

SAS Macro for Generation of Resolvable Completely Linear Trend Resistant PBIB (TR-PBIB) Designs with L_2 Association Scheme

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The following SAS macro has been developed to generate a class of **Resolvable Completely Linear TR-PBIB** designs as obtained in Bhowmik *et al.* (2021). Here, **user need to enter the value of 's'**. If the user executes the program after entering the value of s, then the SAS Macro will produce the design along with parameters and the association scheme of the design. Along with the design, a polynomial coefficient (linear) which will be used to measure the effect of trend component would also be generated.

```
/*SAS MACRO FOR GENERATION OF COMPLETELY LINEAR TREND RESISTANT  
RESOLVABLE PARTIALLY BALANCED INCOMPLETE BLOCK DESIGNS BY METHOD  
2.1*/
```

```
%let s=3; /*Enter the value of s where v (Number of treatments) is of the form  $v=s^2$ */
```

```
proc iml;
```

```
tr_coeff=j(1,&s,0);
```

```
do i=1 to &s;
```

```
if mod(&s,2)=1 then do;
```

```
tr_coeff[1,i]=(-&s+2*(i-1)+1)/2;
```

```
end;
```

```
else do;
```

```
tr_coeff[1,i]=(-&s+2*(i-1)+1);
```

```
end;
```

```
end;
```

```
*print tr_coeff;
```

```
a0=1:&s*&s;
```

```
a=shape(a0,&s,&s);
```

```
*print a;
```

```
a1=j(&s,&s,0);
```

```
do i=1 to &s;
```

```
a1[i,i]=a[i,1];
```

```
end;
```

```
do i=1 to &s;
```

```
k=1;
```

```
do j=1 to &s;
```

```
if j>i then do;
```

```
a1[i,i]=a1[i,i]+k;
```

```
k=k+1;
```

```

end;
end;
end;
do i=1 to &s;
k=1;
do j=1 to &s;
if j<i then do;
a1[i,j]=a1[i,&s]+k;
k=k+1;
end;
end;
end;
*print a 1;
a2=j(&s,&s,0);
do i=1 to &s;
a2[i,&s-i+1]=i;
end;
*print a2;
do i=1 to &s-1;
do j=1 to &s-i;
a2[i,&s-j-(i-1)]=a2[i,&s-j+1-(i-1)]+&s;
end;
end;
do i=2 to &s;
do j=&s-i+2 to &s;
a2[i,j]=a2[i,&s-i+1]+&s*(&s-1)-(j-&s)*&s-(i-2)*&s;
end;
end;
*print a2;
v=&s**2;
b=2*&s;
r=2;
k=&s;
Lambda1=1;
Lambda2=0;
L2=a;
print 'Trend Free Resolvable PBIB Designs';
Trend_Free_Resolvable_PBIBD=tr_coeff//a1//a2;
print Trend_Free_Resolvable_PBIBD;
print 'Top row represents non normalized orthogonal polynomial coefficient of degree one';
print 'Parameters of the design are' v b r k Lambda1 Lambda2;
print 'Association Scheme of the Design';
print L2;
print 'Here treatments appearing in same row and same column are first associates, rest are
second associates';
run;

```

quit;

SAS Output

The SAS System

Trend Free Resolvable PBIB Designs		
Trend_Free_Resolvable_PBIBD		
-1	0	1
1	2	3
6	4	5
8	9	7
7	4	1
5	2	8
3	9	6

Top row represents non normalized orthogonal polynomial coefficient of degree one

	v	b	r	k	Lambda1	Lambda2
Parameters of the design are	9	6	2	3	1	0

Association Scheme of the Design

L2		
1	2	3
4	5	6
7	8	9

Here treatments appearing in same row and same column are first associates, rest are second associates

Note: This macro is available online as supplementary material at <https://www.tandfonline.com/doi/suppl/10.1080/03610918.2021.1951763?scroll=top>

Reference

Bhowmik, A., Gupta, R. K., Jaggi, S., Varghese, E., Harun, M., Varghese, C. and Datta, A. (2021): On the construction of trend resistant PBIB designs. *Communications in Statistics - Simulation and Computation*, DOI: 10.1080/03610918.2021.1951763