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Factor Analysis Comparison of Factor Differences Between Old and New Calculation Methods

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Abstract: In this paper, following the previous: factor analysis, cost difference analysis of the status quo and existing problems; The allocation problem of the total difference caused by the factor interaction of factor analysis, and the application of a new factor analysis method: exponential logarithmic proportion method, make the factor analysis and difference analysis have a correct solution. This paper is mainly based on the above factor analysis of the "exponential logarithmic ratio" method, and the current American management accounting (Srikant m. atar et al.), cost and management accounting (Charles t. orngren et al.), and management accounting (Ray h. arrison et al.). China's current "applied statistics" and "financial analysis" (national excellent course); "Financial cost management" certified public accountant examination book "cost management accounting"; Countries "twelfth five-year" plan of undergraduate course of common higher education teaching materials "management accounting" as an example, through comparing traditional balance of substitution factor analysis method and index of logarithmic ratio method, two kinds of calculation method for the calculation results of difference comparison and draw the conclusion: the new method of factor analysis can correctly allocate factor interactions that main factors differences between factor can be decomposed into the sum of factor analysis the index of logarithmic ratio method can solve the problem of interaction between factors cannot be separated; It has solved the unsolvable problems that have troubled the factor analysis and difference analysis in economic management for many years, which not only has the function of theoretical perfection, but also has the guiding significance in practical activities.

Keywords: Factor Analysis, Exponential Logarithmic Proportional Method, Traditional Calculation Method, Interaction Allocation

1. First, There Is No Need to Assume the Sequence of Factor Replacement

The knowledge points of factor analysis involve many professional courses and are widely used in practice. This paper tries to compare the results of two kinds of calculation methods to find out the scientificity and correctness of the two different methods. Considering the relevance of factor analysis cases, this paper tries to cite influential and authoritative teaching materials at home and abroad as examples, and use the old and new methods of factor analysis to solve problems, so as to establish the scientificity and correctness of the new method. And it can correct the traditional factor analysis method.

In the current application of factor analysis, a lot of conditions and assumptions have been set, among which, the "order" of factors cannot be changed, and the "quantity before quality" hypothesis is adopted in the implementation of analysis.

Following on from the previous article «New Solution of Factor Analysis Difference in Factor Product Combination» On the basis of this, the author USES the exponential logarithmic proportion method to calculate and analyze the current relevant books, the cases of factor analysis and difference analysis, and compares the calculated results with the traditional solution results, so as to prove the correctness of the new factor analysis method. Considering the systematicness, completeness and consistency of the article combination, the structure and preambles of this paper should

be considered as a whole to meet the normative requirements.

Example 1. Financial Accounting by Roman l. eil, Katherine Schipper and Jennifer Francis. Translated by zhu Dan and qu tenglong. 1st edition p 175-176, China machinery industry press, September 2015 [1].

R0E=ROA* financial leverage

Table 1. Analysis of roe difference.

	ROE	R0A	FL
2012'	21.7	7.7	2.82
2011'	20.7	7	2.95

To analyze the change difference of the return on equity of the main factor from 2012 to 2011, the basic theoretical formula of the analysis is: return on equity = net interest rate on sales * return on total assets.

Table 2. Results of traditional analysis (first return on total assets).

	2012'	2011'	differences	FA
ROA%	7.7	7	0.7	2.065
FL	2.82	2.95	-0.13	-1.001
ROE%	21.714	20.65	1.064	1.064

Table 3. Results of traditional analysis (financial leverage ratio).

	2012'	2011'	differences	FA
FL	2.82	2.95	-0.13	-0.91
ROA%	7.7	7	0.7	1.974
ROE%	21.714	20.65	1.064	1.064

The two answers are completely different, because the interaction between the two factors is occupied by the replaced factor. Therefore, factors have different influences on major factors.

Table 4. Factor analysis by exponential logarithm method is as follows.

	2012'	2011'	d	IOL	FA
ROA%	7.7	7	0.7	0.09531	2.0184
FL	2.82	2.95	-0.13	-0.04507	-0.9544
ROE%	21.714	20.65	1.064	0.050242	1.064

The original book did not consider the factor structure of the factors and did not make detailed analysis of the factors. Instead, it directly calculated the difference between the return on equity of the main factors of the two years as 21.7-20.7=1, and did not specifically analyze the difference of the influence of the factors. Since it is the formula structure of multiplication, the factor analysis of factors cannot conclude that the sum of the influence difference between the two factors is 0.7+ (-0.13) ≠1.064. Only according to the factor analysis method, it can be concluded that the total difference is equal to the sum of the differences of the factors, 2.065+ (-1.001) =1.064. It is not clear what method the authors would use if the proposition were to refine the analysis of factors affecting the total.

The results calculated by the traditional method (taking the return on total assets as the first step) are compared with those calculated by the exponential logarithmic ratio

Table 5. Method as follows.

	2012'	2011'	d	TM	ELR	Md
ROA%	7.700	7.00	0.70	2.065	2.018	0.047
FL	2.820	2.95	-0.13	-1.001	-0.954	-0.047
ROE%	21.714	20.65	1.064	1.064	1.064	0.000

In the traditional method, the impact of total return on assets on the return on equity is overcalculated by 0.047%, and the impact of financial leverage on the return on equity is overcalculated by -0.047%.

The influence amount of factors calculated by the exponential logarithmic ratio method is the same regardless of the order of factors, because this method has fairly distributed the interaction difference of the two factors' influence on the main factors.

Example 2. Basic analysis formula of turnover rate of accounts receivable: turnover rate of accounts receivable = sales revenue/average accounts receivable (same as above P 179).

When calculating and analyzing accounts receivable turnover rate = sales revenue * average accounts receivable^(-1), or accounts receivable turnover rate = average accounts receivable^(-1)* sales revenue, the influence amount of factors on the main factors is completely different.

Table 6. Basic information.

	2012'	2011'	d
SR	49694.00	45015.00	4679.00
AAR	1944.00	1397.98	546.02
ART	25.60	32.20	-6.60
DART	14.30	9.80	

Table 7. Sales revenue in front.

	2012'	2011'	d	FA
SR	49694	45015	4679	3.346969
AAR	1944	1397.981	546.0186	0
ART	0.000514	0.000715	-0.0002	-9.98421
DART	25.6	32.2	-6.6	-6.63724

Table 8. The average accounts receivable is at the top.

	2012'	2011'	d	FA
AAR^-1	0.000514	0.000715	-0.0002	-9.04414
SR	49694	45015	4679	2.406893
AAR	1944	1397.981	546.0186	0
ART	25.6	32.2	-6.6	-6.63724

For the two order of factors, the results of the factors' influence on the population calculated by traditional factor analysis are completely different. Once again, because of the interaction of factors, it is assumed by one of the factors.

Table 9. Exponential logarithmic ratio method.

	2012'	2011'	d	IOL	FA
AAR^-1	0.000514	0.000715	-0.0002	-0.32972	-9.4873
SR	49694	45015	4679	0.098888	2.845411
AAR	1944	1397.98	546.02		0
ART	25.6	32.2	-6.6	-0.22937	-6.6

The exponential logarithmic ratio method gives the same result no matter how the order of the factors is changed, because this method fairly allocates the interaction between the two factors.

The original book answer is: 2012 accounts receivable turnover ratio decreased 6.6 compared with 2011. The overall difference is made directly: 25.6-32.2=-6.6. Without the use of factor analysis method, the specific influence amount of the sub-factors "sales revenue" and "average accounts receivable" that affect the main factor "accounts receivable turnover rate" is further decomposed, avoiding the problem of apportionment of the interaction of factors in the product structure. It is not possible to analyze the specific difference of sales revenue and average accounts receivable in affecting the turnover rate of accounts receivable (-6.6), so as to figure out the influence degree of specific factors and the power and responsibility relationship that the corresponding responsible subject should bear.

2. Interaction is Not the Quantity of Breeding Factors

The current factor analysis results in many factors other than the main factors, such as "structure", "rank" and "efficiency". Some are complex variables, some are variables other than factors, it is really confusing, some seem to cover up the interaction between factors, is derived from the factors of variables, such as: structure, actually derived from the amount and amount; Grade is the factor derived from the price of mixed portfolio; Efficiency is derived from unit hours and product costs.

In the author's opinion, these derived factors actually play a role in explaining the unexplainable interaction, thus

leading to the regret that the whitewashing method has defects.

Example 3. In kanter, M, Dartmouth's (Srikant m. atar) Madhav, V, rajan (Madhav V. R ajan) [M]. "management accounting" (Wang Liyan, ChenJia seats, renmin university of China press, on April 1, 2015,) of chapter 13 "flexible budget, differences and management control"[2] p 461-463 price difference and efficiency difference (the original book answers), the differences between "efficiency" of "efficiency" factor is the growth factor.

Price difference = (actual price of input - budget price of input) × actual input quantity

Table 10. Original financial information.

DDC	(TAP-TBP) ×AI=Pd
DM	(28-30) ×22200= 44400$ F
DM	(22-20) ×9000=18000 $ U

The efficiency difference

Efficiency difference = (actual input quantity - budget input quantity under actual output) × the budget price of input

Table 11. Original difference analysis.

DCC	(AI-BI) ×BP=Ted
DM	(22200-20000) ×30=66000($) U
DL	(9000-8000) ×20= 20000 ($) U

Total negative impact: -44400+18000+66000+20000 = 59600 (usd)

The main factor is cost. The object of factor analysis is the difference between actual cost and budget cost. There is no efficiency difference, efficiency factors are breeding.

Table 12. Factor analysis by exponential logarithmic ratio method is as follows.

		AN	BN	d	IOL	FA
	P	28	30	-2	-0.069	-42136
DM	N	22200	20000	2200	0.1044	63736
	Am	621600	600000	21600	0.0354	21600
	P	22	20	2	0.0953	16996
DL	N	9000	8000	1000	0.1178	21004
	Am	198000	160000	38000	0.2131	38000

The overall impact is: -42136.45 + 63736.45 + 16996.26 + 21003.74 = 59600 (usd)

higher costs.

Table 13. Differences of results of the two calculation methods.

AF	TBA	ELR	Md
DMPI	-44400	-42136.45	-2263.55
DMQI	66000	63736.45	2263.55
DMIA	21600	21600	0
DMPI	18000	16996.26	1003.74
DLQ	20000	21003.74	-1003.74
DAT	38000	38000	0

In the original book, the favorable influence of direct materials was undercounted by $2,263.55, while the unfavorable influence of direct materials was overcounted by

$2263.55. $1003.74 of adverse effects of labor price was overcounted and $1003.74 of adverse effects of labor quantity was undercounted. The price of materials is the responsibility of the procurement department, the material consumption is the responsibility of the production department, the labor price, labor hours are the matter of labor efficiency, the influence of the total cost of the factor factors affect the difference in the calculation of the wrong amount, which is not only related to the department's responsibility, rights, interests, but also involves the correct attribution of individual responsibility and rights.

In this example, only price and quantity affect the cost, not the so-called "efficiency effect". The factor influence quantity calculated by the exponential logarithmic proportion method fairly divides the interaction between quantity and price, so the answer is different from the traditional factor

analysis solution method in the original textbook.

Example 4. Financial analysis by zhang xianzhi and Chen youyou [3]. (8th edition) national planning textbook and national excellent courses for undergraduate students of general higher education during the 12th five-year plan period, published by northeast university of finance and economics press in March 2017, P 170.

Table 14. The results of the two methods are compared.

		2015'	2016'	d	IOL	FA
	N	350	360	10	0.028171	2505.04
GA	P	249	252	3	0.011976	1064.96
	Am	87150	90720	3570	0.040147	3570
	N	150	90	-60	-0.51083	-13493.2
S	P	219	232	13	0.057666	1523.21
	Am	32850	20880	-11970	-0.45316	-11970
AC		120000	111600	-8400		

That is, the influence of the quantity and price of first-class products on sales revenue: 2505.04+1064.96=3570

Influence of quantity and price of second-class goods on sales revenue: -13493.2+1523.21=-11970

The influence of the first and second grades on sales revenue: 3570-11970=-8400

Or the impact of sales volume on sales revenue: 2505.04-13493.21= -10988.17

Influence of price on sales revenue =1064.96+1523.21= 2588.17

The original book answer: the price change to the profit influence 2250 thousand yuan, the rank structure change to the profit influence 1350 thousand yuan, the sale quantity to the profit change influence did not do. If calculated according to the traditional calculation method, the effect of quantity on profit is -12000 thousand yuan, and the total effect is: 3600-12000=-8400. There are only two factors here, sales price and sales quantity. How can we get more "grade structure" factors? Obviously, here, the interaction between sales quantity and sales price is derived into "grade" factors, which is the breeding factor.

Example 5. Financial analysis by zhang xianzhi and Chen youyou (8th edition), national planning textbook and national excellent courses for undergraduate courses of general higher education during the 12th five-year plan period, northeast university of finance and economics press, 2017, p 169-170

2016 product sales profit list unit: thousand yuan

Analysis basic equation: sales profit = sales quantity * (unit price - unit cost), or: = sales quantity * unit profit

The "structure" factor in the "influence of selling variety structure" is the breeding factor.

The overall impact is 10200= quantity impact 3608.04+ sales variety structure impact 1691.96+ unit price impact 3600- sales cost impact 1300

Table 15. Exponential logarithmic ratio method.

	AF	2016'	2015'	d	IOL	FA	Md
	N	250	200	50	0.2231	2500	902.264
	P	50	50	0	0	0	0
	SA	12500	10000	2500	0.2231	2500	
	C	40	42	-2	-0.0488	-447.74	447.736
AP	N	250	200	50	0.2231	2047.74	
	CS	10000	8400	1600	0.1744	1600	
	N	250	200	50	0.2231	450	
	U	10	8	2	0.2231	450	450
	SP	2500	1600	900	0.4463	900	1800
	N	450	500	-50	-0.1054	-12195.	-5578
	P	248	240	8	0.0328	3795.4	3795.4
	SA	111600	120000	-8400	-0.0726	-8400	
	N	450	500	-50	-0.1054	-9401.4	
BP	C	186	190	-4	-0.0213	-1898.6	1898.6
	TC	83700	95000	-1130	-0.1266	-11300	
	N	450	500	-50	-0.1054	-2784	
	U	62	50	12	0.2151	5683.99	5683.99
	SP	27900	25000	2900	0.1098	2900	5800
	N	100	80	20	0.2231	24000	14592.3
	P	1200	1200	0	0		0
	SA	120000	96000	24000	0.2231	24000	0
	N	100	80	20	0.2231	16703.5	
CP	C	840	830	10	0.012	896.484	-896.48
	TC	84000	66400	17600	0.235	17600	
	N	100	80	20	0.2231	7295.83	
	U	360	370	-10	-0.0274	-895.83	-895.83
	SP	36000	29600	6400	0.1957	6400	12800
		66400	56200	10200			20400

Factor analysis of the first equation: quantity impact 4954.753+price impact 3795.39592-cost impact -1449.85=10200

Factor analysis of the second equation: quantity influence 4961.836+ unit profit influence 5238.163905=10200

There is a problem with the original proposition:

1) Repeat conditions are given, either:

Total profit = sales quantity × sales unit price - sales

quantity × sales cost;

Either: total profit = sales volume × unit product profit. The given condition satisfies the double calculation of the two equations.

2) Problem creates a "structural" variable effect that does not exist in the equation. Whether the units of the structure are composite units or ratios; If it's a ratio, it can only be a value ratio, because a single quantity, or unit price, doesn't tell you anything about the structure, so the structure is the value ratio of quantity times unit price, which is a compound variable. There is no "structure" factor in the equation. The "structure" effect calculated by the original problem is only the interaction between the sales volume of different products and the sales price, which is regarded as the influence of the sales product structure. In fact, there are three structures of production (assuming the same production and sales volume), and the cost structure of product varieties and the profit structure of product varieties; In factor analysis they also have a product combination of two factors. The resulting structural effects only complicate simple things.

3. Calculation Procedures for Normative Factor Analysis

We standardized factor analysis by the following steps:

Step 1: establish factor analysis equation;

Step 2: calculate the analysis object, i.e. the overall difference of main factors;

Step 3: factor factor analysis, list calculation of factor factor influence, factor index logarithmic ratio calculation;

Step 4: calculate the difference of factors.

Example 6. The relevant knowledge points in the relevant textbooks, using the above method procedures, normative factor analysis at the same time, normative factor analysis steps.

Cost and management accounting (15th edition) by Charles t. gren Srikant m. atar Madhav v. riajan [4]

Translated by wang liyan and liu yingwen the first edition of June 2016 by renmin university of China press the 3rd printing of p 464-470 in November 2017

Table 16. *Budget and actual operating data of 2013 are as follows.*

Product sales department	The actual completion			Budget		
	AN	ucgp	sales%	BN	ucgp	sales%
A Wholesale department	100000	226.275	66.67	93000	225	60
B department	50000	264.45	33.33	62000	275	40

Analyze the differences.

Analysis procedures:

Step 1: analysis equation: gross profit contribution = gross profit contribution × sales quantity;

Step 2: identify the analysis objects (total variance): total actual contribution gross profit - total budget contribution gross profit =3585000-3797500= -212,500 dollars

Step 3: factor analysis (factor factor difference analysis) the only two factors that affect the gross profit contributed by the main factors are the gross profit contributed by the unit and the sales volume. However, there are two types of products to be sold: A and B, which need to calculate the difference of influence respectively.

Table 17. *Calculation results by exponential logarithmic ratio method are as follows.*

	AF	AN	BN	d	IOL	FA
	ucgp	226.275	225	1.275	0.00565	122987.7
AP	n	100000	93000	7000	0.07257	1579512
	TGPC	22627500	20925000	1702500	0.07822	1702500
	ucgp	264.45	275	-10.55	-0.0391	-588945
BP	n	50000	62000	-12000	-0.2151	-323856
	TGPC	13222500	17050000	-3827500	-0.2542	-3827500
	Σ	35850000	37975000	-2125000	-0.0576	-2125000

Among them "structure" ratio is breeding factor, is redundant.

Table 18. *The answers of the original book and the comparison with the calculation results of the exponential logarithmic ratio method are as follows.*

AF	Book Answer	Beneficial effects of	Adverse effects	Md
UCGP	127500	127500		4512.267
Ni	1575000	1575000		-4512.267
A : Tai	1702500			0
UCGP	-527500		-527500	61444.757
Ni	-3300000		-3300000	-61444.757
B : Tai	-3827500			0
Combined effect	-2125000	1702500	-3827500	0

When calculating the difference of product A, the original book wrongly increased the impact of unit contribution gross profit on the total contribution gross profit by $4512.267, and wrongly reduced the impact of product A sales volume on the total contribution gross profit by $4512.267; When calculating the difference between the actual gross profit contribution of product B and the budget, the impact of the gross profit contribution of unit contribution on the gross

profit contribution was overcounted, and the impact of the sales volume of product B on the gross profit contribution was undercounted, which was $61444.757. This calculation result will lead managers to misjudge the effect of different products on the contribution of gross profit.

Example 7. Financial cost management [5], a textbook for the national unified examination of certified public accountants in 2018, was compiled by the China association of certified public accountants, and published in March 2018 by China financial and economic publishing house, China financial publishing and media group. P 29-30.

"Example 2-1: the actual cost of a certain material used by an enterprise in March 20 X1 is 6,720 yuan, while the planned cost is 5,400 yuan. 1320 yuan more than planned. Because material cost is composed of product output, unit product material quantity and material unit price product product product product product product. Therefore, the total index of material cost can be decomposed into three factors, and then analyze their influence on the total material cost one by one. Now suppose the values of these three factors are shown in table 19 (This article is shown in table 19) ."

Table 19. *Material cost information.*

Project	unit	BN	AN	d
Q	piece	120	140	20
SM	kg/piece	9	8	-1
P	yuan/kg	5	6	1
Material cost	yuan	5400	6720	1320

Problem solving:

1) Basic equation of analysis: material cost = product output × material consumption × material unit price;

2) Variation difference of material cost of the objects analyzed: 6720-5400=1320 (RMB);

3) Traditional factor analysis balance substitution method.

Table 20. *Calculation by traditional factor analysis.*

Project		BN	AN	d	FA
TPP	Piece	120	140	20	900
SM	Kg/piece	9	8	-1	-700
TMP	Rmb/kg	5	6	1	1120

Project		BN	AN	d	FA
Material cost	Rmb	5400	6720	1320	1320

4) Calculation results of the new method

Table 21. *Exponential logarithmic proportional method.*

Project	unit	BN	AN	d	IOL	FA
TPP	a	120	140	20	0.154151	930.4479
SM	Kg/a	9	8	-1	-0.11778	-710.934
TMP	Rmb/kg	5	6	1	0.182322	1100.486
MC	Rmb	5400	6720	1320	0.218689	1320

5) The difference ratio calculated by traditional factor analysis method and exponential logarithmic ratio method.

Table 22. *Methods differences.*

Project	unit	BN	AN	TM	ELR	MD
TPP	a	120	140	900	930.448	-30.448
SM	kg/a	9	8	-700	-710.934	10.934
TMP	yuan/kg	5	6	1120	1100.486	19.514
MC	yuan	5400	6720	1320	1320	0

The results of the two methods are compared. The new method changes the difference of the influence of factors on the main factors calculated by the traditional method.

Example 8. Source: cost management accounting by meng yan and liu junyong, national planning textbook for undergraduate courses of general higher education during the 12th five-year plan period, higher education press printed P 109 for the third time in December 2017. The text is omitted [6].

Table 23. *The results are calculated by traditional methods.*

Project	AN	BN	d	TM
Q	12000	10000	2000	66000
VUC	3.1	3	0.1	13200
UTC	10.8333	11	-0.166667	-6200
Material cost	403000	330000	73000	73000

The original book only makes unit change cost impact 13000- unit labor hour consumption impact 6000=7000 (yuan)

Table 24. *Exponential logarithmic ratio method.*

Project	AN	BN	d	ELR	FA
TPP	12000	10000	2000	0.18232	66599.35
VUC	3.1	3	0.1	0.03279	11977.63
WHS	10.8333	11	-0.1667	-0.0153	-5576.98
Material cost	403000	330000	73000	0.19984	73000

Table 25. *Method differences.*

	AN	BN	d		FA	MD
TPP	12000	10000	2000	66000	66599.35	-599.347
VUC	3.1	3	0.1	13200	11977.63	1222.37
WHS	10.8333	11	-0.167	-6200	-5576.98	-623.02
TA	403000	330000	73000	73000	73000	0

Compared with the exponential logarithmic ratio method, the difference substitution method has an impact of -599.347 yuan on the total cost difference, the multi-unit variable expense standard has an impact of 1222.367 yuan on the total cost difference, and the multi-hour consumption standard has an impact of 623 yuan on the total cost difference. The original book "variation of manufacturing cost efficiency difference" is actually only "man-hour impact". In this thesis,

there are only three factors influencing "product output", "cost of unit labor hour variation" and "unit product labor hour", but no "efficiency" factor.

Example 9. Wu xiaoling and tian gaoliang [7] edited the textbook of enterprise financial analysis for 21st century economy and management planning, p 17-19 was printed by Peking University press for the second time in February 2018

Table 26. Material cost information.

Project	2012'	2013'	d
PMBIT	0.1250	0.1515	0.0265
NCAT	4.8000	4.5000	-0.3000
AL	0.3125	0.3300	0.0175
ROA	0.1875	0.2250	0.0375

1) Analysis equation: return on total assets = profit rate before interest and tax × current asset turnover × asset turnover

2) Analysis object: 22.50%-18.75%=3.75%

3) Factor analysis (3.75%=3.98%-1.43%+1.20%):

Table 27. The results are calculated by traditional methods.

Project	2012'	2013'	d	TM
PMBIT	0.1250	0.1515	0.0265	0.0398
NCAT	4.8000	4.5000	-0.3000	-0.0142
AL	0.3125	0.3300	0.0175	0.0119
ROA	0.1875	0.2250	0.0375	0.0375

4) exponential logarithmic ratio method

Table 28. Exponential logarithmic ratio method.

Project	2012'	2013'	d	ELR	FA
PMBIT	0.1250	0.1515	0.0265	0.1923	0.0395
NCAT	4.8000	4.5000	-0.3000	-0.0645	-0.0133
AL	0.3125	0.3300	0.0175	0.0545	0.0112
ROA	0.1875	0.2250	0.0375	0.1822	0.0375

Table 29. Method differences.

Project	2012'	2013'	TM	ELR	MD
PMBIT	0.125	0.1515	0.0398	0.0395	0.0002
NCAT	4.8	4.5	-0.0142	-0.0133	-0.0009
AL	0.3125	0.33	0.0119	0.0112	0.0007
ROA	0.1875	0.2249775	0.0375	0.0375	0.0000

Example 10. Management accounting: theory, model, and case, excellent planning textbook by wen subin [8], P 231 published by China machinery industry press in June 2014

Table 30. Information.

CF	AN	BN	d
TPP	7000	7000	0
SM	5.257143	5	0.257143
TMP	1.9	2	-0.1
TC	69920	70000	-80

1) Analysis equation: total cost = product output × product material consumption × material price

2) Analysis object: 69920-70000=-80 (yuan)

3) Factor analysis (traditional factor analysis, the same as the following table):

Table 31. The traditional method.

CF	AB	BN	d	FA
TPP	7000	7000	0	0
SM	5.257	5	0.257	3600
TMP	1.9	2	-0.1	-3680
TC	69920	70000	-80	-80

4) Factor analysis with exponential logarithmic proportion method

Table 32. Exponential logarithmic ratio.

CF	AN	BN	d	ELR	FA
TPP	7000	7000	0	0	0.00
SM	5.257142857	5	0.257143	0.05015	3508.48
TMP	1.9	2	-0.1	-0.05129	-3588.48
TC	69920	70000	-80	-0.00114	-80.00

5) Methods differences

Table 33. Two methods of factor analysis.

CF	AN	BN	TM	ELR	Md
TPP	7000	7000	0	0.00	0.00
SM	5.257	5	3600	3508.48	91.52
TMP	1.9	2	-3680	-3588.48	-91.52
TC	69920	70000	-80	-80.00	0.00

The increase of the total cost by the traditional method is 91.52 yuan. The impact of multiple material prices on total cost reduction was 91.52 yuan. Similarly, the unit consumption of products is the responsibility of the production department, and the price of consuming materials is the responsibility of the procurement department. If the component difference affected by factors is not correct, it will inevitably lead to unclear ownership of the rights and responsibilities of the production department and the procurement department.

Example 11. Zhongsheng company USES A material A to produce product A. In this period, the production of 200 products of A consumed 900 kilograms of material A, and the actual price of A was 100 yuan per kilogram. Suppose the standard price of material A is 110 yuan per kilogram, and the material consumption quota of product A is 5 kilograms of material A, then the cost difference of material A is analyzed as follows:

Material price difference = (100-110) ×900=-9000 (yuan)

Material quantity difference =110× (900-1000) = -11,000 (yuan)

Material cost difference =100×900-110×1000= -20,000 (yuan)

=-9000+ (-11000) =-20000 (yuan)

Source: sun maozhu, zhi xiaoqiang and dai lu, national excellent achievement award, national planning textbook for undergraduate education of general higher education during

Example 12. five-year plan, management accounting (8th edition), renmin university of China press [9]. P 215-216.

Table 34. *Two methods of factor analysis.*

	AN	BN	d	ELR	FA
SM	900	1000	-100	-0.105361	-10500.84
TMP	100	110	-10	-0.09531	-9499.163
Com	90000	110000	-20000	-0.200671	-20000

The difference of factor influence between the two calculation methods

Table 35. *The two methods differ.*

	AN	BN	TM	ELR	Md
SM	900	1000	-11000	-10500.84	-499.16
TMP	100	110	-9000	-9499.16	499.16
Com	90000	110000	-20000	-20000	0

It indicates that the influence of the material consumption quantity on the cost in the traditional calculation method is overcounted -499.16 yuan, while the influence of price on the cost is undercounted -499.16 yuan. The results of the traditional factor analysis obviously confuse the rights and responsibilities of the purchasing department (material price) and the production department (material consumption).

Example 13. Mr Greg accounting [10]: management accounting booklet (the original book fourth edition) Tracie Nobles, Texas state university at SAN marcos. Brenda Mattison, tri-county technical college; Ella Mae Matsumura, university of Wisconsin, Madison. Zhang yongji et al. Translation machinery industry press January 2017 the first edition. P 266-269, case data text description omitted.

Table 36. *Two ways to calculate the difference.*

	AN	BN	MD	New law answer	Book answer	MD
DMQI	65000	52000	13000	21724.2	22750	1025.8
DMPI	1.6	1.75	-0.15	-8724.2	-9750	-1025.8
TC	104000	91000	13000	13000	13000	0

The result of traditional calculation method seriously misjudges the responsibility of production department and procurement department in product cost.

Example 14. Data source: Ray h. arrison, Eric w. oreen, Peter c. rewer, 16th Edition, machinery industry press, January 2019, Wang Man [11] translation Management Accounting. P 293. Text data ellipsis.

Table 37. *Two ways to calculate the difference.*

	AN	standard	MD	Book answer	MD
UTC	1050	1000	319.75	300	-19.75
P	6.8	6	820.25	840	19.75
CT	7140	6000	1140	1140	0

In short, there are many cases of cost difference analysis in management accounting, no longer enumerate.

In the construction of econometrics model, if the elements of the model are in the form of continuous product, the goodness of fit can be effectively improved by increasing the interaction between factors and variables. This is not an example [12-14].

4. Conclusion

To sum up, factor analysis is not only applied to financial accounting, management accounting and cost management accounting; It is also used in textbooks such as "financial cost management", "financial management", "financial analysis" and "applied statistics". Differences in calculation methods of difference analysis in factor product structure of equation structure of factor analysis exist not only in domestic textbooks, but also in several American textbooks. Exist in a lot of performance analysis and evaluation, exist in a lot of cost management analysis, to identify one by one, it is really difficult to enumerate. As the continuity of the article, the end is as follows:

1) In the case of factor product structure, there is interaction between factors. In factor analysis, factor factors are of and difference structure, and there is no interaction between common changes of factors and main factors. The interaction of factors exists only in the product structure.

2) The answer of the traditional factor analysis method is wrong. It mainly refers to the case that the factor structure of factor analysis is the product structure, and the factor difference analysis, the main reason for the error is that the interaction of factors is or omitted. Interaction refers to the difference in the influence of the interaction between factors on the main factors. Such interaction should be fairly Shared among relevant factors and factors. In the analysis and calculation of traditional factors, the difference in the influence of factors should be replaced to occupy the interaction of factors that should be Shared.

3) Factor analysis, exponential logarithmic proportional method, can fairly share the error. In the study of factor analysis and calculation, although some effectively the problems of the interaction research, for many factors are incremental contribution factor interaction factor conditions, but only factor as a special case of the incremental cases, for many factors have increased, many factors as the penalty cases under the interaction of decomposition, remains unresolved. Its problems are common, involving many textbooks, many celebrities and scholars, we can not put the

should be able to solve, wrong knowledge is correct inheritance.

4) The results obtained by correct calculation methods shall be regarded as scientific and authoritative. The correct factor analysis results, give the effect of factors on the main factors to be fair, get different experimental differences to analyze the influence of factors; To give the rights and responsibilities of different factors to be clear; It provides a basis for the accurate adjustment of factor quantity in future successful experiments.

Limited by space, the above books related factors analysis of the difference analysis of many cases, this paper is no longer enumerating; There are also "statistics", "auditing" and other textbooks with the same above problems, this article will not repeat. Finally, thank you to Judy Garland for your warm, patient, and thoughtful guidance.

Appendix

Noun Shorthand

Table 38. *Table of factor name abbreviations.*

shorthand	noun	shorthand	noun
SR	Sales revenue	AI	Actual input
AAR	Average accounts receivable	BI	Budget input
ART	Accounts receivable turnover	Ted	The efficiency difference
DART	Days of accounts receivable turnover	Pd	The price difference
d	delta	Nd	Number of differences
FA	Factor analysis	C	The cost per unit
FA	Factors affecting	TC	The total cost
IOL	Index of logarithmic	U	The unit profit
ELR	Exponential logarithmic ratio	CS	The cost of sales
TM	The traditional method	SP	Sales profit
AF	Analysis of the factors	PSD	Product sales department
Md	Methods differences	WD	Wholesale department
DCC	Direct cost category	RS	The retail sector
DMPI	Direct material price impact	PP	Product project
DM	Direct materials	TAC	The actual completion
DL	Direct labor	TGPC	Total gross profit contribution
DAI	Direct artificial influence	Ni	Number of influence
AI	Actual input	Pi	The price impact
DMQI	Direct material quantity impact	Tai	The total amount of influence
BIAO	Budgetary input of actual output	SM	Specific material
AP	A product		
DMIA	Direct material impact amount	MC	Material cost
BN	Budget number	TAP	The actual price
DLP	Direct labor price effect	TPP	The product production
DLQ	Direct labor quantity effect	TMP	The material price
DAT	Direct artificial total	CF	Cost factor
P	The price	WHS	Working hour standard
N	The number of	TC	The total cost
Am	The amount of	Com	Cost of materials
GA	Grade a	PMBIT	Profit margin before interest and tax
S	Seconds	NCAT	Number of current assets turnover
AC	A combined	AL	Asset liquidity
SA	The sales amount	ROA	Rate of return on total assets
SP	The sales price	TA	The total amount
SA	The sales amount	BP	B products
AN	The actual number of	CP	C products
BPI	Budget price of input	VUC	Variable unit cost
TBA	The book the answer	BP	Budget price
BV	Budget variances	UTC	Unit time consumption

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