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## CHAPTER 2

### *Statistical Estimation of Weights for Book Value, Dividends, and Earnings*

Chart 1, setting the keynote of the inquiry, showed ratios of price to book value and of earnings to book value for seventeen New York City bank stocks in early 1952. It incorporated a trend line for estimating the rate of earnings required, on the average, to support the market price of New York bank stocks at book value at the given point of time. As was indicated, the estimating trend line ordinarily requires fitting by some method, such as multiple regression, that can take account of dividends, since dividend rates may have an appreciable effect upon stock prices and hence upon the required rate of earnings. Multiple regression is a standard statistical procedure and does not call for systematic treatment here, though certain specialized aspects of its application to stock price analysis are covered in Appendix A. The immediate problem is to show how the results of multiple regression can contribute to our understanding of the bank stock market, of rates of return, and of cost-of-capital problems in general.

#### *A Problem in Valuation*

Table 1 presents the supporting data for Chart 1 and some additional information for the seventeen New York bank stocks in 1952. From the figures in the last line we learn that the average market yield was 4.47 per cent, the average price earnings ratio 14.2, and the average ratio of price to book value 0.89. These averages could be applied to the valuation of an individual security — say Chemical Bank and Trust — along the following lines:

Book value:	\$47.31	×	0.89	=	\$42.1
Dividends:	2.00	÷	0.0447	=	44.7
Earnings:	3.29	×	14.2	=	46.7
Average					\$44.5

In effect, three separate appraisals have been determined — one based on book value, one on dividends, and one on earnings. Each of them may be compared individually with the market price of 45, or all three may be averaged and compared jointly. The average of \$44.5 indicated above is unweighted, implying that book value, dividends, and earnings are all equally important as determinants of bank stock value. But since equality for these three factors is questionable, a weighted average would appear more appropriate. The problem is to ascertain the weights, and this is the first task of the multiple regression procedure. Later, the weights will be applied toward analyzing required rates of return and the cost of capital.

To derive the weights, we collected data from 117 large banks situated all over the United States. Their number includes virtually every bank having total assets of \$100,000,000 or more in the spring of 1952 and with suitable published financial records available at yearly intervals from early 1946 to early 1953. To improve representation in certain areas, a few smaller banks were also included. Several large banks had to be excluded for lack of a published earnings statement during one or more of the years covered, and a few others, because suitable price quotations could not be obtained from published sources. Another problem of inclusion was posed by mergers. The policy adopted was to include banks whose stock continued as an entity during the merger. Thus, for example, the Bankers Trust was included, despite its merger with the Commercial National in 1950, but the Girard Trust and the Corn Exchange National were excluded because their merger in 1951 created a new bank and a new stock. A list of the 117 bank stocks, broken down into six groups, appears in Appendix Table B-1, accompanied by a discussion of the problems encountered in classifying the stocks.

#### *Table of Weights for Book Value, Dividends, and Earnings*

Table 2 presents the weights, derived by multiple regression, for six groups of bank stocks over the eight-year period 1946-53. Table 3 presents collateral information in the form of average price, average book value, average dividends, and average earnings for the same groups of stocks and the same years. These averages, like others in this study, are geometric averages, which are advantageous for use

TABLE 1

## Statistics of 17 New York City Bank Stocks, Early 1952

BANK	PRICE	BOOK VALUE <sup>a</sup>	DIVIDEND RATE	NET OPERATING EARNINGS <sup>a</sup>	YIELD (DIVIDEND ÷ PRICE)	PRICE ÷ EARNINGS	PRICE ÷ BOOK VALUE
Bank of the Manhattan Co.	\$ 33	\$ 32.90	\$ 1.40	2.38	4.24%	13.9	1.00
Bank of New York	354	453.30	16.00	25.20	4.52	14.0	0.78
Bankers Trust Co.	45¾	56.29	2.00	2.96	4.37	15.5	0.81
Chase National Bank	39½	48.81	1.80	2.88	4.56	13.7	0.81
Chemical Bank & Trust Co.	45	47.31	2.00	3.29	4.44	13.7	0.95
Corn Exchange Bank & Trust Co.	68¼	65.21	3.00	4.68	4.40	14.6	1.05
Empire Trust Co.	132	115.48	3.00	9.20	2.27	14.3	1.14
First National Bank	391	472.03	20.00	21.68	5.12	18.0	0.83
Guaranty Trust Co.	295	377.97	14.00	17.66	4.75	16.7	0.78
Hanover Bank	89	115.44	4.00	6.53	4.49	13.6	0.77
Irving Trust Co.	21½	23.92	1.40	1.56	6.51	13.8	0.90
Manufacturers Trust Co.	63¾	63.92	2.60	4.96	4.12	12.7	0.99
J. P. Morgan & Co.	244	256.96	10.00	16.52	4.10	14.8	0.95
National City Bank <sup>b</sup>	47	54.99	2.00	3.51	4.26	13.4	0.85
New York Trust Co.	108½	116.96	5.00	8.09	4.61	13.4	0.93
Public National Bank & Trust Co.	48	53.00	2.25	4.02	4.69	11.9	0.91
United States Trust Co.	246	306.74	14.00	17.79	5.69	13.8	0.80
Geometric average	90.28	101.29	4.04	6.38	4.47	14.2	0.89

Based on Moody's, Standard's Corporation Records, the Wall Street Journal, the Bank and Quotation Record, and other published sources. Earnings (net operating earnings) refer to the calendar year 1951, book value to the end of 1951 (after adjustments cited in the next note), and price and dividend rate to the end of February.

<sup>a</sup>Adjusted for splits, stock dividends, and other changes in the capital stock account occurring during January and February, 1952.

<sup>b</sup>Figures adjusted for City Bank Farmers Trust Company.

TABLE 2

Geometric Weights for Book Value, Dividends, and Earnings,  
as Price Factors for Six Groups of Bank Stocks, 1946-1953

YEAR	BOOK VALUE	DIVIDENDS	EARNINGS	SUM
<i>Group I: 17 New York City Banks</i>				
1946	0.58	0.27	0.19	1.04
1947	0.55	0.40	0.06	1.01
1948	0.45	0.33	0.24	1.02
1949	0.71	0.29	0.00	1.00
1950	0.63	0.21	0.16	1.00
1951	0.57	0.23	0.17	0.97
1952	0.40	-0.02	0.64	1.02
1953	0.56	-0.06	0.50	1.00
Average <sup>c</sup>	0.54	0.19	0.29	1.02
<i>Group II: 25 Large Banks outside New York</i>				
1946	0.27	0.49	0.28	1.04
1947	0.13	0.63	0.27	1.03
1948	0.26	0.77	0.07	1.10
1949	0.24	0.70	0.16	1.10
1950	0.31	0.66	0.12	1.09
1951	0.33	0.74	0.06	1.13
1952	0.29	0.74	0.09	1.12
1953	0.22	0.70	0.21	1.13
Average <sup>c</sup>	0.27	0.66	0.16	1.09
<i>Group III: 17 Northeastern Banks<sup>a</sup></i>				
1946	0.03	0.44	0.54	1.01
1947	0.36	0.38	0.27	1.01
1948	0.21	0.47	0.38	1.06
1949	0.43	0.21	0.40	1.04
1950	0.35	0.61	0.06	1.02
1951	0.22	0.54	0.34	1.10
1952	0.12	0.73	0.19	1.04
1953	0.09	0.38	0.54	1.01
Average <sup>c</sup>	0.29	0.45	0.29	1.03

Earnings (net operating earnings) refer to the preceding year, book value to the end of the preceding year, price to the end of January or February, and dividends to the current rate at the time of the price quotation.

TABLE 2 (contd.)

YEAR	BOOK VALUE	DIVIDENDS	EARNINGS	SUM
<i>Group IV: 17 Midwestern Banks<sup>b</sup></i>				
1946	0.25	0.81	-0.16	0.90
1947	0.17	0.58	0.19	0.94
1948	0.16	0.69	0.10	0.95
1949	0.28	0.84	-0.15	0.97
1950	0.25	0.77	-0.06	0.96
1951	0.09	0.78	0.15	1.02
1952	0.27	0.67	0.05	0.99
1953	0.43	0.52	0.06	1.01
Average <sup>c</sup>	0.26	0.69	0.01	0.96
<i>Group V: 17 Southeastern Banks<sup>b</sup></i>				
1946	-0.05	0.76	0.28	0.99
1947	0.35	0.70	0.00	1.05
1948	0.44	0.74	-0.10	1.08
1949	0.13	0.90	0.03	1.06
1950	0.23	0.76	0.11	1.10
1951	0.26	0.64	0.17	1.07
1952	0.32	0.59	0.16	1.07
1953	0.24	0.69	0.19	1.12
Average <sup>c</sup>	0.25	0.71	0.11	1.07
<i>Group VI: 24 Southwestern and Western Banks<sup>b</sup></i>				
1946	0.43	0.37	0.28	1.08
1947	0.44	0.27	0.37	1.08
1948	0.59	0.29	0.21	1.09
1949	0.48	0.39	0.21	1.08
1950	0.36	0.29	0.40	1.05
1951	0.49	0.24	0.32	1.05
1952	0.40	0.26	0.38	1.04
1953	0.30	0.29	0.43	1.02
Average <sup>c</sup>	0.47	0.30	0.30	1.07

<sup>a</sup>Other than group I or II.

<sup>b</sup>Other than group II.

<sup>c</sup>Obtained by pooling the data for eight years and extracting weights from the results. The weights themselves have not been averaged.

TABLE 3

Mean Values (Geometric Averages) of Price, Book Value, Dividends, and Earnings for Six Groups of Bank Stocks, 1946-1953 (dollars)

YEAR	PRICE	BOOK VALUE <sup>a</sup>	DIVIDEND RATE	EARNINGS <sup>a</sup>
<i>Group I: 17 New York City Banks</i>				
1946	110.24	101.98	3.94	7.78
1947	94.66	106.94	4.05	7.42
1948	82.06	110.09	4.05	6.56
1949	84.48	112.58	4.05	6.95
1950	97.66	114.20	4.26	6.79
1951	94.92	108.54	4.17	6.58
1952	90.28	101.29	4.04	6.38
1953	90.28 <sup>d</sup>	94.14	3.78 <sup>d</sup>	6.46
<i>Group II: 25 Large Banks outside New York</i>				
1946	95.15	74.89	2.94	7.27
1947	79.84	79.80	3.07	7.00
1948	66.41	78.20	2.93	6.44
1949	66.68	79.47	3.09	7.01
1950	76.10	82.26	3.19	7.45
1951	75.51	80.61	3.24	7.26
1952	69.98	73.49	3.07	6.41
1953	71.78 <sup>d</sup>	68.61	2.97 <sup>d</sup>	6.00
<i>Group III: 17 Northeastern Banks<sup>b</sup></i>				
1946	71.47	68.30	2.29	5.39
1947	53.92	60.09	1.93	4.04
1948	45.86	61.20	2.01	4.06
1949	45.22	61.53	2.05	4.42
1950	46.05	56.77	2.01	4.04
1951	45.49	54.14	2.02	4.25
1952	45.62	54.29	2.05	4.39
1953	48.19 <sup>d</sup>	54.44	2.15 <sup>d</sup>	4.25

Earnings (net operating earnings) refer to the preceding year, book value to the end of that year, and price and dividend rate to the end of February, except as otherwise noted.

TABLE 3 (contd.)

YEAR	PRICE	BOOK VALUE <sup>a</sup>	DIVIDEND RATE	EARNINGS <sup>a</sup>
<i>Group IV: 17 Midwestern Banks<sup>c</sup></i>				
1946	106.14	111.97	3.17	9.90
1947	94.47	101.78	2.81	8.94
1948	85.87	103.93	2.89	8.35
1949	70.03	92.51	2.78	8.44
1950	74.59	96.34	3.03	8.76
1951	68.95	85.75	2.79	8.09
1952	60.87	72.64	2.37	7.08
1953	51.78 <sup>d</sup>	60.38	2.02 <sup>d</sup>	6.15
<i>Group V: 17 Southeastern Banks<sup>c</sup></i>				
1946	81.67	59.61	2.33	5.73
1947	76.17	65.67	2.41	6.96
1948	66.88	67.24	2.51	6.86
1949	57.27	61.37	2.37	6.80
1950	58.29	60.71	2.39	6.54
1951	63.78	63.52	2.52	6.84
1952	65.22	64.78	2.56	6.65
1953	69.18 <sup>d</sup>	66.34	2.66 <sup>d</sup>	6.63
<i>Group VI: 24 Southwestern and Western Banks<sup>c</sup></i>				
1946	89.25	71.79	2.86	6.87
1947	85.07	75.24	2.85	7.90
1948	77.70	76.00	2.91	7.51
1949	71.99	75.10	2.84	8.37
1950	66.13	66.90	2.53	7.09
1951	61.04	61.96	2.35	6.58
1952	60.40	62.55	2.41	6.02
1953	60.40 <sup>d</sup>	60.87	2.33 <sup>d</sup>	5.65

<sup>a</sup>Adjusted for splits, stock dividends, and stock flotations occurring between year end and the date of the price quotation — February 28 or January 31.

<sup>c</sup>Other than group II.

<sup>b</sup>Other than group I or II.

<sup>d</sup>January 31.

**TABLE 4**

**Mean Ratios of Price, Dividends, and Earnings to Book Value,  
of Earnings and Dividends to Price, and of Dividends to  
Earnings, for Six Groups of Banks, 1946-1953**

YEAR	P/B	D/B	E/B	E/P	D/P	D/E
<i>Group I: 17 New York City Banks</i>						
1946	108%	3.86%	7.63%	7.06%	3.57%	51%
1947	89	3.79	6.94	7.84	4.28	55
1948	75	3.68	5.96	7.99	4.94	62
1949	75	3.60	6.17	8.23	4.79	58
1950	86	3.73	5.95	6.95	4.36	63
1951	87	3.84	6.06	6.93	4.39	63
1952	89	3.99	6.30	7.07	4.47	63
1953	96	4.02	6.86	7.16	4.19	59
<i>Group II: 25 Large Banks outside New York</i>						
1946	127	3.93	9.71	7.64	3.09	40
1947	100	3.85	8.77	8.77	3.85	44
1948	85	3.75	8.24	9.70	4.41	45
1949	84	3.89	8.82	10.51	4.63	44
1950	93	3.88	9.06	9.79	4.19	43
1951	94	4.02	9.01	9.61	4.29	45
1952	95	4.18	8.72	9.16	4.39	48
1953	105	4.33	8.75	8.36	4.14	50
<i>Group III: 17 Northeastern Banks<sup>a</sup></i>						
1946	105	3.35	7.89	7.54	3.20	42
1947	90	3.21	6.72	7.49	3.58	48
1948	75	3.28	6.63	8.85	4.38	50
1949	73	3.33	7.18	9.77	4.53	46
1950	81	3.54	7.12	8.77	4.36	50
1951	84	3.73	7.85	9.34	4.44	48
1952	84	3.78	8.09	9.62	4.49	47
1953	89	3.95	7.81	8.82	4.46	51

TABLE 4 (contd.)

YEAR	P/B	D/B	E/B	E/P	D/P	D/E
<i>Group IV: 17 Midwestern Banks<sup>b</sup></i>						
1946	95	2.83	8.84	9.33	2.99	32
1947	93	2.76	8.78	9.46	2.97	31
1948	83	2.78	8.03	9.72	3.37	35
1949	76	3.01	9.12	12.05	3.97	33
1950	77	3.15	9.09	11.74	4.06	35
1951	80	3.25	9.43	11.73	4.05	34
1952	84	3.26	9.75	11.63	3.89	33
1953	86	3.35	10.19	11.88	3.90	33
<i>Group V: 17 Southeastern Banks<sup>b</sup></i>						
1946	137%	3.91%	9.61%	7.02%	2.85%	41%
1947	116	3.67	10.60	9.14	3.16	35
1948	99	3.73	10.20	10.26	3.75	37
1949	93	3.86	11.08	11.87	4.14	35
1950	96	3.94	10.77	11.22	4.10	37
1951	100	3.97	10.77	10.72	3.95	37
1952	101	3.95	10.27	10.20	3.93	38
1953	104	4.01	9.99	9.58	3.85	40
<i>Group VI: 24 Southwestern and Western Banks<sup>b</sup></i>						
1946	124	3.98	9.57	7.70	3.20	42
1947	113	3.79	10.50	9.29	3.35	36
1948	102	3.83	9.88	9.67	3.75	39
1949	96	3.78	11.15	11.63	3.94	34
1950	99	3.78	10.60	10.72	3.83	36
1951	99	3.79	10.62	10.78	3.85	36
1952	97	3.85	9.62	9.97	3.99	40
1953	99	3.83	9.28	9.35	3.86	41

The mean ratios were derived from the averages in Table 3.

<sup>a</sup>Other than group I or II.

<sup>b</sup>Other than group II.

with ratios. Specifically, when geometric averages are used, the average of a ratio, say price to book value, is equal to the ratio of the averages; but this is not true of arithmetic averages. The average ratios are given in Table 4.

Probably the most striking characteristic of the weights in Table 2 is the variation from group to group. Thus in groups II, IV, and V, the weight for dividends exceeds the weights for book value and for earnings in all years, which implies that dividends ranks first among the three factors in its effect on the market prices of most of the stocks in these three groups. But in group I, consisting of New York City bank stocks, first place goes to book value, whose weight exceeds that for dividends in all years and that for earnings in all years but one. The persistence of these differences over the years leads to the conclusion that the groups are basically heterogeneous, and that averages purporting to represent all groups would not in fact be representative. Generalizations, moreover, may be misleading unless very carefully drawn. From the frequency with which dividends takes first place among the weights, one might be tempted to conclude that this factor is the most important one affecting bank stock prices in general; but one should not lose sight of the presence of exceptions among the 117 stocks from 1946 to 1953 or of the possibility that other factors might take first place for other groups of stocks or for other periods of time.

In addition to the variation among groups, some variation will be noticed from year to year within a group. Variation of this sort, however, appears erratic in character and exhibits no definite trends that might point to consistent changes in investor preference for book value, dividends, or earnings. In the absence of such trends, it is tempting to average the yearly values for each group although such a step cannot readily be justified. Certainly the market is not such a stable institution and investor preferences are not so rigidly fixed that no changes in weights are to be expected from year to year. Averages might therefore have the undesirable effect of concealing these year-to-year changes even while performing the useful function of eliminating some unwanted erratic variation. At any rate, average weights are included in Table 2, even though little use is made of them in subsequent chapters.<sup>1</sup>

<sup>1</sup>For a more detailed and technical discussion of the apparently erratic variation in the bank stock weights see "Bank Stocks and the Analysis of Covariance," by David Durand, *Econometrica*, Vol. 23 (1955), pp. 30-45.

### *Other Factors*

Factors other than book value, dividends, and earnings must also affect bank stock prices, and their absence may conceivably distort the weights in Table 2. Accordingly, substantial efforts were made to identify some of the other factors, to include them in the table of weights, and to measure their effects. These efforts, for the most part, yielded only negative results. But even this is an important finding — partly because it illustrates some of the difficulties and limitations of applying statistical methods to stock price analysis, and partly because it indicates that the other factors exert a substantially smaller influence on bank stock prices than do book value, dividends, and earnings.

The additional factors actually investigated may be divided into two categories: first, those for which published data were available; second, those for which confidential data were required. Among the first were the following:

1. Total capital, as a measure of size of bank
2. Ratio of assets to capital
3. Ratio of risk assets to capital
4. Ratio of current dividend rate to average past dividend rate
5. Average annual rate of increase in earnings<sup>2</sup>
6. Stability of earnings<sup>2</sup>

With regard to the second group of factors, those for which confidential data were needed, primary interest centered in reserves. Most banks carry a variety of reserves. Some of these, like reserve for taxes, represent anticipated expenditures that are almost certain to occur in the near future. But others, like reserve for contingencies, represent possible expenditures that may occur in the more remote future — or conceivably never. The question therefore arises whether this second type of reserve constitutes, in effect, a hidden addition to capital that might affect stock prices. The attempt to include such reserves in a statistical study poses two serious problems: first, the

<sup>2</sup>For estimating the average rate of increase in earnings, a regression line was fitted to a seven-year earnings record for each bank, and the regression coefficient of earnings on time provided the average rate of increase. The standard deviation of earnings around this trend line provided the estimate of earnings stability.

difficulty of identifying the reserves from descriptions ordinarily available in published reports; and second, the fact that many banks do not publish all their reserves. Accordingly, most of the 117 banks<sup>3</sup> were asked to supply — on a confidential basis — the information on reserves that they had submitted earlier to the Board of Governors of the Federal Reserve System for the survey of excess profits taxes.<sup>4</sup> The banks were asked also to supply confidential data, covering a short period of years, on net operating earnings and net earnings — the same data, in fact, that they ordinarily report to government regulatory agencies. On the basis of the information thus assembled, it was possible to test whether bank stocks showed any measurable relation to what might be called “inside information.”

It would not be quite correct to report that none of the additional factors — risk asset ratios, reserves, stability of earnings, and the like — exerted any effect on bank stock prices. But it is certainly true that none of these factors exerted systematic effects that were clearly discernible with the statistical methods used. The inevitable conclusion is that even fairly refined statistical methods are not sensitive enough to detect some of the subtle relationships that almost certainly exist between stock prices and numerous related quantities.<sup>5</sup>

Consider, for example, the problem of measuring the capital adequacy for a bank by means of one or two simple ratios. The old-fashioned ratios of assets to capital, or deposits to capital, were fairly clear-cut and easy to obtain, but they had obvious imperfections. The modern use of risk asset ratios, in which cash and government securities are deducted from total assets, attempts to remove one of these imperfections by segregating the assets most likely to decline and therefore most urgently requiring a capital cushion. But the attempt runs into difficulty, since no clear dividing line can be found between risky and riskless assets. Long-term government bonds, classified in the riskless category, presumably entail some risk — possibly more than short-term high grade municipals, which fall into the risky category; and the variations in risk within such categories as “corporate bonds” or “loans and discounts” may be very great indeed. Thus bank supervisors currently tend to regard

<sup>3</sup>The request was limited to members of the Association of Reserve City Bankers, virtually all of whom complied.

<sup>4</sup>See “Excess Profits Taxes of Commercial Banks,” *Federal Reserve Bulletin*, Vol. 38 (1952), pp. 612-19.

<sup>5</sup>Certain specially designed statistical methods are sensitive enough to measure the effects of other factors in addition to book value, dividends, and earnings, but these methods are inadequate to identify the particular factors that cause the effects. For further discussion see Durand, *loc. cit.* (especially section 6).

bank capital ratios as suitable only for screening purposes, and to conclude that the real test of capital adequacy requires a detailed examination of individual assets within categories. In the same way, a sophisticated bank stock buyer might argue that simple ratios are not particularly trustworthy measures of capital adequacy for purposes of bank stock evaluation.

### *Reliability of the Weights*

According to modern statistical theory, estimates derived from small samples are subject to error. When samples are obtained from carefully controlled scientific experiments, it is possible to estimate the magnitude of the errors that may reasonably be expected. For the present study considerable research was conducted along this line in order to appraise, more realistically, the reliability of the weights in Table 2 (see Appendix A).

Inasmuch as the sample of 117 bank stocks was not obtained from carefully controlled scientific experiments, the weights derived from it are subject to a number of important sources of error in addition to purely statistical sampling variation. One such source, the omission of other relevant factors in the calculation of the weights, has already been discussed. Another source, the basic heterogeneity of the market, will be discussed briefly at this point, and at some length in Appendix B.

Bank stocks as a class are not particularly homogeneous, although they appear less heterogeneous than some other classes, especially the highly diverse industrials. For this reason, the sample of 117 bank stocks was classified into six groups in the hope that these would exhibit more internal homogeneity than the complete sample. That the classification was at least partly successful in this respect is attested by the substantial and consistent variation in weights from group to group. But there remains evidence of heterogeneity within groups, which may consist either of operating differences among individual institutions or of differences within the market mechanism itself. The market is essentially a human phenomenon, in which buyers and sellers attempt to make rational appraisals but are hampered by a certain amount of prejudice and ignorance and a great deal of institutional and legal red tape. An individual stock may presumably attract a specialized following of investors and traders, and the price behavior of that stock may then reflect, in part, the particular characteristics of its following.

Let us consider, as an example of a nonuniform market within groups, the New York City bank stocks. Most of these are eligible

for investment by Massachusetts savings banks, which constitute an important class of bank stock investor. But the stocks of some of the smaller New York banks are ineligible because they fail to meet the \$40,000,000 capital requirement, and these stocks are thereby cut off from a very substantial volume of investment funds. It does not necessarily follow that the smaller New York banks suffer from this restriction, for they may be able to attract compensating interest from other types of investors. The main point is that stockholder interest, in one way or another, is not uniform.

Though heterogeneity in the New York City group could have been reduced, no doubt, by eliminating the smaller banks and perhaps some others with individual characteristics, such a process would have unduly decimated the sample. Even a sample of seventeen is uncomfortably small. Nevertheless, strictly as an experiment, one of the smaller banks, also believed deviant in other respects, was eliminated from the calculations, and the following differences in weights came to light:

	16 BANKS	17 BANKS
Book value	0.48	0.56
Dividends	0.15	-0.06
Earnings	0.37	0.50

These differences, resulting from the elimination of just one bank, are appreciable. Moreover, they indicate the order of magnitude of the error that may be attributable to heterogeneity. Nevertheless, they are not sufficient to alter the fundamental conclusion regarding the New York City bank stocks — namely, that dividends are relatively unimportant for this group.

In view of the many sources of error to which the weights are subject, it would be rash to attempt precise estimates of the limits of the error. Nevertheless, some sort of rough appraisal is essential. It should be perfectly clear, for instance, that the weights are not reliable to two decimal places as tabled. Nor are subsequent estimates of required rates of return derived from the weights correct to one-tenth of a percentage point, even though the calculation procedures imply roughly this degree of accuracy. From the differences just observed in the weights for sixteen versus seventeen New York banks, one is tempted to conclude that even the first figure to the right of the decimal point may be in error. A similar conclusion results from the presence of negative weights for earnings, of which the most striking examples are -0.16 and -0.15 for group iv in

1946 and 1949.<sup>6</sup> Since it is unlikely, in fact unthinkable, that the market actually prefers stocks with low earnings, which is the implication of these negative weights, the inevitable conclusion is that these weights are in error to the extent of at least 0.16 and 0.15 respectively. Finally, the investigation of statistical sampling errors (see Appendix A) indicates that errors in the order of 0.15 to 0.20 are to be expected.

### *Use of the Table of Weights for Stock Valuation*

The opening sections of this chapter posed the problem of evaluating the stock of some bank, such as Chemical Bank and Trust, by averaging three separate appraisals — one based on book value, one on dividends, and one on earnings. It is now appropriate to solve that problem by means of the table of weights.

Strictly speaking, the weights are geometric and should be used only for obtaining weighted geometric averages. But since geometric averages are difficult to compute, and since precision is neither sought nor deemed possible, arithmetic averages will often suffice. In the Chemical Bank and Trust example, the three appraisals — \$42.1 for book value, \$44.7 for dividends, and \$46.7 for earnings — do not differ very much from one another, and under this condition the arithmetic and geometric averages will be virtually identical.

The first step in using the weights is to adjust them so that they add up to one. That adjustment was not provided in the original statistical design, even though it could have been, because geometric weights that do not add up to one have important implications concerning the effects of stock splits (see Appendix A). Moreover, a rough adjustment is easily made and is certainly accurate enough for practical purposes. In the following illustrative calculation of the weighted arithmetic-average appraisal of Chemical Bank and Trust stock,

	Appraisal due to		Adjusted weight		
Book value	\$42.1	×	0.39	=	\$16.4
Dividends	44.7	×	-0.02	=	-0.9
Earnings	46.7	×	0.63	=	29.4
Weighted average					<u>\$44.9</u>

the weights for New York City banks in 1952 have been adjusted

<sup>6</sup>It should be noted that negative weights for dividends, which occur in the New York City group, do not necessarily imply errors. Instead, they may possibly imply that the market is seeking growth stocks, especially those with large earnings retention. This question is discussed in Chapter 4.

to add up to one, but the negative weight for dividends has not been replaced by zero.

The weighted geometric average of Chemical Bank and Trust stock was calculated for comparison, and it differed negligibly from the arithmetic average.<sup>7</sup> In fact, to one decimal place, the two averages were the same — \$44.9. If, however, the disparity among the three appraisals of the stock had been great — suppose, for example, the earnings appraisal had exceeded the book value appraisal by more than 50 per cent — the geometric average might have fallen appreciably below the arithmetic. But examples of this sort are hard to find in actual operating experience.

These averaging procedures have implications for security analysis, but here cautious interpretation is needed. On very superficial reasoning one might conclude that stocks selling substantially above or below their weighted average appraisals are either over- or under-priced. But although this conclusion is possible, it is by no means irrefutable. In the first place, these weighted averages are not exact because they must be calculated from weights that are not exact either. In the second place, some deviations from the average are normally to be expected as a result of factors other than book value, dividends, and earnings that may exert an effect, even if only a subtle one, on market price. And finally, we have no evidence that deviations from the weighted average tend to correct themselves over the long run; and indeed we have a good deal of evidence that such deviations tend to persist over the short run.<sup>8</sup> Therefore, these deviations from the average do not constitute a conclusive index of over- or underpricing, but they may provide the stimulus and a starting point for more intensive investigation.

#### *Estimating the Probable Effect on Market Price of Changes in Earnings or Dividends*

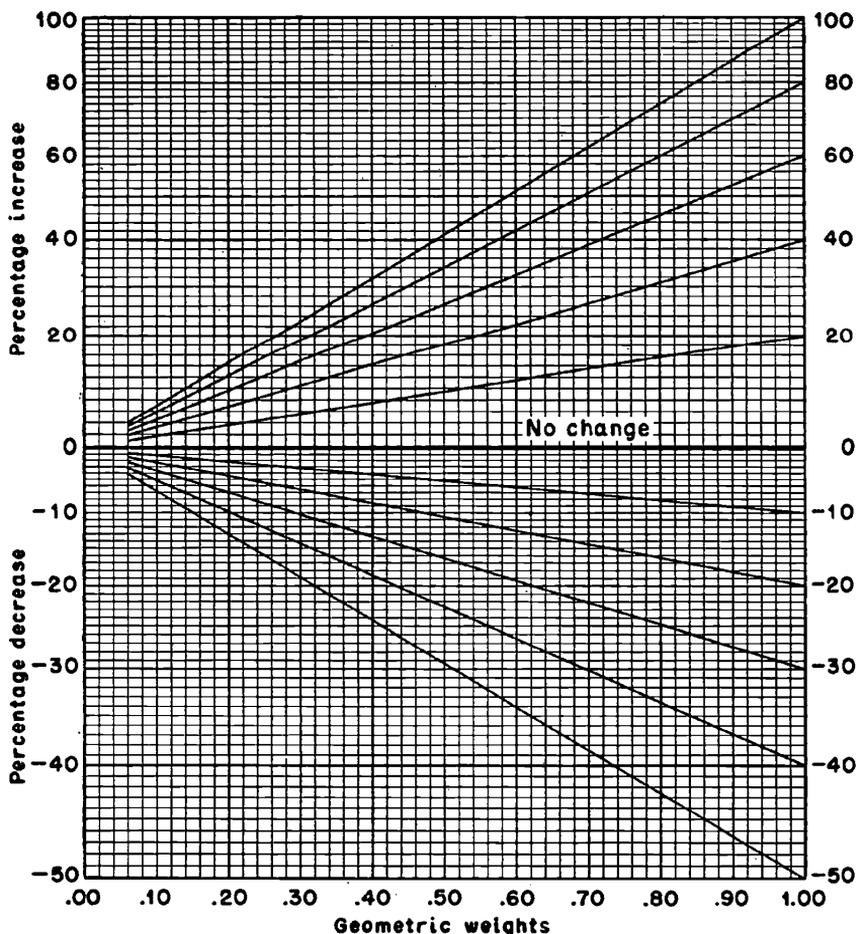
Although the probable effects of changes in dividends or earnings can be estimated by the averaging procedure just described, a more direct approach is afforded by the calculator in Chart 2. This approach will underlie much of the analysis of required rates of return in the next chapter. Suppose that a bank pays \$5 per share out of \$10 earned, and suppose further that the appropriate weights are 0.20 for book value, 0.60 for dividends, and 0.20 for earnings.

<sup>7</sup>The geometric average is calculated by first converting the three individual appraisals into logarithms, then obtaining the weighted average logarithm, and finally converting the average logarithm back into dollars.

<sup>8</sup>See Durand, *loc. cit.*

## CHART 2

### Calculator for Estimating Price Changes Attributable to Changes in Contributing Factors



What would be the expected result of, say, a 40 per cent rise in the dividend rate from \$5 to \$7? The answer can be read directly off the chart at the point where the upward-sloping 40 per cent line crosses the vertical line representing a weight of 0.60. This point corresponds to a value of 22 per cent, implying that the price of the stock is expected to rise by the same amount. The expected price change corresponding to a decline in dividends can be estimated from one of the downward-sloping lines, and values can be interpolated between lines when necessary.

The expected price reaction can be estimated in essentially the same fashion if earnings change and dividends remain constant. Given, say, a rise in earnings from \$10 to \$14 and the same weights as before, the answer is read off the chart at the point where the 40 per cent line crosses the vertical through 0.20, and the result is an implied rise of 7 per cent in price. If, however, the earnings increase is accompanied by a corresponding change in dividends, so that the payout ratio remains constant, the answer is obtained by combining the weights of earnings and dividends. Then a value of 31 per cent is read off the chart at the point where the 40 per cent line crosses the vertical at 80.

To be sure, these procedures, which are so easily applied to hypothetical examples, have yet to be tested in practice. When a bank actually changes its dividends or reports increased earnings, does the magnitude of the price reaction in fact correspond to the theoretical estimate? The statistical difficulties of testing this important question have not been adequately investigated, but they promise to be great. Market behavior is complex and often erratic. Instead of reacting to changes in dividends and earnings immediately after they are announced, the market may anticipate the announcement weeks or months in advance. Moreover, the anticipatory market reaction need not occur as a sudden surge in the price, but may proceed gradually over a period of time, during which it may become mixed up with other reactions attributable to other anticipated events. In short, the analyst who attempts to disentangle the timing, duration, and magnitude of market reactions in retrospect confronts a Herculean task.

### *Conclusion*

This chapter has introduced the idea of estimating empirical weights to indicate the relative importance of book value, dividends, and earnings as factors affecting bank stock prices, and has presented a table of such weights derived from the analysis of 117 stocks. The salient characteristic of the weights is the striking variation from group to group, which implies that bank stock prices are heterogeneous, and that broad generalizations are to be viewed critically. However, from the consistency of the variation from year to year conclusions can be drawn concerning the relative importance of the factors within groups — for example, the predominance of dividends for three of the groups, and the predominance of book value for the New York City group. While bank stock prices are undoubtedly influenced by many other factors both financial and institutional in

nature, the analysis implies that the influence of these others is of a much smaller order of magnitude than that of book value, dividends, and earnings.

The table of weights provides a versatile tool for analyzing a number of financial problems. For security analysts the weights may prove useful for appraising individual securities — provided that the limitations of the approach are observed — and for tentatively identifying stocks that appear overpriced or underpriced. For management the weights afford the means of estimating roughly the effects of changes in earnings or dividends. And finally, in the next chapter, the weights will provide the basis for analyzing required rates of return and the cost of capital.