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

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The following SAS macro has been developed to generate a class of completely linear m-associate TR-PBIB designs based on methods discussed in Bhowmik $et\ al$. (2021). The class of completely linear m-associate TR-PBIB designs based on method 2.2 can be generated by **entering the value of 'v' and 'k'** in the macro. Once executed, the SAS macro will generate the required designs along with parameters $v\ =\ b,\ r\ =\ k\ =(v\text{-}2),\lambda_1 =(v\text{-}3),\lambda_j =(v\text{-}4)$ for all j = 2,3, ..., m. If user execute the program after entering the **value of 'v' and 'k = v-1'**, then the SAS Macro will generate a class of Completely linear trend resistant balanced incomplete block design designs along with all the parameters of the BIB design based on method 2.2 mentioned as note. The polynomial coefficient (linear) which will be used to measure the effect of trend component will also be generated along with design.

```
/*SAS MACRO FOR GENERATION OF COMPLETELY LINEAR TREND RESISTANT BALANCED
INCOMPLETE BLOCK DESIGNS AND PARTIALLY BALANCED INCOMPLETE BLOCK DESIGNS BY
METHOD 2*/

%let v=7;/*Enter the number of treatments*/
%let k=4;/*Enter the block size (Maximum value of k=v-1)*/
ods rtf  file= 'output.rtf' startpage=no;
proc iml;
tr_coeff=j(1,&k,0);
do i=1 to &k;
if mod(&k,2)=1 then do;
tr_coeff[1,i]=(-&k+2*(i-1)+1)/2;
end;
else do;
tr_coeff[1,i]=(-&k+2*(i-1)+1);
end;
end;
*print tr_coeff;
a=j(&v,&k,0);
do i=1 to &v;
do j=1 to &k;
a[i,j]=mod(i+(j-1),&v);
if a[i,j]=0 then a[i,j]=&v;
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```
end;
end;
*print a;
v=&v;
b=&v;
r=&k;
k=&k;
Lambda=&v-2;
if &k=&v-1 then do;
print 'Trend Free BIB Designs';
Trend_Free_BIBD=tr_coeff//a;
print Trend_Free_BIBD;
print 'Top row represents non normalized orthogonal polynomial coefficient of degree one';
print 'Parameters of the design are' ;
print v b r k Lambda;
end;
else do;
Lambda1=&v-3;
Lambdaj=&v-4;
print 'Trend Free PBIB Designs';
Trend_Free_PBIBD=tr_coeff//a;
print Trend_Free_PBIBD;
print 'Top row represents non normalized orthogonal polynomial coefficient of degree one';
print 'Parameters of the design are' ;
print v b r k Lambda1 Lambdaj;
print 'Here treatments follow a varying association scheme';
end;
run;
ods rtf close;
quit;
```

SAS Output

The SAS System

Trend Free PBIB Designs

Trend_Free_PBIBD		
-1	0	1
1	2	3
2	3	4
3	4	5

Trend_Free_PBIBD		
4	5	1
5	1	2

Top row represents non normalized orthogonal polynomial coefficient of degree one

Parameters of the design are

V	b	r	k	Lambda1	Lambdaj
7	7	4	4	4	3

Here treatments follow a varying association scheme

Note: If user enter k = 4 in the above macro, a TF-BIB design will be generated

Trend Free BIB Designs

Trend_Free_BIBD			
-3	-1	1	3
1	2	3	4
2	3	4	5
3	4	5	1
4	5	1	2
5	1	2	3

Top row represents non normalized orthogonal polynomial coefficient of degree one

Parameters of the design are

v	b	r	k	Lambda

v	b	r	k	Lambda
5	5	4	4	3

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