

## التحليل العاملي المعكوس Inverted Factor

يعود الفضل إلى استخدام هذا الأسلوب إلى رايوند كاتل Remond Kahle ١٩٤٦، وتهدف هذه الطريقة إلى دراسة فرد واحد من خلال فترات زمنية ممتدة وفي ظروف متباينة.

وتختلف هذه الطريقة عن طرق التحليل العاملي التقليدية في أنها لا تقوم على عينة من الأفراد بل على عينة من الظروف الزمنية بالنسبة لفرد واحد فقط. كما ان الارتباطات في هذه الطريقة تكون بين الأفراد في حين أن الطريقة التقليدية للارتباطات تكون بين المتغيرات.

ولكن هذا الأسلوب يجب أن يأخذ بحذر شديد نظرا لصعوبة استخدامه والشروط الواجب توافرها للحصول على نتائج صحيحة.

### ملحوظة :

يجب استخدام أسلوب التدوير لأنه الأسلوب الذي يتوافق بدقة مع استخدام التحليل العاملي المعكوس.

ومن خلال المثال التالي يمكن توضيح هذه الفكرة.

### جدول (٥٤)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	VA																			
1	4	2	3	3	3	3	3	2	3	4	3	2	2	4	3	3	3	2	3	4
2	2	4	3	2	4	3	2	3	3	2	4	3	3	3	4	2	3	4	4	3
3	2	3	1	1	2	3	3	2	1	2	3	2	1	2	1	2	3	3	1	2
4	2	1	2	1	4	4	1	2	1	2	3	3	2	1	4	1	4	1	2	3
5	4	2	3	2	4	4	4	1	2	3	3	3	2	1	4	1	1	4	1	3
6	3	2	3	2	1	4	1	4	1	2	3	2	1	4	1	4	1	2	2	3
7	4	2	4	1	4	1	4	1	2	3	3	3	2	1	4	1	2	3	2	1
8	2	3	2	3	2	4	1	2	1	4	2	3	3	2	1	4	2	1	3	4
9	4	1	4	1	2	3	3	2	3	2	3	2	4	1	2	3	2	4	1	2
10	4	2	1	4	2	3	3	3	2	3	2	3	2	3	4	1	2	3	3	1

جدول (٥٥)  
الإحصاء الوصفي

Descriptive Statistics (wmc.sta)							
Variable	Valid N	Mean	Median	Minimum	Maximum	Std.Dev.	Skewness
A	10	3.100000	4.000000	2.000000	4.000000	.994429	-.23728
VAR2	10	2.200000	2.000000	1.000000	4.000000	.918937	.60138
VAR3	10	2.600000	3.000000	1.000000	4.000000	1.074968	-.32201
VAR4	10	2.000000	2.000000	1.000000	4.000000	1.054093	.71151
VAR5	10	2.800000	3.500000	1.000000	4.000000	1.135292	-.09112
VAR6	10	3.200000	3.500000	1.000000	4.000000	.918937	-1.54641
VAR7	10	2.500000	3.000000	1.000000	4.000000	1.178511	-.25456
VAR8	10	2.200000	2.000000	1.000000	4.000000	.918937	.60138
VAR9	10	1.900000	2.000000	1.000000	3.000000	.875595	.22345
VAR10	10	2.700000	3.000000	2.000000	4.000000	.823273	.68698
VAR11	10	2.900000	3.000000	2.000000	4.000000	.567646	-.09112
VAR12	10	2.600000	3.000000	2.000000	3.000000	.516398	-.48412
VAR13	10	2.200000	2.000000	1.000000	4.000000	.918937	.60138
VAR14	10	2.200000	2.500000	1.000000	4.000000	1.229273	.43067
VAR15	10	2.800000	4.000000	1.000000	4.000000	1.398412	-.47538
VAR16	10	2.200000	2.500000	1.000000	4.000000	1.229273	.43067
VAR17	10	2.300000	2.500000	1.000000	4.000000	.948683	.23424
VAR18	10	2.700000	3.000000	1.000000	4.000000	1.159502	-.34212
VAR19	10	2.200000	2.500000	1.000000	4.000000	1.032796	.27232
VAR20	10	2.700000	3.000000	1.000000	4.000000	.948683	-.23424

جدول (٥٦)

مصفوفة البواقي

STAT.		Residual Correlations (wmc.sta)										
FACTOR		Extraction: Principal components										
ANALYSIS		(Marked residuals are > .100000)										
Variable	A	VAR2	VAR3	VAR4	VAR5	VAR6	VAR7	VAR8	VAR9	VAR10	VAR11	
A	.03	.01	.01	-.01	-.00	-.02	-.02	.01	-.02	-.01	-.00	
VAR2	.01	.02	-.01	-.00	-.00	.02	.01	-.01	-.02	-.00	-.00	
VAR3	.01	-.01	.19	-.03	.00	-.12*	-.09	.08	-.11*	-.01	-.02	
VAR4	-.01	-.00	-.03	.04	-.00	.02	.02	-.02	.02	-.01	.01	
VAR5	-.00	-.00	.00	-.00	.04	-.00	-.00	.01	-.00	-.00	-.01	
VAR6	-.02	.02	-.12*	.02	-.00	.13	.08	-.08	.09	.01	.02	
VAR7	-.02	.01	-.09	.02	-.00	.08	.09	-.04	.06	-.00	.01	
VAR8	.01	-.01	.08	-.02	.01	-.08	-.04	.08	-.06	.01	-.02	
VAR9	-.02	.02	-.11*	.02	-.00	.09	.06	-.06	.10	.00	.01	
VAR10	-.01	-.00	-.01	-.01	-.00	.01	-.00	.01	.00	.03	.01	
VAR11	-.30	-.00	-.02	.01	-.01	.02	.01	-.02	.01	.01	.03	
VAR12	.02	-.02	.12*	-.03	-.01	-.10*	-.07	.07	-.08	-.01	-.02	
VAR13	-.01	.01	-.08	.02	.00	.06	.05	-.04	.04	.00	.01	
VAR14	.00	-.01	.03	-.01	.00	-.02	-.02	.01	-.02	-.00	-.01	
VAR15	.00	.00	.03	-.01	-.01	-.03	-.02	.02	-.03	-.00	-.01	
VAR16	.00	-.00	.02	-.01	.01	-.02	-.01	.01	-.02	-.00	.00	
VAR17	-.01	.02	-.11*	.03	-.01	.10*	.07	-.06	.07	.01	.01	
VAR18	-.02	.00	-.11*	.02	-.00	.09	.05	-.06	.07	.01	.01	
VAR19	.02	-.02	.09	-.02	-.00	-.07	-.05	.05	-.07	-.01	-.02	
VAR20	-.02	.02	-.11*	.01	-.01	.08	.07	-.06	.07	-.00	.02	

STAT.		Residual Correlations (wmc.sta)									
FACTOR		Extraction: Principal components									
ANALYSIS		(Marked residuals are > .100000)									
Variable	VAR12	VAR13	VAR14	VAR15	VAR16	VAR17	VAR18	VAR19	VAR20		
A	.02	-.01	.00	.00	.00	-.01	-.02	.02	-.02		
VAR2	-.02	.01	-.01	.00	-.00	.02	.00	-.02	.02		
VAR3	.12*	-.08	.03	.03	.02	-.11*	-.11*	.09	-.11*		
VAR4	-.03	.02	-.01	-.01	-.01	.03	.02	-.02	.01		
VAR5	-.01	.00	.00	-.01	.01	-.01	-.00	-.00	-.01		
VAR6	-.10*	.06	-.02	-.03	-.02	.10*	.09	-.07	.08		
VAR7	-.07	.05	-.02	-.02	-.01	.07	.05	-.05	.07		
VAR8	.07	-.04	.01	.02	.01	-.06	-.06	.05	-.06		
VAR9	-.08	.04	-.02	-.03	-.02	.07	.07	-.07	.07		
VAR10	-.01	.00	-.00	-.00	-.00	.01	.01	-.01	-.00		
VAR11	-.02	.01	-.01	-.01	.00	.01	.01	-.02	.02		
VAR12	.12	-.06	.03	.02	.02	-.09	-.08	.07	-.09		
VAR13	-.06	.05	-.00	-.01	-.02	.05	.04	-.05	.05		
VAR14	.03	-.00	.04	.01	-.00	-.02	-.02	.01	-.02		
VAR15	.02	-.01	.01	.04	.01	-.03	-.02	.02	-.03		
VAR16	.02	-.02	-.00	.01	.04	-.01	-.01	.01	-.02		
VAR17	-.09	.05	-.02	-.03	-.01	.11	.09	-.08	.08		
VAR18	-.08	.04	-.02	-.02	-.01	.09	.10	-.06	.08		
VAR19	.07	-.05	.01	.02	.01	-.08	-.06	.09	-.07		
VAR20	-.09	.05	-.02	-.03	-.02	.08	.08	-.07	.11		

جدول (٥٧)

مصفوفة الارتباط

STAT.		Correlations (wmc.sta)									
BASIC		Marked correlations are significant at p < .05000									
STATS		N=9 (Casewise deletion of missing data)									
Variable	A	VAR2	VAR3	VAR4	VAR5	VAR6	VAR7	VAR8	VAR9	VAR10	VAR11
A	1.00	-.51	.77*	-.00	.11	-.39	.71*	-.40	.54	.29	.00
VAR2	-.51	1.00	-.34	.38	.02	-.06	-.09	.25	.03	.10	.26
VAR3	.77*	-.34	1.00	-.07	.20	-.47	.40	-.11	.66	.05	.26
VAR4	-.00	.38	-.07	1.00	-.16	.38	-.26	.20	.13	.75*	-.30
VAR5	.11	.02	.20	-.16	1.00	-.31	.39	-.56	.33	.08	.43
VAR6	-.39	-.06	-.47	.38	-.31	1.00	-.61	.39	-.39	-.05	-.26
VAR7	.71*	-.09	.40	-.26	.39	-.61	1.00	-.70*	.48	.16	.20
VAR8	-.40	.25	-.11	.20	-.56	.39	-.70*	1.00	-.13	-.41	.27
VAR9	.54	.03	.66	.13	.33	-.39	.48	-.13	1.00	.10	.54
VAR10	.29	.10	.05	.75*	.08	-.05	.16	-.41	.10	1.00	-.58
VAR11	.00	.26	.26	-.30	.43	-.26	.20	.27	.54	-.58	1.00
VAR12	-.24	.22	.03	.03	.72*	-.03	-.04	-.40	-.11	.18	-.00
VAR13	.13	-.06	.46	.07	.13	-.06	.01	-.17	.59	.10	0.00
VAR14	-.10	.38	-.08	.62	-.41	.18	-.35	.73*	.12	.15	.20
VAR15	.27	-.12	.39	-.18	.96*	-.30	.38	-.44	.44	-.00	.53
VAR16	-.10	.14	-.04	.57	-.85*	.35	-.52	.62	-.07	.24	-.41
VAR17	-.50	.04	-.43	-.20	.36	-.09	-.24	-.04	.04	-.14	.25
VAR18	.41	.18	.46	-.33	.23	-.35	.69*	-.18	.62	-.35	.61
VAR_9	-.36	.58	-.03	.60	.21	-.03	-.43	.37	.27	.32	.24
VAR20	-.26	.19	-.32	.86*	-.13	.72*	-.53	.31	-.03	.50	-.26

STAT.		Correlations (wmc.sta)								
BASIC		Marked correlations are significant at p < .05000								
STATS		N=9 (Casewise deletion of missing data)								
Variable	VAR12	VAR13	VAR14	VAR15	VAR16	VAR17	VAR18	VAR19	VAR20	
A	-.24	.13	-.10	.27	-.10	-.50	.41	-.36	-.26	
VAR2	.22	-.06	.38	-.12	.14	.04	.18	.58	.19	
VAR3	.03	.46	-.08	.39	-.04	-.43	.46	.03	-.32	
VAR4	.03	.07	.62	-.18	.57	-.20	-.33	.60	.86*	
VAR5	.72*	.13	-.41	.96*	-.85*	.36	.23	.21	-.13	
VAR6	-.03	-.06	.18	-.30	.35	-.09	-.35	-.03	.72*	
VAR7	-.04	.01	-.35	.38	-.52	-.24	.69*	-.43	-.53	
VAR8	-.40	-.17	.73*	-.44	.62	-.04	-.18	.37	.31	
VAR9	-.11	.59	.12	.44	-.07	.04	.62	.27	-.03	
VAR10	-.18	.10	.15	-.00	.24	-.14	-.35	.32	.50	
VAR11	-.00	0.00	.20	.53	-.41	.25	.61	.24	-.26	
VAR12	1.00	.22	-.48	.61	-.52	.08	-.06	.33	.03	
VAR13	.22	1.00	-.33	.15	.14	.04	.28	.22	.06	
VAR14	-.48	-.33	1.00	-.32	.62	-.03	-.21	.55	.53	
VAR15	.61	.15	-.32	1.00	-.79*	.27	.29	.20	-.15	
VAR16	-.52	.14	.62	-.79*	1.00	-.31	-.33	.26	.49	
VAR17	.08	.04	-.03	.27	-.31	1.00	-.31	.32	.09	
VAR18	-.06	.28	-.21	.29	-.33	-.31	1.00	-.26	-.49	
VAR19	.33	.22	.55	.20	.26	.32	-.26	1.00	.52	
VAR20	.03	.06	.53	-.15	.49	.09	-.49	.52	1.00	

## جدول (٥٨) الجذور الكامنة

Number of variables: 20  
Method: Principal components  
log(10) determinant of correlation matrix: -13.452

NOTE: The raw correlation matrix could not be inverted and was slightly modified: A small constant was added to the diagonal of the correlation matrix until the determinant of the matrix was greater than 1.e-50. All subsequent estimates will not be exact!

Number of factors extracted: 7  
Eigenvalues: 5.86748 3.23669 3.09111 2.60487 1.43384 1.19524 1.09000

STAT.	Eigenvalues (wmc.sta)				
FACTOR	Extraction: Principal components				
ANALYSIS					
Value	Eigenval	% total	Cumul.	Cumul.	
		Variance	Eigenval	%	
1	5.867476	29.33738	5.86748	29.33738	
2	3.236694	16.18347	9.10417	45.52085	
3	3.091106	15.45553	12.19528	60.97638	
4	2.604865	13.02432	14.80014	74.00070	
5	1.433844	7.16922	16.23399	81.16993	
6	1.195245	5.97622	17.42923	87.14615	
7	1.089996	5.44998	18.51923	92.59613	

## جدول (٥٩) التشبعات قبل التدوير

STAT.	Factor Loadings (Unrotated) (wmc.sta)						
FACTOR	Extraction: Principal components						
ANALYSIS	(Marked loadings are > .700000)						
Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
A	-.533486	-.205218	.691367	-.251720	-.029724	-.296330	-.091390
VAR2	.262721	.485552	-.038678	.329726	-.499903	.557514	-.022996
VAR3	-.533520	.050854	.653757	.050340	.305123	-.058455	-.031490
VAR4	.571260	.526353	.462620	-.309433	-.158441	-.014108	-.146058
VAR5	-.669562	.606206	-.312387	-.117675	-.022496	-.147755	-.122785
VAR6	.625669	-.015025	-.169229	-.125241	.342863	-.077486	-.559242
VAR7	-.779629*	-.125215	.309286	-.129272	-.420344	.024500	-.004435
VAR8	.656079	-.027833	.113381	.651741	.161087	-.080036	-.128437
VAR9	-.472413	.402452	.622786	.266392	.168493	-.060212	.141466
VAR10	.167615	.387382	.381065	-.735873*	-.279885	-.027250	.162789
VAR11	-.407023	.310934	.012945	.807042*	-.030666	-.151307	-.168323
VAR12	-.287042	.569227	-.431029	-.341132	.105702	.308457	-.247590
VAR13	-.220415	.291805	.316247	-.081399	.687729	.426364	.233608
VAR14	.622396	.237604	.414007	.403449	-.298317	-.311677	-.008811
VAR15	.701643*	.556017	-.165496	-.020101	.088589	-.289491	-.193044
VAR16	.777319*	.139237	.518935	.035512	.145617	-.153331	.151628
VAR17	-.001666	.363370	-.554666	.189913	.111308	-.307888	.555967
VAR18	-.644631	-.062326	.330262	.424053	-.079673	.338604	-.260396
VAR19	.332247	.846642*	-.105788	.191436	-.000133	.041478	.189338
VAR20	.683427	.489302	.142924	-.244400	.124756	-.195792	-.225034
Expl. Var	5.867476	3.236694	3.091106	2.604865	1.433844	1.195245	1.089996
Exp. Totl	.293374	.161835	.154555	.130243	.071692	.059762	.054500

**جدول (١٠)**  
**التشبعات بعد التدوير**

STAT. FACTOR ANALYSIS	Factor Loadings (Varimax raw) (wmc.sta)						
	Extraction: Principal components						
	(Marked loadings are > .700000)						
Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
A	.360561	.140040	.524441	.069724	.130309	.636712	.496845
VAR2	-.024248	.242131	.069938	.187068	-.052132	.934248*	.040174
VAR3	.094738	.047522	.354914	.398440	.542136	-.411425	.353865
VAR4	-.137092	.932644*	-.166904	-.033792	.045056	.156944	.124527
VAR5	.948650*	.024735	.168085	.126006	.078536	-.014852	-.116522
VAR6	-.114079	.183852	-.884119*	-.070861	.120539	-.067987	.140240
VAR7	.316726	-.125673	.771315	-.001872	-.054041	-.140846	.423474
VAR8	-.575278	.059097	-.481640	.528599	-.051245	.160162	.104659
VAR9	.152978	.214715	.451265	.524519	.561093	-.148669	.103996
VAR10	.081034	.817006*	.266421	.469605	.043450	-.032551	.043980
VAR11	.295906	-.240948	.118130	.884439*	.033192	.149885	-.025064
VAR12	.781105*	.062465	-.206990	-.261931	.205467	.329200	.010916
VAR13	.064095	.014160	-.003405	-.068787	.969855*	-.005276	-.000914
VAR14	-.484774	.585103	-.065402	.541596	-.257261	.119516	-.093798
VAR15	.896033*	.025503	.143252	.296017	.124476	.168137	-.052285
VAR16	-.837874*	.403029	-.225341	-.037430	.201247	.054729	.041623
VAR17	.241844	-.084524	.006474	.112358	-.016859	.064321	-.899623*
VAR18	.166705	-.161104	-.186829	.426926	.256714	.146911	.565295
VAR19	.097247	.615180	-.092067	.337683	.270900	.432831	-.384855
VAR20	-.066036	.766752*	-.538557	.001405	-.001397	.019744	-.092083
Expl. Var	3.948010	3.391696	2.925787	2.498840	1.904277	1.935488	1.915127
Exp. Totl	.197400	.169585	.146289	.124942	.095214	.096774	.095756

**جدول (١١)**  
**التشبعات بعد التدوير**

STAT. FACTOR ANALYSIS	Factor Loadings (Varimax normalized) (wmc.sta)						
	Extraction: Principal components						
	(Marked loadings are > .700000)						
Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
A	.046523	-.135361	.513477	.061289	.150574	-.648528	.483692
VAR2	-.017631	.263108	.083069	.194527	-.060547	.925326*	.045599
VAR3	.080564	.044108	.344751	.290714	.558397	-.416870	.342459
VAR4	-.126249	.932429*	-.168316	-.063538	.047421	.146902	.135009
VAR5	.939395*	.028426	.186566	.154234	.074041	-.002730	-.131492
VAR6	-.094321	-.180492	-.886505*	-.073766	-.127085	-.059103	.140970
VAR7	.304647	-.132282	.773766*	.015811	-.043052	-.157033	.421181
VAR8	-.584379	.081657	-.487391	.539451	-.047460	.165263	-.106757
VAR9	.130031	.224604	.447506	.512219	.576012	-.160924	.091242
VAR10	.094497	.799998*	.265363	.493038	.044397	-.042221	.059019
VAR11	.264020	-.210365	.128521	.902141*	.040782	.133870	-.045509
VAR12	.800245*	.057491	-.190617	-.232736	.189490	.325678	-.004293
VAR13	.074295	.006609	-.012667	-.079757	.968225*	.009073	-.008605
VAR14	-.502329	.606734	-.067921	.509116	.246374	.106674	-.088695
VAR15	.879876*	.030939	.158071	.319813	.125611	.186912	-.071064
VAR16	-.827549*	.402065	-.242926	-.079354	.206025	.067708	.055125
VAR17	.226005	-.072365	.016740	.108333	-.025993	.065101	.904856*
VAR18	.155293	-.351376	.387891	.451177	.266213	.138476	.552710
VAR19	.092164	.634072	-.084120	.307750	.267285	.423599	-.386507
VAR20	-.055078	.767789*	-.538736	-.024511	-.003789	.016145	-.086625
Expl. Var	3.890140	3.405505	2.935061	2.509654	1.936848	1.933408	1.908610
Exp. Totl	.194507	.170275	.146753	.125483	.096842	.096670	.095430