
1990	0.1604			0.2004	0.1064	0.2054	0.1110	0.2104	0.1156
1991	0.1679			0.2079	0.1051	0.2129	0.1097	0.2179	0.1143
1992	0.1317			0.1717	0.1023	0.1767	0.1070	0.1817	0.1117
1993	0.1196			0.1596	0.1065	0.1646	0.1113	0.1696	0.1160
1994	0.1346			0.1746	0.1060	0.1796	0.1107	0.1846	0.1154
1995	0.0924			0.1324	0.0836	0.1374	0.0884	0.1424	0.0932
1996	0.1144			0.1544	0.1329	0.1594	0.1378	0.1644	0.1427
1997	0.1532			0.1932	0.1418	0.1982	0.1466	0.2032	0.1514
1998	0.0759			0.1159	0.0380	0.1209	0.0427	0.1259	0.0473
1999	0.1007			0.1407	0.1316	0.1457	0.1366	0.1507	0.1416
2000	0.0704			0.1104	0.0854	0.1154	0.0903	0.1204	0.0952
80				0.1904	0.1207	0.1954	0.1254	0.2004	0.1301
90				0.1561	0.1033	0.1611	0.1081	0.1661	0.1129
				0.1733	0.1120	0.1783	0.1168	0.1833	0.1215

2) SOC

SOC

Burgess(1989)

가 () 가

= + +

가

1.5%, 2%, 2.5% 가

2%

SOC $[r_{soc} - (F_Z - 1)] < 4.3 >$

가

1980

11.96%

1990

9.93%

가

2000

8.06%

< 4-5> SOC

	(A)	(B)	$r_{soc} - (F_Z - 1)$ (C)	(A+B+C)	
	()	()	()	()	()
1981	0.2440	0.0200	0.0280	0.2920	0.0652
1982	0.1580		0.0197	0.1977	0.1183
1983	0.1330		0.0178	0.1708	0.1323
1984	0.1560		0.0157	0.1917	0.1661
1985	0.1387		0.0163	0.1750	0.1485
1986	0.1213		0.0178	0.1591	0.1275
1987	0.1232		0.0176	0.1608	0.1259
1988	0.1221		0.0215	0.1636	0.0865
1989	0.1476		0.0178	0.1854	0.1215
1990	0.1604		0.0178	0.1982	0.1043
1991	0.1679		0.0201	0.2080	0.1052
1992	0.1317		0.0195	0.1712	0.1018
1993	0.1196		0.0181	0.1577	0.1047
1994	0.1346		0.0175	0.1721	0.1037
1995	0.0924		0.0174	0.1298	0.0811
1996	0.1144		0.0120	0.1464	0.1251
1997	0.1532		0.0040	0.1772	0.1265
1998	0.0759		0.0219	0.1178	0.0398
1999	0.1007		0.0133	0.1340	0.1250
2000	0.0704		0.0150	0.1054	0.0806
80				0.1894	0.1196
90				0.1520	0.0993
				0.1707	0.1095

3) 가

가 () 가

가

가

가

가

가 (WA CC)

가

$$WA\ CC = K_b \times (b_r) + K_s \times (s_r) \tag{31}$$

, K_b :

K_s :

b_r :

s_r :

75% 가 . (s_r) (b_r) 25%
 25% 가
 18% 가 . 18%
 2
 (ROE) 18%
 20% 가 가
 25% 가 가
 가
 3 ()
 2.5% 가 가 ()
 가 가 .
 < 4-6 > 가 가
 가 1980 18.27%,
 1990 16.44% ,
 1980 11.35%, 1990 11.13%
 가
 '80 '90 .
 18%

가

18% 가

< 4-6 > 가

	K_s		K_b	s_r	b_r	WA CC	
	()	()	()			()	()
1981	0.18	0.2690	0.2940	0.25	0.75	0.2655	0.0433
1982		0.1590	0.1840			0.1830	0.1046
1983		0.1420	0.1670			0.1703	0.1318
1984		0.1500	0.1750			0.1763	0.1509
1985		0.1360	0.1610			0.1658	0.1395
1986		0.1280	0.1530			0.1598	0.1282
1987		0.1274	0.1524			0.1593	0.1244
1988		0.1358	0.1608			0.1656	0.0883
1989		0.1538	0.1788			0.1791	0.1155
1990		0.1851	0.2101			0.2026	0.1084
1991		0.1898	0.2148			0.2061	0.1035
1992		0.1400	0.1650			0.1688	0.0995
1993		0.1221	0.1471			0.1553	0.1024
1994		0.1422	0.1672			0.1704	0.1021
1995		0.1165	0.1415			0.1511	0.1016
1996		0.1257	0.1507			0.1580	0.1364
1997		0.2431	0.2681			0.2461	0.1924
1998		0.0830	0.1080			0.1260	0.0474
1999		0.0985	0.1235			0.1376	0.1286
2000		0.0812	0.1062			0.1247	0.0994
80					0.1827	0.1135	
90					0.1644	0.1113	
					0.1736	0.1124	

4. 가

1)

가 가 0 가

가

SOC

가

가

< 47> 가

가

1980

18.27%, 1990

16.44%

1980

11.35%, 1990

11.13%

2.5%

가

가

1.5%

1990

10.33%

2%

1990

10.81%

2.5%

1990

11.29%

SOC

가

1980

11.96%

1990

9.93%

()

1980 37.03%, 1990 26.37% 1980
28.82%, 1990 20.54%

< 4-7 >

	가		(가)								ρ	
			15% 가		2% 가		25% 가					
	()	()	()	()	()	()	()	()	()	()	()	
1981	0.2655	0.0433	0.2840	0.0585	0.2890	0.0627	0.2940	0.0668	0.2920	0.0652	0.5978	0.3173
1982	0.1830	0.1046	0.1980	0.1186	0.2080	0.1232	0.2080	0.1279	0.1977	0.1183	0.3946	0.3021
1983	0.1703	0.1318	0.1730	0.1344	0.1780	0.1393	0.1830	0.1441	0.1708	0.1323	0.3485	0.3041
1984	0.1763	0.1509	0.1960	0.1703	0.2010	0.1751	0.2060	0.1800	0.1917	0.1661	0.3249	0.2963
1985	0.1658	0.1395	0.1787	0.1522	0.1837	0.1570	0.1887	0.1619	0.1750	0.1485	0.3149	0.2853
1986	0.1598	0.1282	0.1613	0.1297	0.1663	0.1345	0.1713	0.1394	0.1591	0.1275	0.3220	0.2860
1987	0.1593	0.1244	0.1632	0.1282	0.1682	0.1331	0.1732	0.1379	0.1608	0.1259	0.3234	0.2837
1988	0.1656	0.0883	0.1621	0.0851	0.1671	0.0897	0.1721	0.0944	0.1636	0.0865	0.3734	0.2823
1989	0.1791	0.1155	0.1876	0.1236	0.1926	0.1283	0.1976	0.1330	0.1854	0.1215	0.3402	0.2679
1990	0.2026	0.1084	0.2004	0.1064	0.2054	0.1110	0.2104	0.1156	0.1982	0.1043	0.3638	0.2569
1991	0.2061	0.1035	0.2079	0.1051	0.2129	0.1097	0.2179	0.1143	0.2080	0.1052	0.3631	0.2471
1992	0.1688	0.0995	0.1717	0.1023	0.1767	0.1070	0.1817	0.1117	0.1712	0.1018	0.3074	0.2300
1993	0.1553	0.1024	0.1596	0.1065	0.1646	0.1113	0.1696	0.1160	0.1577	0.1047	0.2751	0.2167
1994	0.1704	0.1021	0.1746	0.1060	0.1796	0.1107	0.1846	0.1154	0.1721	0.1037	0.2856	0.2105
1995	0.1511	0.1016	0.1324	0.0836	0.1374	0.0884	0.1424	0.0932	0.1298	0.0811	0.2622	0.2078
1996	0.1580	0.1364	0.1544	0.1329	0.1594	0.1378	0.1644	0.1427	0.1464	0.1251	0.2229	0.2001
1997	0.2461	0.1924	0.1932	0.1418	0.1982	0.1466	0.2032	0.1514	0.1772	0.1265	0.2444	0.1908
1998	0.1260	0.0474	0.1159	0.0380	0.1209	0.0427	0.1259	0.0473	0.1178	0.0398	0.2690	0.1804
1999	0.1376	0.1286	0.1407	0.1316	0.1457	0.1366	0.1507	0.1416	0.1340	0.1250	0.2034	0.1938
2000	0.1247	0.0994	0.1104	0.0854	0.1154	0.0903	0.1204	0.0952	0.1054	0.0806	0.2038	0.1768
80	0.1827	0.1135	0.1904	0.1207	0.1954	0.1254	0.2004	0.1301	0.1894	0.1196	0.3703	0.2882
90	0.1644	0.1113	0.1561	0.1033	0.1611	0.1081	0.1661	0.1129	0.1520	0.0993	0.2637	0.2054
	0.1736	0.1124	0.1733	0.1120	0.1783	0.1168	0.1833	0.1215	0.1707	0.1095	0.3170	0.2468

2) 가

가

가

가

2

가

가

가 가 가

, SOC

가

2000

9.03%

가

9.94%

2000

9%

SOC

8.06%

2000

2000

SOC

SOC

가

가

가

가

가가

가

2 <

2-1>

가

가

가?

65)

가?

가

가

가

가

가

가

1990

가

2000

. 1990

가

65)

가가

()

() (0.5%) () 가

0.37%가 () . 가 가

가

가

가

< 4-8 >

(2000)

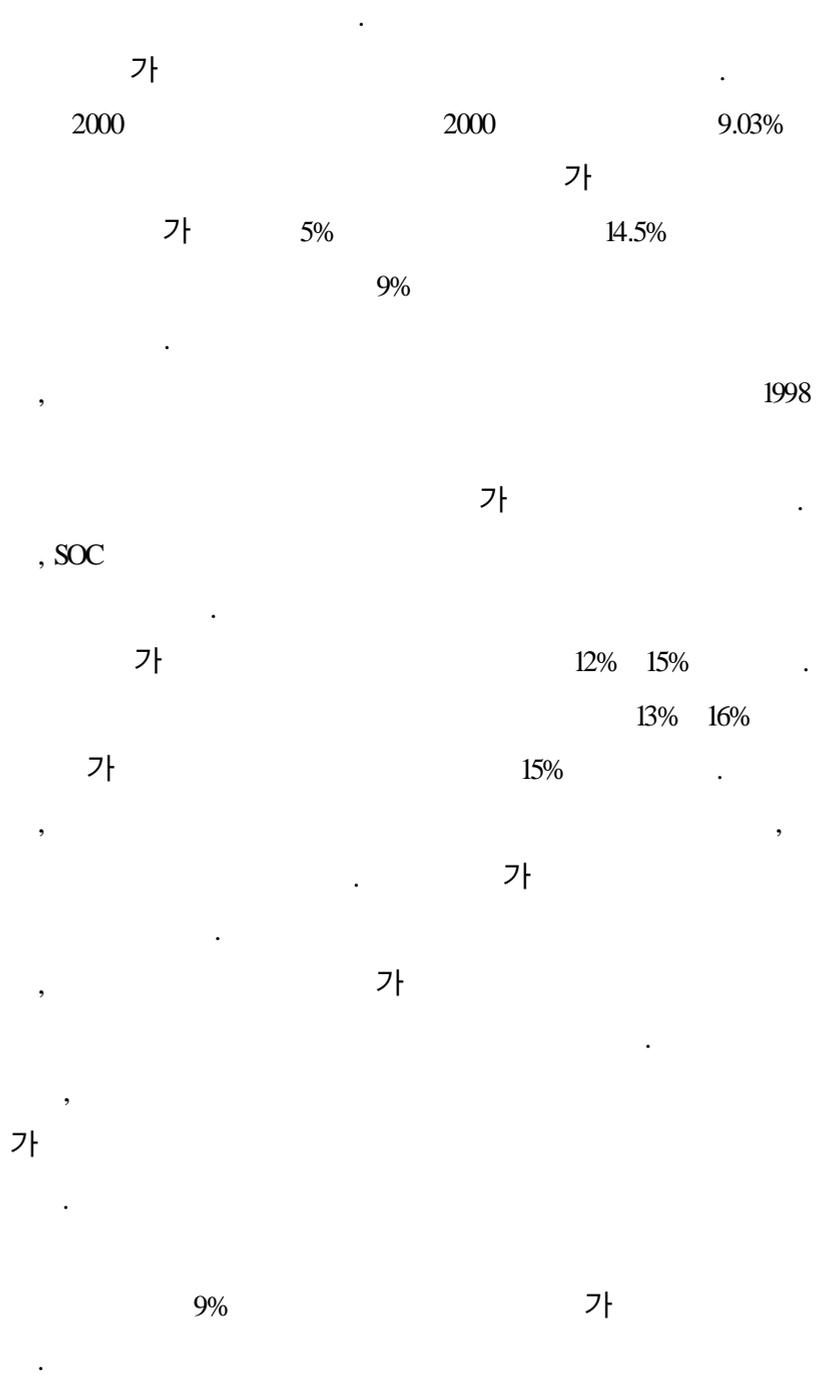
(: %)

		()						
		1.5%P	1%P	0.5%P		0.5%P	1%P	1.5%P
가	()	11.31	11.70	12.08	12.47	12.85	13.23	13.62
	()	8.81	9.19	9.56	9.94	10.31	10.69	11.06
	()	10.01	10.52	11.03	11.54	12.05	12.56	13.07
	()	7.53	8.03	8.53	9.03	9.53	10.03	10.53
	()	9.01	9.52	10.03	10.54	11.06	11.57	12.08
	()	6.56	7.06	7.56	8.06	8.56	9.06	9.56

67)

가 () 가 ()

가 . 가 () ()
가 '90 1.1% 가



가

SOC

가

가

가 가

,

SOC

5 CHAPTER

가

SOC

가

가

가

SOC

가

SOC

Squire-van der Tak(1975)

1980

11.74%, 1990

8.38%

2 (1999 2000)

7.3%

1990

가

가

7% 8%

7.5%

2% 가 5.5%

SOC

가 , SOC

()

()

SOC

1980

11.4% 12.5%

1990 9.9% 11.1% .가 2000
8.1% 9.9% 9.0%

SOC

가 5% 가 14.5%) 9%(
(reference rate)
9%

SOC

가

가

가

가

2006

가 가

가

가

가 가 가



. 1981. 「 가 」. : .

. 1983. “ . ”. 「
 」 22 : .

. 1999. 「
 」. : .

. 1996. “ : ”.
 「 」 11 2 : : .

. 2000. 「 ()」.
 : .

. 2000. “ GDP ”. 「 」: :
 .

. 1996. 「 」. :
 .

3 . 1999. 「 」. : .

. 2001. 12. 「 」.
 .

. 1997. “ ”. 「
 」 39 :
 . 1994. 「 」. :
 .

- . 1986. “ ”. 「 」 41 : .
- . 1992. “3 가 ”. 「 」 : .
- . 1996. “ - ”. 「 」 : .
- . 1998. 「 」. : .
- . 2000. “ : ”. 「 」
- 2000 5 2 : .
- . 1987. 「 」. : .
- 7 . 1999. 「 」. :
- . 4 . 1999. 「 」. : .
- . 1998. 「 」. : .
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- . 3 . 1999. 「 (1970 1990)」. :
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SUMMARY

Rate of Return of PPI Projects

*Kyu-bang Lee, Byong-Rok Song, Dong-Jin Kahng
Kyong-Ae Park, Nan-Joo Kim*

Recently it takes a growing interest in rational distribution and the maximizing efficiency in public investment funds. So government placed under an obligation on public investing projects to do the preliminary feasibility study in advance. Also it has enhanced private participating investments in SOC facilities for inducing funds and efficiency from private sector.

In public investing projects, the economic feasibility study is very important as a guide to judge the efficient distribution of funds. For the right judging of feasibility, proper understanding and application of social discount rate has to go first. It is also important for efficient distribution of funds and achieving the desired goals of policies.

This study sets the right concept of social discount rate which can be applicable to feasibility study and evaluation of SOC facilities. Also it estimates the right level of social discount rate and establishes the

theory of calculation of rate of return as a discounting coefficient. For this purpose, this study consists of introduction, three main chapters and conclusion.

In chapter 1 it described the background, purpose, the scope, the main contents and expecting effects of this study. We reviewed theories of social discount rate and rate of return, and then chose the most proper model. We did empirical analysis of the proper level of rate of return in PPI(Private Participation in Infrastructure) projects and the social discount rate in Korea for the period of 1981-2000.

In chapter 2 which is "the theoretical reviews on the social discount rate and rate of return", we reviewed the related theories and calculating methods. Also we had case studies in Korea and other countries.

In chapter 3 "Estimating social discount rate using IBRD model", we estimated the social discount rate in Korea using the model of Squire-Vander Tak(1975) of IBRD. The reason we used this model is that it has same aspect of "periodic change rate of valuation" and there is another empirical study in Korea so that we can compare two studies.

We presented the accounting rate of interest(ARI) as a social discount rate. We estimated variables first. Firstly we calculated sectional net capital stocks in public sector and private sector. For calculating consumption conversing coefficient we calculated export volume, import volume and tariff rate yearly. We put 0% of subsidy rate for exporting after 1995 and for 1987-1994 when there's no data, we extrapolated using the time series data by 1986.

For getting yearly marginal productivity of capital, we consisted Cobb-Douglas production function with national net capital stock and the number of employers. By regressing the marginal productivity of capital, we could get the capital elasticity of production. We estimated yearly marginal productivity of capital with these estimated values. The yearly marginal propensity to reinvest was estimated by estimating

marginal propensity to consume which calculated by the ratio of the amount increased on private consumption per capita and on domestic gross production per capita. We used the investing rate in national account as a marginal propensity to reinvest after comparing the estimated values of marginal propensity to reinvest and investing rate in national account.

We used the weighted average deposit rate of deposit banks as a proxy variable of consumption interest rate. It was for solving the constraint problem caused by the distortion of domestic capital market in the past. We calculated it indirectly for 1981–1997 by using the date of monthly weighted average deposit rate and prime corporate bond rate of 1998–2000.

We estimated yearly ARI using IBRD model with the estimated values of consuming conversing coefficients, the marginal productivity of capital, the marginal propensity to reinvest. As a result, in real terms in the 1980's ARI was 11.74%, in the 1990's 8.38% in average and in 1999–2000 when the level of interest rate was quite stable, it was estimated 7.3% in average.

In this study we did the sensitivity analysis in the base of the average value of 1990's for proper level of social discount rate. The sensitivity analysis shows the effects of the change of the marginal productivity of capital and consuming interest rate to social discount rate. This analysis showed that consuming interest rate effects to social discount rate most and then marginal productivity of capital does.

we can conclude the social discount rate to applicate to SOC facilities is 7–8%. It is reasonable that we use 7.5% in real term for roads, railways, ports and airports. For developing projects of lagging behind areas we'd better use 5.5%.

In chapter 4 "Estimating rate of return by empirical analysis", we estimated rate of return indices in advance such as weighted average

investing capital; rate of return, adjusting capital cost, investing rate of return of contribution in SOC invest and the marginal productivity of private capital. We suggest the proper rate of return by considering all these variables. And we did the sensitivity analysis on the each level of estimated rate of return with no risk interest rate and market interest rate.

For estimating the rate of return, we used average investing capital rate of return in whole industries by using Dr. Choi, Do Sung's model(1998) as investing capital rate of return. The second variable is the marginal productivity of private capital which produced by regression Cobb-Douglas production function.

The third variable is the indirect effect of public investing projects which calculated using Burgess' estimating formula. It is the value which is the difference of social opportunity cost rate and the marginal rate of return of public investing projects.

We used all the estimated variables as mentioned above for rate of return indices. First of all, we estimated adjusting capital costs with considering the peculiar project risks of PPI projects such as the market risk of capital and liquidity risk. For calculating the adjusting capital cost, we used no risk interest rate(treasury bond rate), market risk rate and project risk rate.

The second rate of return index is investing rate of return considering SOC investing effects. We calculated this by no risk interest rate and market risk rate adding the indirect effect of public investing projects. The third rate of return index is weighted average capital cost which is estimated by assuming the expected rate of return for equity and lending.

As the result of empirical analysis, the real rate of return was 11.4% 12.5% in 1980's, 9.9% 11.1% in 1990's and in 2000 8.1% 9.9%(9.0% in average). By the result of this study including empirical analysis,

sensitivity analysis, case studies, current domestic capital market and political goals in SOC, the investing rate of return in PPI projects can be 9% in real term (14.5% under the condition of 5% CPI increasing rate). Because 9% is applicable in general cases, when we choose the proper rate of return we have to consider the characteristics, financing structures and risk sharing in each projects.

In chapter 5 "Summary and conclusion", we concluded by synthesizing the research we've done. Also we showed the limits of this study and suggested the necessity of further review.



1.

1) PFI

PFI(Private Finance Initiative)

가

. ,
가

68).

PFI Scheme

, , ,

가 .

PFI 1992

(Autumn Statement)

Ryrie Rule

, Ryrie Rule 1980

68) PFI

500

10

, 가 . ,

. ,
가

()

가 .

1992 가 Norman Lamont

가 (self financed)

가 가 ,

가 .2 1994

PFI .

1997 가 PFI Scheme 가

. Malcolm Bates PFI

Treasury Taskforce . Bates 1

1998 Partnership UK

, PFI 가

PFI ,

. Peter Gershon

(central government procurement) , PFI

Value for Money Test⁶⁹⁾ .

69) . 가

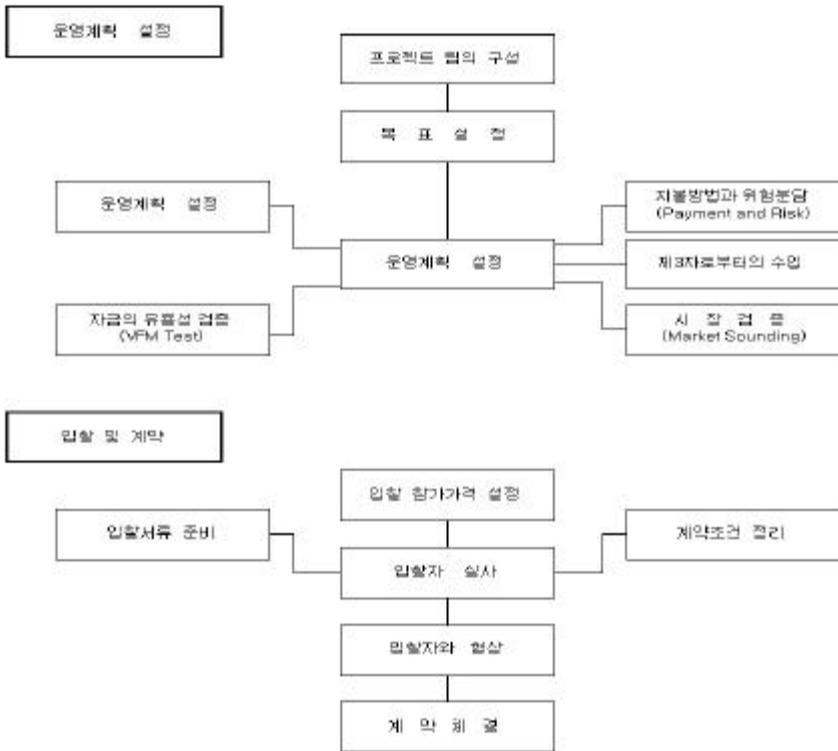
(Institute for Public Policy Research)

(Public Private Partnership: PPP)

PFI

가

< 1> PFI



가

2)

1997 5

가

(Public Expenditure Survey)

가

Comprehensive Spending Review

. 2

Spending Review

3

Golden Rule Sustainable Investment Rule

가

. Golden Rule

가

, Sustainable Investment Rule 純

가

GDP

. '60

가

2001 4

. RAB(Resource Accounting and Budgeting)

1994 Green Book 1995

가

. RAB 가 가 .

가

3) SOC

(Economic and Fiscal

Strategy Report)

Total Managed Expenditure

(current budget)

(capital budget)

. , Total Managed Expenditure Departmental

Expenditure Limits Annually Managed Expenditure

(TME = DELs + AME)

. Departmental Expenditure Limits

Comprehensive

Spending Review 3

Annually

Managed Expenditure

가

Comprehensive Spending Review

3

2. PFI

PFI

가

Taskforce

1)

(VFM test)

(1)

(PPPs)가

PPPs . PPPs

()

PPPs가

, PPPs

가

가

가 Value for Money Test

가 Public Sector Comparator

가

Reference Project

가

Reference Project

Project

(2)

VFM Test

PFI

가

(options)

가

가

가

가

가

PFI Scheme

가

. PFI

Scheme

가

Reference

Project

Reference Project

가

, Reference Project

. 1)

Reference Project

Project , . 2) Reference
가

. 3) Reference Project

PFI Project 가

, VFM Test 가 ,
Project가 가
가 가 .
가 가

(3) (Risk)

VFM Test

가
PSC
가
1)
가 (variability), 2)

(4) Risk

PFI 3가 , 가
 , 가
 , 가
 가 .
 가
 . 가 가

. HM Treasury(1999a, p.34) 가 (IT)

0.6 가 1,000
 가 0.4 , 4,800 가
 . $(£ 10m \times 0.6) + (£ 48m \times 0.4) = £ 25.2m$.

(5)

가
 . Scotland Faslane Trident Submarine 1
 3 1,400 가 ,
 2 . Woodhill Prison 7,800
 , 1 200 가 가 , 15
 . Limehouse Link 1 4,200 가
 , 가 2 9,300 가 가
 4 . 1994 1995
 13% 가 가 .

가

가

가

Fazakarley prison

가

2)

(Public Sector Comparator: PSC)

(1) PSC

PSC PFI가

가

가

PSC

가

PFI

가 PSC

Reference project

PSC

Reference Project

, PSC가 Value for Money test

PSC

Risk가

Risk

PSC

PFI가 PSC

Value for Money

PSC

(financially free standing projects)

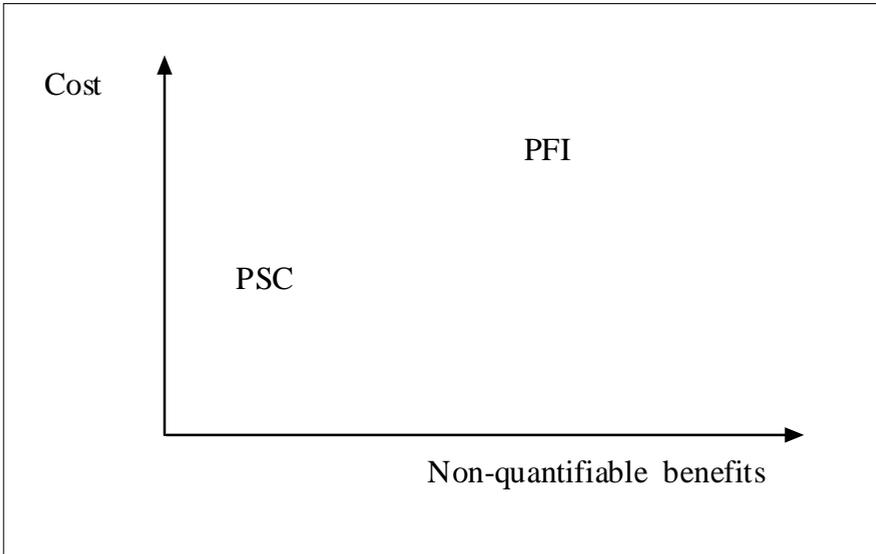
PSC가

가

PSC가

< 2> PSC

PFI



PSC
 . PSC
 . 가
 가 .

(2) PSC

PFI Scheme

. PFI Value for Money 가
 가 PSC . PFI 가 PSC
 가 PFI가 Value for Money
 . PSC
 Value for Money
 .

PSC

PFI

70)

PFI

가

PSC

(3) PSC

< ▷ PSC

	1	2	3	4	5	6
					()	가
0	0	3.5	3.0	2.5	0	1.0000
1	20.0	4.4	1.0	6.1	0	0.9434
2	40.0	5.0	1.0	15.7	0	0.8900
3	10.0	2.0	3.0	41.0	0	0.8396
4	2	2.1	3.5	55.0	8.2	0.7921
5	0	2.2	0	59.0	2.0	0.7473
6	0	2.3	0	61.4	2.1	0.7050
7	0	2.4	0	63.8	2.2	0.6651
8	0	2.6	0	66.4	2.2	0.6274
9	0	2.7	0	69.0	2.3	0.5919
10	0	2.8	0	71.8	2.4	0.5584
가	64.4	25.1	10.1	352.6	15.0	

: Author's calculations and HM Treasury 1999a

70)

< 1 > PFI PSC .

1, 2, 3

(10) .

4 1

가

() . 6%

, < 1 > 가

64.4 (1) , 가

$$64.4 = (20 \times 0.9434) + (40 \times 0.8900) + (10 \times 0.8396) + (2 \times 0.7921) \quad (1)$$

, < 2 > < 1 > Public Sector Comparator 가

(A, B) . Public Sector Comparator

, A , B .

< 2> PSC PFI

	1	2	3
	PSC	PFI-A	PFI-B
가	417.0	450	430
	25.1	transfd	transfd
	10.1	transfd	transfd
	15.0	transfd	15.0
VFM	467.2	450	445

Public Sector Comparator

가 417 가

A 가 450 Public Sector Comparator ,
 , 가
 가 가 .
 B 가 430
 B 430+15=445가 .
 VFM Test PSC PFI
 . VFM 가
 PFI B PFI A PSC .

3)

가 가 가 .

(1)

가 .
가 .

() .
(long-term value) 1% .

1.5 가 . (-) ,
1

g , g 2% 가 .

$$r = + \beta g \quad , \quad 1\% + (1.5\% \times 2) = 4\%$$

(2)

3% 1% 4%가

(3) Variability Risk

(Variability Risk) 가 . Variability Risk
Variability가 GDP (+)
가
Variability Risk 0.5% 가 가

(4)

6% . 6%
PFI
4% 5%
PFI
가
. PSC
VFM Test 가
. PFI Scheme ,
PFI Scheme

3. PFI

1) Fazakerley Bridegend

< 3> 가

PFI

		HMPS	가
		HMPS	HMPS가
	가	HMPS 가	HMPS가 5%
			HMPS가 가 NPV

Fazakerley Bridgend

가

가 가

7

18%

3 8 6

. Fazakerley

Bridgend ITT(Initial Invitation to Tender) 3 6

가

가

가

(2)

Public Accounts Committee(House of Commons, 2001F)

Fazakerley Prison Service Limited가 Fazakerley

가 , 가 , 가 , 가 ,

가 , 가 , 가 ,

가 , 가 , 가 , 가 , 가 , 가 , 가 , 가 ,

가 , 가 , 가 , 가 , 가 , 가 ,

가 ,

가 .
Prison Service 가
. 가 . 3 (1), ,
, , , 1 ,
/ , 가 , ()
, 가 , , ,
,
. , , ,
, , , , ,
, , , ,
, 가 ,
, 가 .
HMPS . 가
가 .

(3) 가

< 3 >

(

)

가 .

< 3>

Date	
1994. 4	Six bidding consortia short-listed
1994. 7	Initial ITT issued
1994. 10	Initial bids received
1994. 12	Switch to negotiated procedure
1995. 2	Revised ITT issued
1995. 3	Revised bids received
1995. 5	Preferred bidders announced
1995. 12/ 1996. 1	Contracts signed

< 4>

가 , 가 ,

, 가 가 가 .

< 4> 가

가	가
	20%
	15%
	15%
	12%
	12%
	6%

< 5> Fazakerley Prison Services Ltd.

	Date	(%)	
	December 1995	13	17.5
Refinancing	November 1999	16	20.9
Refinancing	November 1999	39	30.6

2) DBFO

PFI

DBFO(design-build-finance-operate)

< 6> 8

DBFO

30

20

Highway Agency

Shadow Toll

가

< 6>

DBFO

8

	Miles	Capital Value (£m)
Tranche 1		
A69 Newcastle to Carlisle	52	9.4
M1/A1 Motorway link, Leeds	18	21.4
A1(M) Alconbury to Peterborough	13	12.8
A417/A419 Swindon to Gloucester	32	4.9
Tranche 2		
A50/A564 Stoke to Derby Link	35	20.6
A30/A35 Exeter to Bere Regis	63	75.7
M40 Junctions 1-15	76	37.1
A168/A19 Dishforth to Tyne Tunnel	73	29.4

가 가

5

25%

가 가 . , 가

, Public Accounts Committee

가 VFM

가

가 . PFI 가

가

가

가

(specification)

가

가

DBFO

(Highway Agency)가

, Highway Agency

. DBFO

Highway Agency

가 . 가
 가 . Highway
 Agency ,
 , 3 ,
 , 15 20
 120 140bps(1.2 1.4%) 가
 25 (5 , 20) 1 6,500 가 .
 가 AMBAC Indemnity Corp.
 AAA 가 . 9.18% .
 Public Sector Comparator Highways Agency가
 NPV ,
 NPV NPV
 가 . PFI
 8% HM Treasury가 (6% : 1997)
 , Public Sector Comparator 6%
 8% Public Accounts Committee .
 “8%
 가 가 .
 6% 6,900 가 .
 6%가 9,900
 . PFI VFM
 .
 PFI
 A419/A417 A69 6%

VFM

.(House of Commons, 1998r,

p.vii)”

8%

“ DBFO

9.5%

DBFO

.”(House of Commons, 1998r, Evidence, Appendix2)

PFI

가

. 1)

2)

3)

4)

가

가

(

)

Highway Agency

가

가

가

가

, 가

가

Public Sector Comparator

Highways

Agency

Highways

Agency

가

- 1)
- 2)
- 3)
- 4)
- 5) 가
- 6) .
- 7) 가
- 가
- 4 , , , ,

Highways Agency

Public

Sector Comparator

VFM

가

. Highways Agency

(PPB : provisional preferred bidder)

. PPB

PPB

PPB

DBFO

Highways Agency

Highways Agency가

PPB

가

. , Highways Agency

DBFO