Relation Between Cowles and S & P Indexes

Cowles extended the Standard Stat. Service Indexes (which begin in 1918 or later) backward to 1871, using the same formula, with an adjustment only for the fact that monthly high and low data were used, instead of daily price data.

(See attached from Cowles Book Common Stock Indexes 1871-1937, 1938)

A second edition of the above, entitled Common Stock Indexes was published in 1939. (It corrected "such errors as have been discovered" p.viii)


Later, Standard Stat. Service changed base again, to 1941-3=10. There is no Cowles response to this, and Cowles never responded regarding his dividend or earning series.

There are slight differences between Cowles Series p-1 in 1938 edition and Cowles Series p-1 in 1939 edition going all the way back to 1871. These must be due to data errors, as the figures for recent years agree.

There are also slight discrepancies between DA-1 in the respective editions. The series I used in "Do Stock Prices..." and elsewhere is from the older edition.

The series S & P composite from S & P Statistical Service attached differs from the Cowles Series by a base year change, but there are other small discrepancies which I can't account for.
THE STANDARD STATISTICS COMPANY FORMULA

(18.3) \[ I_t = \prod \frac{\sum_{i}^{t} x_{p,q_i}}{\sum_{p=1}^{t} q_{i-1}}. \]

If also the original list of issues is retained throughout the construction of the index, \( \sum_{i}^{t} x_{p,q_i} = \sum_{p=1}^{t} q_{i-1} \), and (18.3) reduces to

(4.2) \[ I_t = \frac{\sum_{i}^{t} x_{p,q_i}}{\sum_{p=1}^{t} q_0}. \]

There are two minor differences between the Standard Statistics and Cowles Commission index formulas: (a) because of scarcity of price data for earlier years, the definition of \( p_t \) must be modified; and (b) because of the different definition of \( p_t \), the correction for the sale of rights must be changed. Price data for the earlier years are confined in the case of each stock to tables of monthly highs and lows published in the Commercial and Financial Chronicle. No information is given regarding the day of the month to which any such quotation applies. It was therefore necessary, in the case of the Cowles Commission indexes, to let \( p_t \) represent the simple arithmetic average of monthly high and low, subject to adjustments as described on pages 18-20. These limitations in the data also necessitated resorting to approximations described on page 22 in the case of corrections for the issue of rights. The Standard Statistics indexes cover only the more recent period, for which daily quotations are available. It was not necessary, therefore, that they employ these approximations.

The general expression for the Cowles Commission indexes, Series F (and, if the corrections for payment of cash dividends are included in \( c_i \), for Series C as well) is given by

(16.1) \[ I_t = \prod \frac{\sum_{i}^{t} x_{c,p,q_i}}{\sum_{p=1}^{t} q_{i-1}}. \]

However, if daily closing prices had been available, a definition of \( p_t \) similar to that employed by Standard Statistics could have been used, and the correction for changes in capital structure could have been accomplished by subtracting from the new value of stock outstanding the new capital received, rather than by computing a reduction factor [formula (14)] by which the value of stock outstanding must be multiplied.
COMMON-STOCK INDEXES

Effective stocks is of considerable assistance. The Standard Statistics procedure is to adjust the numerator of (17) so as to include the value of all new issues to be added in period i, and exclude the value of all old issues to be withdrawn in period i. The numerator of (17) after adjustment represents simply the value of the effective stocks for the period i+1, and may be written \( \Sigma p_i q_i \).

The value of new stocks added to the list of included issues does not represent a profit to investors, nor does the value of old stocks removed represent a loss. Therefore, the base value must be adjusted so that the additions and withdrawals will not result in a change in the level of the index for the period in which they occur. This adjustment is made by multiplying the previous base value by \( \frac{\Sigma p_i q_i}{\Sigma p_i q_i} \). This factor simply restores the index to the figure which would have been obtained had no new issues been introduced, or old issues withdrawn, in period i. The most general form of the Standard Statistics formula is therefore

\[
I_i = \frac{\Sigma p_i q_i}{\Sigma p_i q_i} \prod_{i=1}^{i} \left[ \frac{\Sigma p_i q_i}{\Sigma p_i q_i - \Sigma p_i(q_i - q_{i-1})} \right]
\]

or, more simply,

\[
I_i = \frac{\Sigma p_i q_i}{\Sigma p_i q_i} \prod_{i=1}^{i} \left[ \frac{\Sigma p_i q_i}{\Sigma p_i q_i - \Sigma p_i(q_i - q_{i-1})} \right]
\]

Since

\[
\prod_{i=1}^{i} \frac{\Sigma p_i q_i}{\Sigma p_i q_i} = \frac{\Sigma p_i q_i}{\Sigma p_i q_i} \prod_{i=1}^{i} \frac{\Sigma p_i q_i}{\Sigma p_i q_i}
\]

(18.1) may be still further reduced to

\[
I_i = \prod_{i=1}^{i} \frac{\Sigma p_i q_i - \Sigma p_i(q_i - q_{i-1})}{\Sigma p_i q_i - \Sigma p_i q_{i-1}}
\]

(18.2)

If no additional stock is sold in any period, the \( p_i \) are all zero, and (18.2) becomes

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### Description of Method Used in Computation—Continued

**SPIN-OFFS**—Spins-off to common stockholders of subsidiary companies produce an arbitrary downward price change at the time the stock sells ex-dividend. This situation has no effect upon the weighting factor for the stock involved. It does, however, necessitate a new base value for the group that will be smaller than the old base value. The method of adjusting the base is as described in the footnote below. This adjustment always reduces the last period value, the adjustment being dependent on the decline in price due to the spin-off.

**ADDING OR DROPPING STOCKS**—The addition of new stocks to any group involves only an increase in the old base value (see footnote). The reverse operation is employed when stocks are dropped from the group.

**SUBSTITUTIONS**—Substitutions are kept to an absolute minimum. However, to maintain current representation, and because of mergers, delistings, etc., substitutions are unavoidable. The adjustment to offset the difference between the two stocks involved is basically the same as for adding or dropping stocks, but based on the difference in market value between the two.

Weighting factors are revised to include small stock issues such as those for stock absorptions, stock sold to employees, etc., as the multiplying factors are checked with the latest corporation report. An increase in stock outstanding involves an increase in the weighting factor for that stock, the stock added to the group is evaluated at current prices, and a new base value is computed (as shown in footnote) that offsets the value thus added.

### Dates of Indexes

The weekly data contained in this book are based on Wednesday's closing prices, or the last preceding sale price, this mid-week observation being considered most representative. The monthly averages are based on the indexes of the four or five weekly indexes of the month. Prior to 1954, the year's closing price index was the last Wednesday of the year, beginning 1954 it is as of the last trading day of the year.

### Distribution of Indexes

Standard & Poor's Indexes for the main groups appear hourly on the tickers of the American Stock Exchange, the Commodity News Service, the Cotton Exchange Ticker, the Pacific Coast Stock Exchange, and the Montreal Stock Exchange. Also Bunker Ramo, Quotron, and ADP/F.I.S. (all electronic quotation services) carry the S & P 500 on a minute by minute basis, as well as the sub-indexes on an hourly basis. The Associated Press, United Press International and Reuters (world wide) send the closing indexes over their financial news wires every day for publication by member papers. In addition, many of the national weekly news magazines report the indexes regularly.

The weekly indexes, by industrial groups, are published in the S & P weekly "Standard & Poor's Indexes of the Security Markets," and in the monthly "Current Statistics."

### Footnote

**BASE CHANGES**—Base changes are, in effect, proportional adjustments in its value to offset arbitrary changes in the market values upon which the index is based. The procedure is always as illustrated below.

\[
\text{NEW BASE VALUE = Old Base Value} + \text{New Value} - \text{Old Market Value} \]

For instance, a change which increases the market value by 12.0 million dollars, and that our aggregate market value after the increase is 1500.0 million dollars, and a base period value of 302.7. Then the new base period is

\[
\frac{302.7 \times 1500.0}{302.7 + 12.0} = 305.1
\]

It will be noted that the difference between the numerator and denominator in the above equation is 12.0, the amount for which the adjustment is being made.

Adjustments are always made in this manner. Reductions in base period values sometimes occur, if a stock is withdrawn or the substitution of a smaller company is made. In such cases the numerator is, of course, smaller than the denominator.