

財務分析の実証的研究 (第三報)

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Positive Studies of Financial Statements Analysis. III

(Analysis of Financial Ratio Structure by Using
Correlation Technique)

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In an analysis of financial statement, one of the fundamental consideration is the correlation among the various ratios. Besides, the financial ratios can clearly be divided into groups which are strongly related and can obviously be known by assessing how much they are contributed each other, a new created ratio can easily be used by nonprofession for the recognition of financial statements. In this paper, a correlation technique deals successfully with above stated problem and furthermore, the procedures of financial data processing is rediscussed.

Introduction

After the world war II, Japan has rapidly been realized as an economic gaint in the world. This was contributed particularly to industrialization nineteen-sixties, which made economic society and firms very complicated. As there are so many interested parties in the joint stock corporation, via the reporting system of the financial statements it is necessary to inform the exact situation to interested. The purpose of the financial statement analysis is to make predictions about a firm, which will facilitate decision making. Credit grantors and equity investors have utilized the analysis of financial statements, but nowadays other groups such as managers, labor unions, and regulatory agencies increasingly concern themselves with the same sort of predictions and therefore utilize the financial statement analysis.

In order to essentially understand the situation of a firm, it is important to analyze the financial statement which involves predictions about the evaluation of profitability, safetiability, productivity and growth rate. However, it should be understood that the point of view weighted is varied with person to person, i. e., credit grantor is interested in capacity of payment whereas equity investor is concerned with ability of growth and ratio of dividend on capital. This paper is based on an executive management from the standpoint of the analysis of financial statements, so that the financial statement analysis is one of the convenient tools or techniques for management and control.

When balance of financial structure is lost by the inferior control, an executive manager has make an effort to redress it. A primarily important tool is considered to be a ratio analysis which involves the comparison of relationships among various ratios as follows. The financial ratio analysis involves three types of comparisons:

(1) comparison of items within a single years' financial statement, (2) comparison over time, and (3) comparisons among firms. In general, the number of ratios is always more than twenty, but in some special case, it may exceed fifty. But every ratio is not always important and necessary for analysis. Therefore, it is very difficult to recognize the financial situations using excessive ratios. So proficiency and experience enables to make an accurate and reasonable analysis by an excellent professional person. The scientific rationality may give an idea to execute professional skill and experience and develop a procedure of some simplification for the ratio analysis.

EXHIBIT 1 Financial Ratios

01 Capital Stock	Business
02 Number of Employees	19 Ratio of Depreciation on Tangible Fixed Assets
03 Ratio of Net Profit to Liabilities & Net Worth	20 Current Ratio
04 Ratio of Net Profit to Equity	21 Quick Ratio
05 Ratio of Profit on Sales	22 Fixed Ratio
06 Ratio of Gross Profit on Sales	23 Ratio of Fixed Assets to Fixed Liabilities & Net Worth
07 Ratio of Operating Profit on Sales	24 Ratio of Liabilities to Equity
08 Turnover Ratio of Liability & Net Worth	25 Stockholders' Equity
09 Turnover Ratio of Equity	26 Net Sales Per Employee
10 Turnover Ratio of Accounts & Notes Receivable	27 Personnel Expenses Per Employee
11 Turnover Ratio of Accounts & Notes Payable	28 Productivity of Labor (value added base)
12 Turnover Ratio of Current Assets	29 Property Per Employee
13 Turnover Ratio of Inventories	30 Productivity of Property
14 Turnover Ratio of Fixed Assets	31 Distribution Ratio to Labor on Gross Value Added
15 Ratio of Dividend on Capital	32 Distribution Ratio to Capital on Gross Value Added
16 Ratio of Dividend Charged to Net Profit	33 Ratio of Gross Value Added on Sales
17 Distributions Ratio	34 Position of Break-even Volume
18 Ratio of Net Income Retained in the	

Index method

Analysis of financial statements is generally classified as actual number method and ratio method. The former is based on the actual amount of money appeared in a financial report and the latter is related to the ratio which can be calculated from related amount of money. Ratio analysis is constructed by structural method, trend analysis, related ratios analysis, normalized ratio method and index method.

The index method, which is originally advocated by Alexander wall, is developed by the use of static ratios and dynamical ratios. These ratios were reduced to eight ratios

as follows by Alexander. Index method advocated by Alexander Wall, is consisted of four dynamical ratios and four statical ratios. The former is the turnover ratios of accounts and net receivable, inventories, fixed asset and equity, whereas the latter is current ratio, liabilities to equity ratio, quick ratio and accounts receivable ratio. By using the significant ratios which are selected according to excellent skill and experience, index method takes the weights to synthesize the results of various ratios into consideration. This is one of the synthesizing methods and is known as weighted ratio method. Accounts and notes receivable was, however, removed because of a large and thus, the seven ratios were used. In other words, the total value is defined as 100% and weighted percentage, is assigned to each ratio. the weight as a relative value is apt to change through the agency of subjective judgement of analyzer and the sort of firms. The index method is one of the most superior ratios analysis to judge overall situation of the firm. How to judge whether the situation becomes better or worse from overall standpoint of view. A better trend of firm is immediately confirmed if all ratios give good results, but if there are a few ratios which give bad results, complicated and unresolved problems in analyzing the situations. Index method is extensively appreciated, and is contributed to the synthesized financial analysis. This method should not used for the internal analysis of financial statements as a tool of management control, because A, Wall had stood upon the creditor. Few person have no doubts how to select the relative weights. The overall predictions of the analysis is not reliable without sever selection of weights.

Correlatio Technique

Correlation technique has been frequently applied to extensive fields with following the development of computer systems. This technique can evaluate complicated phenomena which consist of many characteristics. For instance, the enterprises have many characteristics of productivity, profitability, safetiability and so on from a financial standpoint of view. Systematic evaluation of an enterprise is gained by recognizing the relation among such characteristics.

In analyses of financial statement, for example, exist as ratios concerning to the profits as follow: ratio of net profit to liability, net profit to equity, net profit on sales, gross profit on sales and operating profit on sales. They are strongly related each other. Provide the correlation coefficient of two variables be considered, is 0.99 that is, two variates are most strongly correlated, then only one variable is enough to achive evaluation.

In multivariate technique, the principle component analysis which is known to resarchers in many files reduces informations of P pices of characteristics, x_1, x_2, \dots, x_p , to M pices of characteristics which fulfill two conditions. Let be reduced characteristics called first, second, \dots , Mth principal component z_1, z_2, \dots, z_m .

Principal components are expressed in termes of linear equations of weighted factors as:

$$z_1 = L_{11} x_1 + L_{12} x_2 + \dots + L_{1p} x_p$$

$$z_m = L_{m1} x_1 + L_{m2} x_2 + \dots + L_{mp} x_p$$

,where the z is principal component, the L is variance and the x is original value.

EXHIBIT 2 ESIGEN-VALUE AND EIGEN-VECTORS

PRINCIPAL COMPONENT ANALYSIS												** C-1 **	
	6.9648	4.2837	3.2304	1.9948	1.8114	1.6556	1.3013	-0.9006	0.5753	0.5565	0.5154	-0.3461	0.3289
(01)	0.2862	0.1801	0.0873	-0.0873	0.0220	-0.0098	-0.1554	-0.0672	-0.1744	-0.1555	-0.0408	0.0736	-0.0816
(02)	0.1501	0.1479	-0.1400	-0.0004	0.0060	-0.6209	-0.0422	-0.0136	0.1197	0.0801	0.1010	-0.0344	-0.0314
(03)	0.3251	0.1668	-0.0469	-0.0934	0.0086	0.0771	-0.1532	-0.0365	-0.1631	-0.1486	-0.0469	0.0958	-0.2696
(04)	0.2222	0.0830	-0.0875	-0.1480	-0.0684	0.2593	-0.1820	-0.2494	0.6635	-0.0825	0.1494	-0.4788	-0.0666
(05)	0.2793	0.1554	-0.2045	-0.1513	-0.0467	0.1147	-0.1316	-0.0108	-0.1867	-0.1276	-0.0562	0.1144	0.0439
(06)	0.0739	0.1251	0.3879	0.0551	0.0856	-0.0715	0.0190	-0.1326	0.5468	0.0012	-0.3753	0.5212	0.0876
(07)	-0.1432	-0.0681	0.2169	0.0279	0.0840	0.6199	-0.0679	0.0132	-0.1045	-0.0914	-0.0919	0.0284	0.0284
(08)	-0.0753	0.2026	0.2993	-0.2417	-0.1104	-0.1230	0.0403	0.3512	-0.0561	-0.0348	-0.3863	-0.5666	0.0578
(09)	0.1531	0.1714	0.1135	-0.1282	-0.0416	0.1451	0.2757	0.5834	0.1947	-0.0528	0.6001	0.2047	-0.0119
(10)	-0.0407	0.2706	0.3765	-0.1533	-0.0428	-0.0590	0.2237	-0.1035	-0.1200	0.0093	-0.0320	0.0039	0.0952
(11)	-0.0078	0.2415	0.1802	-0.0198	0.0241	0.0211	0.4010	-0.5712	-0.1749	0.0728	0.3413	-0.1462	0.1176
(12)	0.1451	-0.0521	0.3366	0.3194	0.2432	-0.0442	-0.2116	0.0767	-0.0571	0.0153	0.1476	-0.1397	0.2772
(13)	0.2668	-0.1069	-0.1329	0.1423	0.1431	0.1174	0.3729	0.1814	0.0694	-0.0352	-0.2808	-0.1252	-0.0144
(14)	0.2268	-0.0443	-0.1627	0.2034	0.1853	0.1345	0.4593	-0.1387	-0.0086	-0.0052	-0.1606	-0.0489	0.0008
(15)	-0.1227	-0.0014	-0.0575	-0.4005	0.5559	0.0296	0.0126	0.0121	0.0115	-0.0416	0.0024	0.0070	0.0116
(16)	-0.2547	0.1842	0.0990	-0.2666	-0.2071	0.0865	-0.1138	-0.0766	0.0056	0.0543	0.0025	0.1153	-0.0300
(17)	-0.1050	-0.0311	-0.0557	-0.3427	0.5947	-0.0573	0.0134	0.0125	0.0107	-0.0433	0.0022	0.0077	0.0106
(18)	0.2934	0.0837	0.1101	-0.0845	-0.1052	-0.0206	0.2388	0.1351	-0.0559	0.1876	-0.1480	0.0064	-0.0317
(19)	-0.0975	0.3167	0.0229	0.3057	0.2297	0.0793	-0.1000	0.0924	0.0032	0.2490	0.0047	-0.0751	-0.4156
(20)	-0.0673	0.3892	-0.1561	0.1708	0.0960	0.1101	-0.1025	0.0558	0.0180	0.3219	-0.0457	0.0112	0.0203
(21)	-0.1792	0.3452	-0.1924	0.1020	0.0522	0.1103	0.0073	0.0549	0.0183	0.3230	-0.0571	0.0073	0.0219
(22)	0.2606	-0.1217	0.1518	0.0900	0.1522	0.0497	-0.2820	0.0523	-0.0801	0.2884	0.1078	-0.0684	0.4695
(23)	-0.0239	-0.3851	0.2085	-0.1440	-0.0364	0.0046	0.0540	-0.0087	-0.0066	0.3576	0.0496	0.0202	-0.4073
(24)	-0.2521	0.1707	-0.2702	0.0610	-0.0774	0.0146	0.0925	0.0977	0.0560	-0.3002	-0.0553	0.0662	0.3840
(25)	0.1710	-0.0680	-0.2401	-0.3823	-0.1657	0.1248	0.0074	-0.0280	-0.0043	0.5189	-0.1069	0.1070	0.2884
(26)	-0.2773	-0.1957	-0.0405	0.0665	-0.0298	-0.0589	0.1714	0.0520	0.1691	0.1502	0.0417	-0.0838	0.0913

EXHIBIT 3

same category ratios

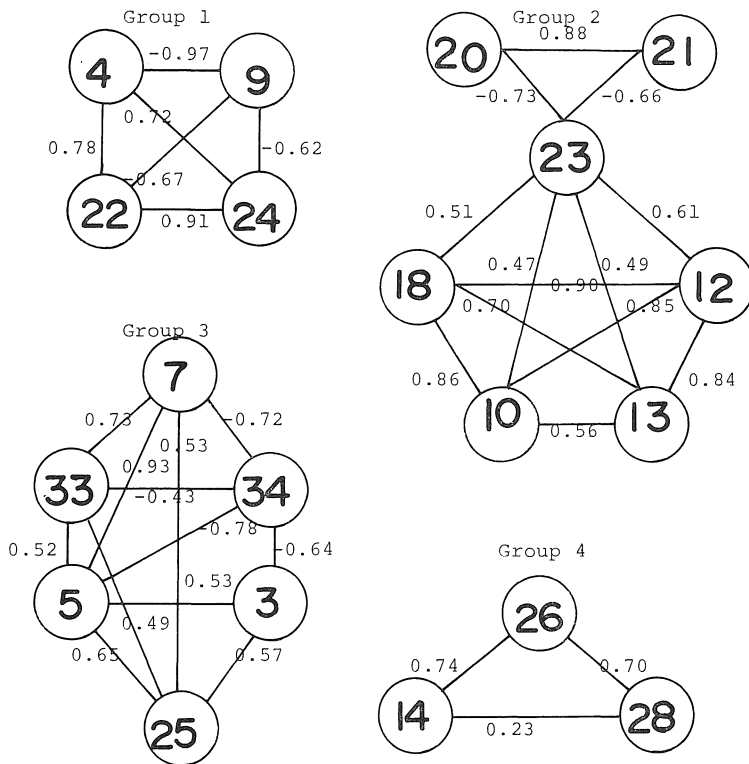


EXHIBIT 5 THE PROGRAM OF JACOB'S METHOD

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C      MATRIX OF ORDER NN STORED IN ARRAY A BY JACOB'S METHOD.
4889  DIMENSION A(28,28),U(28,28)
      PAUSE 55
      READ(4)IND,NN,ITMAX,EPS
      DO 710 I#1,NN
      DO 700 J#1,NN
      READ(4)A(I,J)
      CONTINUE
      CONTINUE
      N1#NN-1
      ISW#1HD-2
      IHD#1
      IF(N1) 1040,2,5
      IF(1SW) 3,4,3
      U(I,1)#1.0
      ITER#0
      FMAX#0.0
      GO TO 900
      JSW#1
      IF(1SW) 6,9,100
      DO 8 I#1,NN
      DO 7 J#1,NN
      U(I,J)#0.0
      CONTINUE
      U(I,1)#1.0
      CONTINUE
      GO TO 100
      JSW#2
      FMAX#0.0
      DO 135 I#1,N1
      I1#1
      DO 130 J#1,NN
      IF(A(I,J)-A(J,1)) 1020,110,1020
      W#ABS(A(I,J))
      IF(CMAX-W) 120,130,130
      FMAX#W
      N#I
      L#J
      CONTINUE
      CONTINUE
      ITER#0
      GO TO 300
      FMAX#0.0
      DO 230 I#1,N1
      I1#1+1
      DO 220 J#1,NN
      W#ABS(A(I,J))
      IF(CMAX-W) 210,220,220
      FMAX#W
      N#I
      L#J
      CONTINUE
      CONTINUE
      IF(EPS-FMAX) 310,900,900
      IF(ITER-ITMAX) 400,1030,1030
      ITER#ITER+1
      A1#A(K,K)
      A2#A(L,L)
      A3#A(K,L)
      Z#(A1-A2)*0.5
      TT#ABS(Z)-FMAX
      IF(TT) 420,410,410
      W#A3/W
      Z#SQRT(W*W*1.0)+1.0
      T#W/2
      GO TO 430
      W#W/A3
      Z#W#SQRT(W*W*1.0)
      IF(W) 421,420,420
      Z#-ZAA+W
      GO TO 425
      Z#ZAA+W
      T1#Z/2
      C
      T#TAN(Z),C#COS(Z),S#SIN(Z)  WHERE TAN(Z)#A3/W
      Z#T*1.0
      Z#SQRT(1.0/Z)
      Z#T#C
      DO 550 I#1,NN
      GO TO 510,520,JSW
      W#(1.0)
      W#U(I,L)
      U(I,A)#W#C+Z#S
      U(I,L)#W#S+Z#C
      IF(1-L) 530,550,530
      IF(1-L) 540,550,540
      W#A(I,K)
      Z#A(I,L)
      A(I,A)#W#C+Z#S
      A(I,L)#W#S+Z#C
      A(K,1)#A(I,K)
      A(L,1)#A(I,L)
      CONTINUE
      A(K,K)#(A1#(C#C))+(A2#(S#S))+(C+C)#A3#S)
      A(L,L)#A1+A2-A(K,K)
      A(K,L)#0.0
      A(L,K)#0.0
      GO TO 200
      ITMAX#ITER
      EPS#FMAX
      DO 610 I#1,NN
      WRITE(6,60)I,A(I,1)
      DO 600 K#1,NN
      WRITE(8,80) K,U(K,1)
      CONTINUE
      CONTINUE
      GO TO 4889
      IHD#2
      WRITE(5,20)I,J,A(I,J),J,1,A(J,1),NN
      GO TO 1000
      IHD#3
      GO TO 900
      IHD#4
      WRITE(5,40)NN
      GO TO 1000
      20  FORMAT(1H1,47H(PRG. EIG1) THE GIVEN MATRIX IS NOT SYMMETRIC/
      40  1H0,2(SX,2HA(13,1H,13,2H)#,E14.6),4X,2HN#,14,1H0,29H RETURNED WITH NO CALCULATION/
      60  FORMAT(1H1,16H(PRG. EIG1)  NH,14,5X,20HN SHOULD BE POSITIVE/
      60  1H0,29H RETURNED WITH NO CALCULATION/)
      80  FORMAT(1H0,/,1H0,/,1H0,/,1H0,/,1H0,/,1H0,27X,13HEIGEN-VALUE (,13,1H)1H0,30X,F10.4/1H0,/)
      80  FORMAT(1H0,10X,12HEIGEN-VECTOR,3H H(,12,3H)#,F10.4/)
      END

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liquidation and others. Nevertheless, it is rather difficult to interpret the results of principal component analysis. The weighted ratio can be estimated by the eigenvectors or structure vectors. This idea is variation of the previous index method of ratio analysis. The results of the P. C. A, are indicated in EXHIBIT 2. The linear equations which are similar to those in the index method are obtained by:

$$\begin{aligned}
 F1 &= 0.29(3)+0.33(5)+0.28(7)+0.29(25)-0.28(34) \\
 F2 &= 0.32(26)+0.39(13)+0.35(29)-0.39(31) \\
 F3 &= 0.39(8)+0.31(10)+0.38(12)+0.34(14) \\
 F4 &= 0.32(14)+0.40(22)-0.34(24)+0.31(26)-0.38(25) \\
 F5 &= 0.56(22)+0.59(24) \\
 F6 &= -0.62(4)+0.62(9) \\
 F7 &= 0.40(13)+0.37(20)+0.46(21)
 \end{aligned}$$

Measurement error

General material for evaluating an enterprise is financial statement which depends upon financial accounting. Business accounting is one of the powerful knowledge for business administration and is processed by series of recording, calculating, estimating and reporting. Financial statement is not only expressed by daily recordings and accounts but also indicated

by an amount of money which is evaluated and assessed by an executive manager and/or person in charge of finance. It is combination of three requisites composed of recorded facts, accounting convention and personal judgment, so that the results on the financial statement are remarkably governed by applicable accounting convention and subjective choice of treatment of accounting procedure. From historical development of accounting and this book-keeping, it is evident that income accounting and capital-equity's accounting were brought out at first. Whereas the function for calculation was established to confirm the profit which must be distributed by stockholder and the other persons. Managerial accounting comes next to calculation of distribution, where the trustee manager has to publish of the situation of financial control. Financial accounting for company depending on an idea of cost basis and of market prices basis has been formed by and its object is to find out a profit for the proper distribution. The acquire cost dependent upon the expenditure is measured by the purchasing goods and services. In the practical business, the cost basis accounting to be accepted now, is dependent upon the evaluation of original cost required to calculate the assets and payments. It is more reliable with respect to practical price to prepare the financial statements on cost basis from the financial information. The practical price is consisted of transaction value which is recognized by the persons associated with the external transaction. This is the objective price emerged by transaction facts and is considered rational and appropriate from in view of reliability of the financial information. Business accounting must be established by a promise or an assumption, which are on the bases of generally accepted principles on accounting. Reliability of financial information by any kind of firm has been organized by recognizing generally accepted principles. The financial information is a fundamental factor to compute the taxable income and to decide the selling price. A concept of "General accepted" is generally applied every where by everyone. Familiar accounting convention is a fundamental assumption based on generally accepted accounting principles.

In general, accounting conventions are as follows: (1) Business entity, (2) Going concern and (3) Stable monetary unit. The problem to be considered for management concerning to third convention, that is, the stable monetary unit. The monetary (the 'YEN' in Japan) is a measure to evaluate assets and equities. It is a common denominator to quantify the effectiveness of various transactions. The accountant records, classifies, summarizes and reports in terms of the YEN,

This convention includes three standards given as follows:

(1) same quality standard (to disclose information on finance with the same monetary unit),
(2) same matter standard (to disclose information on finance with the same content),
(3) simplified standard (to disclose information on finance with the theory of simple and adequate form) (1). Stable monetary convention is an assumption not to change in price-level and mean a single scale base. Business equity is appeared in its accounting record in terms of YEN at the time of each transaction. The business accounting records from summary total appeared in its external financial reports. Since, these accounting records contain the value of the currency recored at different periods, so the summarization is made among different values with no recognition in the purchasing power of those periods. The usage of the historical currency accounting has its most pronounced effects on the

accounting and reporting for long-live assets whose costs are allocated to operations over their useful lives. In fact, it contradicts remarkably the situations of the firm and the accounting reports during the period when the price-level furiously fluctuates. Above stated criticism causes following five fact: (1) shortage of funds to keep in the same management level in different years despite of an increase in the profit of the income statement accounting, (2) current assets extremely unbalanced compared to long-lived assets, (3) difference of the capital value between an old company and a newly established company, (4) impossible to judge the efficiency of production on the basis of cost comparison in different periods, (5) inaccurate judgement from the series comparison.

Conclusion

The correlation technique will be frequently applied in future. But this technique is based on the linear regression, but unfortunately high order regression is disregarded, Furthermore, in some cases unexpected relations may show high correlatio and thus the proper examination is necessary for certifying the results of the correlation technique.

In this work, the macro trend through nine and a half of fiscal years was analyzed and clarified. How ever trend in each period are obviously different in detale. This work is considered to include fundamental results to analyze the ratio structure and the financial structure.

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