11.2 The statistical test method of Theomatics (1)

P The statistical test method of Theomatics is based on two elements:

1. Determination of the (relative) **quantities of multiples (= hits)** of a theomatic factor resulting from the standard number allocation to the letters of the Hebrew and Greek alphabets in a text sample of the Bible, in relation to the possible word / phrase combinations in this text sample, and probability calculation of the observed quantity compared to the expected random one.

2. Comparison of the **distribution of** the observed relative **quantities of multiples (= hits)** of a theomatic factor in the hit categories “direct hits” (+/- 0) and “acceptable tolerance hits” (+/- 1 and +/-2) with such hit distribution, that could be expected from randomness of the number allocation (20%, 40%, 40%).

P As defined in section 11.1 the statistical test will here be performed as a significance level test, aiming for rejection of the test hypothesis. Therefore, the **test hypothesis (H_o)** must claim the opposite of what should be proven, i.e. it has to be tested with a defined error probability, whether the observed hits and the hit distribution are in line with the ones that could be expected from random (hypothetic) values or not.

P Essential for correctly performing the test is the clear definition of the text sample, its elements, the feature to be tested, and what is counted to be a hit or not.

P The following rules apply for word / phrase combinations:
- Articles (αι / η / ο / οι / τα / ταισ / τασ / της / την / τους / το / τοις / τον / τω / των) and conjunctions (δε / γαρ / και / μεν / οτι / ουν) are “variables”.
- Word / phrase combinations can also be build by deleting “variables”, especially by deleting conjunctions at the beginning of a sentence, because they have no influence on the theological meaning.
- Chapter and verse separations have to be respected.

P The text passage for the test is taken from the Majority Text of the NT and exists of 409 words from the **Gospel of Luke**, **chapter 15**, **verses 10 - 32**.

P The key word of this text is the word “αδελφος” (brother) from verse 27. Its theomatical value is 810 or 90 x 9. The “**90**" is taken as the theomatic factor for the test and the identification of multiples. There are the following theological references to the theomatic factor of “90":

מים (water) = 90
αστερες (stars) = 811 bzw. 90 x 9 + 1
τοις αγγελοις (the angels) = 902, bzw. 90 x 10 + 2
אמים (man) = 91 bzw. 90 + 1
λεγιων (legion) = 811 bzw. 90 x 9 + 1
ουρανοις (heaven) = 901 bzw. 90 x 10 + 1

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11.2 The statistical test method of Theomatics (2)

P In line with the rules defined above, word / phrase combinations can be build out of the 409 words of the chosen text passage. These word / phrase combinations are forming the sample for testing. The following criteria apply:

- Hits are those theomatic values, which show a multiple of 90 with a maximum deviation of +/-2 and where the related word / phrase combination show a direct relationship to one of the two sons being a brother.
- Each of the word / phrase combinations must only be taken once, double counts are not allowed.

  Remark: According to test theory double counts are allowed. In the following tests the results for double counts are provided additionally in round brackets.
- Each word / phrase combination must only exist of words in juxtaposition (side-by-side) in the original text.
- Each word / phrase combination must not have more than 3 words in length, variables do not count as words.
- Text variants to the Majority Text are not allowed.

P The application of these rules leads to the following test sample:

Phrases 1 word each	=	48 elements	=	48 words
Phrases 2 words each	=	178 elements	=	356 words
Phrases 3 words each	=	241 elements	=	723 words
Total	=	**467 elements**	=	1,127 words

Remark: Del Washburn permits word / phrase combinations up to **4** words each. For ease of presentation and for better comparison with the results of the supplementary experiment in section 11.4, the following test will be limited to **3** words maximum!

P The hits out of the sample of 467 elements are presented in the table on the following page.
In summary the following result is observed (without double counts):

Direct hits:	**15**	=	**38.5%**	
Hits +/- 1:	**16**	=	**41.0%**	
Hits +/- 2:	**8**	=	**20.5%**	
Total:	**39**		**100.0%**	with an average word length **WLA** of 39/81 = **2.077**.

P Whether the observed hits are random or not, has to be determined in comparison with that probability that can be expected for the quantity of random hits divisable by 90 out of a sample size of 467:

		Probability	
For natural numbers divisable by	"1":	100%	
	"2":	50%	etc.
	"90":	1.111%.	

Within a sample existing of 467 **random** natural numbers there can be expected 5.2 hits **on average**.

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THEOMATICS

11.2 The statistical test method of Theomatics (3)

Luke 15:10-32		Statistical Analysis					date:	24.06.04	file:	luke15_pre_el	
								Multiple			
No.	Verse	Greek	English Translation		Words	Value		90		Clustering	
									0	.+/-1	.+/-2
	Key word:	αδελφος	"the brother"			810		9,000			
1	15:10	αμαρτωλω	sinner		1	2.072		23,022			X
2	15:11	υιους	sons		1	1.080		12,000	X		
3	15:12	και ειπεν ο νεωτερος αυτων	and said the younger of them		3	3.332		37,022			X
4	15:12	και ειπεν νεωτερος	and said the younger		2	1.711		19,011		X	
5	15:12	ο νεωτερος αυτων	the younger of them		2	3.151		35,011		X	
6	15:12	νεωτερος	the younger		1	1.530		17,000	X		
7	15:12	και διειλεν αυτοις βιον	and He divided to them His living		3	1.258		13,978			X
8	15:13	νεωτερος υιος αποδημησεν	the younger son departed		3	2.611		29,011		X	
9	15:13	υιος αποδημησεν	the son departed		2	1.081		12,011		X	
10	15:14	αυτου	he		1	1.171		13,011		X	
11	15:15	εκολληθη	he joined himself		1	180		2,000	X		
12	15:17	πατρος μου	the Father of me		2	1.261		14,011		X	
13	15:17	εγω	I		1	808		8,978			X
14	15:19	ειμι αξιος κληθηναι	am I worthy to be called		3	542		6,022			X
15	15:19	υιος σου	Thy son		2	1.350		15,000	X		
16	15:20	ηλθε προς πατερα	he came to the Father		3	989		10,989		X	
17	15:20	και κατεφιλησεν αυτον	and fervently kissed him		2	1.981		22,011		X	
18	15:21	αυτω ο υιος	to Him the son		2	2.251		25,011		X	
19	15:21	και ουκετι ειμι	and no longer am I		2	901		10,011		X	
20	15:24	οτι ουτος υιος μου	for this My son		3	2.610		29,000	X		
21	15:24	ο υιος μου	My son		2	1.260		14,000	X		
22	15:24	ην απολωλως	he was lost		2	2.069		22,989		X	
23	15:25	ην ο υιος αυτου	was the son of Him		3	1.979		21,989		X	
24	15:25	ην ο υιος	was the son		2	808		8,978			X
25	15:25	ο πρεσβυτερος	the older		1	1.532		17,022			X
26	15:25	ηγγισε τη οικια ηκουσε	he drew nigh to the house, he heard		3	1.351		15,011		X	
27	15:27	οτι ο αδελφος	for the brother		1	1.260		14,000	X		
28	15:27	αδελφος	the brother		1	810		9,000	X		
29	15:27	πατηρ σου τον μοσχον	Father of thee calf		3	2.609		28,989		X	
30	15:27	υγιαινοντα αυτον απελαβεν	received him back in health		3	1.890		21,000	X		
31	15:28	ωργισθη δε και	but he was angry and		1	1.170		13,000	X		
32	15:28	ο ουν πατηρ αυτου	but the Father of him		2	2.250		25,000	X		
33	15:29	δουλευω	I served		1	1.709		18,989		X	
34	15:29	εντολην σου παρηλθον	a command of Thee I transgressed		3	1.531		17,011		X	
35	15:30	σου ουτος	of Thee this		2	1.710		19,000	X		
36	15:31	εμα σα εστιν	Mine are thine		3	812		9,022			X
37	15:32	οτι ο αδελφος σου ουτος	for this thy brother		3	2.970		33,000	X		
38	15:32	αδελφος σου ουτος	this thy brother		3	2.520		28,000	X		
39	15:32	σου ουτος *)	this thy		2	1.710		19,000	X		
39	Total				81				15	16	8
		*) no double count for Del Washburn		WLA	2,077	observed		100%	38,5%	41,0%	20,5%
						expected		100%	20%	40%	40%

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11.2 The statistical test method of Theomatics (4)

- Due to the clustering hit tolerance, there are 5 hit categories instead of 1 in Theomatics. Therefore, the probability to find a clustering hit is 1,11% x 5 = 5,56% or 25,9 random hits out of a sample size of 467 on average.
- The comparison between the observed hits and those hits that could randomly be expeceted out of the sample is:

	observed		expected	
Direct hits	15	38.5%	5.2	20%
Hits +/- 1	16	41.0%	10.35	40%
Hits +/- 2	8	20.5%	10.35	40%
Total	39	100%	25.9	100%

- Due to the nature of randomness, the number of both the observed hits and the clustering of the hits out of that sample could indeed happen with a certain probability. Therefore, before drawing any conclusions from the sample results it has to be determined whether the observed deviations from expectation are **statistically significant** or not.
- The verification of the statistical significance will be performed based on the information provided in section 11.1 in the following steps:
  - 1. Calculation of the probabilities for the observed quantity of hits
  - 2. Verification of the statistical significance (in addition to “Theomatics”)
  - 3. χ^2-test to check the hit distribution within the clustering (in addition to “Theomatics”)

- **1. Pobability for the observed quantity of hits:**

sample size:	n = 467	(with double counts)
expected hypothetical probability:	p_0 = 1/90 = 0.0111	(5/90 = 0.0556)
quantity of expected hypothetical hits:	$n*p_0$ = 5.1888	(25.9444)
observed quantity of hits [direct / clustering]	x = 15 / 39	(17 / 45)

Pobabilities:	**direct hits**	(with double counts)	**clustering hits**	(with double counts)
Binomial distribution	**0.00030087**	(0.00002713)	**0.00813148**	(0.00028317)
or **1:**	**3,324**	(36,858)	**123**	(3,531)
Poisson distribution (approx.)	0.00033201	(0.00003133)	0.00993956	(0.00043054)

as an approximation for comparison reason only.

Remark: A probability of on 1: 3,324 means, that the observed quantity of hits can on average happen randomly in 1 of 3,324 samples. If tests are performed on a sufficient number of samples, there could happen at least one random number allocation, that could provide a comparable (or even higher) quantity of hits. This would not mean, that the statistical evidence of Theomatics is invalid. The statistical proof of Theomatics would only be in question, if that very random number allocation would deliver similar results for all the other theomatic factors as well!

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11.2 The statistical test method of Theomatics (5)

2. Check of statistical significance with significance level "α" = 0.05 for best test quality:

sample size:	n = 467	(with double counts)
expected hypothetical probability:	p_0 = 1/90 = 0.0111	(5/90 = 0.0556)
observed quantity of hits [direct / clustering]:	x = 15 / 39	(17 / 45)
observed hit probability:	p_{SP} = x/n = 0.0321 / 0.0835	(0.0364 / 0.0964)

Aim: rejection of $H_0 : p = p_0$	**direct hits**		**clustering hits**	
for **$\lvert z \rvert > \lambda_{1-\alpha/2}$**	(with double counts)		(with double counts)	
standardized normal distribution:	$\lambda_{1-\alpha/2}$ = 1.9600		$\lambda_{1-\alpha/2}$ = 1.9600	
check measure "**z**" (see 11.1)	**4.3312**	(2.6375)	**5.2141**	(3.8496)
condition **$\lvert z \rvert > \lambda_{1-\alpha/2}$** met:	**yes**	(yes)	**yes**	(yes)
test quality (approximation):				
acceptance level lower limit	0.0016		0.0348	
upper limit	0.0206		0.0763	
observed probability p_{SP}:	**0.0321**	(0.0364)	**0.0835**	(0.0964)
p_{SP} out of acceptance level:	**yes**	(yes)	**yes**	(yes)

3. χ^2-test to check clustering hit distribution:

	without double counts	(with double counts)
hit categories:	0 / -1 / 1 / -2 / 2	(0 / -1 / 1 / -2 / 2)
quantity of hits for each hit category:	x_i = 15 / 5 / 11 / 3 / 5	(17 / 5 / 14 / 3 / 6)
expected hypothecial probability per hit category:	p_{i0} = 1/5 = 0.02	(0.02)
combined hit categories to achieve $x_i \geq 10$:	0 / other	(0 / other)
quantity of hits for combined hit categories :	x_i = 15 / 24	(17 / 28)
degrees of freedom (combined hit categories):	υ = 2 - 1 - 0 = 1	(1)

Aim: rejection of $H_0 : x_i = \Sigma x_i * p_{i0}$ for $\chi^2 > \chi^2_{1-\alpha;\upsilon}$

$\chi^2_{1-\alpha;\upsilon}$ for υ = 1, α = 0.05 / α = 0.01: $\chi^2_{0.95;1} = 3.84$ / $\chi^2_{0.99;1} = 6.63$ ($\chi^2_{0.95;1} = 3.84$ / $\chi^2_{0.99;1} = 6.63$)

calculation of $\chi^2 = \Sigma((x_i - \Sigma x_i * p_{i0})^2 / \Sigma x_i * p_{i0})$	x_i	$\Sigma x_i * p_{i0}$	$x_i - \Sigma x_i * p_{i0}$	χ^2	(x_i	$\Sigma x_i * p_{i0}$	$x_i - \Sigma x_i * p_{i0}$	χ^2)
hit category "0"	15	7.8	7.2	6.646	(17	9	7.2	7.111)
hit category "other" [-1 / 1 / -2 / 2]	24	31.2	- 7.2	1.662	(28	36	- 7.2	1.778)
sum	39	39.0	0.0	**8.308**	(45	45	0.0	8.889)
condition met $\chi^2 > \chi^2_{0.95;1}$:				**yes**				(yes)
condition met $\chi^2 > \chi^2_{0.99;1}$:				**yes**				(yes)

Probability for $\chi^2 \geq \chi^2_{1-\alpha;\upsilon}$ under validity of H_0: **0.00394775 [1:253]** (0.00286911 [1:349])

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11.2 The statistical test method of Theomatics (6)

- **Theomatics is using the χ^2-test as a significance level test for the quantity of hits out of the total sample size. This is possible but will lead to less exact values than by applying hit categories. For comparison purposes the following values will show up for the rejection of the test hypothesis H_0 : x = n*5/90 for a significance level of α = 0.05, ν = 1,**
  n = 467, x = 39 (45 with double counts), and a check measure $\chi^2_{0.95;1}$ = 3.84:

  χ^2 = 6.570 > 3.84 = $\chi^2_{0.95;1}$ (13.996) i.e. H_0 can be rejected, the observed quantity of hits is by 95% not random; probability for $\chi^2 \geq$ 6.570 (13.996): 0.010371 (0.000183) or 1: 96 (1: 5,458).

- **The quantity of hits and the clustering of hits are two independent events. A first non-randomness can be realized for the hit quantity without any deviation of the expected hit clustering from randomness. A second non-randomness can be realized for the hit clustering without any deviation of the expected hit quantity from randomness.**
- **With Theomatics both events can happen simultaneously. The probability for both events to happen simultaneously can be calculated as the product of the single probabilties for each event (see above):**

		clustering hits	(with double counts)
probability for 39 (45) hits out of n = 467 (binomial distribution):		0.00813148	(0.00028317)
probability for 15/24 (17/28) clustering (χ^2 distribution):		0.00394775	(0.00286911)
probability for hit quantity and hit clustering to happen simultaneously:		**0.00003210**	(0.00000081)
	or 1:	**31.151**	1.230.851

- SUMMARY of the statistical test results

  - **Significance level test: The test hypothesis, that the observed hit quantities result from a random number allocation, can be rejected with an error probability of α = 5% and a high test quality.**

    I.e. the quantity of the observed theomatic hits is with a confidence level of at least 95% not random!

  - **χ^2 matching test:** The test hypothesis, that the observed hit distribution (clustering) is merely random, can be rejected with an error probability of α = 1%. I.e. the observed theomatic hit distribution (clustering) is with a confidence level of 99% not random!

  - **Probability:** It is very improbable, that the observed quantity of hits and the observed clustering of hits occur simultaneously. The deviation from randomness is 1 : 31.151 (1: 1.230.851 with allowable double counts).

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11.2 The statistical test method of Theomatics (7)

SUPPLEMENTARY INFORMATION: **Summary of the results for phrases 2 words in length or less and for phrases 1 word in length** (without double counts)

	phrases 2 words in length or less	**phrases 1 word in length**
sample size:	226	48
hit categories:	0 / -1 / 1 / -2 / 2	0 / -1 / 1 / -2 / 2
quantity of hits for each hit category:	11 / 2 / 8 / 2 / 2 Σ **= 25**	6 / 1 / 1 / 1 / 2 Σ **= 11**

1. Probabilities for the observed quantity of hits (binomial distribution):

	n = 226, p_0 = 1/90, $n*p_0$ = 5/90, x = 11 / 25	n = 48, p_0 = 1/90, $n*p_0$ = 5/90, x = 6 / 11
	[direct / cluster]	**[direct / cluster]**
	0.00005524 / 0.00088073	0.00001547 / 0.00005158
or:	[1 : 18,102 / 1,135]	[1 : 64,620 / 19,389]

2. Check of statistical significance with significance level "α" = 0.05 for best test quality:

	[direct / cluster]	**[direct / cluster]**
aim: rejection of $H_0 : p = p_0$	$\lambda_{1-\alpha/2}$ = 1.9600	$\lambda_{1-\alpha/2}$ = 1.9600
check measure "**z**":	5.3870 / 3.6138	7.5275 / 5.2511
condition **I z I >** $\lambda_{1-\alpha/2}$ met:	yes / yes	yes / yes
acceptance level lower limit	-0.0026 / 0.0257	- 0.0185 / -0.0092
(approx.) upper limit	0.0248 / 0.0854	0.0408 / 0.1204
observed probability p_{SP}:	0.0487 / 0.1106	0.1250 / 0.2292
p_{SP} out of acceptance level:	yes / yes	yes / yes

3. χ^2 - test to check clustering hit distribution:

quantity of hits for combined hit categories:	x_i = 11 / 14	x_i = 11 / 0
degrees of freedom (combined hit categories):	υ = 2 - 1 - 0 = 1	υ = 1 - 1 - 0 = 0
aim: rejection of $H_0 : x_i = \Sigma x_i * p_{i0}$	$\chi^2_{0.95;1}$ = 3.84 / $\chi^2_{0.99;1}$ = 6.63	
check measure χ^2:	9.000	**not applicable here because of too small quantity of hits!**
condition met $\chi^2 > \chi^2_{0.95;1}$:	yes	
condition met $\chi^2 > \chi^2_{0.99;1}$:	yes	
probability for $\chi^2 \geq \chi^2_{1-\alpha;\upsilon}$:	0.00269980 [1 : 370] (under validity of H_0)	

4. Overall probability for the cluster hit quantity and the clustering hit distribution to happen simultaneously:
0.000002378 [1 : 420,557]

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