Checking the Equality of Covariance Matrices: some practical aspects

Appendix D 1
Tables of the Type I Error Rates of the ANOVA Procedures for fixed n_i (5,10,..,50) in Relation to different Types of Covariance Heterogeneity

All tables and graphs refer to α=0.05. Reported are the proportions of rejections of the corresponding null hypothesis.

Table of Contents

1. 1. $\Sigma^{(i)} = c_i\Sigma^{(1)}$ with $r(c_i, n_i) \sim 0$

1. 1. 1 main effect B

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	4.60	5.95	4.65	6.00	4.50	5.50	5.75	5.20	5.00	4.80	5.05	5.40
HF adj	4.45	5.85	4.40	5.95	4.45	5.35	5.35	5.15	4.75	4.65	5.00	5.35
KWF	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
vdWaerden	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
Koch	4.70	4.55	5.15	4.85	4.45	5.85	4.70	4.55	5.15	4.85	4.45	5.85
multivariate	5.95	5.80	4.75	6.65	4.60	5.35	7.25	5.75	5.20	5.50	5.25	5.55
	large design (4*6)											
parem F test	5.85	5.60	5.80	4.95	5.05	5.35	5.25	5.20	5.90	4.60	4.75	5.50
HF adj	5.20	5.10	5.75	4.70	4.85	5.35	4.75	4.80	5.80	4.40	4.65	5.50
KWF	4.45	5.35	5.45	5.10	4.45	5.60	4.45	5.35	5.45	5.10	4.45	5.60
vdWaerden	4.45	5.10	5.50	5.30	4.65	5.50	4.45	5.10	5.50	5.30	4.65	5.50
Koch	2.65	3.85	4.90	4.70	4.65	5.70	2.65	3.85	4.90	4.70	4.65	5.70
multivariate	5.60	5.70	5.50	5.60	5.40	5.60	6.70	6.40	5.70	5.15	5.00	5.75
	multivariate lognormal											
	small design (3*3)											
parem F test	6.55	5.55	4.15	4.50	5.05	5.75	6.75	5.55	4.10	4.75	5.90	6.10
HF adj	6.50	5.55	3.90	4.35	5.05	5.60	6.25	5.10	4.10	4.70	5.70	6.05
KWF	4.85	5.40	4.10	4.85	5.55	4.90	4.80	5.70	4.85	5.15	5.95	4.75
vdWaerden	4.85	5.40	4.10	4.85	5.55	4.90	4.80	5.70	4.85	5.15	5.95	4.75
Koch	4.70	4.50	3.75	4.90	4.90	4.75	5.20	5.45	5.15	4.65	5.65	4.55
multivariate	6.55	5.25	4.30	4.45	5.20	5.45	7.85	5.85	4.55	5.75	6.20	5.95
	large design (4*6)											
parem F test	5.80	4.15	4.55	4.80	5.25	6.20	4.55	4.95	5.35	4.25	4.35	5.45
HF adj	4.85	3.80	4.20	4.55	5.05	6.20	3.45	4.35	5.00	3.95	4.25	5.30
KWF	4.90	4.20	5.15	4.40	5.65	4.90	4.00	5.05	5.15	4.25	4.10	5.40
vdWaerden	4.90	4.65	5.10	4.55	5.75	4.75	4.20	5.05	4.95	4.25	3.95	5.05
Koch	2.95	3.20	4.50	4.70	5.45	4.90	1.95	4.35	5.00	3.80	3.90	4.90
multivariate	6.75	5.30	5.45	4.45	5.40	6.70	7.15	6.15	6.10	4.75	4.55	5.95

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	5.15	6.30	5.15	6.20	4.05	5.30	5.75	5.45	5.50	5.00	4.35	5.60
HF adj	4.90	6.25	5.10	6.10	3.95	5.30	5.55	5.45	5.40	4.85	4.35	5.55
KWF	4.35	4.55	5.80	5.35	4.25	4.95	4.20	5.80	4.65	5.25	4.30	5.45
vdWaerden	4.30	4.60	5.80	5.35	4.25	4.85	4.20	5.80	4.65	5.25	4.20	5.40
Koch	4.10	4.20	5.15	5.15	4.40	5.05	4.40	4.55	4.75	5.15	4.35	5.40
multivariate	5.80	5.90	5.25	6.10	4.00	5.05	7.60	6.70	5.65	5.80	4.75	5.80
	large design (4*6)											
parem F test	6.10	5.50	4.90	5.25	5.15	6.00	5.40	5.35	5.10	5.10	4.95	5.95
HF adj	5.50	5.30	4.65	5.10	5.15	5.85	4.95	5.25	4.90	5.05	4.95	5.80
KWF	4.95	4.70	5.05	4.65	4.85	5.25	4.60	5.15	5.15	4.80	4.25	5.45
vdWaerden	4.95	5.00	4.90	4.65	5.10	5.15	4.60	5.50	5.30	4.75	4.45	5.60
Koch	2.95	4.45	4.65	4.55	4.65	5.35	2.55	4.35	4.45	4.95	4.55	5.60
multivariate	6.90	5.80	5.20	5.60	5.15	5.10	7.55	7.20	5.60	5.35	5.10	5.95
	multivariate exponential											
	small design (3*3)											
parem F test	4.00	5.15	4.55	5.85	4.80	4.85	4.60	5.15	5.30	4.80	5.10	4.60
HF adj	3.20	4.60	4.45	5.50	4.50	4.65	3.50	4.60	4.75	4.45	4.90	4.40
KWF	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
vdWaerden	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
Koch	4.70	4.55	5.15	4.85	4.45	5.85	4.70	4.55	5.15	4.85	4.45	5.85
multivariate	5.00	6.00	5.45	6.65	4.90	4.80	5.90	5.55	5.50	5.50	5.65	4.85
	large design (4*6)											
parem F test	5.50	6.05	5.65	5.35	5.10	4.85	4.90	5.55	5.15	4.75	5.00	5.35
HF adj	3.50	4.40	4.25	4.60	4.45	4.55	3.05	4.15	4.60	4.10	4.35	4.90
KWF	4.45	5.35	5.45	5.10	4.45	5.60	4.45	5.35	5.45	5.10	4.45	5.60
vdWaerden	4.45	5.10	5.50	5.30	4.65	5.50	4.45	5.10	5.50	5.30	4.65	5.50
Koch	2.65	3.85	4.90	4.70	4.65	5.70	2.65	3.85	4.90	4.70	4.65	5.70
multivariate	5.60	5.90	5.80	6.70	5.75	5.10	6.95	6.25	5.80	6.10	5.80	5.55

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	4.75	5.90	5.05	6.25	4.05	5.50	5.85	5.05	5.05	4.90	4.30	5.15
HF adj	4.55	5.85	4.90	6.20	4.05	5.45	5.35	4.95	4.95	4.85	4.30	5.10
KWF	3.45	6.05	4.65	6.00	5.00	5.65	3.40	6.05	5.60	5.90	5.65	6.65
vdWaerden	3.45	6.05	4.65	6.00	5.00	5.65	3.40	6.05	5.60	5.90	5.65	6.65
Koch	4.00	5.00	4.65	5.60	5.00	5.65	3.65	4.85	5.55	5.75	5.60	6.55
multivariate	6.20	6.10	5.25	5.95	4.30	5.25	7.35	6.10	5.75	5.90	4.65	5.35
	large design (4*6)											
parem F test	5.70	5.25	5.05	4.50	3.75	5.50	5.20	5.85	5.05	4.70	4.45	4.95
HF adj	5.20	5.00	4.75	4.35	3.75	5.35	4.75	5.50	4.95	4.60	4.30	4.95
KWF	4.60	5.30	6.95	7.15	7.10	9.10	4.85	5.15	6.95	7.15	7.10	9.10
vdWaerden	4.50	5.65	7.45	8.10	8.25	10.10	4.75	5.20	7.45	8.10	8.25	10.10
Koch	2.75	4.80	6.25	6.80	7.00	8.85	3.05	4.40	6.25	6.80	7.00	8.85
multivariate	6.15	6.35	4.80	4.80	4.75	5.70	7.00	7.15	5.35	4.60	5.05	5.60

1. 1. 2 interaction effect AB

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	7.65	6.25	5.65	7.35	5.70	7.45	8.50	8.05	3.80	3.75	4.25	4.20
HF adj	7.30	6.20	5.75	7.35	5.75	7.35	8.00	8.00	3.85	3.70	4.25	4.05
KWF	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
vdWaerden	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
Koch	3.80	5.50	5.35	6.15	5.30	5.95	4.65	5.25	4.60	5.15	5.70	5.30
multivariate	9.45	9.45	8.85	9.80	8.50	10.65	14.25	13.70	10.05	8.30	9.30	9.90
	large design (4*6)											
parem F test	8.20	7.35	8.05	7.50	7.65	7.20	5.25	4.10	4.95	4.25	4.35	4.75
HF adj	7.25	6.85	7.90	7.35	7.35	7.10	4.25	3.95	4.80	4.25	4.25	4.75
KWF	3.55	4.60	4.70	5.10	4.30	4.80	2.70	3.75	4.80	4.80	4.30	4.70
vdWaerden	3.45	4.75	4.70	5.00	4.20	4.65	2.90	3.55	4.60	4.80	4.10	4.90
Koch	1.65	3.10	5.20	5.45	5.55	5.60	1.70	2.40	4.30	4.05	4.55	4.45
multivariate	12.60	13.55	15.35	14.00	14.50	14.65	11.70	11.35	10.45	10.20	10.35	11.10
	multivariate lognormal											
	small design (3*3)											
parem F test	6.35	6.45	6.50	6.35	6.00	6.65	8.35	7.20	4.05	4.70	4.70	4.10
HF adj	5.90	6.00	6.35	6.30	6.00	6.65	7.45	6.75	3.90	4.50	4.40	3.95
KWF	3.80	4.30	4.55	4.85	4.70	4.30	2.75	3.50	4.45	4.50	4.80	4.45
vdWaerden	3.80	4.30	4.55	4.85	4.70	4.30	2.75	3.50	4.45	4.50	4.80	4.45
Koch	3.40	5.45	5.60	5.50	5.15	5.55	4.35	5.85	5.20	5.05	5.50	5.20
multivariate	9.30	8.95	9.05	9.50	8.15	9.25	13.20	13.25	8.80	9.90	9.00	8.05
	large design (4*6)											
parem F test	8.20	6.65	7.05	7.70	7.55	6.85	4.50	4.25	4.75	5.20	5.35	4.55
HF adj	6.70	6.00	6.65	7.35	7.05	6.95	3.90	3.80	4.50	5.05	5.10	4.45
KWF	3.30	3.50	4.30	5.20	5.15	4.90	2.60	3.70	4.70	4.50	4.55	4.50
vdWaerden	3.45	3.55	4.15	4.80	4.95	4.55	2.85	4.10	4.60	4.80	4.70	4.65
Koch	1.60	3.45	4.15	4.80	5.90	5.80	1.45	4.00	4.10	5.25	4.95	5.30
multivariate	11.75	13.60	12.15	13.65	14.45	13.75	12.35	11.10	9.20	10.70	10.95	9.05

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	8.20	7.05	5.60	8.10	6.25	7.00	8.55	7.85	4.30	3.70	4.15	4.30
HF adj	7.55	6.90	5.65	7.90	6.20	6.95	8.45	7.90	4.20	3.70	4.20	4.25
KWF	4.70	4.90	4.20	5.00	5.15	5.05	3.70	4.80	4.60	4.35	4.15	5.70
vdWaerden	4.65	4.85	4.20	5.00	5.15	5.15	3.70	4.75	4.60	4.30	4.05	5.65
Koch	3.75	4.60	5.05	6.35	5.45	5.70	4.95	5.55	5.00	4.65	5.55	6.05
multivariate	9.30	10.15	8.40	11.10	9.40	10.60	13.90	13.40	9.80	9.05	9.25	8.75
	large design (4*6)											
parem F test	9.05	7.25	8.20	7.40	7.75	7.85	6.00	4.65	4.50	4.70	4.35	4.85
HF adj	7.85	6.95	8.05	7.25	7.45	7.80	5.35	4.50	4.30	4.50	4.40	4.85
KWF	3.25	3.95	5.15	4.95	3.90	5.15	3.05	4.25	4.90	4.90	3.95	4.75
vdWaerden	3.25	4.15	4.95	5.05	4.00	5.10	3.00	4.00	4.70	5.10	4.00	4.80
Koch	1.35	3.20	5.00	5.65	5.60	5.50	1.65	3.40	4.50	4.55	4.55	4.35
multivariate	11.75	14.15	16.05	15.15	14.35	13.95	11.95	12.25	10.75	10.30	10.75	10.55
	multivariate exponential											
	small design (3*3)											
parem F test	6.00	6.10	5.95	6.85	5.20	6.50	6.60	7.00	3.45	3.50	4.25	4.45
HF adj	4.70	5.50	5.40	6.75	4.75	6.00	5.35	6.10	3.20	3.30	4.00	4.25
KWF	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
vdWaerden	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
Koch	3.35	5.10	5.00	6.05	4.50	5.20	3.80	6.05	4.55	4.65	5.10	5.05
multivariate	7.40	9.10	8.50	9.80	7.40	9.70	10.75	11.75	9.55	8.20	9.25	9.20
	large design (4*6)											
parem F test	7.70	6.10	7.10	7.35	7.60	7.75	5.40	5.00	4.05	4.55	4.10	4.60
HF adj	5.15	4.65	6.20	6.45	7.20	7.50	3.60	3.85	3.30	3.85	3.80	4.35
KWF	3.55	4.60	4.70	5.10	4.30	4.80	2.70	3.75	4.80	4.80	4.30	4.70
vdWaerden	3.45	4.75	4.70	5.00	4.20	4.65	2.90	3.55	4.60	4.80	4.10	4.90
Koch	1.90	2.75	4.85	5.05	4.95	5.40	1.50	2.85	4.25	4.80	3.80	5.10
multivariate	11.00	10.95	14.40	14.00	13.05	14.95	9.15	9.75	10.00	9.90	9.90	11.05

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	8.65	7.05	6.00	7.60	6.30	7.50	8.35	8.00	3.90	3.95	4.35	4.05
HF adj	8.15	6.95	5.90	7.65	6.10	7.45	8.35	7.60	3.95	3.80	4.20	4.00
KWF	4.75	4.85	4.90	5.70	5.95	5.95	3.95	5.00	4.70	6.20	5.85	5.60
vdWaerden	4.75	4.85	4.90	5.70	5.95	5.95	3.95	5.00	4.70	6.20	5.85	5.60
Koch	4.00	4.45	5.40	6.55	5.55	7.20	4.55	5.05	4.60	5.10	5.05	5.25
multivariate	9.55	9.85	8.55	10.50	9.10	10.50	14.30	13.15	9.40	8.60	9.55	8.55
	large design (4*6)											
parem F test	7.70	7.60	7.15	7.00	7.45	7.90	4.75	4.35	3.90	4.10	4.35	3.95
HF adj	6.70	6.80	6.80	6.85	7.30	7.75	4.50	4.05	3.85	4.05	4.25	3.85
KWF	3.70	4.15	5.60	5.75	6.55	6.30	3.05	4.15	5.25	6.20	6.20	6.40
vdWaerden	3.65	4.45	5.75	6.00	6.95	6.35	3.15	4.15	5.55	6.50	6.55	7.10
Koch	1.40	3.65	4.75	5.25	5.35	6.05	1.90	2.95	4.45	4.60	5.20	4.30
multivariate	11.75	13.70	14.10	14.65	13.50	14.30	11.75	11.80	8.80	9.95	10.30	9.45

1. 2. $\Sigma^{(i)} = c_i\Sigma^{(1)}$ with $r(c_i, n_i) \sim -0.3$

1. 2. 1 main effect B

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	4.40	5.45	4.65	5.90	4.05	4.70	4.60	5.40	4.45	6.00	4.20	5.00
HF adj	4.20	5.55	4.60	5.95	4.15	4.75	4.50	5.35	4.40	6.00	4.20	4.95
KWF	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
vdWaerden	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
Koch	4.70	4.55	5.15	4.85	4.45	5.85	4.70	4.55	5.15	4.85	4.45	5.85
multivariate	5.25	5.55	4.70	6.50	4.40	4.55	5.30	5.85	4.70	5.95	4.75	4.60
	large design (4*6)											
parem F test	4.75	5.50	5.35	4.90	4.80	5.30	5.00	5.40	5.60	4.50	5.00	5.35
HF adj	4.75	5.50	5.35	4.90	4.70	5.35	4.95	5.35	5.60	4.45	4.95	5.30
KWF	4.45	5.35	5.45	5.10	4.45	5.60	4.45	5.35	5.45	5.10	4.45	5.60
vdWaerden	4.45	5.10	5.50	5.30	4.65	5.50	4.45	5.10	5.50	5.30	4.65	5.50
Koch	2.65	3.85	4.90	4.70	4.65	5.70	2.65	3.85	4.90	4.70	4.65	5.70
multivariate	5.60	5.15	5.30	5.10	4.85	5.45	6.40	5.80	5.60	5.05	5.05	5.80
	multivariate lognormal											
	small design (3*3)											
parem F test	6.15	5.00	4.15	4.70	5.05	5.10	5.80	5.30	4.45	4.80	5.90	5.00
HF adj	6.00	4.80	4.25	4.60	5.10	5.10	5.60	4.90	4.45	4.70	5.80	4.90
KWF	4.85	5.40	4.10	4.85	5.55	4.90	4.80	5.70	4.85	5.15	5.95	4.75
vdWaerden	4.85	5.40	4.10	4.85	5.55	4.90	4.80	5.70	4.85	5.15	5.95	4.75
Koch	4.70	4.50	3.75	4.90	4.90	4.75	5.20	5.45	5.15	4.65	5.65	4.55
multivariate	5.80	4.75	4.20	4.50	5.40	5.20	5.75	5.50	4.75	4.90	5.70	5.25
	large design (4*6)											
parem F test	5.00	4.20	4.35	4.65	5.30	6.25	4.65	4.80	5.45	4.35	4.55	5.40
HF adj	4.65	3.85	4.25	4.50	5.20	6.15	4.20	4.30	5.35	4.20	4.45	5.45
KWF	4.90	4.20	5.15	4.40	5.65	4.90	4.00	5.05	5.15	4.25	4.10	5.40
vdWaerden	4.90	4.65	5.10	4.55	5.75	4.75	4.20	5.05	4.95	4.25	3.95	5.05
Koch	2.95	3.20	4.50	4.70	5.45	4.90	1.95	4.35	5.00	3.80	3.90	4.90
multivariate	6.25	5.30	4.90	4.60	5.45	6.40	6.85	6.15	5.35	4.75	4.40	6.00

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	4.35	5.75	5.10	6.30	3.85	5.00	4.30	5.50	4.95	6.45	4.15	5.00
HF adj	4.30	5.75	5.05	6.30	3.85	5.00	4.30	5.70	4.95	6.40	4.15	5.10
KWF	3.70	4.80	4.55	4.90	4.70	5.15	3.90	5.10	4.60	5.15	4.15	4.90
vdWaerden	3.65	4.80	4.60	4.85	4.85	5.15	3.85	5.15	4.55	5.30	4.20	4.75
Koch	4.05	4.50	4.80	4.75	4.60	5.05	4.05	4.70	4.10	5.10	4.35	4.90
multivariate	5.15	5.55	4.95	6.10	4.00	4.75	5.20	5.40	4.75	6.35	4.10	4.70
	large design (4*6)											
parem F test	4.95	5.15	5.00	5.10	4.70	5.75	5.85	5.70	5.25	4.75	4.60	6.15
HF adj	5.05	5.25	5.05	5.05	4.70	5.70	5.40	5.55	5.25	4.85	4.50	6.15
KWF	4.25	5.65	4.85	5.00	4.70	5.75	4.90	5.10	5.20	5.20	4.40	5.75
vdWaerden	4.45	5.45	5.00	5.15	4.75	5.75	4.50	5.10	5.15	5.15	4.40	5.65
Koch	2.70	4.30	4.60	4.60	5.00	5.40	2.65	4.20	4.60	4.75	4.60	5.50
multivariate	6.50	5.70	5.40	5.60	4.45	5.65	6.55	6.70	5.50	5.40	4.95	5.70
	multivariate exponential											
	small design (3*3)											
parem F test	3.55	5.20	4.15	5.95	5.55	5.00	3.45	5.50	4.55	6.10	5.35	4.70
HF adj	3.10	5.00	3.95	5.80	5.25	4.55	2.70	5.05	4.05	5.75	5.05	4.60
KWF	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
vdWaerden	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
Koch	4.70	4.55	5.15	4.85	4.45	5.85	4.70	4.55	5.15	4.85	4.45	5.85
multivariate	4.40	5.60	5.05	6.30	5.20	4.70	4.50	5.40	5.05	6.20	5.50	4.75
	large design (4*6)											
parem F test	4.80	5.55	5.05	5.05	4.75	5.20	5.10	5.70	5.50	4.80	4.95	5.40
HF adj	3.05	4.40	4.55	4.40	4.55	4.95	3.25	4.35	4.60	4.35	4.55	4.95
KWF	4.45	5.35	5.45	5.10	4.45	5.60	4.45	5.35	5.45	5.10	4.45	5.60
vdWaerden	4.45	5.10	5.50	5.30	4.65	5.50	4.45	5.10	5.50	5.30	4.65	5.50
Koch	2.65	3.85	4.90	4.70	4.65	5.70	2.65	3.85	4.90	4.70	4.65	5.70
multivariate	6.30	6.05	5.60	6.15	5.55	5.30	6.85	6.05	5.85	6.20	5.75	5.90

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	3.85	5.45	4.85	6.15	4.20	5.20	4.50	5.40	5.00	6.25	4.10	5.40
HF adj	3.95	5.35	4.85	6.15	4.20	5.25	4.65	5.30	4.90	6.15	4.10	5.35
KWF	3.45	6.05	4.65	6.00	5.00	5.65	3.40	6.05	5.60	5.90	5.65	6.65
vdWaerden	3.45	6.05	4.65	6.00	5.00	5.65	3.40	6.05	5.60	5.90	5.65	6.65
Koch	4.00	5.00	4.65	5.60	5.00	5.65	3.65	4.85	5.55	5.75	5.60	6.55
multivariate	5.35	5.25	5.15	6.05	4.05	5.25	5.40	5.35	5.15	5.80	4.30	4.85
	large design (4*6)											
parem F test	5.00	5.45	4.75	4.55	4.65	5.45	5.45	5.95	5.10	4.70	4.45	5.35
HF adj	5.00	5.40	4.60	4.60	4.60	5.50	5.05	5.75	5.00	4.65	4.50	5.30
KWF	4.60	5.30	6.95	7.15	7.10	9.10	4.85	5.15	6.95	7.15	7.10	9.10
vdWaerden	4.50	5.65	7.45	8.10	8.25	10.10	4.75	5.20	7.45	8.10	8.25	10.10
Koch	2.75	4.80	6.25	6.80	7.00	8.85	3.05	4.40	6.25	6.80	7.00	8.85
multivariate	5.95	6.10	4.40	4.45	4.85	5.55	6.90	6.65	5.00	4.55	4.65	5.60

1. 2. 2 interaction effect AB

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	6.40	5.85	5.00	5.75	5.60	5.65	5.80	4.65	5.90	7.80	7.70	7.70
HF adj	6.30	5.80	4.95	5.90	5.55	5.60	5.75	4.50	5.85	7.70	7.55	7.65
KWF	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
vdWaerden	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
Koch	3.90	4.80	4.60	5.35	5.00	5.15	2.95	4.25	5.05	6.75	6.00	6.90
multivariate	3.45	3.00	3.40	3.75	2.95	4.05	2.85	2.35	3.75	3.70	3.45	3.85
	large design (4*6)											
parem F test	5.90	5.25	6.55	6.20	5.65	6.05	9.00	7.95	8.45	7.85	8.10	8.60
HF adj	5.60	5.25	6.35	6.15	5.60	6.05	8.15	7.65	8.30	7.65	8.10	8.65
KWF	3.55	4.60	4.70	5.10	4.30	4.80	2.70	3.75	4.80	4.80	4.30	4.70
vdWaerden	3.45	4.75	4.70	5.00	4.20	4.65	2.90	3.55	4.60	4.80	4.10	4.90
Koch	1.65	3.05	4.55	5.15	4.85	4.90	2.55	4.20	7.05	7.05	7.55	7.35
multivariate	5.55	4.90	6.10	6.90	5.60	5.65	8.20	7.25	7.45	7.35	7.50	7.25
	multivariate lognormal											
	small design (3*3)											
parem F test	5.35	5.50	5.45	5.25	5.15	4.95	5.05	4.40	6.60	6.60	7.90	7.20
HF adj	5.20	5.35	5.20	5.30	5.10	4.90	4.80	4.50	6.55	6.60	7.85	7.20
KWF	3.80	4.30	4.55	4.85	4.70	4.30	2.75	3.50	4.45	4.50	4.80	4.45
vdWaerden	3.80	4.30	4.55	4.85	4.70	4.30	2.75	3.50	4.45	4.50	4.80	4.45
Koch	3.05	4.80	4.90	5.55	4.75	4.80	2.15	3.90	5.75	5.40	6.20	6.55
multivariate	3.10	3.50	3.55	3.55	3.15	3.50	2.55	2.65	3.25	3.60	3.80	3.20
	large design (4*6)											
parem F test	6.40	5.40	5.70	6.15	6.30	6.30	7.55	7.50	8.15	8.45	9.15	7.95
HF adj	5.80	4.85	5.50	6.05	6.10	6.25	7.05	6.90	7.80	8.20	8.90	7.80
KWF	3.30	3.50	4.30	5.20	5.15	4.90	2.60	3.70	4.70	4.50	4.55	4.50
vdWaerden	3.45	3.55	4.15	4.80	4.95	4.55	2.85	4.10	4.60	4.80	4.70	4.65
Koch	1.55	3.40	4.35	4.70	4.95	5.50	2.60	5.30	6.95	7.80	7.75	7.25
multivariate	5.35	5.70	4.95	5.10	6.05	5.80	8.35	7.20	6.70	7.80	7.65	6.55

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	6.10	6.40	4.60	5.85	5.40	5.75	5.45	4.80	6.60	7.75	7.35	7.35
HF adj	6.10	6.25	4.65	5.90	5.55	5.80	5.65	4.80	6.55	7.75	7.25	7.35
KWF	4.10	5.20	4.30	4.85	5.00	5.50	3.15	4.20	4.50	5.50	4.40	5.80
vdWaerden	4.10	5.25	4.30	4.85	4.95	5.45	3.10	4.15	4.40	5.45	4.45	5.70
Koch	3.45	4.60	4.55	5.20	5.20	5.50	2.70	4.25	4.95	6.85	5.60	6.20
multivariate	3.40	3.55	2.90	4.00	2.90	3.85	3.15	2.60	3.30	4.00	3.45	3.90
	large design (4*6)											
parem F test	6.20	5.60	5.75	5.75	6.10	6.25	9.25	8.05	8.60	8.25	8.50	8.45
HF adj	6.60	5.50	5.80	5.70	6.15	6.25	8.90	7.55	8.50	8.20	8.30	8.35
KWF	3.85	4.40	4.35	5.50	4.35	4.75	3.30	4.45	5.45	5.50	4.25	5.95
vdWaerden	3.85	4.35	4.50	5.30	4.25	4.85	3.65	4.80	5.60	6.00	4.70	6.40
Koch	1.65	3.10	4.55	5.40	5.00	4.95	2.90	5.25	7.35	7.45	7.80	7.70
multivariate	5.55	5.75	6.70	7.00	5.65	5.65	8.40	8.15	7.45	7.95	7.60	7.40
	multivariate exponential											
	small design (3*3)											
parem F test	4.85	4.60	4.85	6.30	4.10	5.00	4.60	5.30	6.25	8.10	6.60	7.25
HF adj	4.10	4.45	4.65	6.10	4.10	4.80	3.85	4.75	5.85	7.85	6.35	6.85
KWF	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
vdWaerden	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
Koch	3.10	4.70	5.15	5.85	4.40	4.70	2.80	4.35	4.70	6.00	4.85	5.85
multivariate	3.00	2.80	2.80	3.45	2.85	3.50	2.55	2.85	3.40	3.80	3.10	3.40
	large design (4*6)											
parem F test	6.20	5.05	5.65	5.90	6.05	6.05	8.90	8.35	8.15	7.40	8.05	8.20
HF adj	4.25	4.30	5.35	5.65	5.70	5.95	6.35	6.75	7.15	7.10	7.65	7.50
KWF	3.55	4.60	4.70	5.10	4.30	4.80	2.70	3.75	4.80	4.80	4.30	4.70
vdWaerden	3.45	4.75	4.70	5.00	4.20	4.65	2.90	3.55	4.60	4.80	4.10	4.90
Koch	1.95	3.00	4.40	4.65	4.75	5.60	2.05	3.85	6.30	7.10	5.65	6.90
multivariate	4.95	4.20	5.70	6.20	5.40	6.15	6.25	6.05	6.65	6.70	6.65	8.15

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	6.65	6.40	4.65	5.85	5.20	5.65	6.15	4.70	6.50	8.10	7.45	7.55
HF adj	6.35	5.95	4.60	5.80	5.20	5.65	5.85	4.45	6.30	8.15	7.50	7.50
KWF	4.75	4.85	4.90	5.70	5.95	5.95	3.95	5.00	4.70	6.20	5.85	5.60
vdWaerden	4.75	4.85	4.90	5.70	5.95	5.95	3.95	5.00	4.70	6.20	5.85	5.60
Koch	3.30	4.40	4.70	5.45	5.00	5.50	3.05	4.05	5.45	6.85	6.50	6.80
multivariate	3.15	3.40	3.20	3.85	3.05	4.05	2.80	2.85	3.45	3.85	3.40	3.55
	large design (4*6)											
parem F test	6.05	5.95	5.95	5.90	6.05	5.90	8.65	7.35	8.00	7.45	8.25	7.70
HF adj	5.95	5.85	5.80	5.90	6.05	5.90	8.00	7.10	8.05	7.30	8.10	7.70
KWF	3.70	4.15	5.60	5.75	6.55	6.30	3.05	4.15	5.25	6.20	6.20	6.40
vdWaerden	3.65	4.45	5.75	6.00	6.95	6.35	3.15	4.15	5.55	6.50	6.55	7.10
Koch	1.40	3.20	4.50	4.90	5.15	5.45	2.80	4.60	6.60	7.00	7.50	7.05
multivariate	4.55	5.20	5.35	5.75	5.90	6.10	7.95	7.30	6.65	6.90	7.05	6.75

1. 3. $\Sigma^{(i)} = c_i\Sigma^{(1)}$ with $r(c_i, n_i) \sim -0.7$

1. 3. 1 main effect B

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	4.25	5.30	4.75	6.05	3.85	4.80	4.65	5.25	4.80	6.00	4.15	5.05
HF adj	4.55	5.25	4.70	6.00	3.80	4.80	4.50	5.05	4.65	5.90	4.15	5.00
KWF	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
vdWaerden	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
Koch	4.70	4.55	5.15	4.85	4.45	5.85	4.70	4.55	5.15	4.85	4.45	5.85
multivariate	4.75	4.85	4.75	6.05	4.25	4.50	5.00	4.75	4.75	5.65	4.00	4.80
	large design (4*6)											
parem F test	4.35	5.30	5.15	5.00	5.20	5.75	5.00	5.10	5.55	5.25	4.90	5.80
HF adj	3.80	5.10	5.20	5.00	5.10	5.75	4.65	5.25	5.60	5.05	4.80	5.75
KWF	4.45	5.35	5.45	5.10	4.45	5.60	4.45	5.35	5.45	5.10	4.45	5.60
vdWaerden	4.45	5.10	5.50	5.30	4.65	5.50	4.45	5.10	5.50	5.30	4.65	5.50
Koch	2.65	3.85	4.90	4.70	4.65	5.70	2.65	3.85	4.90	4.70	4.65	5.70
multivariate	4.30	4.95	4.50	4.90	5.40	5.20	4.25	5.50	5.05	5.20	5.15	5.20
	multivariate lognormal											
	small design (3*3)											
parem F test	4.25	5.30	4.75	6.05	3.85	4.80	4.65	5.25	4.80	6.00	4.15	5.05
HF adj	4.55	5.25	4.70	6.00	3.80	4.80	4.50	5.05	4.65	5.90	4.15	5.00
KWF	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
vdWaerden	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
Koch	4.70	4.55	5.15	4.85	4.45	5.85	4.70	4.55	5.15	4.85	4.45	5.85
multivariate	4.75	4.85	4.75	6.05	4.25	4.50	5.00	4.75	4.75	5.65	4.00	4.80
	large design (4*6)											
parem F test	4.35	5.30	5.15	5.00	5.20	5.75	5.00	5.10	5.55	5.25	4.90	5.80
HF adj	3.80	5.10	5.20	5.00	5.10	5.75	4.65	5.25	5.60	5.05	4.80	5.75
KWF	4.45	5.35	5.45	5.10	4.45	5.60	4.45	5.35	5.45	5.10	4.45	5.60
vdWaerden	4.45	5.10	5.50	5.30	4.65	5.50	4.45	5.10	5.50	5.30	4.65	5.50
Koch	2.65	3.85	4.90	4.70	4.65	5.70	2.65	3.85	4.90	4.70	4.65	5.70
multivariate	4.30	4.95	4.50	4.90	5.40	5.20	4.25	5.50	5.05	5.20	5.15	5.20

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	4.20	5.80	4.90	6.45	3.75	4.95	4.60	5.50	4.95	6.30	3.45	4.95
HF adj	4.25	5.75	4.90	6.40	3.80	4.90	4.65	5.65	5.00	6.25	3.50	4.95
KWF	4.20	4.80	4.35	4.80	4.25	5.70	4.35	5.05	4.90	4.95	4.25	5.45
vdWaerden	4.05	4.75	4.40	4.80	4.10	5.70	4.35	5.10	4.85	5.10	4.30	5.40
Koch	4.20	4.35	4.25	4.75	4.40	5.45	4.25	4.55	4.50	4.90	4.55	5.45
multivariate	5.05	5.40	5.00	6.00	3.90	4.90	5.30	4.95	4.80	5.85	3.90	4.75
	large design (4*6)											
parem F test	4.65	5.40	5.15	5.25	4.85	5.35	5.20	5.95	5.45	5.50	4.90	5.75
HF adj	4.50	5.15	5.15	5.30	4.85	5.25	5.20	5.70	5.35	5.45	4.85	5.65
KWF	5.00	4.85	5.65	5.05	4.15	5.65	4.65	5.05	5.85	5.70	4.30	5.75
vdWaerden	4.90	4.95	5.55	5.00	4.35	5.55	4.60	5.10	5.65	5.55	4.35	5.80
Koch	2.55	4.30	4.80	5.00	4.10	5.30	2.65	4.60	4.70	5.35	3.95	5.50
multivariate	5.00	4.95	5.00	4.85	4.80	5.50	4.90	5.45	4.60	4.95	5.20	5.45
	multivariate exponential											
	small design (3*3)											
parem F test	3.50	5.55	4.55	6.15	5.50	4.75	3.90	5.35	4.50	6.05	5.30	4.95
HF adj	3.00	5.00	4.25	5.85	5.25	4.45	3.50	5.20	4.35	5.80	4.90	4.65
KWF	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
vdWaerden	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
Koch	4.70	4.55	5.15	4.85	4.45	5.85	4.70	4.55	5.15	4.85	4.45	5.85
multivariate	4.05	5.45	4.90	6.30	5.10	4.75	4.35	5.40	5.20	6.15	5.25	4.60
	large design (4*6)											
parem F test	4.50	5.65	5.45	5.25	4.80	5.20	4.90	6.10	5.95	5.65	5.10	4.85
HF adj	2.80	4.10	4.85	4.70	4.35	4.65	3.25	4.60	5.05	5.20	4.85	4.70
KWF	4.45	5.35	5.45	5.10	4.45	5.60	4.45	5.35	5.45	5.10	4.45	5.60
vdWaerden	4.45	5.10	5.50	5.30	4.65	5.50	4.45	5.10	5.50	5.30	4.65	5.50
Koch	2.65	3.85	4.90	4.70	4.65	5.70	2.65	3.85	4.90	4.70	4.65	5.70
multivariate	5.00	6.30	5.60	5.85	5.30	5.20	4.70	5.95	5.60	5.85	5.65	5.15

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	4.30	4.85	5.15	6.25	3.80	5.00	4.90	4.80	5.05	6.10	3.80	5.50
HF adj	4.25	4.95	5.15	6.15	3.75	4.90	4.85	4.95	4.95	6.05	3.80	5.50
KWF	3.45	6.05	4.65	6.00	5.00	5.65	3.40	6.05	5.60	5.90	5.65	6.65
vdWaerden	3.45	6.05	4.65	6.00	5.00	5.65	3.40	6.05	5.60	5.90	5.65	6.65
Koch	4.00	5.00	4.65	5.60	5.00	5.65	3.65	4.85	5.55	5.75	5.60	6.55
multivariate	4.85	5.05	5.25	6.15	3.95	4.80	5.10	5.15	5.35	5.60	3.80	5.25
	large design (4*6)											
parem F test	5.30	4.95	4.50	4.90	4.65	5.75	5.95	5.50	4.90	5.00	4.45	6.05
HF adj	4.80	4.85	4.50	4.85	4.55	5.65	5.90	5.25	4.85	5.00	4.50	5.95
KWF	4.60	5.30	6.95	7.15	7.10	9.10	4.85	5.15	6.95	7.15	7.10	9.10
vdWaerden	4.50	5.65	7.45	8.10	8.25	10.10	4.75	5.20	7.45	8.10	8.25	10.10
Koch	2.75	4.80	6.25	6.80	7.00	8.85	3.05	4.40	6.25	6.80	7.00	8.85
multivariate	5.30	4.85	4.20	5.00	4.70	5.55	5.20	5.30	4.30	5.05	4.95	5.90

1. 3. 2 interaction effect AB

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	6.35	5.60	4.95	5.15	5.50	5.15	8.50	6.80	8.55	11.65	11.00	11.00
HF adj	6.15	5.70	4.95	5.10	5.45	5.15	8.50	6.90	8.65	11.65	11.00	11.05
KWF	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
vdWaerden	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
Koch	3.80	4.25	4.60	5.00	5.00	5.25	3.05	4.70	5.70	7.70	6.85	7.70
multivariate	2.25	2.05	2.20	2.10	1.80	2.45	2.40	2.20	3.15	3.30	2.85	3.35
	large design (4*6)											
parem F test	6.45	5.80	6.30	6.60	7.60	6.05	15.30	15.85	22.15	20.45	21.75	21.20
HF adj	5.95	5.80	6.25	6.50	7.45	5.95	14.90	15.45	22.00	20.20	21.50	21.05
KWF	3.55	4.60	4.70	5.10	4.30	4.80	2.70	3.75	4.80	4.80	4.30	4.70
vdWaerden	3.45	4.75	4.70	5.00	4.20	4.65	2.90	3.55	4.60	4.80	4.10	4.90
Koch	1.55	3.20	4.60	5.00	4.90	4.60	1.85	5.35	8.00	8.65	8.20	8.85
multivariate	2.35	1.05	1.20	0.90	1.10	1.20	2.25	1.25	2.05	2.30	2.30	1.75
	multivariate lognormal											
	small design (3*3)											
parem F test	6.35	5.60	4.95	5.15	5.50	5.15	8.50	6.80	8.55	11.65	11.00	11.00
HF adj	6.15	5.70	4.95	5.10	5.45	5.15	8.50	6.90	8.65	11.65	11.00	11.05
KWF	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
vdWaerden	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
Koch	3.80	4.25	4.60	5.00	5.00	5.25	3.05	4.70	5.70	7.70	6.85	7.70
multivariate	2.25	2.05	2.20	2.10	1.80	2.45	2.40	2.20	3.15	3.30	2.85	3.35
	large design (4*6)											
parem F test	6.45	5.80	6.30	6.60	7.60	6.05	15.30	15.85	22.15	20.45	21.75	21.20
HF adj	5.95	5.80	6.25	6.50	7.45	5.95	14.90	15.45	22.00	20.20	21.50	21.05
KWF	3.55	4.60	4.70	5.10	4.30	4.80	2.70	3.75	4.80	4.80	4.30	4.70
vdWaerden	3.45	4.75	4.70	5.00	4.20	4.65	2.90	3.55	4.60	4.80	4.10	4.90
Koch	1.55	3.20	4.60	5.00	4.90	4.60	1.85	5.35	8.00	8.65	8.20	8.85
multivariate	2.35	1.05	1.20	0.90	1.10	1.20	2.25	1.25	2.05	2.30	2.30	1.75

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	6.15	5.50	4.45	5.55	6.25	5.50	8.20	7.20	9.00	10.80	10.35	11.00
HF adj	6.05	5.70	4.45	5.50	6.15	5.50	8.40	6.95	9.10	10.75	10.35	11.10
KWF	4.55	5.35	4.40	5.00	5.25	5.55	3.30	4.10	4.40	5.35	4.70	5.65
vdWaerden	4.55	5.35	4.35	5.05	5.20	5.65	3.25	4.10	4.55	5.35	4.75	5.50
Koch	3.30	4.55	4.15	5.30	5.05	5.55	3.00	4.65	5.90	7.20	6.10	7.40
multivariate	1.95	2.25	2.15	2.30	1.85	2.55	3.00	1.95	2.65	3.25	3.05	3.15
	large design (4*6)											
parem F test	6.65	6.15	6.05	6.10	6.75	6.45	15.70	15.95	22.15	20.75	21.15	20.90
HF adj	6.30	5.90	5.95	6.10	6.70	6.40	15.30	15.65	22.10	20.80	20.90	20.75
KWF	3.50	4.40	4.95	5.25	5.00	4.60	3.35	4.45	5.90	5.60	4.90	4.80
vdWaerden	3.60	4.45	4.80	4.95	5.15	4.40	3.60	4.45	6.10	5.65	5.00	5.15
Koch	1.60	3.30	4.65	4.90	4.85	5.00	1.80	5.75	8.45	9.10	8.85	8.45
multivariate	1.85	0.80	1.25	1.25	1.20	0.90	1.70	1.15	2.20	2.30	2.05	2.00
	multivariate exponential											
	small design (3*3)											
parem F test	4.95	5.10	4.95	6.05	4.00	4.75	6.65	7.10	9.30	10.85	10.30	10.60
HF adj	4.35	4.85	4.85	5.90	3.95	4.60	5.75	6.50	8.80	10.65	10.05	10.45
KWF	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
vdWaerden	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
Koch	3.10	4.55	4.90	5.70	4.65	4.75	3.15	4.45	5.25	7.00	5.95	6.65
multivariate	2.00	2.05	1.95	2.15	1.65	2.20	2.00	2.50	3.00	3.35	2.80	3.10
	large design (4*6)											
parem F test	5.70	5.30	6.70	6.75	6.50	6.35	15.60	14.80	21.75	20.40	20.50	20.40
HF adj	3.80	3.85	5.85	6.05	6.10	5.85	11.40	12.80	20.20	19.40	19.90	19.55
KWF	3.55	4.60	4.70	5.10	4.30	4.80	2.70	3.75	4.80	4.80	4.30	4.70
vdWaerden	3.45	4.75	4.70	5.00	4.20	4.65	2.90	3.55	4.60	4.80	4.10	4.90
Koch	1.60	3.05	4.70	4.45	4.25	5.10	1.80	4.40	7.65	8.00	6.80	7.85
multivariate	2.10	1.00	1.00	1.20	1.25	1.45	1.90	1.15	2.00	2.35	1.95	2.65

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	6.40	6.05	4.70	5.75	5.95	6.00	9.10	7.50	9.55	11.25	11.55	10.95
HF adj	6.25	5.90	4.70	5.80	5.85	5.95	9.00	7.35	9.45	11.30	11.45	11.00
KWF	4.75	4.85	4.90	5.70	5.95	5.95	3.95	5.00	4.70	6.20	5.85	5.60
vdWaerden	4.75	4.85	4.90	5.70	5.95	5.95	3.95	5.00	4.70	6.20	5.85	5.60
Koch	3.25	4.05	4.30	5.00	5.10	5.05	3.20	4.60	5.90	7.85	7.60	7.70
multivariate	1.95	2.15	2.05	2.30	2.00	2.55	2.70	2.40	2.95	3.35	3.45	3.50
	large design (4*6)											
parem F test	6.45	5.70	6.35	6.35	6.00	6.25	15.35	15.75	22.30	21.45	20.70	20.65
HF adj	6.05	5.65	6.30	6.20	5.85	6.25	14.80	15.65	22.20	21.55	20.55	20.45
KWF	3.70	4.15	5.60	5.75	6.55	6.30	3.05	4.15	5.25	6.20	6.20	6.40
vdWaerden	3.65	4.45	5.75	6.00	6.95	6.35	3.15	4.15	5.55	6.50	6.55	7.10
Koch	1.55	2.80	4.35	4.75	4.30	4.60	2.15	5.00	8.40	8.90	8.40	7.80
multivariate	1.25	1.10	1.00	0.80	1.15	1.25	1.60	1.40	2.10	2.20	1.65	2.00

1. 4. $\Sigma^{(i)} = c_i\Sigma^{(1)}$ with $r(c_i, n_i) \sim +0.7$ (positive pairing)

1. 4. 1 main effect B

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	4.90	5.00	5.25	5.30	3.95	5.30	3.80	4.80	5.00	5.45	4.45	5.05
HF adj	4.45	5.05	5.20	5.40	3.95	5.30	3.70	4.85	4.95	5.30	4.45	5.05
KWF	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
vdWaerden	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
Koch	4.70	4.55	5.15	4.85	4.45	5.85	4.70	4.55	5.15	4.85	4.45	5.85
multivariate	4.85	5.10	5.15	5.60	4.25	5.15	4.70	5.30	4.85	5.70	4.55	5.10
	large design (4*6)											
parem F test	4.85	5.55	5.75	5.60	4.95	5.50	4.10	5.00	5.25	5.75	4.40	5.35
HF adj	4.85	5.50	5.70	5.35	4.90	5.60	3.80	4.95	5.15	5.75	4.40	5.40
KWF	4.45	5.35	5.45	5.10	4.45	5.60	4.45	5.35	5.45	5.10	4.45	5.60
vdWaerden	4.45	5.10	5.50	5.30	4.65	5.50	4.45	5.10	5.50	5.30	4.65	5.50
Koch	2.65	3.85	4.90	4.70	4.65	5.70	2.65	3.85	4.90	4.70	4.65	5.70
multivariate	4.45	5.15	5.10	5.15	5.05	5.20	4.50	5.40	5.90	5.95	4.85	5.35
	multivariate lognormal											
	small design (3*3)											
parem F test	6.20	5.25	4.60	4.05	5.00	6.05	5.50	4.65	4.50	4.70	5.25	5.60
HF adj	6.20	5.15	4.55	3.95	5.00	5.95	5.00	4.55	4.50	4.75	5.20	5.60
KWF	4.85	5.40	4.10	4.85	5.55	4.90	4.80	5.70	4.85	5.15	5.95	4.75
vdWaerden	4.85	5.40	4.10	4.85	5.55	4.90	4.80	5.70	4.85	5.15	5.95	4.75
Koch	4.70	4.50	3.75	4.90	4.90	4.75	5.20	5.45	5.15	4.65	5.65	4.55
multivariate	5.60	5.10	4.50	4.40	4.95	6.10	5.65	4.60	4.65	5.10	5.30	5.45
	large design (4*6)											
parem F test	5.20	3.80	5.60	4.50	5.10	5.65	4.10	5.10	5.05	4.85	4.85	5.10
HF adj	4.60	3.30	5.55	4.40	5.05	5.60	3.95	4.75	4.90	4.80	4.90	5.00
KWF	4.90	4.20	5.15	4.40	5.65	4.90	4.00	5.05	5.15	4.25	4.10	5.40
vdWaerden	4.90	4.65	5.10	4.55	5.75	4.75	4.20	5.05	4.95	4.25	3.95	5.05
Koch	2.95	3.20	4.50	4.70	5.45	4.90	1.95	4.35	5.00	3.80	3.90	4.90
multivariate	4.75	3.65	4.80	4.10	6.05	5.75	5.15	5.60	5.50	4.70	5.10	5.35

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	5.00	5.30	5.30	5.00	4.05	5.40	4.10	5.25	4.60	5.60	3.95	4.95
HF adj	4.70	5.35	5.30	5.00	4.00	5.45	4.15	5.10	4.70	5.50	4.00	4.90
KWF	4.55	5.15	4.85	5.10	4.50	5.85	4.60	5.30	4.70	5.15	4.30	5.80
vdWaerden	4.45	5.05	4.85	5.20	4.45	5.80	4.55	5.30	4.75	5.15	4.35	5.65
Koch	4.45	4.60	4.45	5.15	4.65	5.65	4.20	4.90	4.55	5.45	4.70	5.40
multivariate	4.85	5.05	4.95	5.05	4.30	5.45	4.90	5.20	4.65	5.85	4.30	5.20
	large design (4*6)											
parem F test	5.10	5.40	5.25	5.35	4.65	5.45	4.55	5.40	4.25	5.60	4.70	5.15
HF adj	4.75	4.95	5.05	5.40	4.50	5.45	4.60	5.30	4.20	5.55	4.70	5.15
KWF	4.40	5.10	5.35	4.75	4.15	5.45	4.60	5.80	5.00	5.30	4.25	5.65
vdWaerden	4.50	5.20	5.20	4.80	4.30	5.70	4.35	5.75	4.85	5.30	4.20	5.65
Koch	2.85	4.35	4.50	4.85	3.90	5.50	2.85	4.90	4.30	5.50	3.70	5.45
multivariate	4.70	5.25	4.60	5.30	4.25	5.45	4.40	5.85	4.60	5.50	4.50	5.30
	multivariate exponential											
	small design (3*3)											
parem F test	3.85	4.65	5.35	5.35	5.00	4.90	3.40	4.75	4.85	5.10	5.10	4.95
HF adj	3.10	4.45	4.85	5.00	4.75	4.70	2.85	4.45	4.40	4.95	5.00	4.85
KWF	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
vdWaerden	4.25	5.80	5.50	5.00	4.75	5.35	4.25	5.80	5.50	5.00	4.75	5.35
Koch	4.70	4.55	5.15	4.85	4.45	5.85	4.70	4.55	5.15	4.85	4.45	5.85
multivariate	4.20	4.90	5.60	6.10	5.35	5.30	4.25	4.85	5.75	6.00	5.25	5.05
	large design (4*6)											
parem F test	5.00	5.25	5.80	5.35	4.85	4.85	3.75	5.05	5.70	5.60	4.70	4.65
HF adj	3.15	4.15	5.00	4.80	4.45	4.70	2.40	4.05	5.00	5.05	4.10	4.30
KWF	4.45	5.35	5.45	5.10	4.45	5.60	4.45	5.35	5.45	5.10	4.45	5.60
vdWaerden	4.45	5.10	5.50	5.30	4.65	5.50	4.45	5.10	5.50	5.30	4.65	5.50
Koch	2.65	3.85	4.90	4.70	4.65	5.70	2.65	3.85	4.90	4.70	4.65	5.70
multivariate	4.70	5.60	5.45	6.10	5.10	5.15	5.10	6.05	5.95	6.25	5.40	5.20

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	4.65	5.15	5.00	5.50	4.05	5.30	4.10	5.10	4.65	5.25	3.60	5.25
HF adj	4.50	5.10	4.85	5.50	3.95	5.30	4.00	5.10	4.55	5.15	3.60	5.15
KWF	3.45	6.05	4.65	6.00	5.00	5.65	3.40	6.05	5.60	5.90	5.65	6.65
vdWaerden	3.45	6.05	4.65	6.00	5.00	5.65	3.40	6.05	5.60	5.90	5.65	6.65
Koch	4.00	5.00	4.65	5.60	5.00	5.65	3.65	4.85	5.55	5.75	5.60	6.55
multivariate	4.40	5.15	4.70	5.40	4.00	5.75	4.40	4.95	4.75	5.45	3.90	5.30
	large design (4*6)											
parem F test	5.60	5.35	5.30	5.30	4.50	5.85	4.60	5.05	4.85	5.65	4.55	5.45
HF adj	5.15	5.20	5.25	5.10	4.45	5.75	4.15	4.85	4.80	5.55	4.55	5.45
KWF	4.60	5.30	6.95	7.15	7.10	9.10	4.85	5.15	6.95	7.15	7.10	9.10
vdWaerden	4.50	5.65	7.45	8.10	8.25	10.10	4.75	5.20	7.45	8.10	8.25	10.10
Koch	2.75	4.80	6.25	6.80	7.00	8.85	3.05	4.40	6.25	6.80	7.00	8.85
multivariate	4.75	4.95	5.30	5.10	4.85	5.25	5.10	5.30	5.35	5.00	4.65	5.30

1. 4. 2 interaction effect AB

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	5.55	5.85	5.90	5.25	6.10	6.35	4.10	3.35	2.65	2.95	3.15	2.65
HF adj	5.50	5.90	5.80	5.25	6.10	6.35	3.85	3.55	2.70	2.85	3.10	2.65
KWF	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
vdWaerden	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
Koch	3.45	4.70	5.05	5.25	5.60	5.70	2.15	2.80	2.75	3.05	2.90	3.15
multivariate	10.20	10.25	9.75	9.85	10.30	11.95	8.15	8.50	6.90	6.85	8.05	8.45
	large design (4*6)											
parem F test	6.10	5.25	5.85	6.10	6.10	6.40	1.45	1.80	1.20	1.30	1.40	1.25
HF adj	5.85	4.90	5.85	6.00	6.00	6.40	1.30	1.55	1.15	1.20	1.40	1.15
KWF	3.55	4.60	4.70	5.10	4.30	4.80	2.70	3.75	4.80	4.80	4.30	4.70
vdWaerden	3.45	4.75	4.70	5.00	4.20	4.65	2.90	3.55	4.60	4.80	4.10	4.90
Koch	1.60	3.35	4.65	4.65	4.70	5.75	0.60	1.70	1.60	1.80	2.20	2.15
multivariate	8.50	8.15	9.70	10.55	9.30	8.95	5.45	5.55	6.45	6.40	6.10	6.20
	multivariate lognormal											
	small design (3*3)											
parem F test	4.95	5.20	5.50	5.10	5.75	5.80	3.05	3.35	2.20	3.05	2.80	2.75
HF adj	4.85	5.15	5.30	5.10	5.75	5.85	2.85	3.15	2.15	2.90	2.75	2.70
KWF	3.80	4.30	4.55	4.85	4.70	4.30	2.75	3.50	4.45	4.50	4.80	4.45
vdWaerden	3.80	4.30	4.55	4.85	4.70	4.30	2.75	3.50	4.45	4.50	4.80	4.45
Koch	2.65	4.90	4.85	5.65	5.15	5.75	2.05	2.85	2.55	2.85	3.20	3.05
multivariate	9.40	9.70	10.10	10.15	9.70	9.65	7.00	8.70	6.45	7.90	6.70	6.00
	large design (4*6)											
parem F test	6.05	5.25	5.80	6.35	6.35	6.75	1.95	2.40	1.90	1.60	1.25	1.35
HF adj	5.10	4.75	5.50	6.20	6.15	6.60	1.75	2.10	1.80	1.60	1.25	1.30
KWF	3.30	3.50	4.30	5.20	5.15	4.90	2.60	3.70	4.70	4.50	4.55	4.50
vdWaerden	3.45	3.55	4.15	4.80	4.95	4.55	2.85	4.10	4.60	4.80	4.70	4.65
Koch	1.25	3.30	4.30	5.15	5.10	5.80	0.90	1.65	2.00	2.70	2.30	2.45
multivariate	7.55	8.20	8.70	8.65	9.15	9.55	5.35	6.10	5.60	6.55	6.70	4.70

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	6.05	5.85	5.40	5.65	6.10	6.00	3.75	3.45	2.65	2.30	2.85	2.45
HF adj	6.10	5.80	5.40	5.65	6.00	6.00	3.40	3.45	2.70	2.30	2.85	2.45
KWF	4.30	4.05	4.50	4.55	5.00	5.20	3.45	3.85	3.60	4.25	3.40	4.60
vdWaerden	4.30	4.10	4.50	4.55	5.05	5.20	3.45	3.85	3.50	4.20	3.35	4.60
Koch	3.65	4.30	5.20	5.20	5.70	6.00	1.95	2.90	2.90	2.90	2.65	2.90
multivariate	10.35	10.20	9.65	10.15	10.60	11.45	8.40	8.85	6.85	7.00	7.65	8.15
	large design (4*6)											
parem F test	6.25	5.90	6.55	6.20	6.10	6.10	1.50	1.90	1.40	1.10	1.35	1.35
HF adj	6.20	5.55	6.30	6.20	6.05	6.15	1.40	1.95	1.35	1.10	1.45	1.30
KWF	3.80	4.00	5.15	4.50	4.40	5.25	2.65	3.60	4.55	4.05	3.75	4.15
vdWaerden	3.95	4.00	4.80	4.50	4.50	5.10	2.85	3.70	4.15	3.80	3.75	4.00
Koch	1.80	3.35	5.00	4.90	5.00	5.50	0.60	1.95	1.60	2.30	2.40	2.15
multivariate	8.40	8.35	10.65	10.15	8.55	9.15	5.30	6.05	6.30	5.65	5.60	6.00
	multivariate exponential											
	small design (3*3)											
parem F test	4.65	5.45	5.70	5.55	5.35	5.25	2.75	3.30	2.25	2.55	2.65	2.15
HF adj	4.25	5.15	5.25	5.35	5.10	5.20	2.20	3.20	2.10	2.40	2.65	2.10
KWF	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
vdWaerden	4.15	5.15	4.65	4.35	5.30	4.75	3.45	4.70	3.95	4.55	4.70	5.20
Koch	2.75	5.05	4.80	5.30	5.25	5.75	1.85	3.85	2.55	3.45	2.95	3.20
multivariate	8.15	8.80	10.55	9.80	9.55	10.50	6.10	7.50	7.15	6.45	7.00	7.70
	large design (4*6)											
parem F test	5.95	4.45	5.60	6.15	6.05	6.15	2.10	1.70	1.60	1.25	1.15	1.60
HF adj	4.00	3.65	4.95	5.75	5.40	5.95	1.55	1.25	1.35	1.20	1.05	1.55
KWF	3.55	4.60	4.70	5.10	4.30	4.80	2.70	3.75	4.80	4.80	4.30	4.70
vdWaerden	3.45	4.75	4.70	5.00	4.20	4.65	2.90	3.55	4.60	4.80	4.10	4.90
Koch	1.85	3.15	4.95	4.10	4.55	5.55	0.70	1.65	2.05	2.75	2.30	2.85
multivariate	6.55	7.10	9.65	9.55	8.80	9.50	4.65	4.95	5.45	5.90	5.70	6.65

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	6.45	5.90	5.30	5.30	6.40	6.50	3.90	4.05	2.35	2.60	2.95	2.15
HF adj	6.20	5.85	5.35	5.20	6.45	6.50	3.65	4.15	2.30	2.60	2.95	2.10
KWF	4.75	4.85	4.90	5.70	5.95	5.95	3.95	5.00	4.70	6.20	5.85	5.60
vdWaerden	4.75	4.85	4.90	5.70	5.95	5.95	3.95	5.00	4.70	6.20	5.85	5.60
Koch	3.45	4.05	5.25	5.05	5.40	5.85	2.20	2.90	2.45	3.10	3.05	2.85
multivariate	10.40	10.20	9.75	10.25	10.65	11.80	8.90	8.85	6.95	6.90	7.85	7.95
	large design (4*6)											
parem F test	6.25	5.55	6.55	5.95	6.00	5.80	1.20	1.55	1.25	1.45	1.60	1.30
HF adj	5.80	5.55	6.45	5.85	6.05	5.80	1.25	1.55	1.20	1.50	1.55	1.30
KWF	3.70	4.15	5.60	5.75	6.55	6.30	3.05	4.15	5.25	6.20	6.20	6.40
vdWaerden	3.65	4.45	5.75	6.00	6.95	6.35	3.15	4.15	5.55	6.50	6.55	7.10
Koch	1.45	2.90	4.70	4.95	5.40	5.15	0.65	1.60	1.80	2.10	2.50	2.05
multivariate	7.50	9.35	9.05	10.05	8.90	9.30	5.95	5.25	5.40	5.90	5.55	5.40

1. 5. unequal correlations $r^{(i)}$ = (0.2, 0.3, 0.4, 0.5) with r($r^{(i)}$, n_i) ~ 0

1. 5. 1 main effect B

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	4.80	4.90	4.40	5.25	4.85	4.55	5.10	5.95	5.10	5.35	4.65	4.20
HF adj	4.85	5.10	4.40	5.25	4.85	4.55	5.30	6.10	5.05	5.30	4.65	4.25
KWF	5.20	5.50	4.50	5.05	5.00	4.65	5.20	5.30	4.95	4.15	5.55	4.40
vdWaerden	5.20	5.50	4.50	5.05	5.00	4.65	5.20	5.30	4.95	4.15	5.55	4.40
Koch	4.70	4.65	4.25	4.85	4.70	4.95	4.75	4.85	5.15	4.30	5.25	4.75
multivariate	5.05	5.10	4.05	4.80	4.90	4.75	5.20	5.85	4.85	5.30	4.90	4.40
	large design (4*6)											
parem F test	5.55	5.75	4.55	5.15	4.45	4.60	5.25	5.15	5.65	4.80	4.60	4.55
HF adj	5.75	5.85	4.50	5.15	4.30	4.60	5.40	4.85	5.65	4.75	4.50	4.55
KWF	4.95	5.90	4.40	4.80	4.85	4.80	4.80	4.35	6.20	4.75	4.95	5.35
vdWaerden	4.95	6.00	4.45	4.70	4.65	5.05	4.90	4.45	6.25	4.85	4.70	5.55
Koch	2.80	4.50	4.45	4.70	4.60	4.75	2.15	3.70	5.20	4.95	4.55	4.60
multivariate	5.80	6.00	4.75	5.05	4.50	5.25	4.70	4.40	5.40	5.10	4.55	4.50
	multivariate lognormal											
	small design (3*3)											
parem F test	5.15	5.40	4.05	5.60	4.45	4.80	5.10	6.10	4.70	5.00	4.75	4.75
HF adj	5.15	5.15	4.00	5.55	4.45	4.75	4.90	6.10	4.70	4.95	4.70	4.60
KWF	5.20	5.50	4.50	5.05	5.00	4.65	5.20	5.30	4.95	4.15	5.55	4.40
vdWaerden	5.20	5.50	4.50	5.05	5.00	4.65	5.20	5.30	4.95	4.15	5.55	4.40
Koch	4.70	4.65	4.25	4.85	4.70	4.95	4.75	4.85	5.15	4.30	5.25	4.75
multivariate	5.05	5.00	4.05	5.55	4.90	4.75	5.35	5.40	4.40	4.85	5.30	4.95
	large design (4*6)											
parem F test	5.00	5.55	4.60	4.70	4.35	4.90	5.00	4.55	5.60	5.40	4.75	4.65
HF adj	5.05	5.20	4.45	4.75	4.45	4.80	4.80	4.35	5.50	5.35	4.70	4.65
KWF	4.95	5.90	4.40	4.80	4.85	4.80	4.80	4.35	6.20	4.75	4.95	5.35
vdWaerden	4.95	6.00	4.45	4.70	4.65	5.05	4.90	4.45	6.25	4.85	4.70	5.55
Koch	2.80	4.50	4.45	4.70	4.60	4.75	2.15	3.70	5.20	4.95	4.55	4.60
multivariate	5.80	5.85	4.50	5.45	4.55	4.95	5.15	4.50	5.40	5.25	4.75	4.50

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	5.45	4.50	5.05	6.00	5.10	4.45	5.80	4.75	5.25	5.95	4.60	4.10
HF adj	5.90	4.75	5.10	6.05	5.10	4.40	5.75	4.70	5.20	5.95	4.60	4.15
KWF	5.15	4.80	4.90	4.95	5.35	4.65	4.90	4.80	5.20	4.20	5.05	4.45
vdWaerden	4.95	4.75	4.95	5.05	5.35	4.65	4.90	4.70	5.25	4.20	5.05	4.50
Koch	4.75	4.70	4.60	4.95	5.35	4.85	4.60	4.30	4.75	4.35	4.55	4.40
multivariate	5.90	4.50	5.00	5.70	5.05	4.40	5.50	4.70	5.20	5.65	5.10	4.35
	large design (4*6)											
parem F test	4.65	4.95	4.80	5.25	4.75	5.00	4.90	4.75	6.00	5.20	4.25	5.30
HF adj	4.75	4.95	4.70	5.40	4.70	5.05	4.85	4.85	6.05	5.25	4.15	5.25
KWF	4.55	5.15	4.85	5.35	4.55	5.40	4.50	5.00	6.15	5.35	4.35	5.45
vdWaerden	4.30	5.20	4.70	5.35	4.70	5.60	4.45	4.75	6.25	5.45	4.35	5.35
Koch	2.45	3.80	4.15	5.75	4.50	5.10	2.35	3.90	5.15	5.15	4.20	5.25
multivariate	4.80	5.05	4.45	5.80	4.45	4.90	5.30	4.50	5.95	5.15	4.10	5.50
	multivariate exponential											
	small design (3*3)											
parem F test	4.75	5.00	4.35	5.60	4.95	4.85	4.40	5.55	4.45	4.65	4.75	4.35
HF adj	4.25	4.45	4.10	5.50	4.85	4.75	3.90	5.15	4.30	4.65	4.70	4.20
KWF	5.20	5.50	4.50	5.05	5.00	4.65	5.20	5.30	4.95	4.15	5.55	4.40
vdWaerden	5.20	5.50	4.50	5.05	5.00	4.65	5.20	5.30	4.95	4.15	5.55	4.40
Koch	4.70	4.65	4.25	4.85	4.70	4.95	4.75	4.85	5.15	4.30	5.25	4.75
multivariate	4.55	5.20	3.90	5.70	4.75	4.50	4.70	4.75	4.60	4.45	5.35	4.70
	large design (4*6)											
parem F test	4.90	5.00	4.85	4.95	4.25	4.75	4.45	4.55	5.50	5.70	5.25	4.15
HF adj	3.40	3.75	4.05	4.70	4.10	4.35	3.45	3.35	5.10	5.10	4.95	3.95
KWF	4.95	5.90	4.40	4.80	4.85	4.80	4.80	4.35	6.20	4.75	4.95	5.35
vdWaerden	4.95	6.00	4.45	4.70	4.65	5.05	4.90	4.45	6.25	4.85	4.70	5.55
Koch	2.80	4.50	4.45	4.70	4.60	4.75	2.15	3.70	5.20	4.95	4.55	4.60
multivariate	5.95	6.05	5.40	6.05	5.30	4.70	6.10	4.85	5.30	6.05	5.00	4.35

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	5.00	5.15	4.55	5.25	5.20	4.70	5.95	5.40	5.20	5.50	4.80	4.85
HF adj	5.20	5.30	4.65	5.25	5.15	4.65	6.00	5.50	5.20	5.55	4.85	4.90
KWF	5.15	5.65	5.65	7.00	6.40	6.80	5.30	7.00	6.45	7.75	8.95	8.65
vdWaerden	5.15	5.65	5.65	7.00	6.40	6.80	5.30	7.00	6.45	7.75	8.95	8.65
Koch	5.00	4.85	5.60	6.60	5.95	6.70	5.20	5.80	6.30	7.30	8.45	8.60
multivariate	5.25	5.30	4.35	4.80	4.95	4.15	5.40	4.95	5.05	5.55	5.00	4.90
	large design (4*6)											
parem F test	5.10	5.40	4.45	5.40	4.25	4.65	4.75	5.15	5.65	5.10	4.35	4.85
HF adj	5.35	5.55	4.35	5.35	4.35	4.80	4.70	5.20	5.70	5.15	4.35	4.85
KWF	4.85	4.75	6.25	7.00	6.55	7.15	4.25	4.20	6.30	5.80	7.10	7.65
vdWaerden	4.85	5.20	6.55	7.30	7.25	8.50	4.40	4.35	7.05	6.35	7.85	7.95
Koch	2.75	4.25	5.65	6.55	5.95	7.65	2.75	4.10	5.75	5.45	7.25	6.55
multivariate	5.00	5.55	4.50	5.55	4.30	5.10	4.95	4.55	5.50	4.90	4.60	5.30

1. 5. 2 interaction effect AB

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	4.75	5.60	5.25	4.70	5.40	6.50	5.85	5.60	5.20	4.90	4.90	4.95
HF adj	4.80	5.85	5.30	4.65	5.40	6.55	5.90	5.55	5.20	4.90	4.90	5.05
KWF	3.40	4.95	4.90	4.40	4.45	6.00	3.65	4.80	4.40	4.35	4.35	5.30
vdWaerden	3.40	4.95	4.90	4.40	4.45	6.00	3.65	4.80	4.40	4.35	4.35	5.30
Koch	2.50	5.10	5.20	4.40	4.80	6.15	2.95	4.70	4.30	4.40	4.35	5.30
multivariate	5.25	5.20	4.40	4.95	5.05	5.90	6.40	5.55	5.80	5.55	4.50	5.35
	large design (4*6)											
parem F test	5.10	5.25	4.30	6.10	5.55	5.80	5.65	6.60	6.10	5.65	6.45	6.45
HF adj	5.10	5.35	4.35	5.85	5.65	5.80	5.50	6.45	6.05	5.65	6.40	6.50
KWF	3.65	4.15	4.75	5.55	4.30	5.15	2.45	4.45	3.95	4.30	5.10	4.25
vdWaerden	3.75	4.20	4.70	5.40	4.35	5.00	2.45	4.75	4.15	4.15	5.05	4.30
Koch	1.60	3.25	3.95	5.25	5.00	5.25	1.70	4.55	4.35	4.75	6.00	5.85
multivariate	5.15	5.00	5.20	5.30	4.50	4.15	6.10	6.20	6.30	5.45	4.85	6.00
	multivariate lognormal											
	small design (3*3)											
parem F test	4.75	5.05	5.00	4.55	5.00	6.10	5.45	4.90	4.65	5.55	4.95	5.75
HF adj	4.55	5.00	5.05	4.55	5.00	6.10	5.40	4.85	4.70	5.65	5.00	5.70
KWF	3.40	4.95	4.90	4.40	4.45	6.00	3.65	4.80	4.40	4.35	4.35	5.30
vdWaerden	3.40	4.95	4.90	4.40	4.45	6.00	3.65	4.80	4.40	4.35	4.35	5.30
Koch	2.65	4.80	5.05	4.30	4.90	6.05	3.05	4.60	4.25	4.35	4.25	5.25
multivariate	5.35	4.80	4.10	5.50	5.35	5.25	6.00	5.30	5.15	5.40	4.65	5.75
	large design (4*6)											
parem F test	4.75	5.40	4.90	5.65	5.90	5.25	6.40	6.85	6.65	5.45	6.45	6.35
HF adj	4.20	5.10	4.90	5.55	5.95	5.35	5.70	6.45	6.30	5.30	6.35	6.35
KWF	3.65	4.15	4.75	5.55	4.30	5.15	2.45	4.45	3.95	4.30	5.10	4.25
vdWaerden	3.75	4.20	4.70	5.40	4.35	5.00	2.45	4.75	4.15	4.15	5.05	4.30
Koch	1.20	3.30	3.85	4.80	4.85	4.90	1.55	5.10	4.55	4.60	5.90	5.85
multivariate	5.05	5.00	5.15	5.05	4.45	4.25	5.90	6.20	6.15	5.70	5.20	5.75

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	4.70	5.70	4.80	4.60	5.00	6.40	5.55	5.55	5.05	5.45	4.55	5.60
HF adj	4.80	5.70	4.80	4.60	5.00	6.35	5.35	5.40	5.05	5.50	4.60	5.70
KWF	3.95	5.00	4.85	5.05	4.70	5.45	3.00	4.60	4.70	4.40	4.50	4.95
vdWaerden	3.95	5.10	4.75	5.00	4.75	5.45	3.05	4.60	4.65	4.30	4.45	4.80
Koch	2.25	4.55	4.85	4.85	4.55	5.70	2.45	4.65	4.80	4.65	4.45	5.60
multivariate	5.20	4.70	4.40	5.00	5.20	5.10	6.10	6.00	5.70	5.80	4.65	5.95
	large design (4*6)											
parem F test	5.45	4.90	5.00	5.20	5.35	5.65	5.85	6.60	5.20	5.65	5.90	6.30
HF adj	5.40	4.90	4.95	5.20	5.45	5.65	5.95	6.50	5.10	5.65	5.85	6.25
KWF	3.90	4.50	4.35	5.90	5.10	5.55	2.45	5.15	4.55	4.35	5.30	4.90
vdWaerden	4.10	4.80	4.35	5.90	5.20	5.45	2.35	5.35	4.45	4.25	5.40	5.05
Koch	1.50	3.10	4.10	4.85	4.90	5.20	1.65	4.30	3.75	4.25	5.10	5.40
multivariate	4.75	4.45	5.30	5.05	4.25	4.20	5.80	5.80	5.40	5.35	5.15	5.25
	multivariate exponential											
	small design (3*3)											
parem F test	4.50	5.15	4.30	5.30	4.70	5.40	6.70	4.75	5.20	6.35	5.25	6.50
HF adj	4.00	4.45	4.35	5.10	4.60	5.35	5.40	4.60	4.95	6.15	5.15	6.35
KWF	3.40	4.95	4.90	4.40	4.45	6.00	3.65	4.80	4.40	4.35	4.35	5.30
vdWaerden	3.40	4.95	4.90	4.40	4.45	6.00	3.65	4.80	4.40	4.35	4.35	5.30
Koch	2.85	4.55	4.70	5.00	4.45	5.95	2.90	4.50	4.45	5.15	4.40	5.50
multivariate	4.70	5.35	3.75	5.05	5.05	4.60	5.35	4.85	4.95	5.35	4.40	6.25
	large design (4*6)											
parem F test	4.35	5.50	5.55	5.15	5.60	4.85	6.50	7.00	7.35	5.60	6.25	6.30
HF adj	3.40	4.55	4.90	4.90	5.25	4.70	5.15	5.90	7.00	5.45	5.95	5.90
KWF	3.65	4.15	4.75	5.55	4.30	5.15	2.45	4.45	3.95	4.30	5.10	4.25
vdWaerden	3.75	4.20	4.70	5.40	4.35	5.00	2.45	4.75	4.15	4.15	5.05	4.30
Koch	1.15	3.30	4.10	4.70	4.50	4.95	1.55	4.65	4.50	4.05	4.60	5.60
multivariate	3.95	4.20	4.40	4.95	4.40	4.25	4.30	5.25	5.85	5.60	5.05	5.50

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	4.45	6.15	5.30	4.40	5.35	6.50	5.45	6.25	5.45	5.55	4.40	5.15
HF adj	4.50	6.20	5.20	4.45	5.40	6.40	5.05	6.35	5.45	5.55	4.50	5.20
KWF	3.30	5.50	5.70	6.80	6.95	7.95	3.90	4.95	5.90	6.40	6.50	7.70
vdWaerden	3.30	5.50	5.70	6.80	6.95	7.95	3.90	4.95	5.90	6.40	6.50	7.70
Koch	2.65	5.35	4.95	4.85	5.00	6.55	2.60	5.35	5.35	5.10	4.75	5.50
multivariate	5.05	5.15	4.60	4.65	4.95	5.65	6.20	6.50	6.00	5.40	4.50	6.00
	large design (4*6)											
parem F test	5.30	5.20	4.90	5.35	5.40	6.05	5.85	6.85	5.95	5.20	6.60	6.45
HF adj	5.25	5.35	4.90	5.50	5.35	6.10	5.95	6.75	5.85	5.15	6.60	6.35
KWF	3.30	4.45	5.40	6.75	6.40	7.60	2.30	4.40	4.35	5.60	6.00	5.80
vdWaerden	3.50	4.45	5.60	7.05	7.20	7.95	2.40	4.50	4.75	5.90	6.25	6.90
Koch	1.20	3.00	3.85	4.80	4.20	5.25	1.50	4.15	4.15	4.20	4.85	5.65
multivariate	4.00	3.30	4.80	3.45	3.95	3.70	5.60	5.05	4.35	4.35	3.75	4.55

1. 6. unequal correlations $r^{(i)}$ = (0.6, 0.15, 0.15, 0.6) with r($r^{(i)}$, n_i) ~ 0.9

1. 6. 1 main effect B

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	4.60	7.05	4.90	5.50	4.50	4.05	6.10	6.05	5.95	5.35	5.00	4.95
HF adj	4.55	7.10	5.00	5.40	4.55	4.05	6.30	6.00	5.95	5.45	5.05	4.95
KWF	3.90	5.70	5.15	5.70	4.70	4.55	4.65	5.30	4.85	6.15	5.30	4.05
vdWaerden	3.90	5.70	5.15	5.70	4.70	4.55	4.65	5.30	4.85	6.15	5.30	4.05
Koch	3.55	4.65	4.65	5.10	4.35	4.50	4.65	4.95	4.85	5.65	5.00	4.30
multivariate	4.10	6.05	4.95	5.45	4.70	4.30	5.20	5.70	5.60	5.80	4.95	5.05
	large design (4*6)											
parem F test	5.10	5.40	4.45	5.40	4.25	4.65	6.05	5.35	5.35	5.90	5.95	5.00
HF adj	5.35	5.55	4.35	5.35	4.35	4.80	5.75	5.25	5.10	5.80	5.85	4.95
KWF	4.85	4.75	6.25	7.00	6.55	7.15	4.40	4.85	5.45	5.25	5.00	4.35
vdWaerden	4.85	5.20	6.55	7.30	7.25	8.50	4.35	4.75	5.45	5.45	5.10	4.20
Koch	2.75	4.25	5.65	6.55	5.95	7.65	2.80	4.25	4.80	5.30	4.90	4.30
multivariate	5.00	5.55	4.50	5.55	4.30	5.10	3.95	4.85	5.25	5.40	5.55	4.45
	multivariate lognormal											
	small design (3*3)											
parem F test	4.80	5.20	4.65	5.05	5.00	4.40	5.20	5.60	5.35	4.75	5.00	4.35
HF adj	4.50	5.05	4.60	5.05	4.95	4.40	5.00	5.50	5.35	4.65	4.90	4.25
KWF	4.95	5.70	5.25	5.15	5.15	4.50	5.80	6.30	5.05	4.95	5.30	5.10
vdWaerden	4.95	5.70	5.25	5.15	5.15	4.50	5.80	6.30	5.05	4.95	5.30	5.10
Koch	4.30	5.25	5.10	5.00	4.90	4.65	5.10	5.55	4.75	4.80	5.10	4.90
multivariate	4.30	5.35	5.25	4.70	5.40	4.35	5.05	5.65	5.20	4.95	5.15	4.90
	large design (4*6)											
parem F test	5.45	4.50	4.45	5.60	4.90	5.90	4.95	4.20	5.70	5.50	4.70	5.95
HF adj	5.35	4.30	4.30	5.30	4.85	5.80	4.60	4.05	5.35	5.25	4.65	5.80
KWF	4.10	4.70	4.30	5.00	5.15	4.80	5.00	4.55	5.55	4.55	5.10	5.30
vdWaerden	4.15	4.65	4.20	4.95	4.90	4.95	4.95	4.65	5.50	4.40	4.95	5.10
Koch	3.05	4.00	4.35	5.30	4.65	4.70	2.75	4.05	5.05	4.25	4.90	5.45
multivariate	5.15	4.50	4.85	5.30	5.00	5.90	5.45	4.15	5.55	5.30	5.10	5.65

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	4.95	5.40	5.25	5.70	4.90	4.70	5.70	5.65	5.25	5.20	4.40	4.90
HF adj	5.05	5.30	5.30	5.60	4.95	4.70	5.60	5.65	5.15	5.20	4.40	4.95
KWF	4.30	5.00	4.85	4.70	4.45	4.35	4.45	5.00	4.55	4.90	4.95	4.95
vdWaerden	4.30	5.20	5.00	4.75	4.30	4.40	4.35	5.00	4.45	4.90	5.05	5.00
Koch	4.00	5.00	5.05	5.10	4.40	4.30	3.90	5.00	4.65	4.95	4.65	5.05
multivariate	4.90	5.55	4.95	5.10	4.80	4.35	4.95	5.00	5.40	5.35	4.75	4.95
	large design (4*6)											
parem F test	5.10	5.40	4.45	5.40	4.25	4.65	6.10	5.25	5.30	5.50	5.70	4.50
HF adj	5.35	5.55	4.35	5.35	4.35	4.80	5.55	5.15	5.35	5.50	5.65	4.50
KWF	4.85	4.75	6.25	7.00	6.55	7.15	4.80	5.05	5.40	4.50	4.65	4.65
vdWaerden	4.85	5.20	6.55	7.30	7.25	8.50	4.85	5.20	5.50	4.50	4.65	4.65
Koch	2.75	4.25	5.65	6.55	5.95	7.65	2.00	4.45	4.80	4.45	4.60	4.45
multivariate	5.00	5.55	4.50	5.55	4.30	5.10	3.25	4.95	5.85	5.40	5.35	4.25
	multivariate exponential											
	small design (3*3)											
parem F test	4.05	6.25	4.85	5.25	4.95	4.50	4.90	5.15	5.95	5.10	4.80	4.25
HF adj	3.25	5.50	4.60	5.10	4.80	4.45	4.15	4.60	5.70	4.80	4.75	4.10
KWF	3.90	5.70	5.15	5.70	4.70	4.55	4.65	5.30	4.85	6.15	5.30	4.05
vdWaerden	3.90	5.70	5.15	5.70	4.70	4.55	4.65	5.30	4.85	6.15	5.30	4.05
Koch	3.55	4.65	4.65	5.10	4.35	4.50	4.65	4.95	4.85	5.65	5.00	4.30
multivariate	4.20	5.50	5.55	5.25	4.75	4.70	4.60	5.10	5.60	5.30	4.55	4.50
	large design (4*6)											
parem F test	4.55	4.90	4.85	5.10	5.50	4.50	5.30	5.20	5.95	5.75	5.75	4.25
HF adj	3.00	3.55	4.25	4.70	4.95	4.15	4.10	4.25	5.20	5.30	5.35	4.10
KWF	5.40	4.60	4.50	5.35	5.50	5.10	4.40	4.85	5.45	5.25	5.00	4.35
vdWaerden	5.40	4.50	4.60	5.50	5.35	5.45	4.35	4.75	5.45	5.45	5.10	4.20
Koch	2.55	4.20	4.15	5.25	4.95	4.85	2.80	4.25	4.80	5.30	4.90	4.30
multivariate	6.15	5.20	4.95	6.10	4.70	4.60	4.00	4.65	6.20	6.00	5.50	4.80

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	4.95	5.35	4.90	4.80	5.15	4.40	5.40	5.15	5.20	4.30	5.00	5.35
HF adj	4.95	5.40	4.75	4.75	5.10	4.40	5.30	5.15	5.05	4.25	4.80	5.15
KWF	5.25	5.65	5.40	5.55	6.75	6.40	5.20	6.70	6.35	6.75	6.80	6.80
vdWaerden	5.25	5.65	5.40	5.55	6.75	6.40	5.20	6.70	6.35	6.75	6.80	6.80
Koch	5.30	4.55	5.35	5.00	6.50	6.50	4.85	5.80	5.95	6.50	7.10	7.15
multivariate	5.05	4.60	4.85	5.00	5.30	4.65	4.90	5.05	5.00	4.55	5.10	5.35
	large design (4*6)											
parem F test	4.70	5.00	4.55	5.20	5.15	5.35	4.70	4.50	5.75	4.85	4.65	6.00
HF adj	4.85	4.95	4.55	5.15	5.05	5.20	4.80	4.50	5.70	4.80	4.55	5.70
KWF	4.80	4.95	6.70	8.60	8.85	9.95	3.85	4.75	7.25	7.10	8.50	9.15
vdWaerden	4.55	5.25	7.25	9.15	9.40	10.55	3.95	4.85	7.55	7.80	8.75	9.75
Koch	2.50	4.70	6.25	8.00	7.65	9.70	2.80	4.00	6.45	6.45	7.85	8.75
multivariate	5.15	4.80	4.90	5.15	5.15	5.35	5.30	4.85	5.45	4.20	5.20	5.30

1. 6. 2 interaction effect AB

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	5.60	5.20	5.25	5.20	6.10	6.40	9.20	8.90	10.65	11.75	11.40	10.90
HF adj	5.65	5.15	5.45	5.20	6.10	6.35	9.50	9.05	10.65	11.90	11.30	11.00
KWF	3.65	3.70	4.35	4.80	4.60	5.75	3.40	3.85	4.65	3.60	4.90	4.75
vdWaerden	3.65	3.70	4.35	4.80	4.60	5.75	3.40	3.85	4.65	3.60	4.90	4.75
Koch	3.10	4.30	4.65	4.40	5.60	6.15	3.80	5.30	7.20	6.70	6.75	7.30
multivariate	2.65	2.15	1.65	2.25	2.10	2.05	3.60	3.55	3.70	3.95	3.40	4.00
	large design (4*6)											
parem F test	5.30	5.20	4.90	5.35	5.40	6.05	16.70	17.35	17.30	15.15	15.85	16.25
HF adj	5.25	5.35	4.90	5.50	5.35	6.10	16.20	17.10	17.10	15.20	15.60	16.20
KWF	3.30	4.45	5.40	6.75	6.40	7.60	2.80	4.35	4.25	4.60	4.90	4.80
vdWaerden	3.50	4.45	5.60	7.05	7.20	7.95	2.60	4.45	4.30	4.55	4.95	4.95
Koch	1.20	3.00	3.85	4.80	4.20	5.25	2.45	6.10	8.75	7.35	8.60	8.95
multivariate	4.00	3.30	4.80	3.45	3.95	3.70	2.40	1.90	1.75	1.90	1.50	1.80
	multivariate lognormal											
	small design (3*3)											
parem F test	4.85	5.20	4.70	5.05	5.35	6.15	6.30	6.20	5.80	6.15	5.70	6.40
HF adj	4.55	4.90	4.75	5.00	5.30	6.10	5.95	6.05	5.70	5.90	5.40	6.30
KWF	3.90	4.35	3.85	5.55	4.60	5.50	3.30	4.20	4.35	4.40	4.55	4.45
vdWaerden	3.90	4.35	3.85	5.55	4.60	5.50	3.30	4.20	4.35	4.40	4.55	4.45
Koch	2.30	4.40	3.95	5.35	4.95	5.95	3.65	4.60	4.70	5.10	5.05	5.20
multivariate	4.15	4.30	3.70	4.45	3.95	4.60	4.75	4.70	4.25	4.90	3.95	5.15
	large design (4*6)											
parem F test	4.80	5.10	4.75	5.35	5.70	5.00	5.05	5.45	6.50	5.10	5.55	5.10
HF adj	4.40	4.75	4.55	5.25	5.50	4.85	4.45	5.35	6.30	4.75	5.25	5.00
KWF	3.00	4.75	5.10	5.35	4.85	5.10	2.65	4.65	5.50	4.65	5.40	5.15
vdWaerden	3.20	4.60	4.85	5.65	5.10	4.80	2.45	4.65	5.60	4.60	5.55	5.20
Koch	1.65	3.70	3.65	4.90	4.50	4.50	0.95	3.40	4.65	4.50	4.60	5.25
multivariate	3.95	5.30	4.65	4.85	5.65	4.35	3.90	4.95	5.30	5.15	4.45	4.60

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	5.55	5.10	4.90	5.35	5.75	6.05	9.25	9.10	9.60	10.80	10.85	9.60
HF adj	5.70	5.25	5.00	5.25	5.75	6.05	9.35	8.85	9.55	10.80	10.75	9.55
KWF	4.45	4.10	4.50	4.95	5.05	5.35	4.50	5.45	5.35	5.95	6.25	5.05
vdWaerden	4.40	4.10	4.55	4.85	5.05	5.35	4.50	5.45	5.40	5.95	6.30	5.00
Koch	3.10	4.20	4.60	5.10	5.15	5.40	4.40	5.90	7.00	7.65	7.80	6.35
multivariate	2.60	2.05	1.75	2.45	2.50	2.30	4.25	3.65	4.45	4.65	3.75	3.55
	large design (4*6)											
parem F test	5.30	5.20	4.90	5.35	5.40	6.05	14.50	16.00	15.70	12.95	14.50	14.05
HF adj	5.25	5.35	4.90	5.50	5.35	6.10	14.25	15.65	15.75	12.90	14.35	14.05
KWF	3.30	4.45	5.40	6.75	6.40	7.60	4.20	6.45	6.05	4.95	6.90	6.75
vdWaerden	3.50	4.45	5.60	7.05	7.20	7.95	4.30	6.30	6.15	5.35	6.95	6.75
Koch	1.20	3.00	3.85	4.80	4.20	5.25	2.55	7.65	9.40	7.70	9.80	9.45
multivariate	4.00	3.30	4.80	3.45	3.95	3.70	1.45	2.55	1.75	1.85	1.95	1.85
	multivariate exponential											
	small design (3*3)											
parem F test	4.60	4.50	4.40	4.65	5.50	5.30	8.00	8.50	9.75	9.55	9.65	10.35
HF adj	3.85	3.90	4.20	4.45	5.45	5.25	7.55	7.95	9.40	9.20	9.35	10.30
KWF	3.65	3.70	4.35	4.80	4.60	5.75	3.40	3.85	4.65	3.60	4.90	4.75
vdWaerden	3.65	3.70	4.35	4.80	4.60	5.75	3.40	3.85	4.65	3.60	4.90	4.75
Koch	2.70	3.90	4.30	4.40	5.50	5.70	4.00	5.10	6.15	6.60	6.50	6.75
multivariate	2.65	2.15	1.70	2.55	3.00	2.30	3.10	3.70	3.25	3.45	3.55	4.35
	large design (4*6)											
parem F test	5.35	5.80	5.15	7.05	5.90	6.20	15.55	15.00	15.75	14.15	16.55	16.00
HF adj	3.95	5.10	4.60	6.70	5.60	5.70	12.55	13.20	14.85	13.55	15.70	15.30
KWF	3.50	3.90	4.60	5.85	4.90	5.00	2.80	4.35	4.25	4.60	4.90	4.80
vdWaerden	3.25	4.10	4.55	5.75	4.95	5.10	2.60	4.45	4.30	4.55	4.95	4.95
Koch	1.50	3.40	4.25	5.75	4.85	4.90	2.00	5.60	7.55	6.70	8.15	8.35
multivariate	1.25	0.75	0.95	1.30	1.30	1.00	1.60	2.00	1.95	2.05	2.05	2.20

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	4.75	5.90	4.45	5.10	5.55	6.15	6.45	6.25	5.85	5.80	5.85	5.65
HF adj	5.10	5.95	4.45	5.15	5.40	6.15	6.50	6.20	5.60	5.65	5.85	5.50
KWF	3.95	4.70	4.50	6.90	6.60	6.55	3.10	4.70	4.75	6.05	6.25	6.45
vdWaerden	3.95	4.70	4.50	6.90	6.60	6.55	3.10	4.70	4.75	6.05	6.25	6.45
Koch	3.10	4.45	4.35	4.50	5.30	5.80	3.35	5.15	4.95	5.70	5.55	5.60
multivariate	4.45	4.25	3.65	4.50	4.00	4.40	5.25	4.70	5.15	4.50	4.20	5.15
	large design (4*6)											
parem F test	4.85	5.95	5.65	5.90	5.00	5.70	4.70	5.00	6.00	5.55	5.15	5.30
HF adj	4.90	5.85	5.45	5.75	4.95	5.55	4.25	5.15	6.05	5.50	5.10	5.25
KWF	4.20	5.05	5.80	7.55	6.65	7.50	2.65	4.25	6.90	5.50	7.10	6.75
vdWaerden	4.10	5.05	6.05	8.25	7.35	8.05	2.65	4.60	6.95	5.85	7.65	7.20
Koch	1.70	3.70	4.15	4.85	4.80	5.15	1.25	2.90	4.75	4.90	4.35	5.05
multivariate	4.70	6.60	4.90	5.55	5.50	4.40	4.80	5.15	5.85	5.45	4.85	4.60

1. 7. unequal correlations $r^{(i)}$ = (0.15, 0.6, 0.6, 0.15) with r($r^{(i)}$, n_i) ~ -0.9

1. 7. 1 main effect B

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	5.05	6.20	5.40	5.85	4.75	4.30	5.05	5.55	6.00	5.20	4.95	4.60
HF adj	4.75	6.20	5.45	5.80	4.80	4.20	5.05	5.60	6.05	5.25	4.85	4.65
KWF	3.90	5.70	5.15	5.70	4.70	4.55	4.65	5.30	4.85	6.15	5.30	4.05
vdWaerden	3.90	5.70	5.15	5.70	4.70	4.55	4.65	5.30	4.85	6.15	5.30	4.05
Koch	3.55	4.65	4.65	5.10	4.35	4.50	4.65	4.95	4.85	5.65	5.00	4.30
multivariate	4.85	5.95	5.45	5.90	4.35	4.20	5.65	5.85	5.80	5.15	4.90	4.40
	large design (4*6)											
parem F test	5.05	4.65	5.10	5.15	4.85	4.70	4.25	4.80	5.70	5.15	4.90	5.80
HF adj	5.05	4.50	5.25	5.10	4.80	4.70	4.15	4.70	5.70	5.05	4.80	5.80
KWF	5.35	4.30	5.30	5.50	4.70	4.95	4.60	4.50	5.05	5.10	5.40	4.95
vdWaerden	5.10	4.50	5.00	5.50	4.80	4.90	4.70	4.80	5.05	4.80	5.40	5.00
Koch	2.45	4.40	4.85	5.20	4.70	4.85	2.30	4.00	4.75	4.45	4.80	4.90
multivariate	4.80	5.00	5.55	5.05	4.40	4.85	4.40	5.05	5.20	4.80	5.10	5.65
	multivariate lognormal											
	small design (3*3)											
parem F test	5.10	5.85	5.65	5.35	5.00	4.45	5.05	5.35	6.10	5.35	4.90	4.50
HF adj	5.05	5.80	5.65	5.35	5.00	4.40	4.90	5.40	6.20	5.30	4.80	4.50
KWF	3.90	5.70	5.15	5.70	4.70	4.55	4.65	5.30	4.85	6.15	5.30	4.05
vdWaerden	3.90	5.70	5.15	5.70	4.70	4.55	4.65	5.30	4.85	6.15	5.30	4.05
Koch	3.55	4.65	4.65	5.10	4.35	4.50	4.65	4.95	4.85	5.65	5.00	4.30
multivariate	4.80	6.20	5.50	5.50	4.80	4.45	5.15	6.00	5.75	5.35	4.75	4.50
	large design (4*6)											
parem F test	5.25	4.35	4.85	4.80	5.25	5.20	3.90	4.95	5.40	5.25	4.90	4.85
HF adj	4.50	4.05	4.60	4.80	5.25	5.15	3.55	4.70	5.30	5.10	4.70	4.85
KWF	5.35	4.30	5.30	5.50	4.70	4.95	4.60	4.50	5.05	5.10	5.40	4.95
vdWaerden	5.10	4.50	5.00	5.50	4.80	4.90	4.70	4.80	5.05	4.80	5.40	5.00
Koch	2.45	4.40	4.85	5.20	4.70	4.85	2.30	4.00	4.75	4.45	4.80	4.90
multivariate	4.95	4.85	5.25	5.45	4.85	5.15	4.50	5.45	5.60	4.65	4.65	4.75

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	4.55	5.85	5.05	5.75	4.75	4.25	4.75	4.95	5.20	4.55	5.30	4.40
HF adj	4.50	5.75	5.05	5.75	4.60	4.30	4.70	5.05	5.30	4.60	5.30	4.45
KWF	3.65	5.85	4.95	4.50	4.25	4.30	5.05	5.35	5.30	4.45	5.55	4.80
vdWaerden	3.65	5.85	4.95	4.45	4.35	4.25	5.00	5.35	5.30	4.50	5.55	4.80
Koch	3.30	5.40	4.65	4.60	4.20	4.30	4.05	4.90	5.20	4.50	5.60	4.85
multivariate	4.90	6.10	4.55	5.70	4.50	4.50	5.40	5.45	5.55	4.95	5.35	4.60
	large design (4*6)											
parem F test	4.95	4.25	5.05	5.00	5.55	4.50	4.40	5.00	5.50	5.60	5.60	5.15
HF adj	4.80	4.20	4.95	5.05	5.55	4.55	4.40	5.05	5.50	5.75	5.70	5.20
KWF	4.75	4.25	5.15	4.70	5.20	5.15	4.35	5.10	5.30	5.10	5.20	4.95
vdWaerden	5.05	4.30	5.35	5.10	5.35	4.90	4.60	5.25	5.50	5.10	5.00	5.05
Koch	2.65	3.30	4.75	5.05	4.95	4.55	2.10	3.95	4.60	5.00	5.15	4.90
multivariate	4.80	4.70	5.20	4.80	5.45	5.00	3.85	5.30	5.05	5.45	5.80	6.00
	multivariate exponential											
	small design (3*3)											
parem F test	4.10	5.65	5.20	5.20	4.70	4.80	4.30	4.95	5.15	5.30	4.50	4.55
HF adj	3.65	4.95	4.95	5.05	4.40	4.70	3.85	4.65	4.95	4.95	4.30	4.40
KWF	3.90	5.70	5.15	5.70	4.70	4.55	4.65	5.30	4.85	6.15	5.30	4.05
vdWaerden	3.90	5.70	5.15	5.70	4.70	4.55	4.65	5.30	4.85	6.15	5.30	4.05
Koch	3.55	4.65	4.65	5.10	4.35	4.50	4.65	4.95	4.85	5.65	5.00	4.30
multivariate	5.05	5.95	5.55	5.50	4.65	4.65	5.20	5.40	5.40	5.60	4.65	4.90
	large design (4*6)											
parem F test	4.20	4.30	4.45	4.85	5.45	5.00	3.80	5.25	5.90	5.20	4.80	4.00
HF adj	2.90	3.65	3.75	4.65	5.20	4.75	3.20	4.00	5.10	4.85	4.55	3.65
KWF	5.35	4.30	5.30	5.50	4.70	4.95	4.60	4.50	5.05	5.10	5.40	4.95
vdWaerden	5.10	4.50	5.00	5.50	4.80	4.90	4.70	4.80	5.05	4.80	5.40	5.00
Koch	2.45	4.40	4.85	5.20	4.70	4.85	2.30	4.00	4.75	4.45	4.80	4.90
multivariate	5.20	5.80	5.25	6.00	4.65	5.20	5.60	5.75	6.50	5.30	5.10	4.15

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	4.30	5.65	5.05	5.70	4.55	4.40	5.00	4.70	5.60	4.65	5.10	4.70
HF adj	4.40	5.95	5.10	5.75	4.55	4.35	5.15	4.85	5.75	4.70	5.05	4.70
KWF	4.40	5.70	5.40	5.90	4.50	4.85	4.35	4.80	4.75	5.80	5.80	5.30
vdWaerden	4.40	5.70	5.40	5.90	4.50	4.85	4.35	4.80	4.75	5.80	5.80	5.30
Koch	4.25	4.60	5.10	5.45	4.20	4.90	4.05	4.05	4.60	5.40	5.30	5.25
multivariate	5.15	6.05	4.60	5.50	4.45	4.30	5.40	5.20	5.75	5.00	5.55	4.50
	large design (4*6)											
parem F test	5.10	4.55	5.10	5.25	5.10	4.75	4.55	5.00	5.55	5.15	4.95	5.55
HF adj	5.05	4.45	5.15	5.25	5.05	4.65	4.75	4.85	5.60	5.15	4.85	5.55
KWF	5.75	7.20	9.95	13.25	13.90	14.95	5.10	6.20	10.15	11.20	11.90	13.50
vdWaerden	5.75	7.60	10.50	14.15	14.90	15.75	5.15	6.40	10.65	12.05	13.10	14.95
Koch	2.35	5.40	8.70	11.55	12.10	13.50	2.25	4.75	8.40	9.95	10.90	12.35
multivariate	5.40	4.95	5.10	5.00	5.10	4.50	5.00	4.95	5.50	5.20	4.80	6.20

1. 7. 2 interaction effect AB

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	4.95	5.45	4.50	5.15	5.20	6.50	3.15	3.80	2.15	2.15	2.50	2.95
HF adj	5.25	5.35	4.45	5.15	5.15	6.45	3.35	3.80	2.20	2.20	2.50	2.95
KWF	3.65	3.70	4.35	4.80	4.60	5.75	3.40	3.85	4.65	3.60	4.90	4.75
vdWaerden	3.65	3.70	4.35	4.80	4.60	5.75	3.40	3.85	4.65	3.60	4.90	4.75
Koch	3.25	4.30	4.20	4.40	5.35	6.50	2.25	3.20	2.75	2.15	2.55	3.40
multivariate	8.75	8.80	6.85	8.75	8.30	8.80	7.20	6.85	6.20	6.25	5.45	6.15
	large design (4*6)											
parem F test	5.30	5.35	5.15	6.05	6.15	5.60	1.60	1.35	1.70	1.95	1.50	1.80
HF adj	5.30	5.40	5.05	6.00	6.10	5.60	1.55	1.35	1.65	1.90	1.45	1.80
KWF	3.90	4.50	3.85	4.95	5.20	5.20	3.20	3.90	4.95	4.70	4.60	5.05
vdWaerden	3.90	4.60	3.90	5.05	5.15	5.10	3.10	3.90	4.85	4.80	4.70	4.65
Koch	1.60	3.75	4.10	5.40	4.95	5.35	0.80	1.65	2.45	2.45	2.00	2.65
multivariate	11.15	12.25	12.20	11.80	13.20	12.25	8.60	8.40	8.95	9.45	8.95	9.50
	multivariate lognormal											
	small design (3*3)											
parem F test	4.65	5.05	4.50	5.05	5.05	6.75	3.30	3.05	1.75	2.05	2.25	3.05
HF adj	4.40	5.05	4.35	5.00	5.00	6.80	3.10	3.20	1.80	2.05	2.30	3.05
KWF	3.65	3.70	4.35	4.80	4.60	5.75	3.40	3.85	4.65	3.60	4.90	4.75
vdWaerden	3.65	3.70	4.35	4.80	4.60	5.75	3.40	3.85	4.65	3.60	4.90	4.75
Koch	3.15	4.45	4.15	4.55	5.30	6.35	2.05	3.30	3.10	2.15	2.70	3.55
multivariate	8.40	8.40	6.85	8.75	8.55	9.20	6.80	6.15	6.45	6.10	5.80	5.60
	large design (4*6)											
parem F test	5.20	5.35	5.15	5.65	5.90	5.35	1.80	1.10	1.95	2.00	1.65	1.75
HF adj	4.75	5.30	4.95	5.60	5.80	5.30	1.60	1.10	1.80	2.00	1.65	1.70
KWF	3.90	4.50	3.85	4.95	5.20	5.20	3.20	3.90	4.95	4.70	4.60	5.05
vdWaerden	3.90	4.60	3.90	5.05	5.15	5.10	3.10	3.90	4.85	4.80	4.70	4.65
Koch	1.60	3.50	4.55	5.80	5.40	5.10	0.60	1.80	2.30	2.15	2.15	2.65
multivariate	10.30	12.40	11.80	11.95	12.70	11.50	8.40	9.00	8.30	9.50	9.00	9.35

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	5.55	5.65	4.60	5.20	5.00	5.40	3.70	3.65	2.25	2.90	2.65	2.95
HF adj	5.55	5.60	4.55	5.20	5.05	5.35	3.80	3.95	2.30	2.90	2.70	2.95
KWF	4.70	4.00	4.60	5.30	5.35	5.50	3.35	3.95	3.65	3.65	3.90	4.20
vdWaerden	4.70	3.95	4.55	5.10	5.30	5.40	3.35	3.95	3.60	3.70	3.85	4.20
Koch	3.45	4.65	3.95	5.15	5.35	5.50	2.10	3.55	2.55	2.90	3.15	3.40
multivariate	8.90	8.80	7.15	8.50	8.20	8.20	7.80	6.75	5.70	6.05	5.80	5.80
	large design (4*6)											
parem F test	5.20	5.75	5.50	6.45	5.85	5.10	1.60	1.75	1.80	1.85	1.70	1.75
HF adj	5.05	5.75	5.50	6.25	5.75	5.05	1.55	1.75	1.95	1.65	1.80	1.75
KWF	3.00	4.80	4.90	5.80	4.75	5.05	2.65	3.05	3.05	3.20	3.15	3.55
vdWaerden	3.00	4.75	4.75	5.65	4.80	5.35	2.70	3.30	3.05	3.35	3.05	3.40
Koch	1.15	4.30	4.50	5.30	5.40	5.20	0.65	1.65	2.10	2.10	2.30	2.25
multivariate	10.50	12.40	11.25	11.15	10.95	12.05	7.75	9.85	8.25	9.35	8.35	9.05
	multivariate exponential											
	small design (3*3)											
parem F test	4.60	4.70	4.60	4.95	5.15	6.35	2.80	3.10	2.40	2.75	2.45	2.80
HF adj	4.00	4.20	4.50	4.65	4.75	6.25	2.55	2.85	2.20	2.80	2.45	2.80
KWF	3.65	3.70	4.35	4.80	4.60	5.75	3.40	3.85	4.65	3.60	4.90	4.75
vdWaerden	3.65	3.70	4.35	4.80	4.60	5.75	3.40	3.85	4.65	3.60	4.90	4.75
Koch	2.90	4.70	4.10	4.70	4.95	5.55	1.75	3.75	3.10	2.80	3.15	3.50
multivariate	7.10	6.85	6.75	8.40	7.80	9.20	6.05	5.60	6.05	6.05	5.40	5.65
	large design (4*6)											
parem F test	5.40	5.50	5.25	5.85	5.25	5.05	1.70	1.50	2.30	2.25	2.00	2.00
HF adj	4.10	4.75	4.35	5.40	5.10	4.70	1.40	1.20	1.90	2.10	1.95	1.85
KWF	3.90	4.50	3.85	4.95	5.20	5.20	3.20	3.90	4.95	4.70	4.60	5.05
vdWaerden	3.90	4.60	3.90	5.05	5.15	5.10	3.10	3.90	4.85	4.80	4.70	4.65
Koch	1.55	3.65	4.35	5.25	5.10	4.65	0.55	2.10	2.70	2.65	2.65	3.00
multivariate	10.30	10.05	10.60	11.45	11.30	11.40	6.60	8.60	7.45	9.15	8.50	8.00

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	5.35	5.90	4.50	5.05	5.35	6.65	3.90	3.55	2.30	2.55	2.65	3.20
HF adj	5.35	6.00	4.55	5.00	5.35	6.65	3.95	3.70	2.35	2.70	2.65	3.20
KWF	3.60	3.40	4.20	4.65	5.05	5.45	3.60	3.60	4.60	4.35	4.55	5.05
vdWaerden	3.60	3.40	4.20	4.65	5.05	5.45	3.60	3.60	4.60	4.35	4.55	5.05
Koch	2.80	4.10	3.30	4.10	4.45	5.15	2.20	2.90	2.45	2.45	2.50	3.00
multivariate	8.80	9.10	7.55	9.25	8.45	8.85	7.50	7.00	6.60	6.15	5.85	5.95
	large design (4*6)											
parem F test	5.75	5.55	5.30	6.05	6.45	5.75	1.85	1.75	1.80	1.55	1.45	1.70
HF adj	5.65	5.45	5.40	5.95	6.40	5.75	1.75	1.80	1.80	1.65	1.45	1.70
KWF	4.90	8.75	12.40	15.65	16.50	17.75	2.55	5.40	12.10	13.55	14.60	17.00
vdWaerden	4.90	8.90	12.75	15.70	16.80	17.90	2.65	6.00	12.30	13.95	15.10	17.90
Koch	1.20	4.45	6.00	6.95	7.20	7.40	0.70	1.90	3.35	2.30	3.00	3.20
multivariate	5.65	4.70	4.50	5.00	4.60	5.30	3.95	5.25	4.20	4.60	3.75	3.65

1. 8. varying correlations $r^{(i)}_{j1j2}$ for variables j_1, j_2 (j_1, j_2 =1,...,J) within each $\Sigma^{(i)}$

1. 8. 1 main effect B

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	4.60	5.65	4.70	4.95	4.75	4.35	5.10	5.35	5.70	5.00	4.75	4.55
HF adj	4.45	5.55	4.60	5.00	4.60	4.30	5.05	5.40	5.55	4.90	4.65	4.35
KWF	4.95	5.70	5.25	5.15	5.15	4.50	5.80	6.30	5.05	4.95	5.30	5.10
vdWaerden	4.95	5.70	5.25	5.15	5.15	4.50	5.80	6.30	5.05	4.95	5.30	5.10
Koch	4.30	5.25	5.10	5.00	4.90	4.65	5.10	5.55	4.75	4.80	5.10	4.90
multivariate	4.50	5.25	4.75	5.05	5.05	4.20	5.40	5.10	5.60	4.85	5.00	4.70
	large design (4*6)											
parem F test	4.85	4.90	4.55	5.75	4.90	5.85	5.05	4.55	5.80	4.90	4.75	6.00
HF adj	4.85	4.90	4.45	5.70	4.75	5.85	4.95	4.40	5.50	4.85	4.55	5.95
KWF	4.10	4.70	4.30	5.00	5.15	4.80	5.00	4.55	5.55	4.55	5.10	5.30
vdWaerden	4.15	4.65	4.20	4.95	4.90	4.95	4.95	4.65	5.50	4.40	4.95	5.10
Koch	3.05	4.00	4.35	5.30	4.65	4.70	2.75	4.05	5.05	4.25	4.90	5.45
multivariate	4.85	5.00	4.70	5.10	4.80	5.60	4.90	4.65	5.55	5.00	5.25	5.95
	multivariate lognormal											
	small design (3*3)											
parem F test	4.80	5.20	4.65	5.05	5.00	4.40	5.20	5.60	5.35	4.75	5.00	4.35
HF adj	4.50	5.05	4.60	5.05	4.95	4.40	5.00	5.50	5.35	4.65	4.90	4.25
KWF	4.95	5.70	5.25	5.15	5.15	4.50	5.80	6.30	5.05	4.95	5.30	5.10
vdWaerden	4.95	5.70	5.25	5.15	5.15	4.50	5.80	6.30	5.05	4.95	5.30	5.10
Koch	4.30	5.25	5.10	5.00	4.90	4.65	5.10	5.55	4.75	4.80	5.10	4.90
multivariate	4.30	5.35	5.25	4.70	5.40	4.35	5.05	5.65	5.20	4.95	5.15	4.90
	large design (4*6)											
parem F test	5.45	4.50	4.45	5.60	4.90	5.90	4.95	4.20	5.70	5.50	4.70	5.95
HF adj	5.35	4.30	4.30	5.30	4.85	5.80	4.60	4.05	5.35	5.25	4.65	5.80
KWF	4.10	4.70	4.30	5.00	5.15	4.80	5.00	4.55	5.55	4.55	5.10	5.30
vdWaerden	4.15	4.65	4.20	4.95	4.90	4.95	4.95	4.65	5.50	4.40	4.95	5.10
Koch	3.05	4.00	4.35	5.30	4.65	4.70	2.75	4.05	5.05	4.25	4.90	5.45
multivariate	5.15	4.50	4.85	5.30	5.00	5.90	5.45	4.15	5.55	5.30	5.10	5.65

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	4.80	5.30	5.10	4.95	5.00	4.40	5.05	5.40	5.10	4.35	5.05	5.25
HF adj	4.80	5.30	5.15	5.05	4.90	4.35	5.10	5.60	4.85	4.30	4.95	5.25
KWF	4.60	4.60	4.55	4.85	4.60	4.65	5.00	4.90	5.10	4.85	5.25	4.75
vdWaerden	4.55	4.60	4.55	4.85	4.55	4.65	5.00	4.80	5.10	4.75	5.20	4.90
Koch	3.90	4.45	4.75	5.05	4.70	4.40	4.45	4.65	4.85	4.55	5.25	4.10
multivariate	4.70	5.00	5.20	4.80	5.10	4.55	5.50	4.75	4.50	4.65	4.65	5.70
	large design (4*6)											
parem F test	4.95	5.00	4.70	4.60	5.10	5.35	5.00	4.35	5.35	4.70	5.05	5.60
HF adj	5.35	5.15	4.65	4.50	5.10	5.35	4.95	4.35	5.35	4.60	5.00	5.50
KWF	4.35	5.25	4.75	4.95	5.25	5.25	4.15	4.40	5.05	5.10	4.85	5.20
vdWaerden	4.45	5.20	4.65	4.95	5.40	5.30	4.40	4.25	5.25	5.30	4.80	5.15
Koch	2.65	4.10	4.40	5.00	4.65	5.15	2.05	3.90	4.90	4.30	4.60	5.25
multivariate	4.40	4.90	5.15	4.60	5.20	5.20	4.95	4.60	4.95	4.15	4.95	5.20
	multivariate exponential											
	small design (3*3)											
parem F test	4.40	4.75	5.00	4.85	5.25	4.30	4.40	5.35	4.90	4.30	4.45	4.25
HF adj	3.55	3.90	4.70	4.50	4.80	4.30	3.85	4.90	4.60	4.00	4.30	4.00
KWF	4.95	5.70	5.25	5.15	5.15	4.50	5.80	6.30	5.05	4.95	5.30	5.10
vdWaerden	4.95	5.70	5.25	5.15	5.15	4.50	5.80	6.30	5.05	4.95	5.30	5.10
Koch	4.30	5.25	5.10	5.00	4.90	4.65	5.10	5.55	4.75	4.80	5.10	4.90
multivariate	4.30	5.25	5.05	4.70	5.65	4.50	4.25	5.60	4.80	5.00	5.15	4.25
	large design (4*6)											
parem F test	5.00	4.25	4.70	5.50	4.80	5.40	4.45	4.25	4.95	5.30	4.90	6.45
HF adj	3.70	3.50	4.10	4.90	4.40	4.75	3.40	3.40	4.50	4.90	4.60	5.95
KWF	4.10	4.70	4.30	5.00	5.15	4.80	5.00	4.55	5.55	4.55	5.10	5.30
vdWaerden	4.15	4.65	4.20	4.95	4.90	4.95	4.95	4.65	5.50	4.40	4.95	5.10
Koch	3.05	4.00	4.35	5.30	4.65	4.70	2.75	4.05	5.05	4.25	4.90	5.45
multivariate	5.50	4.40	5.30	5.40	5.30	5.90	5.55	5.00	4.75	5.70	5.35	5.95

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	4.95	5.35	4.90	4.80	5.15	4.40	5.40	5.15	5.20	4.30	5.00	5.35
HF adj	4.95	5.40	4.75	4.75	5.10	4.40	5.30	5.15	5.05	4.25	4.80	5.15
KWF	5.25	5.65	5.40	5.55	6.75	6.40	5.20	6.70	6.35	6.75	6.80	6.80
vdWaerden	5.25	5.65	5.40	5.55	6.75	6.40	5.20	6.70	6.35	6.75	6.80	6.80
Koch	5.30	4.55	5.35	5.00	6.50	6.50	4.85	5.80	5.95	6.50	7.10	7.15
multivariate	5.05	4.60	4.85	5.00	5.30	4.65	4.90	5.05	5.00	4.55	5.10	5.35
	large design (4*6)											
parem F test	4.70	5.00	4.55	5.20	5.15	5.35	4.70	4.50	5.75	4.85	4.65	6.00
HF adj	4.85	4.95	4.55	5.15	5.05	5.20	4.80	4.50	5.70	4.80	4.55	5.70
KWF	4.80	4.95	6.70	8.60	8.85	9.95	3.85	4.75	7.25	7.10	8.50	9.15
vdWaerden	4.55	5.25	7.25	9.15	9.40	10.55	3.95	4.85	7.55	7.80	8.75	9.75
Koch	2.50	4.70	6.25	8.00	7.65	9.70	2.80	4.00	6.45	6.45	7.85	8.75
multivariate	5.15	4.80	4.90	5.15	5.15	5.35	5.30	4.85	5.45	4.20	5.20	5.30

1. 8. 2 interaction effect AB

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	5.10	5.55	4.70	5.25	4.95	6.45	6.60	6.30	5.75	5.60	5.70	6.30
HF adj	5.00	5.45	4.70	5.25	4.85	6.45	6.70	6.20	5.65	5.45	5.70	6.10
KWF	3.90	4.35	3.85	5.55	4.60	5.50	3.30	4.20	4.35	4.40	4.55	4.45
vdWaerden	3.90	4.35	3.85	5.55	4.60	5.50	3.30	4.20	4.35	4.40	4.55	4.45
Koch	2.35	4.50	4.25	5.05	4.65	5.85	4.00	5.05	4.95	5.35	5.35	5.40
multivariate	4.35	4.40	3.50	4.55	3.85	4.45	5.10	4.95	4.60	5.00	3.95	5.15
	large design (4*6)											
parem F test	5.35	5.55	5.05	5.65	5.30	5.70	5.05	5.30	6.40	5.15	5.05	5.50
HF adj	5.25	5.40	5.00	5.60	5.30	5.70	4.75	5.55	6.20	5.15	4.85	5.35
KWF	3.00	4.75	5.10	5.35	4.85	5.10	2.65	4.65	5.50	4.65	5.40	5.15
vdWaerden	3.20	4.60	4.85	5.65	5.10	4.80	2.45	4.65	5.60	4.60	5.55	5.20
Koch	1.45	4.05	3.95	4.60	4.35	4.95	1.10	3.45	4.95	4.50	4.45	5.25
multivariate	4.30	4.85	4.60	5.10	5.20	3.85	3.85	4.65	5.30	5.10	4.60	4.30
	multivariate lognormal											
	small design (3*3)											
parem F test	4.85	5.20	4.70	5.05	5.35	6.15	6.30	6.20	5.80	6.15	5.70	6.40
HF adj	4.55	4.90	4.75	5.00	5.30	6.10	5.95	6.05	5.70	5.90	5.40	6.30
KWF	3.90	4.35	3.85	5.55	4.60	5.50	3.30	4.20	4.35	4.40	4.55	4.45
vdWaerden	3.90	4.35	3.85	5.55	4.60	5.50	3.30	4.20	4.35	4.40	4.55	4.45
Koch	2.30	4.40	3.95	5.35	4.95	5.95	3.65	4.60	4.70	5.10	5.05	5.20
multivariate	4.15	4.30	3.70	4.45	3.95	4.60	4.75	4.70	4.25	4.90	3.95	5.15
	large design (4*6)											
parem F test	4.80	5.10	4.75	5.35	5.70	5.00	5.05	5.45	6.50	5.10	5.55	5.10
HF adj	4.40	4.75	4.55	5.25	5.50	4.85	4.45	5.35	6.30	4.75	5.25	5.00
KWF	3.00	4.75	5.10	5.35	4.85	5.10	2.65	4.65	5.50	4.65	5.40	5.15
vdWaerden	3.20	4.60	4.85	5.65	5.10	4.80	2.45	4.65	5.60	4.60	5.55	5.20
Koch	1.65	3.70	3.65	4.90	4.50	4.50	0.95	3.40	4.65	4.50	4.60	5.25
multivariate	3.95	5.30	4.65	4.85	5.65	4.35	3.90	4.95	5.30	5.15	4.45	4.60

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	5.65	5.90	5.25	4.75	5.40	5.15	6.30	5.90	5.50	5.85	6.45	6.10
HF adj	5.60	5.75	5.25	4.80	5.35	5.05	6.50	6.00	5.60	5.85	6.35	6.10
KWF	4.30	5.40	4.45	5.70	5.35	4.75	3.85	4.45	4.70	4.90	5.45	4.75
vdWaerden	4.25	5.40	4.50	5.75	5.30	4.65	3.80	4.35	4.85	5.00	5.45	4.80
Koch	3.00	5.45	4.80	4.95	5.35	4.70	3.60	4.95	5.45	4.95	6.30	5.55
multivariate	4.80	4.40	3.95	4.50	4.60	4.40	4.85	4.85	4.85	4.50	4.70	5.30
	large design (4*6)											
parem F test	5.10	5.75	5.25	5.70	5.30	5.65	4.75	4.95	6.35	5.00	4.85	4.90
HF adj	5.25	5.80	4.90	5.70	5.25	5.45	4.55	4.70	6.25	4.95	4.70	4.70
KWF	3.40	4.90	4.80	5.40	5.40	5.25	2.65	4.45	5.10	4.70	4.75	5.10
vdWaerden	3.35	4.75	4.65	5.50	5.25	5.35	2.55	4.50	5.20	4.55	4.85	5.10
Koch	1.55	3.65	3.75	5.45	4.75	4.90	1.15	3.35	5.05	4.10	4.60	4.50
multivariate	4.40	5.10	4.70	5.10	4.85	3.85	3.60	4.35	5.25	5.00	5.10	4.25
	multivariate exponential											
	small design (3*3)											
parem F test	4.25	4.85	4.75	5.05	5.00	5.50	5.55	5.65	5.65	5.85	5.55	6.25
HF adj	3.65	4.30	4.75	5.00	4.85	5.40	5.05	5.05	5.20	5.60	5.40	6.00
KWF	3.90	4.35	3.85	5.55	4.60	5.50	3.30	4.20	4.35	4.40	4.55	4.45
vdWaerden	3.90	4.35	3.85	5.55	4.60	5.50	3.30	4.20	4.35	4.40	4.55	4.45
Koch	2.55	4.55	4.30	5.10	5.60	5.80	3.60	4.50	4.70	5.20	5.55	5.50
multivariate	3.70	4.45	3.55	4.20	4.15	3.95	4.70	3.70	4.15	4.50	3.90	4.95
	large design (4*6)											
parem F test	4.90	5.15	5.20	5.85	5.00	4.80	5.65	6.00	6.40	5.25	5.75	5.95
HF adj	3.70	4.35	4.50	5.50	4.85	4.45	4.50	5.25	5.85	4.80	5.70	5.55
KWF	3.00	4.75	5.10	5.35	4.85	5.10	2.65	4.65	5.50	4.65	5.40	5.15
vdWaerden	3.20	4.60	4.85	5.65	5.10	4.80	2.45	4.65	5.60	4.60	5.55	5.20
Koch	1.50	3.60	4.15	5.40	4.60	4.25	1.05	3.65	5.05	3.55	4.85	4.40
multivariate	4.35	4.05	4.20	5.15	5.60	3.85	3.60	4.45	4.65	5.50	5.05	4.70

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	4.75	5.90	4.45	5.10	5.55	6.15	6.45	6.25	5.85	5.80	5.85	5.65
HF adj	5.10	5.95	4.45	5.15	5.40	6.15	6.50	6.20	5.60	5.65	5.85	5.50
KWF	3.95	4.70	4.50	6.90	6.60	6.55	3.10	4.70	4.75	6.05	6.25	6.45
vdWaerden	3.95	4.70	4.50	6.90	6.60	6.55	3.10	4.70	4.75	6.05	6.25	6.45
Koch	3.10	4.45	4.35	4.50	5.30	5.80	3.35	5.15	4.95	5.70	5.55	5.60
multivariate	4.45	4.25	3.65	4.50	4.00	4.40	5.25	4.70	5.15	4.50	4.20	5.15
	large design (4*6)											
parem F test	4.85	5.95	5.65	5.90	5.00	5.70	4.70	5.00	6.00	5.55	5.15	5.30
HF adj	4.90	5.85	5.45	5.75	4.95	5.55	4.25	5.15	6.05	5.50	5.10	5.25
KWF	4.20	5.05	5.80	7.55	6.65	7.50	2.65	4.25	6.90	5.50	7.10	6.75
vdWaerden	4.10	5.05	6.05	8.25	7.35	8.05	2.65	4.60	6.95	5.85	7.65	7.20
Koch	1.70	3.70	4.15	4.85	4.80	5.15	1.25	2.90	4.75	4.90	4.35	5.05
multivariate	4.70	6.60	4.90	5.55	5.50	4.40	4.80	5.15	5.85	5.45	4.85	4.60

1. 9. $\Sigma^{(i)} = c_i\Sigma^{(1)}$ with c_i =(2.0, 1.3, 1.3, 1.0) and r(c_i, n_i) ~ -0.7 combined with unequal correlations $r^{(i)}$ = (0.15, 0.6, 0.6, 0.15) with r($r^{(i)}$, n_i) ~ -0.9

1. 9. 1 main effect B

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	5.80	5.50	4.60	4.65	5.40	5.35	5.95	4.65	4.75	4.75	5.45	5.15
HF adj	6.05	5.55	4.60	4.55	5.40	5.40	6.10	4.60	4.70	4.70	5.60	5.20
KWF	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
vdWaerden	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
Koch	4.90	4.25	4.80	4.15	5.10	5.65	4.45	4.80	4.75	4.70	5.25	5.20
multivariate	6.00	5.15	4.70	4.45	5.55	5.20	5.95	5.15	4.60	4.95	5.90	5.35
	large design (4*6)											
parem F test	5.40	5.00	4.55	4.30	5.75	6.10	4.60	4.90	5.10	4.65	4.65	6.15
HF adj	5.70	4.95	4.60	4.25	5.65	6.00	4.55	4.70	4.90	4.70	4.55	6.05
KWF	4.05	4.55	5.05	4.55	5.00	4.75	3.55	4.95	5.35	4.90	4.95	5.25
vdWaerden	4.20	4.70	5.15	4.45	5.00	4.70	3.55	4.60	5.00	4.80	4.70	5.30
Koch	2.85	4.15	4.75	4.30	5.05	4.35	2.30	3.85	5.00	4.80	4.30	5.25
multivariate	5.25	4.70	4.80	4.70	5.45	5.35	4.90	4.65	4.50	5.25	4.80	5.70
	multivariate lognormal											
	small design (3*3)											
parem F test	5.85	5.30	4.50	5.10	5.40	4.55	5.80	4.20	5.55	5.05	5.35	5.20
HF adj	5.80	5.25	4.35	5.10	5.40	4.55	5.80	4.30	5.50	4.90	5.35	5.05
KWF	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
vdWaerden	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
Koch	4.90	4.25	4.80	4.15	5.10	5.65	4.45	4.80	4.75	4.70	5.25	5.20
multivariate	5.50	4.80	4.50	4.60	5.95	4.80	5.75	4.65	4.95	4.90	5.45	5.15
	large design (4*6)											
parem F test	5.30	4.95	4.45	4.60	5.35	6.05	4.50	5.20	5.15	4.70	5.45	6.55
HF adj	5.05	4.60	4.50	4.55	5.25	5.85	4.40	4.90	5.15	4.70	5.35	6.50
KWF	4.05	4.55	5.05	4.55	5.00	4.75	3.55	4.95	5.35	4.90	4.95	5.25
vdWaerden	4.20	4.70	5.15	4.45	5.00	4.70	3.55	4.60	5.00	4.80	4.70	5.30
Koch	2.85	4.15	4.75	4.30	5.05	4.35	2.30	3.85	5.00	4.80	4.30	5.25
multivariate	5.25	4.75	5.10	4.90	5.45	5.85	5.20	4.70	4.95	4.85	5.10	6.25

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	5.50	5.35	4.50	4.70	5.05	5.50	5.80	4.90	5.45	5.15	5.05	5.80
HF adj	5.55	5.40	4.55	4.65	5.05	5.55	5.80	4.95	5.35	5.25	5.10	5.75
KWF	5.45	4.90	4.85	4.55	4.85	5.35	4.95	4.75	5.00	5.20	5.55	5.20
vdWaerden	5.40	4.70	4.95	4.55	4.80	5.25	4.85	4.80	5.00	5.10	5.65	5.20
Koch	5.15	4.75	4.80	4.65	4.50	4.95	4.95	4.50	5.10	4.90	5.30	5.25
multivariate	6.15	5.45	4.65	4.70	5.10	5.25	6.65	4.90	5.50	5.25	5.20	5.80
	large design (4*6)											
parem F test	5.25	4.80	5.35	5.40	5.15	5.55	3.95	4.95	5.20	5.35	4.60	6.35
HF adj	4.95	4.75	5.30	5.50	5.15	5.60	3.80	4.70	5.20	5.25	4.55	6.30
KWF	4.50	4.60	5.35	5.30	5.00	5.50	4.15	5.15	5.00	5.25	4.45	5.60
vdWaerden	4.40	4.55	5.45	5.30	4.80	5.50	4.25	5.10	5.20	5.30	4.40	5.60
Koch	2.65	3.90	4.95	5.05	4.80	5.45	3.05	3.35	4.95	4.80	4.10	5.25
multivariate	5.25	5.20	5.30	5.65	5.05	5.15	5.20	4.50	4.90	5.30	4.30	5.90
	multivariate exponential											
	small design (3*3)											
parem F test	4.75	4.90	3.85	5.10	5.35	4.80	5.25	4.25	5.75	5.10	5.10	4.75
HF adj	4.05	4.65	3.40	4.95	5.10	4.50	4.40	3.60	5.40	4.75	5.05	4.60
KWF	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
vdWaerden	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
Koch	4.90	4.25	4.80	4.15	5.10	5.65	4.45	4.80	4.75	4.70	5.25	5.20
multivariate	5.15	5.05	4.25	5.10	5.30	5.20	5.15	4.50	5.05	5.20	6.05	4.85
	large design (4*6)											
parem F test	4.55	4.10	4.55	5.05	5.10	5.75	4.70	4.55	5.55	4.75	5.70	5.20
HF adj	3.30	3.60	4.20	4.45	4.80	5.40	3.50	3.80	5.05	4.25	5.15	4.80
KWF	4.05	4.55	5.05	4.55	5.00	4.75	3.55	4.95	5.35	4.90	4.95	5.25
vdWaerden	4.20	4.70	5.15	4.45	5.00	4.70	3.55	4.60	5.00	4.80	4.70	5.30
Koch	2.85	4.15	4.75	4.30	5.05	4.35	2.30	3.85	5.00	4.80	4.30	5.25
multivariate	5.05	5.20	5.35	5.05	5.00	5.85	5.50	4.80	5.70	4.90	5.40	5.90

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	5.95	5.25	5.25	4.40	5.35	5.30	5.70	4.60	5.55	4.80	6.05	5.90
HF adj	5.95	5.05	5.20	4.45	5.40	5.30	5.60	4.50	5.50	4.80	6.05	5.90
KWF	5.05	4.85	4.20	4.45	5.60	5.05	4.45	4.75	4.75	4.95	5.40	5.15
vdWaerden	5.05	4.85	4.20	4.45	5.60	5.05	4.45	4.75	4.75	4.95	5.40	5.15
Koch	4.90	4.60	4.15	4.30	5.40	5.30	4.75	4.10	4.60	4.95	5.05	5.25
multivariate	6.05	5.65	5.20	4.95	5.30	5.20	6.30	5.35	5.15	5.10	6.10	5.85
	large design (4*6)											
parem F test	6.50	6.10	6.60	6.45	6.40	6.25	5.50	6.05	6.40	6.85	6.30	7.75
HF adj	6.50	5.85	6.60	6.50	6.40	6.25	5.15	5.95	6.45	6.80	6.40	7.70
KWF	4.55	6.45	10.30	11.55	12.30	13.85	4.90	6.10	9.05	10.45	12.45	13.30
vdWaerden	4.65	6.85	10.65	12.40	13.25	14.95	4.95	6.20	9.75	11.25	13.70	14.25
Koch	2.05	5.20	9.05	9.95	11.85	12.40	2.55	4.95	7.80	9.05	11.30	11.90
multivariate	5.65	6.30	6.15	6.25	6.55	6.25	5.30	5.30	6.20	6.55	6.15	7.25

1. 9. 2 interaction effect AB

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	4.75	4.90	5.35	5.00	5.25	4.90	3.45	2.80	3.90	3.90	4.70	4.10
HF adj	4.80	4.80	5.30	5.05	5.15	4.90	3.55	2.95	3.95	3.85	4.80	4.15
KWF	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
vdWaerden	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
Koch	2.55	4.65	4.20	5.20	4.60	4.40	1.85	2.65	3.70	3.70	4.85	4.60
multivariate	4.90	5.20	5.50	5.35	5.35	5.40	3.90	4.15	3.85	4.40	4.50	4.35
	large design (4*6)											
parem F test	5.60	4.70	5.85	5.30	6.30	6.75	4.25	3.95	6.95	6.60	6.55	6.30
HF adj	5.50	4.70	5.85	5.20	6.35	6.70	4.50	4.00	6.85	6.55	6.60	6.20
KWF	3.30	4.15	4.60	5.05	4.55	5.85	2.75	4.40	4.55	4.90	4.30	4.25
vdWaerden	3.25	4.00	4.55	5.10	4.25	5.90	2.75	4.50	4.70	5.00	4.10	3.90
Koch	1.50	3.00	4.65	4.50	5.75	6.10	1.00	3.00	4.95	4.85	4.90	5.60
multivariate	5.65	4.55	4.60	4.90	5.05	5.45	4.60	4.00	4.35	5.15	6.35	4.10
	multivariate lognormal											
	small design (3*3)											
parem F test	5.05	4.90	5.35	5.10	5.55	4.50	3.45	3.20	3.75	4.50	4.70	4.55
HF adj	4.85	5.00	5.35	5.10	5.55	4.60	3.30	2.95	3.70	4.45	4.70	4.40
KWF	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
vdWaerden	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
Koch	2.45	4.55	4.05	4.50	4.40	4.80	1.70	3.00	4.15	3.85	5.00	4.60
multivariate	5.05	5.50	5.20	5.05	5.45	4.80	3.85	4.00	3.75	4.75	4.10	4.45
	large design (4*6)											
parem F test	5.30	4.60	5.35	5.40	6.30	6.25	4.20	4.45	7.30	7.30	6.80	7.00
HF adj	4.65	4.40	5.30	5.40	6.20	6.20	4.10	4.00	7.05	7.25	6.80	6.95
KWF	3.30	4.15	4.60	5.05	4.55	5.85	2.75	4.40	4.55	4.90	4.30	4.25
vdWaerden	3.25	4.00	4.55	5.10	4.25	5.90	2.75	4.50	4.70	5.00	4.10	3.90
Koch	1.50	2.95	4.50	4.65	5.30	6.20	1.10	2.95	4.65	4.75	5.05	5.15
multivariate	5.25	4.95	4.55	5.10	5.15	5.30	4.45	4.05	4.20	5.50	5.30	3.60

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	4.85	4.55	5.50	5.80	5.50	5.15	3.70	3.20	3.65	4.10	4.55	4.45
HF adj	5.00	4.65	5.45	5.85	5.45	5.10	3.75	3.15	3.70	4.20	4.55	4.40
KWF	3.50	4.15	4.30	5.10	4.40	4.90	3.20	3.55	3.95	4.00	5.20	4.70
vdWaerden	3.45	4.15	4.30	5.10	4.40	4.90	3.25	3.50	3.95	4.00	5.30	4.60
Koch	2.65	4.10	4.65	5.30	4.95	5.00	1.70	2.90	3.90	3.75	4.60	4.30
multivariate	5.55	5.10	5.30	5.40	5.60	5.30	4.30	4.30	4.25	5.00	4.75	4.75
	large design (4*6)											
parem F test	5.60	5.30	4.90	5.60	6.25	5.90	4.30	4.35	7.50	6.95	7.10	6.95
HF adj	5.50	5.10	4.90	5.65	6.30	5.95	4.15	4.50	7.65	6.95	7.10	6.90
KWF	3.45	4.00	4.55	4.55	5.15	5.40	2.65	4.30	4.25	4.65	4.50	4.40
vdWaerden	3.25	4.05	4.65	4.70	5.05	5.25	2.55	4.05	4.35	4.30	4.50	4.30
Koch	1.35	2.70	4.20	4.65	5.30	5.70	0.70	2.70	4.60	4.20	4.80	4.90
multivariate	6.20	4.70	4.80	4.55	5.10	4.40	4.10	4.50	4.25	4.90	5.35	3.75
	multivariate exponential											
	small design (3*3)											
parem F test	4.10	4.95	5.20	5.70	5.00	3.90	3.70	3.30	4.45	5.05	5.15	4.55
HF adj	3.85	4.60	5.00	5.50	4.90	3.90	3.75	3.20	4.25	4.70	5.10	4.55
KWF	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
vdWaerden	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
Koch	2.40	4.00	4.25	5.10	4.80	4.40	1.70	3.55	4.25	4.70	4.80	4.10
multivariate	4.75	5.20	5.15	5.10	5.35	4.70	3.00	4.20	3.55	4.35	3.70	4.45
	large design (4*6)											
parem F test	5.25	4.35	5.00	5.35	6.70	5.70	5.35	5.80	9.00	8.40	8.15	7.40
HF adj	3.70	4.10	4.40	5.10	6.40	5.55	4.20	4.65	8.45	8.00	7.80	6.90
KWF	3.30	4.15	4.60	5.05	4.55	5.85	2.75	4.40	4.55	4.90	4.30	4.25
vdWaerden	3.25	4.00	4.55	5.10	4.25	5.90	2.75	4.50	4.70	5.00	4.10	3.90
Koch	1.40	3.00	4.65	4.70	5.05	5.15	1.10	2.90	4.75	4.35	4.50	4.80
multivariate	4.65	5.10	4.25	4.95	5.25	4.95	3.90	3.45	4.20	5.05	4.85	4.00

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	4.80	5.05	4.75	5.55	5.20	4.75	3.20	2.85	3.55	4.45	4.85	4.65
HF adj	5.00	4.95	4.80	5.45	5.15	4.70	3.45	3.05	3.55	4.50	4.75	4.65
KWF	3.95	3.40	4.40	4.60	4.25	4.95	3.25	3.55	3.95	4.60	4.85	4.50
vdWaerden	3.95	3.40	4.40	4.60	4.25	4.95	3.25	3.55	3.95	4.60	4.85	4.50
Koch	2.75	4.50	3.70	4.55	4.35	3.75	1.75	2.35	3.15	3.30	3.80	3.50
multivariate	4.80	5.15	4.95	5.20	5.40	5.10	4.00	4.25	4.15	4.65	4.35	4.80
	large design (4*6)											
parem F test	8.40	7.80	7.55	8.50	8.15	8.60	5.70	6.40	9.80	9.75	10.05	9.60
HF adj	7.75	7.75	7.55	8.20	8.10	8.60	5.70	6.45	9.80	9.75	10.05	9.65
KWF	4.90	7.35	12.15	15.00	16.85	18.85	2.75	6.95	11.10	14.35	16.80	15.75
vdWaerden	5.05	7.75	12.60	15.80	16.90	19.05	2.45	7.00	11.10	14.55	17.05	16.15
Koch	1.60	4.70	7.20	7.40	8.90	8.90	1.00	3.35	7.25	7.65	8.30	7.70
multivariate	2.30	2.05	2.30	2.85	2.55	2.80	2.60	2.20	2.75	3.00	3.20	2.20

1. 10. $\Sigma^{(i)} = c_i\Sigma^{(1)}$ with c_i =(2.0, 1.3, 1.3, 1.0) and r(c_i, n_i) ~ -0.7 combined with unequal correlations $r^{(i)}$ = (0.6, 0.15, 0.15, 0.6) with r($r^{(i)}$, n_i) ~ +0.9

1. 10. 1 main effect B

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	6.60	5.95	5.05	4.65	4.90	5.15	7.50	5.75	5.75	5.25	5.75	5.20
HF adj	6.35	5.80	5.05	4.65	4.90	5.20	7.15	5.45	5.80	5.20	5.65	5.15
KWF	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
vdWaerden	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
Koch	4.90	4.25	4.80	4.15	5.10	5.65	4.45	4.80	4.75	4.70	5.25	5.20
multivariate	4.50	4.70	4.65	4.50	4.90	4.60	5.30	4.10	4.40	4.85	5.25	5.15
	large design (4*6)											
parem F test	5.80	4.25	5.15	4.50	4.95	5.75	6.45	6.30	6.00	5.05	5.30	5.65
HF adj	5.15	3.90	4.85	4.25	4.75	5.70	5.55	5.80	5.60	4.95	5.15	5.60
KWF	4.15	4.80	5.50	4.15	4.95	4.90	4.10	4.70	4.20	4.45	5.20	4.85
vdWaerden	4.00	4.55	5.10	4.30	5.15	5.10	4.15	4.55	4.25	4.35	5.40	4.85
Koch	2.45	4.30	4.55	3.90	5.10	5.05	2.60	4.15	4.65	4.40	4.75	4.95
multivariate	3.50	3.75	4.85	4.65	4.95	5.50	3.35	4.25	5.05	4.95	4.45	5.10
	multivariate lognormal											
	small design (3*3)											
parem F test	6.30	6.20	5.15	4.85	4.90	5.30	7.05	5.70	5.80	5.45	5.70	5.30
HF adj	6.15	5.85	5.10	4.75	4.85	5.10	6.80	5.35	5.40	5.50	5.65	5.25
KWF	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
vdWaerden	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
Koch	4.90	4.25	4.80	4.15	5.10	5.65	4.45	4.80	4.75	4.70	5.25	5.20
multivariate	4.75	4.20	4.65	4.20	4.95	5.10	5.10	4.10	4.40	4.85	5.35	4.90
	large design (4*6)											
parem F test	5.75	4.75	5.20	4.20	5.20	5.85	6.95	6.05	5.55	5.00	5.45	5.50
HF adj	4.60	4.15	4.65	4.00	5.05	5.60	5.50	5.25	5.30	4.65	5.20	5.25
KWF	4.15	4.80	5.50	4.15	4.95	4.90	4.10	4.70	4.20	4.45	5.20	4.85
vdWaerden	4.00	4.55	5.10	4.30	5.15	5.10	4.15	4.55	4.25	4.35	5.40	4.85
Koch	2.45	4.30	4.55	3.90	5.10	5.05	2.60	4.15	4.65	4.40	4.75	4.95
multivariate	3.55	4.60	4.80	3.95	4.95	5.60	3.60	4.25	4.90	4.60	4.75	5.00

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	5.95	5.15	5.35	4.65	5.05	4.55	7.50	5.20	6.00	5.15	5.10	5.40
HF adj	6.35	4.95	5.35	4.70	5.05	4.45	7.55	5.20	5.95	5.10	5.10	5.30
KWF	5.25	4.80	3.75	4.55	4.60	4.90	4.90	4.70	5.20	5.00	5.20	5.35
vdWaerden	5.25	4.80	3.75	4.60	4.60	4.90	4.80	4.70	5.30	5.00	5.20	5.35
Koch	4.35	4.65	3.85	4.45	4.55	4.70	4.45	4.45	5.40	5.00	5.40	5.35
multivariate	4.65	4.40	4.85	4.35	5.00	4.55	4.85	4.50	5.40	5.00	5.15	5.20
	large design (4*6)											
parem F test	5.95	4.55	5.55	4.85	5.25	5.75	7.45	5.85	5.90	5.15	5.55	5.25
HF adj	5.75	4.15	5.35	4.85	5.15	5.70	5.95	5.45	5.75	5.10	5.35	5.15
KWF	4.30	4.30	4.80	4.45	5.05	5.30	3.75	4.60	5.25	5.35	5.15	4.85
vdWaerden	4.30	4.30	5.10	4.50	4.80	5.35	3.55	4.80	5.30	5.50	5.30	4.75
Koch	2.35	3.70	4.60	4.15	4.60	5.35	2.10	4.00	5.05	5.10	4.55	4.80
multivariate	3.55	3.85	5.10	4.45	5.10	5.55	3.70	4.15	4.70	5.15	4.40	4.40
	multivariate exponential											
	small design (3*3)											
parem F test	5.25	5.80	4.70	4.70	5.05	5.05	5.95	5.45	5.65	5.10	5.60	5.40
HF adj	4.50	5.30	4.20	4.30	4.90	4.85	4.90	4.80	5.20	4.90	5.20	5.25
KWF	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
vdWaerden	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
Koch	4.90	4.25	4.80	4.15	5.10	5.65	4.45	4.80	4.75	4.70	5.25	5.20
multivariate	4.20	4.95	4.15	4.60	5.30	5.00	4.75	4.65	5.05	5.00	5.30	4.95
	large design (4*6)											
parem F test	4.90	5.05	4.85	4.40	5.10	5.70	6.15	5.75	5.50	5.20	5.55	5.05
HF adj	3.40	3.75	4.25	3.90	4.60	5.10	3.85	3.75	4.55	4.45	4.80	4.55
KWF	4.15	4.80	5.50	4.15	4.95	4.90	4.10	4.70	4.20	4.45	5.20	4.85
vdWaerden	4.00	4.55	5.10	4.30	5.15	5.10	4.15	4.55	4.25	4.35	5.40	4.85
Koch	2.45	4.30	4.55	3.90	5.10	5.05	2.60	4.15	4.65	4.40	4.75	4.95
multivariate	3.95	4.85	5.20	4.75	5.05	5.50	3.30	4.80	5.25	4.65	4.95	4.90

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	6.00	4.70	5.25	4.90	5.55	4.90	7.10	5.40	5.75	5.05	5.30	5.15
HF adj	6.15	4.55	5.25	4.90	5.55	4.95	7.35	5.35	5.65	5.00	5.45	5.15
KWF	5.40	6.25	5.90	7.15	7.80	7.85	5.15	6.25	8.35	7.20	9.20	9.70
vdWaerden	5.40	6.25	5.90	7.15	7.80	7.85	5.15	6.25	8.35	7.20	9.20	9.70
Koch	5.20	5.05	5.45	6.40	7.55	7.75	5.05	5.45	8.00	7.50	8.95	9.50
multivariate	4.70	4.60	4.90	4.40	5.30	4.60	5.10	3.85	5.00	4.75	5.05	4.95
	large design (4*6)											
parem F test	5.15	3.50	4.50	4.10	4.20	4.30	5.55	5.35	4.20	4.10	3.90	4.10
HF adj	4.70	3.05	4.40	3.85	3.95	4.20	4.55	5.05	4.00	4.00	3.90	4.05
KWF	5.45	6.30	11.40	11.10	14.20	15.50	5.30	6.70	11.00	12.40	15.15	16.70
vdWaerden	5.50	6.35	12.05	12.05	15.10	16.35	5.55	6.95	11.60	13.20	16.60	17.80
Koch	2.55	4.40	9.35	9.95	13.00	13.90	2.75	4.50	9.00	11.40	13.75	14.35
multivariate	3.20	2.90	4.05	3.85	4.15	4.15	3.55	3.75	3.95	4.05	3.45	3.90

1. 10. 2 interaction effect AB

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	6.45	6.15	6.00	6.35	6.30	5.90	14.90	13.45	21.60	20.70	22.25	21.25
HF adj	6.20	5.85	5.95	6.25	6.25	5.75	14.65	13.05	21.35	20.65	22.15	21.00
KWF	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
vdWaerden	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
Koch	3.40	4.90	4.50	6.00	5.55	5.05	3.75	6.45	9.80	9.65	10.10	9.90
multivariate	0.65	0.90	0.50	0.55	0.45	0.45	1.70	1.25	1.75	1.95	1.50	1.65
	large design (4*6)											
parem F test	9.55	8.40	7.80	7.65	8.50	8.35	34.90	29.95	41.30	39.00	41.05	40.55
HF adj	8.25	7.80	7.30	7.55	8.25	8.20	32.05	28.30	40.80	38.25	40.45	40.35
KWF	3.10	4.80	4.35	5.00	5.00	5.10	3.15	4.00	4.80	4.60	4.85	5.00
vdWaerden	3.20	4.75	4.35	5.00	5.10	4.95	3.15	4.30	4.85	4.70	4.70	4.80
Koch	1.35	4.70	5.35	5.15	6.55	6.60	4.00	9.20	12.85	13.70	14.95	14.45
multivariate	0.50	0.20	0.05	0.10	0.05	NA	0.95	0.30	1.00	0.45	0.50	0.25
	multivariate lognormal											
	small design (3*3)											
parem F test	6.30	5.75	5.95	6.10	5.80	6.25	15.00	13.15	19.95	19.60	21.75	21.65
HF adj	6.00	5.45	5.65	6.10	5.75	6.25	14.30	12.55	19.80	19.45	21.70	21.40
KWF	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
vdWaerden	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
Koch	3.40	4.55	4.60	5.95	5.40	5.40	3.70	6.50	9.40	9.25	9.60	9.50
multivariate	0.80	0.75	0.45	0.50	0.50	0.45	1.45	1.15	1.85	2.00	1.65	1.50
	large design (4*6)											
parem F test	8.70	8.00	7.10	7.10	8.60	8.50	32.50	29.70	40.60	39.20	40.85	40.50
HF adj	7.15	7.25	6.80	6.95	8.35	7.90	30.10	27.80	39.65	38.45	40.05	40.20
KWF	3.10	4.80	4.35	5.00	5.00	5.10	3.15	4.00	4.80	4.60	4.85	5.00
vdWaerden	3.20	4.75	4.35	5.00	5.10	4.95	3.15	4.30	4.85	4.70	4.70	4.80
Koch	1.30	4.40	5.30	4.90	6.65	6.45	3.80	8.95	12.25	13.55	14.10	14.10
multivariate	0.35	0.25	0.10	0.15	0.05	NA	0.80	0.30	0.70	0.55	0.30	0.25

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	7.65	5.40	6.15	6.00	5.95	6.60	14.75	12.95	19.90	18.40	21.15	20.10
HF adj	7.30	5.50	6.05	5.95	5.95	6.50	14.75	13.00	19.70	18.30	21.15	20.20
KWF	3.50	4.10	4.75	4.90	4.35	4.60	3.70	3.85	4.65	5.20	5.35	5.70
vdWaerden	3.40	4.05	4.70	4.95	4.25	4.60	3.70	3.90	4.70	5.35	5.55	5.55
Koch	3.50	4.40	5.00	5.75	5.45	4.70	4.25	6.70	9.40	8.85	10.00	9.55
multivariate	0.80	0.95	0.55	0.60	0.60	0.35	1.85	1.20	2.15	1.85	1.60	1.75
	large design (4*6)											
parem F test	8.80	7.70	7.30	7.55	7.40	8.65	33.25	29.05	40.20	37.75	39.90	38.55
HF adj	7.85	7.30	7.10	7.35	7.35	8.65	31.50	27.85	39.40	37.45	39.60	38.30
KWF	3.45	4.05	4.15	4.85	5.60	5.45	4.10	5.35	6.85	6.10	5.95	6.35
vdWaerden	3.35	4.05	4.40	4.85	5.60	5.25	4.45	5.85	6.80	6.05	6.25	6.60
Koch	1.40	4.20	5.85	5.45	6.75	6.65	3.90	9.85	14.25	14.60	15.60	16.20
multivariate	0.50	0.20	0.15	0.05	0.10	0.05	0.65	0.25	0.85	0.45	0.30	0.35
	multivariate exponential											
	small design (3*3)											
parem F test	5.20	5.50	5.65	5.65	5.65	5.50	12.95	11.75	17.60	18.70	20.15	19.95
HF adj	4.65	4.85	5.25	5.50	5.45	5.45	11.50	10.80	16.90	17.95	19.80	19.80
KWF	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
vdWaerden	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
Koch	3.00	4.50	4.65	5.90	5.05	4.90	3.45	5.50	8.45	7.55	8.60	8.10
multivariate	0.80	0.85	0.70	0.90	0.60	0.60	1.05	1.45	1.95	2.05	1.65	1.55
	large design (4*6)											
parem F test	7.10	6.85	6.80	6.75	9.10	8.10	29.60	27.40	38.05	37.40	39.70	39.95
HF adj	4.90	5.20	6.10	6.25	8.30	7.80	23.80	23.60	35.60	35.55	38.40	38.50
KWF	3.10	4.80	4.35	5.00	5.00	5.10	3.15	4.00	4.80	4.60	4.85	5.00
vdWaerden	3.20	4.75	4.35	5.00	5.10	4.95	3.15	4.30	4.85	4.70	4.70	4.80
Koch	1.60	4.40	5.50	4.95	6.00	6.15	3.70	7.85	10.80	11.80	11.75	12.30
multivariate	0.55	0.30	0.15	0.15	0.15	0.10	0.80	0.45	0.60	0.45	0.45	0.40

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	6.80	5.35	6.25	6.30	5.85	5.80	14.55	13.35	20.65	20.10	21.55	20.55
HF adj	6.65	5.30	6.15	6.25	5.80	5.85	14.00	13.00	20.40	19.80	21.45	20.60
KWF	4.30	4.95	6.05	7.20	7.70	8.35	3.40	4.55	6.25	6.50	8.10	8.15
vdWaerden	4.30	4.95	6.05	7.20	7.70	8.35	3.40	4.55	6.25	6.50	8.10	8.15
Koch	3.40	4.60	5.45	6.45	6.10	5.60	3.95	5.80	10.05	9.60	10.90	10.50
multivariate	0.65	0.95	0.50	0.40	0.60	0.45	1.50	1.00	2.15	1.95	1.50	1.85
	large design (4*6)											
parem F test	7.65	6.15	6.30	5.95	6.05	6.65	30.80	26.45	37.60	34.10	36.15	35.35
HF adj	6.75	5.70	6.20	5.75	5.85	6.55	28.60	25.35	37.15	33.70	35.40	35.05
KWF	4.90	9.35	11.00	13.95	16.95	18.70	7.50	9.70	13.80	14.05	17.40	17.75
vdWaerden	4.90	9.40	11.35	14.95	17.30	19.40	7.30	9.50	13.95	15.50	17.80	18.70
Koch	1.30	3.75	4.40	4.35	5.50	5.45	3.95	9.70	13.50	13.20	14.85	14.50
multivariate	1.25	0.80	0.45	0.70	0.25	0.50	2.00	1.50	2.00	2.10	0.95	1.20

1. 11. $\Sigma^{(i)} = c_i\Sigma^{(1)}$ with c_i =(1.0, 1.3, 1.6, 2.0) and r(c_i, n_i) ~ +0.8 combined with unequal correlations $r^{(i)}$ = (0.15, 0.6, 0.6, 0.15) with r($r^{(i)}$, n_i) ~ - 0.9

1. 11. 1 main effect B

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	6.95	5.10	4.90	4.50	5.30	5.20	5.80	4.65	4.85	4.35	5.40	5.70
HF adj	6.95	5.10	4.90	4.40	5.25	5.25	5.85	4.65	4.85	4.35	5.45	5.70
KWF	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
vdWaerden	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
Koch	4.90	4.25	4.80	4.15	5.10	5.65	4.45	4.80	4.75	4.70	5.25	5.20
multivariate	5.45	5.40	4.80	4.30	5.50	5.00	6.00	4.70	4.75	4.50	5.85	5.65
	large design (4*6)											
parem F test	5.75	4.40	5.30	4.40	4.95	5.15	3.70	5.40	5.10	5.00	4.80	6.20
HF adj	5.25	4.15	5.00	4.15	4.85	4.90	3.65	5.25	4.95	4.90	4.75	6.15
KWF	4.05	4.55	5.05	4.55	5.00	4.75	3.55	4.95	5.35	4.90	4.95	5.25
vdWaerden	4.20	4.70	5.15	4.45	5.00	4.70	3.55	4.60	5.00	4.80	4.70	5.30
Koch	2.85	4.15	4.75	4.30	5.05	4.35	2.30	3.85	5.00	4.80	4.30	5.25
multivariate	4.20	4.70	4.95	4.60	5.25	4.90	5.00	5.00	5.30	5.30	5.15	6.00
	multivariate lognormal											
	small design (3*3)											
parem F test	6.90	5.50	5.05	4.90	4.90	4.80	5.45	4.60	5.10	5.10	5.30	5.45
HF adj	6.80	5.35	4.80	4.80	4.85	4.85	5.60	4.45	5.15	5.05	5.30	5.30
KWF	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
vdWaerden	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
Koch	4.90	4.25	4.80	4.15	5.10	5.65	4.45	4.80	4.75	4.70	5.25	5.20
multivariate	5.45	5.35	4.75	4.40	5.80	5.20	5.55	4.70	5.10	5.55	5.95	5.55
	large design (4*6)											
parem F test	5.55	5.00	5.50	4.10	5.40	5.55	3.90	4.70	5.45	4.95	4.85	6.20
HF adj	4.80	4.30	5.15	3.90	5.00	5.40	3.15	4.25	5.00	4.85	4.75	5.95
KWF	4.05	4.55	5.05	4.55	5.00	4.75	3.55	4.95	5.35	4.90	4.95	5.25
vdWaerden	4.20	4.70	5.15	4.45	5.00	4.70	3.55	4.60	5.00	4.80	4.70	5.30
Koch	2.85	4.15	4.75	4.30	5.05	4.35	2.30	3.85	5.00	4.80	4.30	5.25
multivariate	4.65	4.55	5.35	4.40	4.95	5.00	5.30	4.95	5.55	4.80	5.55	6.25

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	6.90	5.70	4.90	4.15	5.40	5.30	5.65	4.70	5.30	4.70	5.15	5.25
HF adj	6.95	5.55	4.90	4.20	5.35	5.30	5.75	4.75	5.35	4.70	5.20	5.30
KWF	5.60	4.35	4.35	4.55	5.40	5.80	5.15	4.50	5.30	4.50	5.35	4.85
vdWaerden	5.45	4.30	4.30	4.60	5.45	5.80	5.05	4.55	5.30	4.50	5.40	4.80
Koch	4.30	4.25	4.35	4.90	5.20	5.55	4.65	4.35	4.75	4.70	5.30	4.75
multivariate	5.65	5.90	5.10	4.05	4.80	5.35	5.35	4.70	5.15	5.15	5.65	5.35
	large design (4*6)											
parem F test	5.45	4.95	5.25	4.80	5.30	4.80	3.60	4.85	5.85	5.05	4.65	6.25
HF adj	5.30	4.50	5.05	4.75	5.30	4.75	3.55	4.75	5.80	5.15	4.65	6.25
KWF	4.70	4.55	5.85	4.95	4.95	5.25	3.90	5.15	5.25	5.25	4.65	5.60
vdWaerden	4.60	4.45	5.65	5.10	4.95	5.40	4.00	5.20	5.40	5.25	4.60	5.80
Koch	2.40	4.05	5.05	4.85	4.75	4.80	2.75	4.20	5.00	4.30	4.55	5.15
multivariate	4.60	4.65	5.45	4.95	5.30	4.55	4.95	5.40	6.05	5.45	4.75	6.35
	multivariate exponential											
	small design (3*3)											
parem F test	5.80	4.90	4.70	5.20	4.95	4.85	5.05	3.90	5.15	4.65	5.60	5.20
HF adj	5.15	4.45	4.25	5.00	4.55	4.70	4.30	3.60	4.85	4.50	5.25	5.00
KWF	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
vdWaerden	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
Koch	4.90	4.25	4.80	4.15	5.10	5.65	4.45	4.80	4.75	4.70	5.25	5.20
multivariate	4.70	4.85	4.35	4.75	5.45	5.00	5.35	4.45	5.25	5.55	6.30	4.80
	large design (4*6)											
parem F test	4.90	4.55	5.05	4.40	4.75	5.55	3.65	4.60	4.90	5.10	4.95	5.55
HF adj	3.35	3.20	4.20	3.95	4.20	5.35	2.40	3.55	4.10	4.65	4.65	5.15
KWF	4.05	4.55	5.05	4.55	5.00	4.75	3.55	4.95	5.35	4.90	4.95	5.25
vdWaerden	4.20	4.70	5.15	4.45	5.00	4.70	3.55	4.60	5.00	4.80	4.70	5.30
Koch	2.85	4.15	4.75	4.30	5.05	4.35	2.30	3.85	5.00	4.80	4.30	5.25
multivariate	4.70	4.85	5.55	5.00	5.05	6.15	5.50	5.55	5.85	5.45	5.80	5.70

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	6.60	5.75	4.90	4.70	4.80	5.10	5.35	4.55	5.35	4.80	5.45	5.35
HF adj	6.35	5.60	5.00	4.50	4.80	5.10	5.60	4.60	5.40	4.80	5.50	5.40
KWF	5.05	4.85	4.20	4.45	5.60	5.05	4.45	4.75	4.75	4.95	5.40	5.15
vdWaerden	5.05	4.85	4.20	4.45	5.60	5.05	4.45	4.75	4.75	4.95	5.40	5.15
Koch	4.90	4.60	4.15	4.30	5.40	5.30	4.75	4.10	4.60	4.95	5.05	5.25
multivariate	5.65	5.80	5.20	4.55	5.05	5.60	5.25	4.90	5.15	4.75	5.60	5.50
	large design (4*6)											
parem F test	6.75	5.75	6.65	5.95	7.15	5.75	4.55	5.25	6.20	6.00	5.65	7.70
HF adj	6.20	5.35	6.45	5.95	7.00	5.75	4.35	5.10	6.35	6.00	5.70	7.70
KWF	4.55	6.45	10.30	11.55	12.30	13.85	4.90	6.10	9.05	10.45	12.45	13.30
vdWaerden	4.65	6.85	10.65	12.40	13.25	14.95	4.95	6.20	9.75	11.25	13.70	14.25
Koch	2.05	5.20	9.05	9.95	11.85	12.40	2.55	4.95	7.80	9.05	11.30	11.90
multivariate	4.55	6.20	6.30	5.90	6.80	5.70	5.30	5.65	6.20	6.55	5.60	7.70

1. 11. 2 interaction effect AB

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	6.15	6.00	6.10	5.45	6.50	6.10	3.15	3.40	1.75	2.75	2.30	2.40
HF adj	5.85	5.90	6.15	5.45	6.35	6.15	3.05	3.30	1.80	2.65	2.30	2.40
KWF	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
vdWaerden	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
Koch	3.75	5.30	5.70	5.90	6.10	6.05	1.85	2.75	2.50	2.25	2.40	2.35
multivariate	12.75	11.30	11.45	11.40	11.95	12.10	8.00	9.55	7.10	8.60	7.50	6.65
	large design (4*6)											
parem F test	7.30	6.05	7.75	7.80	8.75	7.25	0.45	0.60	0.90	0.75	0.75	0.60
HF adj	6.80	5.65	7.55	7.65	8.40	7.10	0.35	0.65	0.90	0.75	0.75	0.60
KWF	3.30	4.15	4.60	5.05	4.55	5.85	2.75	4.40	4.55	4.90	4.30	4.25
vdWaerden	3.25	4.00	4.55	5.10	4.25	5.90	2.75	4.50	4.70	5.00	4.10	3.90
Koch	1.80	3.60	5.00	5.30	6.25	6.75	0.40	0.80	1.35	1.05	1.45	1.15
multivariate	15.95	16.45	17.10	17.40	17.20	15.60	8.55	8.75	7.95	10.30	9.75	7.10
	multivariate lognormal											
	small design (3*3)											
parem F test	6.10	6.45	6.05	5.55	6.45	5.65	3.35	2.85	1.90	2.55	2.10	2.30
HF adj	5.45	6.30	6.05	5.40	6.55	5.60	3.25	2.80	1.85	2.50	2.10	2.30
KWF	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
vdWaerden	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
Koch	3.75	5.45	5.70	5.90	6.05	5.75	1.65	2.65	2.60	2.55	2.45	2.30
multivariate	11.85	11.70	12.40	11.95	12.30	11.40	8.15	9.35	7.05	8.30	7.20	6.25
	large design (4*6)											
parem F test	7.10	5.25	7.80	7.45	8.90	7.40	0.45	0.60	1.00	0.95	0.60	0.65
HF adj	5.80	4.85	7.35	7.05	8.65	7.35	0.30	0.60	0.75	0.90	0.60	0.65
KWF	3.30	4.15	4.60	5.05	4.55	5.85	2.75	4.40	4.55	4.90	4.30	4.25
vdWaerden	3.25	4.00	4.55	5.10	4.25	5.90	2.75	4.50	4.70	5.00	4.10	3.90
Koch	1.70	3.25	5.05	5.80	6.45	6.50	0.40	0.95	1.25	1.35	1.50	1.30
multivariate	15.00	16.05	16.30	16.95	18.10	16.00	8.15	8.75	8.10	10.35	9.85	7.00

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	5.80	6.25	6.00	5.80	6.35	5.65	3.30	3.75	1.75	2.65	2.40	2.50
HF adj	5.70	6.30	5.85	5.65	6.35	5.55	3.40	3.85	1.80	2.65	2.40	2.50
KWF	3.45	3.85	4.50	5.15	4.60	4.90	2.70	2.85	2.70	3.25	3.80	3.55
vdWaerden	3.50	3.80	4.50	5.20	4.55	4.95	2.65	2.80	2.70	3.15	3.75	3.50
Koch	3.35	5.20	5.90	6.45	6.00	6.15	1.70	2.95	2.00	2.40	2.70	2.90
multivariate	12.55	11.55	11.35	11.95	12.05	11.65	8.15	9.90	7.65	8.25	7.35	7.05
	large design (4*6)											
parem F test	7.45	6.10	7.15	7.85	7.80	7.25	0.60	0.80	1.05	0.80	0.80	0.45
HF adj	6.80	5.90	6.95	7.70	7.75	7.25	0.60	0.55	1.00	0.80	0.80	0.45
KWF	3.50	3.50	4.50	4.85	4.85	6.60	2.30	3.15	3.50	3.50	3.70	3.85
vdWaerden	3.55	3.50	4.35	5.10	4.90	6.60	2.05	3.20	3.50	2.90	3.30	3.75
Koch	1.75	3.45	5.05	5.95	6.40	6.75	0.20	0.90	1.40	1.35	1.50	1.30
multivariate	15.80	16.10	16.50	17.55	17.15	15.30	9.55	9.10	8.15	9.80	9.70	7.10
	multivariate exponential											
	small design (3*3)											
parem F test	5.20	6.00	6.15	5.55	6.70	5.80	2.75	3.05	1.85	2.35	2.05	1.80
HF adj	4.30	5.50	5.70	5.35	6.25	5.50	2.60	2.65	1.80	2.20	1.95	1.80
KWF	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
vdWaerden	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
Koch	3.15	5.15	5.35	5.70	5.90	5.30	1.70	2.85	2.25	2.85	2.95	2.20
multivariate	10.25	11.10	11.70	11.25	12.80	11.35	7.10	9.15	6.25	7.35	7.20	6.75
	large design (4*6)											
parem F test	6.95	4.95	7.00	6.80	8.65	7.00	0.50	0.70	0.80	1.10	0.90	0.70
HF adj	4.75	3.90	6.30	6.40	8.15	6.40	0.35	0.45	0.65	0.90	0.80	0.65
KWF	3.30	4.15	4.60	5.05	4.55	5.85	2.75	4.40	4.55	4.90	4.30	4.25
vdWaerden	3.25	4.00	4.55	5.10	4.25	5.90	2.75	4.50	4.70	5.00	4.10	3.90
Koch	1.60	2.90	4.90	5.55	5.30	5.85	0.45	1.25	1.70	1.50	1.65	2.00
multivariate	11.85	14.40	15.95	16.10	17.70	16.55	7.95	9.00	8.10	8.70	9.35	7.20

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	6.30	6.35	6.20	5.90	6.30	5.95	3.00	3.10	1.90	2.60	2.10	2.75
HF adj	6.45	6.30	6.15	5.85	6.45	5.95	3.10	2.90	1.90	2.55	2.10	2.75
KWF	3.95	3.40	4.40	4.60	4.25	4.95	3.25	3.55	3.95	4.60	4.85	4.50
vdWaerden	3.95	3.40	4.40	4.60	4.25	4.95	3.25	3.55	3.95	4.60	4.85	4.50
Koch	3.20	5.25	5.10	5.70	5.35	5.20	1.80	2.20	1.60	2.45	2.25	2.35
multivariate	11.90	11.75	11.20	11.80	11.85	11.70	8.25	9.60	7.25	8.70	7.30	7.25
	large design (4*6)											
parem F test	9.80	8.25	9.70	10.40	10.05	9.45	0.90	1.15	1.30	1.35	1.35	0.80
HF adj	8.70	7.90	9.60	10.30	9.95	9.40	0.90	1.15	1.35	1.35	1.25	0.70
KWF	4.90	7.35	12.15	15.00	16.85	18.85	2.75	6.95	11.10	14.35	16.80	15.75
vdWaerden	5.05	7.75	12.60	15.80	16.90	19.05	2.45	7.00	11.10	14.55	17.05	16.15
Koch	2.15	5.80	9.35	9.95	11.00	12.35	0.25	1.50	2.55	3.00	2.85	2.85
multivariate	8.15	9.20	11.05	11.95	11.50	11.00	5.75	5.50	6.75	6.30	6.40	5.15

1. 12. $\Sigma^{(i)} = c_i\Sigma^{(1)}$ with c_i =(1.0, 1.3, 1.6, 2.0) and r(c_i, n_i) ~ +0.8 combined with unequal correlations $r^{(i)}$ = (0.6, 0.15, 0.15, 0.6) with r($r^{(i)}$, n_i) ~ +0.9

1. 12. 1 main effect B

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	6.35	5.70	4.90	4.30	5.60	5.40	5.80	4.55	4.55	4.65	5.25	5.75
HF adj	6.40	5.65	4.90	4.35	5.60	5.40	5.90	4.55	4.60	4.60	5.25	5.70
KWF	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
vdWaerden	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
Koch	4.90	4.25	4.80	4.15	5.10	5.65	4.45	4.80	4.75	4.70	5.25	5.20
multivariate	5.70	5.20	4.55	4.60	5.75	5.15	5.85	4.55	4.80	5.00	6.20	5.45
	large design (4*6)											
parem F test	5.50	4.45	5.10	4.65	4.85	4.90	4.60	4.50	5.00	5.15	5.00	5.70
HF adj	5.50	4.45	5.00	4.80	4.75	4.85	4.40	4.55	5.00	5.05	5.00	5.75
KWF	4.15	4.80	5.50	4.15	4.95	4.90	4.10	4.70	4.20	4.45	5.20	4.85
vdWaerden	4.00	4.55	5.10	4.30	5.15	5.10	4.15	4.55	4.25	4.35	5.40	4.85
Koch	2.45	4.30	4.55	3.90	5.10	5.05	2.60	4.15	4.65	4.40	4.75	4.95
multivariate	4.40	3.85	5.30	4.65	4.65	4.85	4.85	4.75	5.20	4.90	4.70	5.35
	multivariate lognormal											
	small design (3*3)											
parem F test	5.60	5.40	4.85	4.10	5.35	6.25	5.45	4.50	4.75	4.75	5.75	5.15
HF adj	5.85	5.50	4.75	4.05	5.20	6.25	5.30	4.35	4.75	4.60	5.70	5.15
KWF	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
vdWaerden	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
Koch	4.90	4.25	4.80	4.15	5.10	5.65	4.45	4.80	4.75	4.70	5.25	5.20
multivariate	5.95	5.35	4.90	4.45	5.35	5.60	6.00	4.60	4.80	4.90	5.60	5.15
	large design (4*6)											
parem F test	5.15	4.95	5.20	4.40	4.55	5.65	4.80	4.75	5.45	4.75	5.05	5.10
HF adj	4.75	4.35	4.95	4.30	4.45	5.50	4.40	4.45	5.25	4.50	4.95	5.05
KWF	4.15	4.80	5.50	4.15	4.95	4.90	4.10	4.70	4.20	4.45	5.20	4.85
vdWaerden	4.00	4.55	5.10	4.30	5.15	5.10	4.15	4.55	4.25	4.35	5.40	4.85
Koch	2.45	4.30	4.55	3.90	5.10	5.05	2.60	4.15	4.65	4.40	4.75	4.95
multivariate	4.50	4.30	5.05	4.60	4.40	5.30	4.25	4.85	4.70	5.20	5.00	5.05

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	5.95	5.25	5.05	4.45	4.95	5.50	5.05	4.75	4.60	5.30	5.25	5.60
HF adj	5.85	5.15	5.10	4.35	4.90	5.55	5.35	4.70	4.65	5.10	5.35	5.60
KWF	5.35	4.75	4.80	4.70	4.90	5.15	5.10	4.80	4.70	4.90	5.35	5.05
vdWaerden	5.15	4.65	5.00	4.70	4.90	5.30	5.05	4.75	4.80	4.90	5.35	5.10
Koch	4.90	3.95	4.80	4.40	4.95	5.15	4.85	4.50	4.40	4.80	5.60	5.25
multivariate	6.20	4.90	4.80	4.50	5.00	5.50	5.35	4.85	5.05	5.05	5.60	5.45
	large design (4*6)											
parem F test	4.80	3.95	5.70	4.70	4.90	4.75	4.40	5.25	5.40	5.10	5.10	4.65
HF adj	4.85	3.90	5.65	4.65	4.85	4.70	4.20	5.20	5.35	5.05	5.00	4.60
KWF	3.70	4.00	5.70	4.70	5.00	4.90	4.05	4.90	5.40	5.65	5.30	4.35
vdWaerden	3.60	4.00	5.70	4.85	5.00	5.15	4.25	4.85	5.50	5.60	5.30	4.65
Koch	2.45	3.55	5.00	4.05	4.60	4.95	2.75	4.00	5.15	5.65	4.80	4.50
multivariate	3.90	3.75	5.60	4.75	4.65	4.55	4.65	5.20	4.70	5.05	4.65	5.35
	multivariate exponential											
	small design (3*3)											
parem F test	4.50	5.20	4.90	4.50	5.10	5.95	4.40	4.55	4.95	4.65	5.15	5.60
HF adj	4.00	4.75	4.65	4.30	4.95	5.80	3.65	3.70	4.70	4.15	5.15	5.45
KWF	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
vdWaerden	5.45	5.30	4.95	4.25	5.55	5.45	4.70	5.30	5.00	4.90	5.65	4.95
Koch	4.90	4.25	4.80	4.15	5.10	5.65	4.45	4.80	4.75	4.70	5.25	5.20
multivariate	5.10	5.35	4.50	4.85	4.95	5.85	5.10	4.55	5.05	4.55	5.25	5.10
	large design (4*6)											
parem F test	4.65	4.85	5.05	4.45	4.95	5.25	4.60	4.50	5.20	4.75	5.05	4.45
HF adj	3.20	3.65	4.55	3.90	4.45	5.05	2.90	3.65	4.40	4.20	4.65	4.15
KWF	4.15	4.80	5.50	4.15	4.95	4.90	4.10	4.70	4.20	4.45	5.20	4.85
vdWaerden	4.00	4.55	5.10	4.30	5.15	5.10	4.15	4.55	4.25	4.35	5.40	4.85
Koch	2.45	4.30	4.55	3.90	5.10	5.05	2.60	4.15	4.65	4.40	4.75	4.95
multivariate	4.75	4.90	5.45	4.90	5.00	5.25	4.30	4.85	4.90	5.05	4.50	4.45

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	6.20	5.15	5.00	4.60	5.55	5.40	5.20	4.75	4.90	5.00	5.50	5.80
HF adj	6.25	4.90	5.05	4.45	5.50	5.45	5.40	4.80	4.75	5.05	5.50	5.80
KWF	5.40	6.25	5.90	7.15	7.80	7.85	5.15	6.25	8.35	7.20	9.20	9.70
vdWaerden	5.40	6.25	5.90	7.15	7.80	7.85	5.15	6.25	8.35	7.20	9.20	9.70
Koch	5.20	5.05	5.45	6.40	7.55	7.75	5.05	5.45	8.00	7.50	8.95	9.50
multivariate	6.00	5.05	4.55	4.40	5.25	5.10	5.60	4.75	5.30	5.40	5.85	5.75
	large design (4*6)											
parem F test	3.65	2.90	4.30	3.30	3.75	3.20	3.10	4.10	3.55	3.70	4.15	4.05
HF adj	3.70	2.85	4.20	3.20	3.70	3.20	3.10	3.90	3.50	3.65	4.15	3.95
KWF	5.45	6.30	11.40	11.10	14.20	15.50	5.30	6.70	11.00	12.40	15.15	16.70
vdWaerden	5.50	6.35	12.05	12.05	15.10	16.35	5.55	6.95	11.60	13.20	16.60	17.80
Koch	2.55	4.40	9.35	9.95	13.00	13.90	2.75	4.50	9.00	11.40	13.75	14.35
multivariate	4.50	3.55	4.50	3.60	3.60	3.60	4.85	4.65	3.85	3.50	3.80	4.15

1. 12. 2 interaction effect AB

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate normal											
	small design (3*3)											
parem F test	5.45	5.30	5.35	4.55	5.45	5.10	4.65	4.70	3.20	3.85	3.65	3.80
HF adj	5.25	5.30	5.30	4.55	5.40	5.10	4.55	4.60	3.20	3.90	3.65	3.75
KWF	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
vdWaerden	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
Koch	2.95	4.70	4.75	4.80	4.85	5.30	2.30	3.65	3.50	3.75	4.05	3.85
multivariate	7.35	7.35	8.15	7.55	7.85	7.10	6.70	7.65	6.55	7.55	6.65	5.75
	large design (4*6)											
parem F test	6.10	5.55	4.85	6.10	7.10	6.60	7.70	6.75	5.10	4.85	4.75	5.10
HF adj	5.95	5.35	4.85	6.05	7.00	6.55	7.50	6.60	4.90	4.80	4.75	5.10
KWF	3.10	4.80	4.35	5.00	5.00	5.10	3.15	4.00	4.80	4.60	4.85	5.00
vdWaerden	3.20	4.75	4.35	5.00	5.10	4.95	3.15	4.30	4.85	4.70	4.70	4.80
Koch	1.55	3.45	4.10	4.95	5.10	6.15	1.35	4.00	3.80	4.65	4.00	3.85
multivariate	3.15	2.85	2.50	3.10	3.05	2.80	3.45	2.50	3.05	3.35	2.95	2.05
	multivariate lognormal											
	small design (3*3)											
parem F test	5.40	4.80	5.10	4.55	5.05	5.00	4.50	4.10	2.85	3.25	3.75	3.50
HF adj	5.05	4.75	5.00	4.55	5.10	5.00	4.25	3.85	2.90	3.35	3.65	3.45
KWF	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
vdWaerden	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
Koch	2.55	4.40	4.60	4.95	4.65	5.15	2.45	3.45	3.35	3.90	4.20	4.20
multivariate	7.15	7.10	7.85	8.05	7.65	7.30	6.30	7.75	6.35	7.00	6.45	5.85
	large design (4*6)											
parem F test	5.65	5.65	5.20	6.30	6.50	6.60	8.35	6.65	5.00	5.00	4.95	5.30
HF adj	5.15	5.25	5.00	6.15	6.40	6.50	7.50	6.10	4.80	4.90	5.05	5.15
KWF	3.10	4.80	4.35	5.00	5.00	5.10	3.15	4.00	4.80	4.60	4.85	5.00
vdWaerden	3.20	4.75	4.35	5.00	5.10	4.95	3.15	4.30	4.85	4.70	4.70	4.80
Koch	1.30	3.40	4.30	4.65	5.45	5.90	1.45	4.00	4.05	4.65	4.55	3.95
multivariate	2.80	2.45	2.80	3.15	2.90	3.00	3.05	2.75	3.20	3.15	3.10	1.75

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate uniform											
	small design (3*3)											
parem F test	5.55	4.75	5.35	5.75	5.60	5.05	4.20	4.65	3.10	3.00	3.25	3.70
HF adj	5.35	4.70	5.30	5.75	5.40	5.05	4.15	4.65	3.20	2.95	3.40	3.70
KWF	4.05	4.10	4.60	4.65	4.05	4.60	3.20	3.30	4.00	4.10	4.90	5.10
vdWaerden	4.00	4.05	4.70	4.80	4.10	4.65	3.20	3.35	4.00	4.10	4.80	5.00
Koch	2.85	3.95	4.60	4.75	4.70	4.80	2.35	3.50	3.60	3.15	4.15	4.25
multivariate	7.05	7.55	7.90	7.85	7.85	8.25	6.95	8.40	6.50	8.10	6.80	6.70
	large design (4*6)											
parem F test	5.95	5.95	5.60	5.65	6.10	6.55	6.55	6.85	4.85	4.30	4.05	5.00
HF adj	5.55	6.10	5.55	5.50	6.05	6.50	5.80	6.80	4.90	4.30	4.05	4.95
KWF	2.95	4.25	3.95	5.40	5.50	5.35	3.30	4.15	4.65	5.00	4.50	5.65
vdWaerden	3.10	4.15	4.00	5.25	5.50	5.25	3.35	4.45	4.50	5.00	4.40	5.45
Koch	1.55	3.50	4.60	5.45	5.25	6.05	1.15	4.20	4.15	4.50	4.30	4.60
multivariate	3.15	2.85	2.60	3.35	3.65	3.20	3.50	3.00	3.15	3.80	2.70	2.25
	multivariate exponential											
	small design (3*3)											
parem F test	4.10	4.10	5.50	4.95	4.75	5.30	3.75	3.90	3.20	3.45	3.85	3.55
HF adj	3.55	3.70	5.05	4.80	4.65	5.20	3.00	3.55	3.00	3.40	3.75	3.30
KWF	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
vdWaerden	3.85	4.15	4.30	5.45	4.40	4.60	3.00	3.60	4.60	4.45	4.75	5.40
Koch	2.55	4.00	4.65	5.10	4.60	5.25	2.65	3.20	3.75	3.80	4.30	4.70
multivariate	5.85	6.25	7.00	8.20	6.75	8.15	4.85	6.75	5.70	6.65	6.80	5.75
	large design (4*6)											
parem F test	5.40	5.25	5.35	5.95	6.30	7.15	9.30	6.60	4.70	5.20	4.95	5.25
HF adj	3.65	4.15	4.95	5.45	6.15	6.95	6.85	5.55	4.30	4.55	4.35	5.20
KWF	3.10	4.80	4.35	5.00	5.00	5.10	3.15	4.00	4.80	4.60	4.85	5.00
vdWaerden	3.20	4.75	4.35	5.00	5.10	4.95	3.15	4.30	4.85	4.70	4.70	4.80
Koch	1.55	3.30	4.05	5.20	5.00	5.80	1.60	3.70	4.30	4.85	4.60	4.45
multivariate	1.95	2.30	2.90	2.95	3.45	3.35	2.30	2.45	2.90	3.00	3.30	2.20

	equal cell counts						unequal cell counts					
method	5	10	20	30	40	50	5	10	20	30	40	50
	multivariate mixed skewed											
	small design (3*3)											
parem F test	5.10	4.40	5.45	5.10	5.50	4.70	4.35	4.50	3.00	3.45	3.55	3.55
HF adj	4.70	4.50	5.65	5.05	5.60	4.70	4.25	4.50	3.00	3.55	3.55	3.60
KWF	4.30	4.95	6.05	7.20	7.70	8.35	3.40	4.55	6.25	6.50	8.10	8.15
vdWaerden	4.30	4.95	6.05	7.20	7.70	8.35	3.40	4.55	6.25	6.50	8.10	8.15
Koch	2.85	4.20	4.90	5.50	5.55	5.35	2.20	3.65	4.05	4.20	4.60	4.65
multivariate	6.35	7.45	7.90	7.15	7.75	7.55	6.75	8.45	6.40	7.70	7.05	6.85
	large design (4*6)											
parem F test	3.75	3.20	3.00	3.05	3.55	3.85	4.05	4.45	2.95	2.40	2.40	2.10
HF adj	3.40	3.35	3.00	3.10	3.60	3.75	4.00	4.40	2.90	2.50	2.40	2.05
KWF	4.90	9.35	11.00	13.95	16.95	18.70	7.50	9.70	13.80	14.05	17.40	17.75
vdWaerden	4.90	9.40	11.35	14.95	17.30	19.40	7.30	9.50	13.95	15.50	17.80	18.70
Koch	1.15	3.25	3.75	4.70	5.35	6.35	1.55	4.65	4.40	5.05	4.80	5.25
multivariate	7.45	7.50	6.50	7.40	8.05	7.20	7.10	6.85	7.00	6.75	4.90	5.45