9-1-1999

세그먼트 변화를 추적하는 다차원척도법

주영 김

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jkim@kmu.kookmin.ac.kr

STP

.

pick any/N   ,

,   ,

external

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: external   ,   ,   , STP   ,   ,
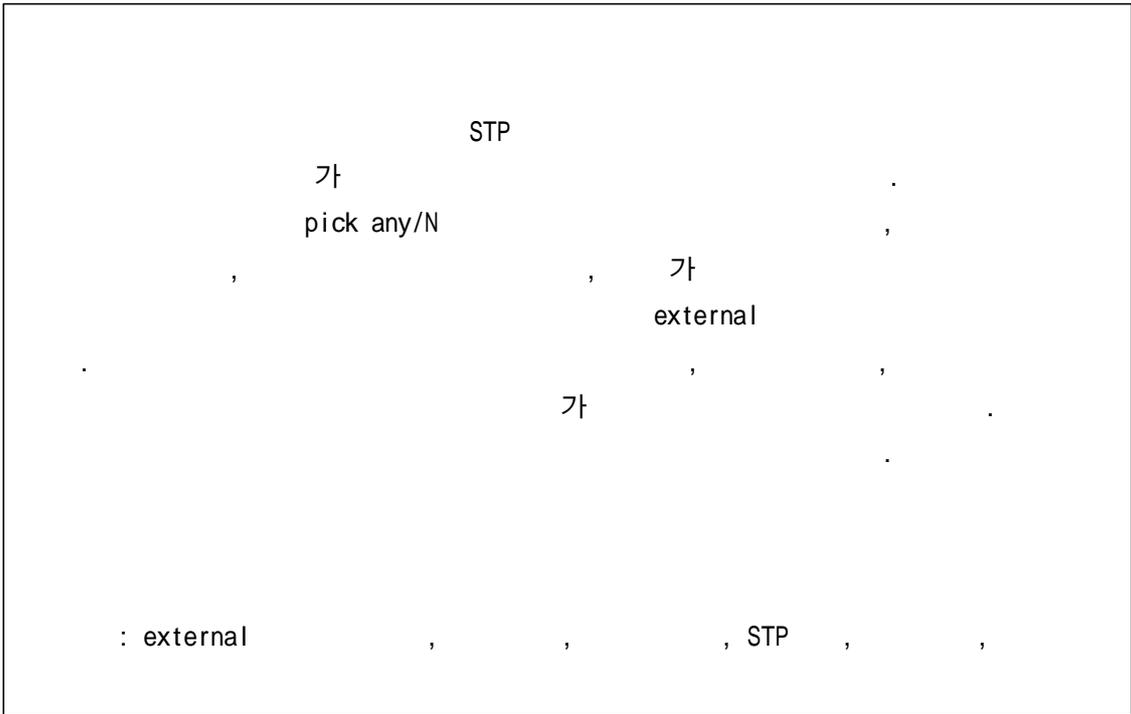
1.

,   ,   (segmentation, targeting,
positioning; STP strategy)
.   (positioning map)   STP
.

,
,   . (Green 1970).
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.   2-3   2   3   .
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.   ,   (e.g., Elrod
1988; Cooper 1988; Sinha and DeSarbo 1998; Tversky and Sattath 1979).
,   ,
.   ,
,
(multidimensional scaling model)   .

(Green and Wind 1973; DeSarbo and Rao 1984; DeSarbo and Cho 1989).

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,   (

; cf. PREFMAP)

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(configural invariance)

(Moinpour et al.
1976; Green et al. 1989).

,   .

.

factor matching   (Peay 1988).
C-match   (Cliff 1989),   (1995)

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, pick any/N

(   )   ,

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external

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2

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2.1

internal

vector   ，

(reparameterization)   ，

． (Davison 1983; Green 1972; Carroll and Arabie 1980)

external

(Green

and Wind 1973).

．   external   ，

，   ．

(Green and Wind

1973; Davision 1983; Coopers and Nakanishi 1983).

．   external

external

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，

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2.2

(Young

1987, Carroll and Arabie 1980).

badness-of-fit   stress

1 4

elbow .

.

likelihood

. (Jedidi and DeSarbo 1991; Ramsay

1977; DeSarbo and Rao 1984)

internal

, external

. internal

, external

,   ,

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2.3   (degeneracy)

internal   /

.

(DeSarbo et al. 1997; DeSarbo and Rao 1984).

,   stress   ,

,   .

external

. external   internal

,   (indeterminacy problem)   .

2.4

3   .

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factor matching

(Peay 1988; Cliff 1969,   1995).   /

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(Green and Wind 1973; Ramsay

1980).

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likelihood ,

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(DeSarbo and Rao 1984).

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2.6

latent class　　　　　　．
latent class　　　　　　　　　latent class

．　　　　　　　　　　　　　　　　　　　　　　　　　　　(AIC、

CAIC、BIC)　　(Grover and Srinivasan 1987; Wedel and DeSarbo 1996).

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(mul ti nonial

di stri buti on)   (Ranaswany and DeSarbo 1990,   1999).

2)

(Cooper and Nakani shi 1983).

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3)   ,

.   l atent cl ass   ,

(Grover and Sri ni vasan 1987; Wedel and DeSarbo 1996).

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5)   ,

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3 2

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I :
J :
S :
K :
d_{sjt} :   t   s   j
  $_{kt}$:   k   s   t
Y_{sk} :   k   s
X_{jkt} :   t   k   j
e_{sjt} :   t   s   j
C_{jt} :   i   t   j   (pick any/N)
S_{ist} :   t   i   s

          i   t   s   ,   t   s
          j   Euclidean distance   .

$$d_{sj}^{t} = \sum_{k} \left(Y_{sk}^{t} + a_{sk}^{t} - X_{jk}^{t} \right)^{2} + e_{sj} \qquad\qquad 1)$$

                    , Y_{sk} , $_{kt}$
                                                            , X_{jkt}
        .

    [1]   t   i   s   ,   i
          j   extreme value   ,
              .

$$P_{ij|s}^{t} = \frac{e^{-d_{sj}^{t}}}{\sum_{j} e^{-d_{sj}^{t}}} \qquad\qquad 2)$$

1999. 9   9

,

(multinomial distribution)   ,   i

s   conditional   .

$$P_{i|s}^{t} = \frac{\left(\sum_j C_{ijt}\right)!}{\prod_j C_{ijt}!} \prod_j \left(\frac{e^{-d_{sj}^t}}{\sum_j e^{-d_{sj}^t}}\right)^{C_{ijt}}$$

$$= \frac{\left(\sum_j C_{ijt}\right)!}{\prod_j C_{ijt}!} \prod_{j \neq J} \left(\frac{e^{-d_{sj}^t}}{1 + \sum_{j \neq J} e^{-d_{sj}^t}}\right)^{C_{ijt}} \left(\frac{1}{1 + \sum_{j \neq J} e^{-d_{sj}^t}}\right)^{C_{iJt}}$$

3)

[3]   i   s

, unconditional   .

$$P_i^t = \sum_s S_{is}^t \times P_{i|s}^t$$

4)

,   ,   likelihood

.

$$L = \prod_i P_i^t$$

$$= \prod_i \left(\sum_s S_{is}^t \times P_{i|s}^t\right)$$

5)

$$= \prod_i \left[\sum_s S_{is}^t \times \frac{\left(\sum_j C_{ijt}\right)!}{\prod_j C_{ijt}!} \prod_j \left(\frac{e^{-d_{sj}^t}}{\sum_j e^{-d_{sj}^t}}\right)^{C_{ijt}}\right]$$

3.3

, latent class   E-M

.   E-M   likelihood

E(expectation)   M(maximization)

. E   , S_{ist}

M   . M

E   , S_{ist} , $_{kt}$

numerical search   (Quasi-Newton   )   [5]

likelihood   log   log-likelihood   .

[6]   E S_{ist} , [7]

log-likelihood   .

$$\hat{S}_{is}^{\,t} = \frac{S_{is}^{\,t} \times P_{i|s}^{\,t}}{\sum_s S_{is}^{\,t} \times P_{i|s}^{\,t}} \tag{6}$$

$$Log \; L_t = \sum_i Log\left(P_i^{\,t}\right) \tag{7}$$

,   t

C_{ijt} (pick any/N   ;   [IxJ])   ,

X_{jkt} ([JxK])   . M

, $_{kt}$ ([KxS])   .

3.4   option

,

local   option   .

,

.   ML

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3.4.1

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(1)   (random number)

1 .

(2) pick any/N

K-Means .

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(3) ,

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(4) .

3.4.2

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(1) (random number) .

(2)

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(3)

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(4) .

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4.1

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1)   ,   2)

,   3)   ,   4)

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4 2

4 2 1   (t=1)

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.   (15)   [1]

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,   .   (30)   [2]   `+'

.   [1]

[2]

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[1 :   ]   [2 :   ]

[2]   ,

                            .   ,

          2   4   [1]
      CAIC   BIC   .
      CAIC, BIC, AIC   .
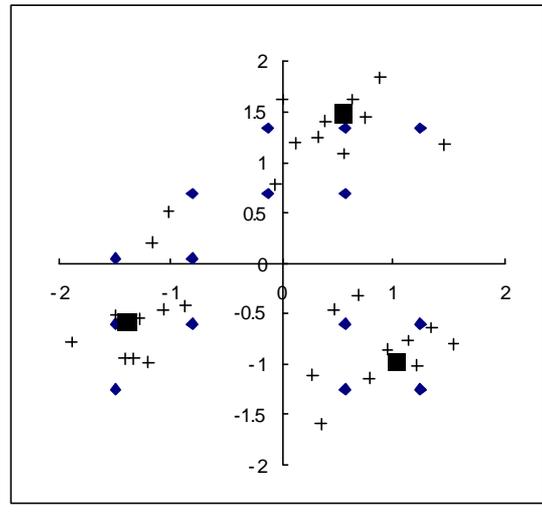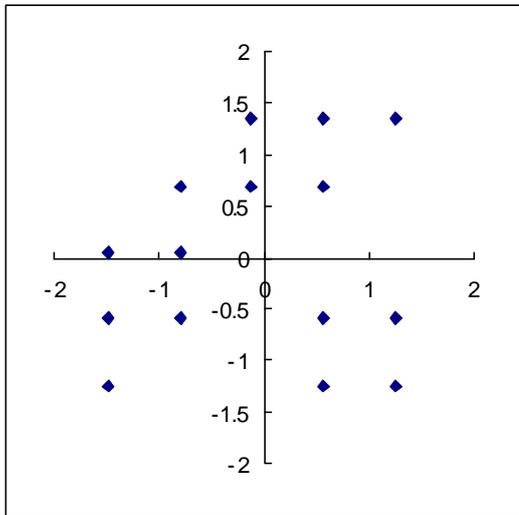
                                              phi coefficient, total matching coefficient,
summed absolute difference   (1999; Jedidi and DeSarbo 1991).
                                                                                        SAD
      [2]   . PHI
      TMC   1   , SAD   0
         .
         ,   PHI   TMC   0.7   , SAD   0.15
         .

	- LN	PHI	TMC	SAD	CAIC	BIC	AIC
2	421.6	.543	.758	.410	992.9	958.9	911.2
3	210.5	.874	.944	.084	711.5	645.5	553.0
4	192.9	.923	.967	.078	817.2	719.2	581.8

[1 :   ]

              [2]   ,
                        ,
               coverage   ,
                    ,   . [2]
                            .

	1	0.056	19.6	22	-2.4	9	0.069	24.1	23	1.1
	2	0.088	31.1	29	2.1	10	0.061	21.6	21	.6
	3	0.061	21.6	19	2.6	11	0.104	36.7	33	3.7
	4	0.065	23.0	23	-0.04	12	0.077	27.2	28	-0.8
	5	0.046	16.3	17	-0.72	13	0.063	22.2	25	-2.8
	6	0.023	7.9	10	-2.1	14	0.087	30.7	27	3.7
	7	0.074	26.2	28	-1.8	15	0.082	29.0	30	-1.0
	8	0.042	14.7	17	-2.3					

[2 :   ]

4.2.2

(t=1)

.

(1)   (t=2)

[3]   3   4

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, [3]   4   4   .

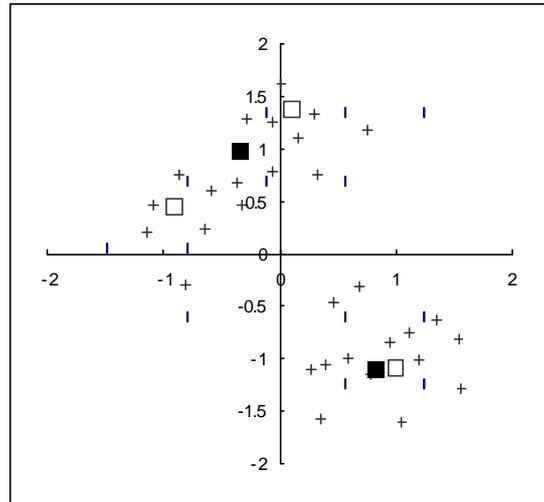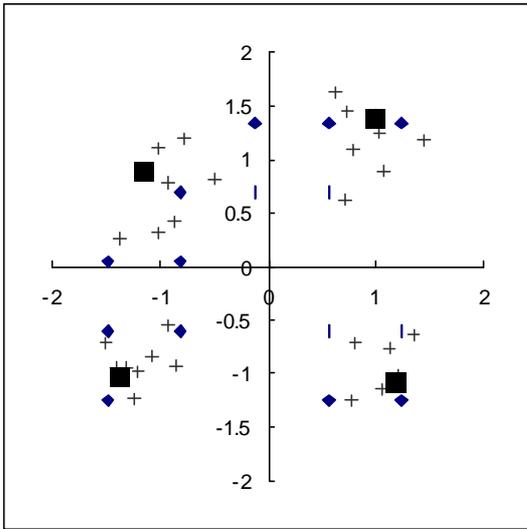4   3 , 4 , 5

[3]   4

.

	- LN	PH	TMC	SAD	CAIC	BIC	AIC
3	277. 1	. 774	. 896	. 217	844. 6	778. 6	686. 1
4	178. 2	. 934	. 971	. 086	787. 7	689. 7	552. 4
5	177. 4	. 934	. 971	. 087	926. 9	796. 9	614. 7

[3 :   ]

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[4]   .

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	. 23	. 10	. 00	. 00
	. 03	. 03	. 20	. 07

[4 :   ]

[3 :   ]   [4 :   ]

   (2)   (t=2)

                         ,   3   ([2]   )   (T=2)
[4]   2   ,   2   ,
                                     [4]   .
              [5]
                      2   .   3
    BIC   PH ,   TMC, SAD   2   3
                                .   [4]   `+'   2
    3   ,
                   .   3   [4]   `   '
              .

	-LN	PH	TMC	SAD	CAIC	BIC	AIC
1	545.2	.120	.510	.626	1099.1	1097.1	1094.3
2	254.5	.741	.874	.191	658.6	624.6	576.9
3	192.3	.887	.946	.083	675.1	609.1	516.7
4	191.8	.887	.946	.088	814.9	716.9	579.6

[5 :   ]

4 2 3

(1)   (t=2)

                                                                    (t=1)
          2   [5-1, 5-2]   3
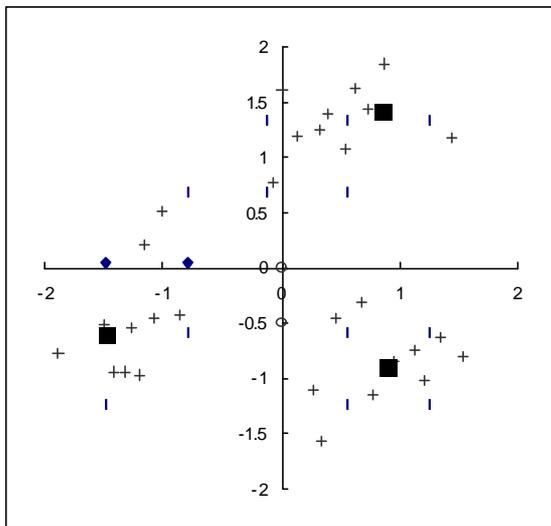   .
                              ,   [1]   1   (   )
              ([5-2]   )   0   ,
        1   (
            ,   )   .
2   (`O   ),
                        [5-2]   .
              [6]   3
                                  . [5-1, 5-2]
                  .

	- LN	PH	TMC	SAD	CAIC	BIC	AIC
2	269. 4	. 694	. 875	1. 672	829. 3	763. 3	670. 8
3	214. 6	. 783	. 918	. 165	732. 9	663. 9	567. 2
4	214. 4	. 818	. 924	. 106	745. 8	673. 8	572. 9

[6 :   ]
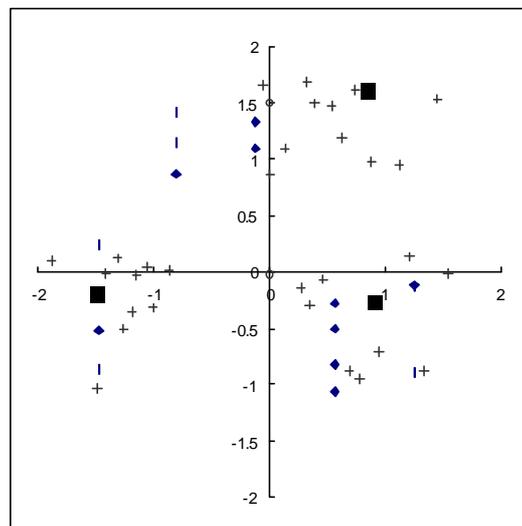
[5-1:   -1   vs.2   ]   [5-2   -1   vs.3   ]

(2)   (t=3)

, t=2   t=3

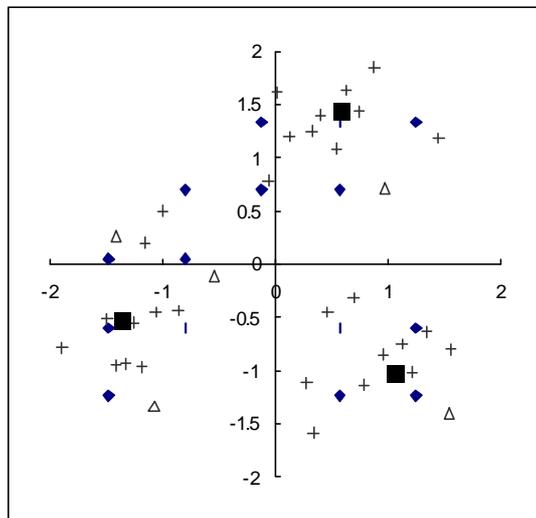,   3   2   .

[6]   . [7]

,   .

3   2   - likelihood

,   3

likelihood   2   .

	-LN	PH	TMC	SAD	CAIC	BIC	AIC
2	210.5	.874	.944	.085	711.6	645.5	553.1
3	218.2	.897	.956	.175	740.2	671.2	574.5

[7 :   ]

[6 :   ]

[7 :   ]

4.2.4   (t=2)

5   . [7]   (

),   .

1   4

[8]   .

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[9]   ,   .

		13	147
		11	128
		11	131

[8 :   ]

	- LN	PHI	TMC	SAD	CAIC	BIC	AIC
2	482.3	.553	.764	.406	1142.2	1103.2	1042.5
3	250.6	.866	.941	.086	847.3	771.3	653.1
4	238.9	.877	.945	.073	992.7	879.7	703.9

[9 :   ]

5.

pick any/N

,   ,

external   .

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. Grover   Srinivasan (1989)

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(cf. Grover and Srinivasan 1989).

external   internal   ,

,   ,   .
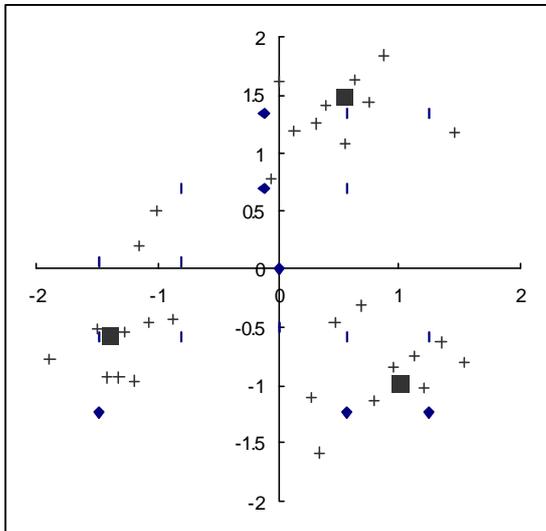
external

external

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1 4

. internal

internal

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option

, local .

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. gibbs sampling

internal

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Appendix

A.1

: likelihood   , AIC, CAIC, BIC

hit-ratios : PH, TMC, SAD

: E   , S_{ist}

: M   , $_{sk}$

: M   standard error

:   , $Y_{sk}+$ $_{sk}$

:

[t-1   x t   ]

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A.2

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