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Variants of the RAS Reconciliation Method

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Outline

- Introduction
- Adding information
  - Variants of RAS
- Incomplete prior
- Handling negative
  - Exogenous
  - Endogenous
- Adding control totals
- Uncertain control totals

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Features of RAS

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RAS: Optimisation Problem

$$SAM\_RAS_{sac,sacp} = R_{sac} * S_{sacp} * SAM\_prior_{sac,sacp}$$

$$col\_con0_{sac} = \sum_{sac} SAM\_RAS_{sac,sacp}$$

$$row\_con0_{sac} = \sum_{sacp} SAM\_RAS_{sac,sacp}$$

$$OB = \sum_{sac,sacp} \left\{ \begin{array}{l} SAM\_RAS_{sac,sacp} \\ * \left[\log\left(SAM\_RAS_{sac,sacp} + \beta \right) - \log\left(SAM\_prior_{sac,sacp} + \beta \right) \right] \end{array} \right\}$$

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RAS: Optimisation Problem

Weights

Logs

$$OB = \sum_{sac,sacp} \left\{ \begin{array}{l} SAM\_RAS_{sac,sacp} \\ *\left[\log\left(SAM\_RAS_{sac,sacp} + \beta \right) - \log\left(SAM\_prior_{sac,sacp} + \beta \right) \right] \end{array} \right\}$$

Solution

Prior

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RAS: Optimisation Problem

```
OB =E= SUM{(sac, sacp)$SAM_prior(sac,sacp),
           SAM_ras(sac, sacp)
        * [log(SAM_ras(sac,sacp) + beta)
        - log(SAM_prior(sac, sacp) + beta)]} ;
```

If SAM_ras(sac,sacp) = 0.0 for any (sac,sacp)
- Weight = 0.0 for any (sac,sacp)
- SAM_ras(sac,sacp) = 0.0

If SAM_prior(sac,sacp) = 0.0 for any (sac,sacp)
- Prior may be 'incomplete'
- SAM_ras(sac,sacp) = 0.0

If SAM_ras(sac,sacp) > 0.0 for any (sac,sacp)
- Weight increases with SAM_ras(sac,sacp)

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Adding information

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Variants of RAS (M_RAS)

$$\mathbf{X}^* = \mathbf{K} + \hat{\mathbf{r}}\left(\mathbf{X} - \mathbf{K}\right)\hat{\mathbf{s}}$$

$$x_{ij}^* = k_{ij} + r_i\left(x_{ij} - k_{ij}\right)s_j$$

$\mathbf{K}$ = a matrix of 'known' values

$$x_{ij} = 0.0 \qquad \forall k_{i,j} \neq 0.0$$

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Incomplete Prior

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Variants of RAS (M_RAS)

$$\mathbf{X}^* = \hat{\mathbf{r}}\left(\mathbf{X} - \mathbf{Z}\right)\hat{\mathbf{s}}$$

$$x_{ij}^* = r_i\left(x_{ij} - z_{ij}\right)s_j$$

$\mathbf{Z}$ = a matrix of 'omitted' values

$$x_{ij} = z_{ij} \;\; \forall z_{i,j} \neq 0.0$$

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Handling negative transactions

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Slide 12

Negative Transactions

- Option 1:
  - Transpose negative prior estimates ($x_{i,j}$ to $-$ve $x_{j,i}$)
  - Adjust row and column control totals
  - Reverse the transposition
- Option 2:
  - Treat negatives as known values
  - Apply M_RAS
    - Adjust prior
    - Adjust row and column control totals
    - Add back the negatives

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Adding control totals

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Adding Control Totals

$$GDP = C + G + I + X - M$$

Internal and External balances

Tax revenues

Compensation of factors

Submatrix reconciliation

Labour
GOS
Mixed income

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Adding Control Totals

	cagr	cnres	cmanu	cserv	aagr	anres	amanu	aserv	flnd	fuskl	fsklb	fcap	h_rich	h_poor	Govt	i_s	row	total
cagr	0	0	0	0	229	1	796	91	0	0	0	0	416	213	4	44	106	1,901
cnres	0	0	0	0	2	54	1,291	15	0	0	0	0	7	2	0	1	859	2,231
cmanu	0	0	0	0	314	269	7,151	1,672	0	0	0	0	2,209	613	76	3,368	3,056	18,727
cserv	0	0	0	0	142	220	1,730	2,029	0	0	0	0	2,136	1,127	1,827	319	786	10,316
aagr	1,777	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,777
anres	0	1,682	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,682
amanu	0	0	14,851	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14,851
aserv	0	0	0	9,566	0	0	0	0	0	0	0	0	0	0	0	0	0	9,566
flnd	0	0	0	0	353	363	0	0	0	0	0	0	0	0	0	0	0	716
fuskl	0	0	0	0	517	143	1,492	1,601	0	0	0	0	0	0	0	0	24	3,777
fsklb	0	0	0	0	5	27	321	1,171	0	0	0	0	0	0	0	0	11	1,536
fcap	0	0	0	0	208	573	1,968	2,745	0	0	0	0	0	0	0	0	36	5,529
h_rich	0	0	0	0	0	0	0	0	353	3,261	1,310	2,474	0	0	0	0	47	7,445
h_poor	0	0	0	0	0	0	0	0	362	496	217	1,776	0	0	0	0	18	2,870
Govt	12	96	872	148	7	31	102	243	0	0	0	0	506	154	0	0	9	2,181
i_s	0	0	0	0	0	0	0	0	0	0	0	1,251	2,113	754	267	0	0	4,386
row	112	453	3,004	602	0	0	0	0	0	20	8	28	58	7	7	653	0	4,953
total	1,901	2,231	18,727	10,316	1,777	1,682	14,851	9,566	716	3,777	1,536	5,529	7,445	2,870	2,181	4,386	4,953	0

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Adding Control Totals

	cagr	cnres	cmanu	cserv	aagr	anres	amanu	aserv	flnd	fuskl	fsklb	fcap	h_rich	h_poor	Govt1	Govt2	i_s1	i_s2	row	total
cagr	0	0	0	0	229	1	796	91	0	0	0	0	416	213	0	4	0	44	106	1,901
cnres	0	0	0	0	2	54	1,291	15	0	0	0	0	7	2	0	0	0	1	859	2,231
cmanu	0	0	0	0	314	269	7,151	1,672	0	0	0	0	2,209	613	0	76	0	3,368	3,056	18,727
cserv	0	0	0	0	142	220	1,730	2,029	0	0	0	0	2,136	1,127	0	1,827	0	319	786	10,316
aagr	1,777	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,777
anres	0	1,682	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,682
amanu	0	0	#####	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14,851
aserv	0	0	0	9,566	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9,566
flnd	0	0	0	0	353	363	0	0	0	0	0	0	0	0	0	0	0	0	0	716
fuskl	0	0	0	0	517	143	1,492	1,601	0	0	0	0	0	0	0	0	0	0	24	3,777
fsklb	0	0	0	0	5	27	321	1,171	0	0	0	0	0	0	0	0	0	0	11	1,536
fcap	0	0	0	0	208	573	1,968	2,745	0	0	0	0	0	0	0	0	0	0	36	5,529
h_rich	0	0	0	0	0	0	0	0	353	3,261	1,310	2,474	0	0	0	0	0	0	47	7,445
h_poor	0	0	0	0	0	0	0	0	362	496	217	1,776	0	0	0	0	0	0	18	2,870
Govt1	12	96	872	148	7	31	102	243	0	0	0	0	506	154	0	0	0	0	9	2,455
Govt2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,907	0	0	0	0	1,907
i_s1	0	0	0	0	0	0	0	0	0	0	0	1,251	2,113	754	267	0	0	0	0	4,386
i_s2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,733	0	0	3,733
row	112	453	3,004	602	0	0	0	0	0	20	8	28	58	7	7	0	653	0	0	4,953
total	1,901	2,231	#####	#####	1,777	1,682	#####	9,566	716	3,777	1,536	5,529	7,445	2,870	274	1,907	4,386	3,733	4,953	0

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Uncertain control totals

Uncertain Control Totals

$$\mathbf{i}'\mathbf{u} = \mathbf{i}'\mathbf{v}$$

$$\mathbf{u}^* = \mathbf{u} + \mathbf{e}_u - \hat{\mathbf{r}}\mathbf{e}_u$$

Not enough for accounting identity

$$\mathbf{v}^* = \mathbf{v} + \mathbf{e}_v - \hat{\mathbf{s}}\mathbf{e}_v$$

Add $\mathbf{e}_u$ and $\mathbf{e}_v$ as additional row and column

$$\mathbf{i}'\mathbf{e}_v \qquad \text{and} \qquad \mathbf{i}'\mathbf{e}_u$$

Reflects Stone's (1942) method before Stone-Byron was possible

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Variants of the RAS Reconciliation Method

The End

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