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# FACULTY WORKING PAPERS

RETURNS ON STOCKS, BONDS, AND COMMERCIAL PAPER:
LONG-TERM CONSTRUCTION, ANALYSIS, AND COMPARISONS

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Faculty Working Paper No. 117 April 1988

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# RETURNS ON STOCKS, BONDS, AND COMMERCIAL PAPER: LONG-TERM CONSTRUCTION, ANALYSIS, AND COMPARISONS

Jack W. Wilson and Charles P. Jones*

## Abstract

We report on the results of the construction of consistent monthly returns for two alternative measures of common stocks, for Aaa bonds, and for commercial paper from December 1870 through December 1987. The annual yields, on the assumption of monthly reinvestment of income returns, are analyzed and compared in both nominal and inflation-adjusted terms. The average returns for each series are reported by return components for the complete 1871-1987 period as well as for the two subperiods 1871-1925 and 1926-1987. The purpose of this paper is to extend return data back in time as far as possible, and to provide alternative data series for research purposes.

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# RETURNS ON STOCKS, BONDS, AND COMMERCIAL PAPER: LONG-TERM CONSTRUCTION, ANALYSIS, AND COMPARISONS

## I. Introduction

Ibbotson and Sinquefield (1976, 1977, 1979, 1982) and Ibbotson Associates (1984, 1985, 1986, 1987, 1988) have constructed returns on stocks, bonds and bills, beginning in 1926 and updated regularly. Recently, Wilson and Jones (1987) extended the stock return series back to January 1871 using data from the Cowles Commission study. Such a doubling of the time series for stock returns provides the basis for new analyses of the long-run performance of the equity market in general, and this equity market proxy in particular, under widely varying economic conditions.

In this paper we extend the fixed-income return data back in a comparable manner by calculating annual returns on Aaa corporate bonds and commercial paper, in both nominal and real terms, from 1871 through 1987.[1] These data provide the basis for the same types of analyses for fixed-income securities as for equities and makes possible very long-run comparisons among the major asset categories. In addition to these two fixed-income return series, we also construct an alternative stock return series that is broader than that of Wilson and Jones (1987), who spliced the Cowles series for the early period to the Ibbotson-Sinquefield series.

Current data available from Federal Reserve System sources allow both continuing monthly updates of the current rates on paper and bonds and the recalculation of cumulative wealth from these assets; furthermore, the stock return series can be updated regularly. Our returns series for all three assets are completely replicable from the data in the sources listed. These results are not intended as a substitute for, but as a complement to, the results of the Ibbotson-Sinquefield studies by almost

doubling the time series of returns as well as providing estimates for a risky short-term asset, commercial paper.

## II. A Review of Earlier Estimates of Asset Returns

The most widely used measure for stock performance is the Standard & Poor's "500," popularized by Ibbotson and Sinquefield, and currently updated in a regular and timely fashion by Ibbotson Associates. As noted in Wilson and Jones (1987), Alfred Cowles (1939) chronicled the monthly returns of common stocks based on the definitions and formula used by the Standard Statistics Company (which merged wih Poor's in 1941), carrying the data back to January 1871. Wilson and Jones (1987) compared monthly returns reconstructed from the Cowles series for 1871-1925 with the Ibbotson and Associates data from 1926-1985, and found differences in nominal returns between the two periods, as well as differences in the proportion of the total returns derived from appreciation and dividends.[2]

The two time periods were quite different in terms of general economic conditions. Further, given the differing definitions of stock returns by Cowles and by Ibbotson and Sinquefield, some differences in results should probably be expected even if everything else were held constant. For example, Cowles attempted to cover all common stocks listed on the New York Stock Exchange (NYSE), while Ibbotson Associates report the Standard & Poor 500 returns. To determine if these differing definitions affect the overall results, we splice the Cowles data to a NYSE-measure of stock returns starting in 1926.

No long-term series of monthly returns on commercial paper seems to have been described in the literature. However, Friedman and Schwartz

(1982, pp. 122-129) present annual average commercial paper interest rates from 1867-1975 based on essentially the same data sources that we have used in constructing the monthly return series.

Annual bond returns have been analyzed in previous studies. Roman Weil (1970) presented an annual returns series from 1900 to 1968, in real and nominal terms, based on Standard and Poor's Aaa corporate bond yields. He calculated calendar year holding-period returns using the assumption of a 4% coupon with 20 years to maturity (compounded semiannually). He was attempting to answer the following questions: "What have real interest rates been throughout this century?", and "What have been the real returns to bondholders?" Weil carefully considered the potential bias of the 4% coupon-20-year-maturity assumption and concluded on the basis of empirical estimates that the bias from the coupon assumption was small relative to the bias from the maturity assumption.

Fisher and Weil (1971) compared the investment performance of Aaa corporate bonds (Standard and Poor's yields) with common stocks for the period 1925-1968. They also used the assumption of the 4's with 20 years to maturity, and, as in Weil's earlier computations, assumed annual reinvestment. Their conclusion was that the performance of bonds was inferior to the performance of common stocks over the period surveyed.

Friedman and Schwartz (1982, pp. 122-128) construct an annual series of yields on high grade corporate bonds from 1867 to 1975. Their series is based on Macaulay's yields adjusted for "drift," spliced to Durand's series in 1900-1902 (1982, pp. 109-110). Ibbotson and Sinquefield and Ibbotson Associates have reported monthly returns for U.S. government bonds, corporate bonds, and Treasury bills from 1926 to the present. They also

have used the 4's with 20 years to maturity in their calculation of corporate bond returns but have assumed monthly reinvestment to provide a better comparison of bond returns with common stock returns. Since 1969, the Ibbotson data are based on actual transactions available from Salomon Brothers. Prior to 1949, the Ibbotson data used the Standard and Poor's high-grade corporate bond yields, assuming the 4% coupon and a 20-year maturity.[3] The Ibbotson data on corporate bond returns appear to contain splices over time between several data sources that are not consistently defined.

## III. Data and Methodology

### A. Stock Return Data

It would seem natural to splice the Cowles data to the Ibbotson data at either 1926, the beginning of the Ibbotson series, or in 1938 when the Cowles series ended. Wilson and Jones followed the former procedure, creating a stock return series covering 1871-1985. However, an alternative series from 1926 is available from the Chicago Research on Security Prices (CRSP) data covering all common stocks listed on the NYSE. Regardless of the splice point, therefore, a legimate question remains--To which stock returns series should the Cowles data be spliced?

Cowles based his reconstruction of the Standard Statistics Company data on their weekly definition of coverage, which included approximately 90% of the market value of all stocks traded on the New York Stock Exchange. Ibbotson and Sinquefield based their coverage on the readily available historical data of Standard and Poor's, which stated (1985, p. 2) "To avoid confusion, Standard & Poor's has standardized on its former daily

price index (50 Industrial, 20 Rails, 20 Utilities, 90 Composite) for the back record." It was not until February 28, 1957 that S&P moved to the 500 securities (425 Industrial, 60 Utilities, and 15 Rails). The composition of the S&P data was changed again in July 1976 to 400 Industrials, 40 Utilities, 20 Transportation, and 40 Financial for the 500 composite. Definitionally, the Cowles data are more comparable to the CRSP data than are the Ibbotson data. For example, there is a closer correspondence in the 1926-1938 overlap of the Cowles return data to the CRSP-NYSE data than with the S&P 90, and the CRSP coverage always is broader than that of S&P.

Wilson and Jones [1987] constructed the monthly returns using the Cowles "All Stock Price Index" [1939, Table P-1, pp. 67-68] and the "Stock Prices Including Cash Dividends Index" [1939, Table C-1 pp.168-169], deriving monthly dividends as the difference in the two indexes. Those months with negative dividend yields were corrected by comparing adjacent months and substituting the mean dividend yield between those relevant months; however, median dividend yields had to be substituted for several other months where negative dividend yields were not adjacent to extremely high yields. This can lead to small errors in the data.

An alternative method of constructing the Wealth Index from the Cowles' data exists from the monthly annualized dividend yield series that is provided in his monthly "Yield Expectations" series [1939], Table Y-1, pp. 270-271]. This monthly series is described as:[4]

> "For this series d, is computed as four times the quarterly rate last declared, unless the corporation announces that a change in rate is to be made, or a so-called extra dividend forms a regular feature of the company's dividend policy, in which cases the last declared rate is adjusted accordingly. When an extra dividend is paid irregularly, it is allocated only among the months to which the payment is assumed to pertain." [1939, p. 15]

Having worked with these series, it is our feeling that errors are likely from a construction using either definition--with the Wilson-Jones series probably overstating dividend yields and increasing the variance of returns, and the "Yield Expectations" series probably understating those yields with a smaller variance of returns. The "truth" probably lies somewhere between these alternative series.

That neither of the series from 1871 to 1926 can be expected to be exact--that is, there are reconstruction problems--is not unprecedented, since Ibbotson and Sinquefield [1976, fn. 5, p. 12] encountered a similar problem with the S&P published quarterly dividend data in the post-1925 period in the second quarter of 1949 and the first quarter of 1959, and had to make adjustments to eliminate the post-diction of monthly dividend returns. In an attempt to replicate the Ibbotson-Sinquefield estimates, we encountered exactly the same problems at the same times. For the more recent period, CRSP still revise their estimates and definitions on a continuous basis. A recent and significant revision by CRSP was to eliminate ADR's from their measure along with other minor changes [1987, pp, 3-4].

We have elected to create two separate stock return series for comparison. The first series splices the Wilson-Jones version of Cowles' returns to the CRSP returns, and the second series generates an alternative Cowles' wealth series using his dividend yields, splicing that series to S&P returns. For each series, the splice date is January 1926, and the completed series extends from December 1870 through December 1987.[5] Average returns are estimated for appreciation, dividend, and total returns

for both series for the complete period, and the subperiods 1870-1925 and 1926-1987.

B. Interest Return Series

Macaulay (1938) went into great detail about the difficulty of comparing yields over long periods of time. The basic problem is in the changing risks associated with bonds (or paper). Macaulay adjusted his bond yields for "drift," and provides monthly values of both the adjusted and unadjusted yields. Similar problems of long-term comparisons apply to the measure of consumer prices. The consumer market basket has changed considerably over the period 1871-1987; therefore, adjustment for quantity weights presents difficult problems. We have used Macaulay's unadjusted bond yields because they seem more comparable to the latter data and are more compatible with the concept of what an interest rate is (or was).

Both Weil (1970) and Fisher and Weil (1971) point out the biases associated with the consistent use of the Aaa rating. Bonds of higher risk should be expected to have higher yields. Therefore, a bond included in the Aaa category in a particular month, which was downrated, would not be included in subsequent months. This is quite similar to Macaulay's concept of "drift," and also is similar to the bias encountered in measuring returns on common stocks where stocks enter or exit the index because of their successes or failures. Furthermore, it is obvious that the bonds included in the estimation of the yield to maturity are not all of 20-year maturity with a 4% coupon and, as we have learned from Durand (1942), the yield on corporate bonds varies with maturity, and the maturity mix of the bonds can affect the average monthly yields.

The data are briefly described below.

Corporate Bonds

The annual returns and cumulative wealth of high-quality and Aaa corporate bonds are based on monthly interest rates on this type of asset from Moody's data as published in Federal Reserve Board of Governors sources from July 1919 through 1986.[6] For the period 1919-1933, yields were monthly averages, but from 1934 the averages are for the last week in each month.[7]

From June 1919 back to December 1870, Macaulay's railroad bond yield series unadjusted for "drift" is used.[8] Macaulay did not provide yields for the four months during which the New York Stock Market was closed (August through November, 1914). We have interpolated arithmetic trend estimates for these four months (where the yield moved from 4.441% in July to 4.657% in December).[9] The two series were spliced in June 1919, using the overlap ratio of 1.0384455 to inflate the Macaulay series to match Moody's yields.[10]

The methodology of calculating monthly returns is based on the assumption of a $100 par, 4% coupon bond, with a 20-year maturity, making semiannual payments of $2.[11] The standard formula is used to calculate the price of the bond (P), based on the current yield to maturity (r):

$$P = (2/.5r)\ [1 - (1 + .5r)^{-m}] + 100\ [1 + .5r)^{-m}]$$

For each month an acquisition price (A) is calculated with m = 40, and a sale price (S) is calculated with m = 39 5/6:

The appreciation return is calculated as S(t)/A(t-1),

The interest return is calculated as 33 and 1/3 cents over A(t-1), and

The total monthly return is equal to the appreciation return plus the interest return.

This approach is a close approximation to the monthly return but, as Whitmore (1985) shows, is not "exact." Whitmore points out that degrees of upward and downward biases vary with the yield.[12]

Commercial Paper

The sources for the monthly Commercial Paper interest rates are the same as the sources listed for Corporate Bonds. Macaulay's rates are used until January 1919, when the Federal Reserve series became available.[13] From January 1871 to December 1923, Macaulay used "choice two name paper" and from January 1924 to the splice date, "4 to 6 month prime double and single name paper."[14] Macaulay's series meshed smoothly with the Federal Reserve data, and no adjustment was needed when the two series were merged.[15] For most of the Federal Reserve System's period, the rates are for 4-6 month paper and since 1970, those rates are for 6-month paper.[16]

Friedman and Schwartz have pointed out that commercial paper as an instrument has changed over time:

> "However, commercial paper has changed in composition since the nineteenth century. Formerly, it consisted of trade notes received by manufacturers, wholesalers, or jobbers in payment for shipments to other firms. Denominations were in odd amounts related to the value of particular shipments. Dealers who bought the notes in turn sold them to banks. In recent decades, commercial paper has been in round denominations, unrelated to shipments of goods, usually by a finance company. As a result, the level of commercial paper rates before World War I is not continuous with the level since. . . . In addition, the eligibility of commercial paper for rediscount at Federal Reserve banks under the Federal Reserve Act of 1913 persumably also lowered commercial paper rates relative to other short-term rates." (1982, pp. 108-109)

This concern about changes in the nature of the instrument is similar to Macaulay's caution about comparing bond interest over long periods of time.[17]

Monthly returns are calculated similarly to bond returns. The basic formula for calculating the monthly price is based on the bank discount rate formula:

$$P = 100 - [100r / (360/d)],$$

where d is days to maturity.[18] An acquisition price (A) and a sales price (S) are calculated for each month. The monthly return is calculated as S(t) divided by A(t-1).[19]

Consumer Price Index

From 1913 to the present, these data are December values. Prior to 1913, the values were constructed to represent December values. A detailed description of the pre-1913 construction is available in Wilson and Jones (1987).

## IV. An Analysis of Stock Returns

Appendix Table 1 contains the complete set of annual nominal total returns for the two measures of stock prices, Aaa bonds, commercial paper, and inflation from 1871 through 1987. The first stock return series shown is that of Cowles--CRSP, while the second is the alternative Cowles--S&P. Appendix Table 2 contains the complete set of cumulative wealth indices for the same five series for the complete time period, with December, 1870 set equal to 1.0.

Table 1, following the Ibbotson Associates' format, shows the geometric mean, arithmetic mean and standard deviation for both the Cowles--S&P series and the Cowles--CRSP series for the entire period 1871-1987 and two major subperiods, 1871-1925 and 1926-1987. Subperiod dates are chosen to permit comparisons with stock returns from 1871 to 1925 by Wilson and

Jones, and from 1926 to 1987 to compare the CRSP returns with those of Ibbotson and Sinquefield.

Part A of Table 1 shows that the Cowles-CRSP measure of stock returns outperformed the Cowles-S&P measure in the 1870-1925 subperiod but underperformed the Cowles-S&P measure over the subperiod 1926-1987.[20] The geometric means for the later subperiod were, respectively, 9.617% and 9.908%, while the arithmetic means were, respectively, 11.720% and 12.017%.[21] However, closer examination of the arithmetic and geometric means show that these differences between the S&P and CRSP definitions primarily arise from differences in the 1926-1956 period as opposed to the post-1956 periods.

From December 1925 to December 1938 the total cumulative appreciation from Ibbotson and Sinquefield, using the Daily definition of the S&P 90, was 3.5%, with a total cumulative wealth (with dividends reinvested monthly) of 101.6%; comparable returns from the CRSP files were -10.2% in total appreciation, and 67.3% in total wealth.[22] For the same period the Cowles cumulative appreciation return, based on the Weekly definition, was -8.3%, with a total wealth return of 67.4%. This comparison for the period encompassing the Great Depression suggests that the S&P Daily index of 90 stocks outperformed both the Weekly index as measured by Cowles and the CRSP index. Comparison of the Cowles returns and the CRSP returns for this period suggests a much closer correspondence in appreciation and total returns because of the closer relation in the coverage definitions.[23]

Standard and Poor's moved to the definition from the "90" to the "500" on March 1, 1957. Comparing the appreciation and total returns for the S&P 90 with the CRSP returns for the period December 1938 through February 1957

also shows some differences between the two measures. From the series constructed by Ibbotson and Sinquefield, the appreciation over this period was 227.5% and the total wealth accumulation was 816.7%, whereas for the CRSP measures the appreciation was 229.7% and the wealth accumulation was 782.9%. Although the S&P coverage during this period tracks much more closely with the CRSP coverage, the S&P portfolio again outperforms the securities included in the broader NYSE definition on the wealth accumulation measure.

For the periods March 1, 1956 to July 1976 and July 1976 to December 1987, which include the initiation of the S&P "500," the appreciation returns for the S&P redefined coverages were 141.1% and 136.9% respectively, and the wealth accumulation returns were 366.2% and 305.9%. The appreciation returns for the CRSP for the two periods were 142.1% and 152.2%, respectively; for the cumulative wealth measures, the results for the two periods were 365.2% and 331.7%, respectively. Therefore, over the period 1956-1987, the S&P "500" portfolios performed similarly with regard to appreciation returns but underperformed the broader CRSP definition when wealth accumulation returns are considered.

In summary, for the total period from December 1925 through December 1987, the capital appreciation for the S&P was 19.3636 and the wealth accumulation figure was 349.7888, while for the CRSP the corresponding figures were 18.0892 and 296.7246, respectively (December 1925 = 1.00). The superior performance of the S&P measures over the complete period 1926-1987 was due to the use of the S&P 90 during the 1926-1956 period when the superior performance of the S&P 90 overstated the returns to stocks relative to the broader measure.

The monthly cumulative nominal returns on stocks, bonds, commercial paper, and inflation are shown in Figure 1. Only the CRSP stock series is shown, since the S&P index lies almost concident with the CRSP, crossing it several times over the period. The ratio of the SP index relative to the CRSP is plotted, and ends at a value of 1.056. The strong performance of the S&P in the 1920s and 1930s can be seen in this ratio plot.

Part B of Table 1 shows the summary statistics for the two components of total return, dividend return and capital change, for the overall period and the two subperiods. Using either measure, the two components of total return are very close to each other on an arithmetic mean basis for the entire period. On a geometric mean basis, the dividend return component dominates the capital change component because of the large variability in the latter.

For the two subperiods, on an arithmetic mean basis, the relative importance of the two components reverse, with the dividend return being more important in the earlier period and less important in the later period for both Cowles-S&P and Cowles-CRSP. On a geometric mean basis, however, the dividend return component is larger than the capital change component in both subperiods for both measures of stock returns.

## V. Annual Returns on Aaa Bonds

The returns on the 20-year, 4% coupon bond have been calculated with monthly reinvestment to make the returns comparable to the preferred method of calculating returns on common stocks. This procedure follows the method of Ibbotson and Sinquefield. Total return is broken down into its two components, price change and the return from the monthly coupon payment.

These results are shown in Table 2, with Appendix Tables 1 and 2 containing the complete year-by-year results for both returns and cumulative wealth.

Table 2 shows the geometric mean annual returns on Aaa bonds over the complete period, and by the subperiods 1871-1925 and 1925-1987 (along with the associated standard deviations), broken down by price returns, interest returns, and total returns. Over the period 1871-1987, the compound annual average total return is 5.318% with a standard deviation of return of 7.469%.

The interest return completely dominates the price return for both the entire period and the two subperiods. The geometric mean interest return over the complete period is 5.094%, and the mean price return is .246%. In addition, the variability of the price return far exceeds the variability of the interest return for the complete period and for each subperiod. The mean price return was negative for the 1926-1987 subperiod while the mean interest return was higher than for the earlier subperiod or for the entire period.

As would be expected, for the 1926-1987 period the geometric mean annual return for the Aaa bonds exceeds the comparable return calculated by Ibbotson Associates for U.S. government bonds, 4.3%, by some 34 basis points--and the variance of the returns of the Aaa bonds is higher. On the other hand, the geometric mean total return for the Moody Aaa bonds of 4.6% is some 30 basis points less than the geometric mean annual return on corporate bonds reported by Ibbotson Associates of 4.9% but with a higher standard deviation--9.4% compared to 8.5%.

Figure 1 shows the performance of bonds over the entire period 1871-1987. On a cumulative basis, bonds outperform commercial paper, but only a

strong boost in the last few years allowed the cumulative line for bonds to rise above that for paper. Cumulative stock returns, of course, dwarf bond returns.

## VI. Annual Returns on Commercial Paper

Since commercial paper has no interest return but trades at a discount from "par," we report only the total return. The returns are calculated in "coupon equivalent" terms, having been translated from the bank discount basis of the quotes.

The annual returns are summarized in Table 3 for the complete period as well as for the same subperiods as the Aaa bonds (see Appendix Tables 1 and 2 for year-by-year results). As expected, overall, and for each of the subperiods, the geometric mean returns are lower than for Aaa bonds, as are the standard deviations. Also, as would be expected, for 1926-1987 the geometric mean return on commercial paper of 4.551% is greater than the geometric mean return for Treasury bills of 3.5% as reported by Ibbotson Associates; furthermore, the risk associated with commercial paper is greater than for bills based on a simple comparison of the measures of variability, although the difference is relatively small--3.9% vs. 3.5%.

## VII. Inflation-Adjusted Returns on Aaa Bonds and Commercial Paper

Inflation-adjusted returns are calculated by division as opposed to the subtraction of the inflation rate from the nominal return.[24] Real wealth accumulation is derived by dividing the decimal of the nominal return (n) by the decimal of the inflation rate (inf), and subtracting 1.

$$(1+n) / (1+inf) = (1+real)$$

The annual inflation-adjusted returns for the four asset series, two stock return measures, Aaa bonds, and commercial paper are shown in Appendix Table 3, while Appendix Table 4 shows the four series on an inflation-adjusted cumulative wealth index basis.

Common stocks registered a negative inflation-adjusted return in 36 of the 117 years for which data are available. Bonds registered a negative inflation-adjusted return in 30 of these years and real returns on paper were negative in 24 of those years.

The geometric means and standard deviations for the complete period and for various subperiods are shown in Table 4 for inflation, the two alternative measures of stock returns, bonds, and paper. The inflation rate for the later subperiod was more than four times that for the earlier subperiod on a geometric mean annual average basis, and more than a full percentage point higher than that for the entire period.

The real return on common stocks for the entire period, as measured by the geometric mean annual average, was 6.49% using the S&P measure and 6.44% using the CRSP measure. As we know from the analysis of nominal returns, the S&P return was higher than the comparable CRSP return for the 1926-1987 subperiod because of the early "S&P 90" effect.

As would be expected, for the complete period and for each of the subperiods, the inflation-adjusted mean return as well as the standard deviation is higher for Aaa bonds than for commercial paper. What is perhaps surprising, however, is that the differentials are quite small, particularly on a geometric mean basis. Thus, for the entire period the geometric mean real annual return for bonds was 3.32%, while the comparable figure for commercial paper was 2.99%, and for the later subperiod the

differential between the two means was only 8 basis points. There were many years in which the annual real return of bonds was less than for commercial paper. It would appear that holders of long-term and short-term debt instruments were unsuccessful in anticipating inflation, and during wartime and post-war periods were especially overly optimistic with regard to the inflation-adjusted return.

The standard deviation for bonds of 9.84% is considerably higher than that for paper, 5.47%, over the complete period. Inflation-adjusted returns for both bonds and paper varied widely over the subperiods, as did the inflation rate.

The inflation-adjusted cumulative wealth series from holding bonds and paper are considerably less impressive than their nominal counterparts because the Consumer Price Index increased by almost 9.5-fold over the complete 1871-1987 period. The summary measures of the inflation rate show considerable variability, indicating that inflation is difficult to anticipate.

## VIII. Summary and Conclusions

This research has sought to generate a consistent series of monthly interest returns on both long-term and short-term debt instruments that are both replicable and readily updatable with publicly available data. The annual data have been presented on the basis of monthly reinvestment so the results can be compared with the preferred method of calculating returns on common stocks. In this process a series of returns on long-term and short-term debt instruments has been generated from January 1871 that complements the returns provided by Ibbotson and Sinquefield from 1926 to the present.

In addition, two alternative measures of common stock returns have been calculated. Although caution should be exercised in any comparison of returns over long periods of time because of changes in the nature of the instruments and their relative degree of risk, we believe these data to be of high quality.

Generally, the returns of the higher risk instrument, the 20-year Aaa bonds, averaged higher than the returns on commercial paper in both nominal and inflation-adjusted terms. The returns on debt instruments are inferior to the returns on equity instruments both in nominal and inflation-adjusted terms.

Table 1. Summary Statistics of Annual Returns on Two Stock Index Measures 1871-1987 and Two Subperiods, 1871-1925 and 1926-1987

Part A: Summary Statisitics on Total Return

| | Geometric Mean | Arithmetic Mean | Standard Deviation |
|---|---|---|---|
| I. Cowles--S&P | | | |
| 1871-1987 | 8.55369 | 10.26956 | 19.03323 |
| 1871-1925 | 7.04707 | 8.30006 | 16.43691 |
| 1926-1987 | 9.90795 | 12.01670 | 21.05056 |
| II. Cowles--CRSP | | | |
| 1871-1987 | 8.50238 | 10.22171 | 18.98879 |
| 1871-1925 | 7.25982 | 8.53323 | 16.58780 |
| 1926-1987 | 9.61669 | 11.71956 | 20.91056 |

Part B: Summary Statisitics on the Components of Total Return

| | Geometric Mean | Arithmetic Mean | Standard Deviation |
|---|---|---|---|
| I. Cowles--S&P | | | |
| 1871-1987 | | | |
| Dividend Return[1] | 5.09789 | 5.10697 | 1.39172 |
| Capital Change | 3.47675 | 5.16259 | 18.37715 |
| 1871-1925 | | | |
| Dividend Return | 5.14232 | 5.14851 | 1.15377 |
| Capital Change | 1.90016 | 3.15155 | 15.98030 |
| 1926-1987 | | | |
| Dividend Return | 5.05849 | 5.07013 | 1.58174 |
| Capital Change | 4.89574 | 6.94657 | 20.23054 |
| II. Cowles--CRSP | | | |
| 1871-1987 | | | |
| Dividend Return | 5.11455 | 5.12322 | 1.35751 |
| Capital Change | 3.41656 | 5.09850 | 18.31914 |
| 1871-1925 | | | |
| Dividend Return | 5.37469 | 5.38168 | 1.22815 |
| Capital Change | 1.90016 | 3.15155 | 15.98030 |
| 1926-1987 | | | |
| Dividend Return | 4.88433 | 4.89394 | 1.43370 |
| Capital Change | 4.78062 | 6.82563 | 20.14096 |

[1]For ease of exposition, reinvestment returns are contained in the dividend return component for each series and for each time period.

Table 2. Means and Standard Deviations of Price Returns, Interest Returns, and Total Returns for Aaa Corporate Bonds, 1871-1987, and by Subperiods

| Period | Price Return | Interest Return | Total Return |
|---|---|---|---|
| 1871-1987 | | | |
| Geometric Mean | .24601 | 5.09402 | 5.31848 |
| Arithmetic Mean | .45021 | 5.11221 | 5.56242 |
| Standard Deviation | 6.50822 | 1.99516 | 7.46876 |
| 1871-1925 | | | |
| Geometric Mean | 1.22123 | 4.87688 | 6.08566 |
| Arithmetic Mean | 1.29293 | 4.88032 | 6.17325 |
| Standard Deviation | 3.83873 | .86159 | 4.35755 |
| 1926-1987 | | | |
| Geometric Mean | -.61124 | 5.28702 | 4.64256 |
| Arithmetic Mean | -.29736 | 5.31792 | 5.02055 |
| Standard Deviation | 8.14213 | 2.61173 | 9.41456 |

Table 3. Means and Standard Deviations of Returns on 4-6 Month Commercial Paper, 1871-1987, and by Subperiods

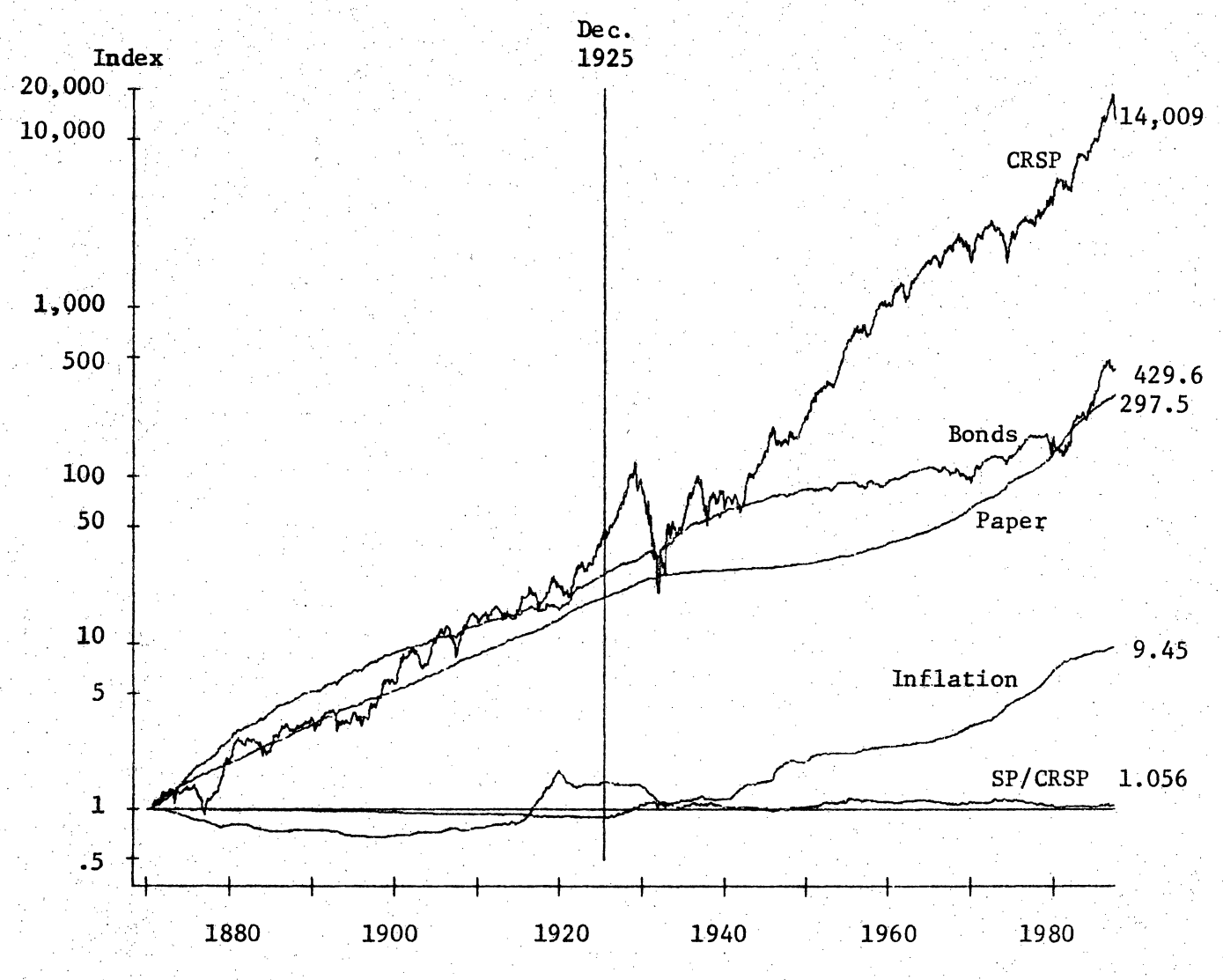
| Period | Total Return |
|---|---|
| 1871-1987 | |
| Geometric Mean | 4.98824 |
| Arithmetic Mean | 5.03155 |
| Standard Deviation | 3.06259 |
| 1871-1925 | |
| Geometric Mean | 5.48370 |
| Arithmetic Mean | 5.49556 |
| Standard Deviation | 1.60755 |
| 1926-1987 | |
| Geometric Mean | 4.55067 |
| Arithmetic Mean | 4.61993 |
| Standard Deviation | 3.89646 |

Table 4. Means and Standard Deviations for Inflation, and Inflation-Adjusted Return Total Returns for Stocks, Bonds, and Paper, 1871-1987, and by Subperiods

| | Geometric Mean | Arithmetic Mean | Standard Deviation |
|---|---|---|---|
| Inflation | | | |
| 1871-1987 | 1.93834 | 2.05999 | 5.07637 |
| 1871-1925 | .70063 | .81915 | 5.09010 |
| 1926-1987 | 3.04904 | 3.16073 | 4.84239 |
| Cowles-S&P | | | |
| 1871-1987 | 6.48904 | 8.27322 | 19.28202 |
| 1871-1925 | 6.30118 | 7.67416 | 16.99589 |
| 1926-1987 | 6.65597 | 8.80464 | 21.22968 |
| Cowles-CRSP | | | |
| 1871-1987 | 6.43922 | 8.21423 | 19.18360 |
| 1871-1925 | 6.51356 | 7.90242 | 17.12215 |
| 1926-1987 | 6.37332 | 8.49083 | 20.97932 |
| Aaa Bonds | | | |
| 1871-1987 | 3.31586 | 3.77281 | 9.84403 |
| 1871-1925 | 5.34756 | 5.65889 | 8.07426 |
| 1926-1987 | 1.54637 | 2.00968 | 10.97784 |
| Commercial Paper | | | |
| 1871-1987 | 2.99191 | 3.13789 | 5.46657 |
| 1871-1925 | 4.74980 | 4.89736 | 5.52006 |
| 1926-1987 | 1.45720 | 1.57706 | 4.95840 |

Figure 1.

Monthly Cumulative Returns on CRSP, Aaa Corporate Bonds, Commercial Paper, Inflation and the Cumulative Differential of SP to CRSP, December 1870 - December 1987



Appendix Table 1. Nominal Total Returns on Common Stocks, Aaa Corporate Bonds, 4-6 Month Commercial Paper, and Inflation, 1870-1987

| Year | CRSP | SPIS | Aaa Bonds | Com. Pap. | Inflation |
|---|---|---|---|---|---|
| 1871 | 13.3032% | 13.0683% | 10.5731% | 6.9981% | -2.1739% |
| 1872 | 12.5614 | 12.9259 | 8.7566 | 9.0638 | -0.7407 |
| 1873 | -7.3430 | -6.4648 | 5.6609 | 12.0582 | -2.2388 |
| 1874 | 10.4007 | 9.2872 | 16.3470 | 8.1916 | -3.8168 |
| 1875 | 2.2452 | 2.4360 | 13.9805 | 5.5259 | -3.9682 |
| 1876 | -12.0846 | -12.1728 | 10.0671 | 5.7939 | -2.0661 |
| 1877 | -3.6964 | -3.7770 | 8.5104 | 5.6301 | -3.3755 |
| 1878 | 11.7700 | 11.2429 | 9.9878 | 5.3463 | -4.3668 |
| 1879 | 50.2411 | 49.3110 | 12.6763 | 4.9719 | -0.4566 |
| 1880 | 24.7191 | 24.1494 | 15.2039 | 5.5364 | 1.3761 |
| 1881 | 7.8936 | 7.4792 | 5.4234 | 5.4160 | 0.9050 |
| 1882 | 2.3062 | 2.1759 | 5.5716 | 6.1972 | -1.7937 |
| 1883 | -3.1092 | -3.0431 | 6.4871 | 6.1805 | -3.6530 |
| 1884 | -13.1776 | -13.3541 | 6.2108 | 5.7617 | -2.3697 |
| 1885 | 26.3329 | 26.3881 | 11.2196 | 4.4994 | -0.9709 |
| 1886 | 12.4037 | 12.6075 | 6.7327 | 4.3804 | 0.0000 |
| 1887 | -2.5792 | -2.7076 | 3.1705 | 6.1326 | 0.9804 |
| 1888 | 1.8432 | 1.9848 | 7.2625 | 5.6534 | 0.9709 |
| 1889 | 7.7420 | 7.5014 | 5.5657 | 4.6490 | -0.4808 |
| 1890 | -10.1486 | -10.1311 | 1.4084 | 5.4296 | -0.4831 |
| 1891 | 23.0823 | 22.8048 | 6.4875 | 6.8919 | 0.0000 |
| 1892 | 6.0892 | 5.7166 | 5.8604 | 4.0310 | -0.5495 |
| 1893 | -15.9526 | -15.8123 | 4.9642 | 8.2061 | -2.7624 |
| 1894 | 1.8596 | 2.0122 | 8.3935 | 3.5243 | -3.4091 |
| 1895 | 5.0362 | 4.7361 | 4.9737 | 3.0238 | -1.1965 |
| 1896 | 1.9479 | 1.7672 | 4.5446 | 6.6858 | -0.5952 |
| 1897 | 17.4309 | 16.9764 | 8.1704 | 3.8057 | -0.5988 |
| 1898 | 23.1790 | 23.0449 | 5.8744 | 4.1851 | 0.0000 |
| 1899 | 10.5873 | 9.9343 | 3.3572 | 3.1053 | 0.6024 |
| 1900 | 18.9820 | 18.5043 | 5.9267 | 5.1399 | 1.1976 |
| 1901 | 20.3243 | 19.6915 | 4.2566 | 4.4320 | 1.1834 |
| 1902 | 5.1727 | 4.9314 | 2.5385 | 4.7399 | 1.7544 |
| 1903 | -14.6449 | -14.7347 | 2.5236 | 5.9030 | 1.7241 |
| 1904 | 31.1982 | 31.0176 | 6.1764 | 5.1425 | 0.0000 |
| 1905 | 20.2049 | 19.6390 | 3.9994 | 3.9583 | 0.5650 |
| 1906 | 7.2529 | 6.8150 | 2.3233 | 5.8651 | 3.3708 |
| 1907 | -29.8732 | -29.6016 | -1.4332 | 6.0858 | 1.0870 |
| 1908 | 44.7686 | 44.3916 | 10.3325 | 6.4383 | -1.6129 |
| 1909 | 19.9833 | 19.0431 | 3.8217 | 3.6204 | 1.6393 |
| 1910 | -8.0500 | -7.8997 | 3.4352 | 5.5286 | 2.1505 |
| 1911 | 5.8113 | 5.7709 | 4.2765 | 4.2547 | 1.0526 |
| 1912 | 8.2739 | 7.9957 | 3.0921 | 4.3991 | 2.0833 |
| 1913 | -9.2227 | -9.5736 | 1.2441 | 6.0997 | 2.3810 |
| 1914 | -3.7010 | -3.5279 | 2.9736 | 5.6887 | 0.9967 |
| 1915 | 35.4936 | 35.2827 | 7.3142 | 4.1703 | 1.9737 |
| 1916 | 10.2336 | 8.9561 | 5.4782 | 3.2174 | 11.6129 |
| 1917 | -24.4198 | -25.1151 | -5.8831 | 4.2994 | 18.4971 |
| 1918 | 25.4340 | 25.0637 | 9.5131 | 6.1347 | 20.4878 |
| 1919 | 19.7445 | 19.6601 | -1.7519 | 5.6420 | 14.7773 |
| 1920 | -18.8000 | -18.6742 | -0.5840 | 7.3201 | 2.2928 |
| 1921 | 14.4499 | 14.4313 | 16.8498 | 8.3506 | -10.6897 |
| 1922 | 27.2119 | 26.8101 | 11.1192 | 4.9188 | -2.5097 |
| 1923 | 3.5338 | 3.1864 | 5.0998 | 5.4039 | 2.5743 |
| 1924 | 25.7807 | 25.4209 | 7.0666 | 4.7074 | -0.1931 |
| 1925 | 29.3014 | 28.9315 | 6.3780 | 3.9199 | 3.8685 |

## APPENDIX TABLE 1 (CONTINUED)

| Year | CRSP | SPIS | Aaa Bonds | Com. Pap. | Inflation |
|---|---|---|---|---|---|
| 1926 | 9.5938% | 11.6239% | 7.2234% | 4.5215% | -1.4898% |
| 1927 | 33.4509 | 37.4884 | 7.7900 | 4.5247 | -2.0794 |
| 1928 | 38.8926 | 43.6085 | 2.5590 | 4.5488 | -0.9653 |
| 1929 | -14.3639 | -8.4153 | 3.9900 | 6.4168 | 0.1949 |
| 1930 | -28.0871 | -24.8971 | 6.7587 | 4.6309 | -6.0311 |
| 1931 | -44.2878 | -43.3366 | -5.8079 | 2.3353 | -9.5238 |
| 1932 | -9.0262 | -8.1928 | 15.7250 | 3.8719 | -10.2975 |
| 1933 | 57.7764 | 53.9900 | 5.8484 | 1.6892 | 0.5102 |
| 1934 | 4.5448 | -1.4428 | 14.4533 | 1.2946 | 2.0305 |
| 1935 | 44.2897 | 47.6690 | 9.1232 | 0.8216 | 2.9851 |
| 1936 | 32.3178 | 33.9214 | 8.0354 | 0.7660 | 1.2077 |
| 1937 | -34.5543 | -35.0265 | 2.0121 | 0.8633 | 3.1026 |
| 1938 | 28.0618 | 31.1217 | 5.1562 | 0.9699 | -2.7778 |
| 1939 | 2.1676 | -0.4107 | 5.2694 | 0.6291 | -0.4762 |
| 1940 | -7.5463 | -9.7845 | 5.8620 | 0.5710 | 0.9569 |
| 1941 | -9.4944 | -11.5921 | 1.0625 | 0.5403 | 9.7156 |
| 1942 | 16.1121 | 20.3404 | 3.3080 | 0.6232 | 9.2873 |
| 1943 | 28.0302 | 25.8999 | 3.8038 | 0.7044 | 3.1621 |
| 1944 | 21.4225 | 19.7524 | 3.3533 | 0.7250 | 2.1073 |
| 1945 | 38.3514 | 36.4360 | 4.1430 | 0.7660 | 2.2514 |
| 1946 | -6.0064 | -8.0713 | 2.5617 | 0.7312 | 18.1651 |
| 1947 | 3.3683 | 5.7081 | -1.1033 | 0.9586 | 9.0062 |
| 1948 | 2.3127 | 5.5013 | 4.0369 | 1.3523 | 2.7066 |
| 1949 | 20.1098 | 18.7925 | 5.8355 | 1.6287 | -1.8031 |
| 1950 | 29.8782 | 31.7130 | 1.3390 | 1.3171 | 5.7910 |
| 1951 | 20.8694 | 24.0164 | -2.3844 | 1.9960 | 5.8745 |
| 1952 | 13.3242 | 18.3676 | 3.7348 | 2.4418 | 0.8827 |
| 1953 | 0.3151 | -0.9891 | 1.2281 | 2.6327 | 0.6250 |
| 1954 | 50.2735 | 52.6237 | 6.0509 | 2.0146 | -0.4969 |
| 1955 | 25.3015 | 31.5627 | -0.4769 | 1.5670 | 0.3745 |
| 1956 | 8.3919 | 6.5561 | -5.2661 | 3.1888 | 2.8607 |
| 1957 | -10.5484 | -10.7826 | 4.8173 | 3.9533 | 3.0230 |
| 1958 | 44.8075 | 43.3639 | -1.1439 | 2.7617 | 1.7606 |
| 1959 | 13.0842 | 11.9550 | -2.3373 | 3.5527 | 1.4994 |
| 1960 | 0.8580 | 0.4695 | 7.9131 | 4.7947 | 1.4773 |
| 1961 | 27.4376 | 26.8884 | 3.1806 | 3.0115 | 0.6719 |
| 1962 | -9.9590 | -8.7285 | 7.4058 | 3.3554 | 1.2236 |
| 1963 | 21.4226 | 22.8010 | 2.3911 | 3.4548 | 1.6484 |
| 1964 | 16.3817 | 16.4828 | 3.6542 | 4.0679 | 1.1892 |
| 1965 | 14.0595 | 12.4511 | 0.7474 | 4.4160 | 1.9231 |
| 1966 | -8.8488 | -10.0633 | -3.8411 | 5.3701 | 3.3543 |
| 1967 | 26.8266 | 23.9756 | -5.0405 | 5.6030 | 3.0426 |
| 1968 | 12.7556 | 11.0613 | 2.6029 | 6.0140 | 4.7244 |
| 1969 | -9.8127 | -8.4451 | -8.2646 | 7.3855 | 6.1090 |
| 1970 | 1.2836 | 3.9389 | 12.5774 | 9.7794 | 5.4916 |
| 1971 | 15.8544 | 14.3127 | 11.2388 | 5.7919 | 3.3585 |
| 1972 | 17.6418 | 18.9761 | 8.9950 | 4.6345 | 3.4119 |
| 1973 | -16.9005 | -14.6614 | 0.0939 | 7.3491 | 8.7981 |
| 1974 | -26.7487 | -26.4680 | -4.6087 | 10.9155 | 12.2022 |
| 1975 | 37.6514 | 37.2031 | 11.3514 | 8.1832 | 7.0142 |
| 1976 | 26.2510 | 23.8432 | 19.1677 | 6.2291 | 4.8106 |
| 1977 | -4.8521 | -7.1842 | 3.8191 | 5.1193 | 6.7699 |
| 1978 | 7.3636 | 6.5598 | -2.2483 | 6.9564 | 9.0274 |
| 1979 | 21.8868 | 18.4411 | -6.7710 | 11.2559 | 13.3070 |
| 1980 | 32.6728 | 32.4272 | -6.9369 | 12.5999 | 12.3967 |
| 1981 | -4.1868 | -4.9221 | 1.5033 | 18.3708 | 8.9396 |
| 1982 | 21.0584 | 21.4094 | 43.3027 | 15.4121 | 3.8721 |
| 1983 | 23.1246 | 22.5137 | 5.1857 | 9.2901 | 3.7962 |
| 1984 | 5.7925 | 6.2777 | 18.8636 | 11.8333 | 3.9539 |
| 1985 | 31.2633 | 32.1510 | 37.4222 | 8.9846 | 3.7718 |
| 1986 | 16.8416 | 18.4618 | 28.5737 | 7.5466 | 1.1301 |
| 1987 | 6.3611 | 5.7922 | -7.5650 | 6.8014 | 4.4095 |

Appendix Table 2. Cumulative Value of Common Stocks, Aaa Corporate Bonds, 4-6 Month Commercial Paper, and the Consumer Price Index, 1870-1987

| Year | CRSP | SPIS | Aaa Bonds | Com. Paper | CPI |
|---|---|---|---|---|---|
| 1870 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 1871 | 1.1330 | 1.1300 | 1.1057 | 1.0700 | 0.9783 |
| 1872 | 1.2754 | 1.2761 | 1.2026 | 1.1670 | 0.9710 |
| 1873 | 1.1817 | 1.1936 | 1.2706 | 1.3077 | 0.9493 |
| 1874 | 1.3046 | 1.3045 | 1.4783 | 1.4148 | 0.9130 |
| 1875 | 1.3339 | 1.3362 | 1.6850 | 1.4930 | 0.8768 |
| 1876 | 1.1727 | 1.1736 | 1.8547 | 1.5795 | 0.8587 |
| 1877 | 1.1294 | 1.1293 | 2.0125 | 1.6684 | 0.8297 |
| 1878 | 1.2623 | 1.2562 | 2.2135 | 1.7576 | 0.7935 |
| 1879 | 1.8965 | 1.8757 | 2.4941 | 1.8450 | 0.7899 |
| 1880 | 2.3653 | 2.3286 | 2.8733 | 1.9471 | 0.8007 |
| 1881 | 2.5520 | 2.5028 | 3.0291 | 2.0526 | 0.7080 |
| 1882 | 2.6108 | 2.5573 | 3.1979 | 2.1798 | 0.7935 |
| 1883 | 2.5296 | 2.4794 | 3.4053 | 2.3145 | 0.7645 |
| 1884 | 2.1963 | 2.1483 | 3.6168 | 2.4479 | 0.7464 |
| 1885 | 2.7747 | 2.7152 | 4.0226 | 2.5580 | 0.7391 |
| 1886 | 3.1188 | 3.0575 | 4.2935 | 2.6701 | 0.7391 |
| 1887 | 3.0384 | 2.9748 | 4.4296 | 2.8338 | 0.7464 |
| 1888 | 3.0944 | 3.0338 | 4.7513 | 2.9940 | 0.7536 |
| 1889 | 3.3339 | 3.2614 | 5.0157 | 3.1332 | 0.7500 |
| 1890 | 2.9956 | 2.9310 | 5.0864 | 3.3033 | 0.7464 |
| 1891 | 3.6870 | 3.5994 | 5.4163 | 3.5310 | 0.7464 |
| 1892 | 3.9116 | 3.8051 | 5.7338 | 3.6733 | 0.7423 |
| 1893 | 3.2876 | 3.2035 | 6.0184 | 3.9748 | 0.7218 |
| 1894 | 3.3487 | 3.2679 | 6.5236 | 4.1148 | 0.6971 |
| 1895 | 3.5173 | 3.4227 | 6.8480 | 4.2393 | 0.6890 |
| 1896 | 3.5859 | 3.4832 | 7.1592 | 4.5227 | 0.6849 |
| 1897 | 4.2109 | 4.0745 | 7.7442 | 4.6948 | 0.6808 |
| 1898 | 5.1869 | 5.0134 | 8.1991 | 4.8913 | 0.6808 |
| 1899 | 5.7361 | 5.5115 | 8.4743 | 5.0432 | 0.6849 |
| 1900 | 6.8249 | 6.5314 | 8.9766 | 5.3024 | 0.6931 |
| 1901 | 8.2120 | 7.8175 | 9.3587 | 5.5374 | 0.7013 |
| 1902 | 8.6368 | 8.2030 | 9.5963 | 5.7999 | 0.7136 |
| 1903 | 7.3720 | 6.9943 | 9.8384 | 6.1422 | 0.7259 |
| 1904 | 9.6719 | 9.1638 | 10.4461 | 6.4581 | 0.7259 |
| 1905 | 11.6261 | 10.9634 | 10.8639 | 6.7137 | 0.7300 |
| 1906 | 12.4693 | 11.7106 | 11.1163 | 7.1075 | 0.7546 |
| 1907 | 8.7443 | 8.2441 | 10.9570 | 7.5401 | 0.7628 |
| 1908 | 12.6591 | 11.9037 | 12.0891 | 8.0255 | 0.7505 |
| 1909 | 15.1888 | 14.1706 | 12.5511 | 8.3161 | 0.7628 |
| 1910 | 13.9661 | 13.0512 | 12.9823 | 8.7758 | 0.7792 |
| 1911 | 14.7777 | 13.8043 | 13.5375 | 9.1492 | 0.7874 |
| 1912 | 16.0004 | 14.9081 | 13.9561 | 9.5517 | 0.8038 |
| 1913 | 14.5247 | 13.4808 | 14.1297 | 10.1343 | 0.8229 |
| 1914 | 13.9871 | 13.0052 | 14.5498 | 10.7108 | 0.8311 |
| 1915 | 18.9517 | 17.5938 | 15.6140 | 11.1575 | 0.8475 |
| 1916 | 20.8911 | 19.1696 | 16.4694 | 11.5165 | 0.9460 |
| 1917 | 15.7896 | 14.3551 | 15.5005 | 12.0116 | 1.1209 |
| 1918 | 19.8055 | 17.9530 | 16.9751 | 12.7485 | 1.3506 |
| 1919 | 23.7160 | 21.4826 | 16.6777 | 13.4678 | 1.5502 |
| 1920 | 19.2574 | 17.4709 | 16.5803 | 14.4537 | 1.5857 |
| 1921 | 22.0400 | 19.9922 | 19.3740 | 15.6606 | 1.4162 |
| 1922 | 28.0375 | 25.3521 | 21.5283 | 16.4309 | 1.3807 |
| 1923 | 29.0283 | 26.1599 | 22.6262 | 17.3188 | 1.4162 |
| 1924 | 36.5121 | 32.8100 | 24.2251 | 18.1341 | 1.4135 |
| 1925 | 47.2106 | 42.3024 | 25.7701 | 18.8450 | 1.4681 |

# APPENDIX TABLE 2 (CONTINUED)

| Year | CRSP | SPIS | Aaa Bonds | Com. Paper | CPI |
|---|---|---|---|---|---|
| 1926 | 51.7399 | 47.2196 | 27.6316 | 19.6970 | 1.4463 |
| 1927 | 69.0473 | 64.9214 | 29.7841 | 20.5883 | 1.4162 |
| 1928 | 95.9016 | 93.2327 | 30.5463 | 21.5248 | 1.4025 |
| 1929 | 82.1264 | 85.3870 | 31.7651 | 22.9060 | 1.4053 |
| 1930 | 59.0594 | 64.1281 | 33.9120 | 23.9667 | 1.3205 |
| 1931 | 32.9033 | 36.3372 | 31.9424 | 24.5264 | 1.1947 |
| 1932 | 29.9334 | 33.3602 | 36.9654 | 25.4761 | 1.0717 |
| 1933 | 47.2278 | 51.3713 | 39.1273 | 25.9064 | 1.0772 |
| 1934 | 49.3742 | 50.6301 | 44.7824 | 26.2418 | 1.0991 |
| 1935 | 71.2419 | 74.7650 | 48.8680 | 26.4574 | 1.1319 |
| 1936 | 94.2658 | 100.1263 | 52.7947 | 26.6601 | 1.1455 |
| 1937 | 61.6929 | 65.0555 | 53.8570 | 26.8902 | 1.1811 |
| 1938 | 79.0050 | 85.3019 | 56.6340 | 27.1510 | 1.1482 |
| 1939 | 80.7175 | 84.9515 | 59.6183 | 27.3218 | 1.1428 |
| 1940 | 74.6264 | 76.6395 | 63.1131 | 27.4778 | 1.1537 |
| 1941 | 67.5410 | 67.7553 | 63.7837 | 27.6263 | 1.2658 |
| 1942 | 78.4233 | 81.5370 | 65.8937 | 27.7985 | 1.3834 |
| 1943 | 100.4055 | 102.6550 | 68.4001 | 27.9943 | 1.4271 |
| 1944 | 121.9150 | 122.9319 | 70.6938 | 28.1972 | 1.4572 |
| 1945 | 168.6711 | 167.7233 | 73.6226 | 28.4132 | 1.4900 |
| 1946 | 158.5399 | 154.1858 | 75.5086 | 28.6210 | 1.7607 |
| 1947 | 163.8800 | 162.9869 | 74.6755 | 28.8953 | 1.9192 |
| 1948 | 167.6700 | 171.9532 | 77.6900 | 29.2861 | 1.9712 |
| 1949 | 201.3881 | 204.2675 | 82.2236 | 29.7631 | 1.9357 |
| 1950 | 261.5593 | 269.0468 | 83.3246 | 30.1551 | 2.0478 |
| 1951 | 316.1451 | 333.6622 | 81.3378 | 30.7570 | 2.1680 |
| 1952 | 358.2688 | 394.9479 | 84.3756 | 31.5080 | 2.1872 |
| 1953 | 359.3976 | 391.0414 | 85.4118 | 32.3375 | 2.2009 |
| 1954 | 540.0793 | 596.8220 | 90.5799 | 32.9890 | 2.1899 |
| 1955 | 676.7275 | 785.1954 | 90.1479 | 33.5059 | 2.1981 |
| 1956 | 733.5175 | 836.6736 | 85.4006 | 34.5743 | 2.2610 |
| 1957 | 656.1431 | 746.4585 | 89.5147 | 35.9411 | 2.3294 |
| 1958 | 950.1444 | 1070.1517 | 88.4907 | 36.9337 | 2.3704 |
| 1959 | 1074.4632 | 1198.0881 | 86.4224 | 38.2459 | 2.4059 |
| 1960 | 1083.6820 | 1203.7129 | 93.2611 | 40.0796 | 2.4414 |
| 1961 | 1381.0182 | 1527.3726 | 96.2274 | 41.2866 | 2.4578 |
| 1962 | 1243.4831 | 1394.0566 | 103.3538 | 42.6719 | 2.4879 |
| 1963 | 1509.8698 | 1711.9156 | 105.8250 | 44.1462 | 2.5289 |
| 1964 | 1757.2124 | 1994.0880 | 109.6921 | 45.9420 | 2.5590 |
| 1965 | 2004.2679 | 2242.3736 | 110.5119 | 47.9708 | 2.6082 |
| 1966 | 1826.9147 | 2016.7160 | 106.2670 | 50.5469 | 2.6957 |
| 1967 | 2317.0141 | 2500.2357 | 100.9107 | 53.3790 | 2.7777 |
| 1968 | 2612.5623 | 2776.7946 | 103.5373 | 56.5892 | 2.9090 |
| 1969 | 2356.1986 | 2542.2911 | 94.9803 | 60.7686 | 3.0867 |
| 1970 | 2386.4417 | 2642.4287 | 106.9264 | 66.7115 | 3.2562 |
| 1971 | 2764.7967 | 3020.6324 | 118.9437 | 70.5753 | 3.3655 |
| 1972 | 3252.5576 | 3593.8310 | 129.6427 | 73.8461 | 3.4804 |
| 1973 | 2702.8586 | 3066.9248 | 129.7644 | 79.2732 | 3.7866 |
| 1974 | 1979.8785 | 2255.1706 | 123.7840 | 87.9262 | 4.2486 |
| 1975 | 2725.3314 | 3094.1640 | 137.8353 | 95.1214 | 4.5466 |
| 1976 | 3440.7591 | 3831.9105 | 164.2551 | 101.0466 | 4.7653 |
| 1977 | 3273.8104 | 3556.6181 | 170.5281 | 106.2195 | 5.0879 |
| 1978 | 3514.8823 | 3789.9254 | 166.6941 | 113.6085 | 5.5472 |
| 1979 | 4284.1789 | 4488.8298 | 155.4072 | 126.3962 | 6.2854 |
| 1980 | 5683.9381 | 5944.4321 | 144.6268 | 142.3220 | 7.0646 |
| 1981 | 5445.9631 | 5651.8397 | 146.8010 | 168.4677 | 7.6962 |
| 1982 | 6592.7972 | 6861.8662 | 210.3698 | 194.4322 | 7.9942 |
| 1983 | 8117.3553 | 8406.7258 | 221.2791 | 212.4952 | 8.2976 |
| 1984 | 8587.5499 | 8934.4707 | 263.0202 | 237.6404 | 8.6257 |
| 1985 | 11272.3014 | 11806.9913 | 361.4482 | 258.9914 | 8.9511 |
| 1986 | 13170.7319 | 13986.7723 | 464.7272 | 278.5364 | 9.0522 |
| 1987 | 14008.5401 | 14796.9078 | 429.5704 | 297.4807 | 9.4514 |

Appendix Table 3. Inflation-Adjusted Total Returns on Common Stocks, Aaa Corporate Bonds, and 4-6 Month Commercial Paper, 1870-1987

| Year | CRSP | SPIS | Aaa Bonds | Com. Pap. |
|---|---|---|---|---|
| 1871 | 15.8208% | 15.5152% | 13.0303% | 9.3758% |
| 1872 | 13.4019 | 13.7679 | 9.5682 | 9.8777 |
| 1873 | -5.2211 | -4.3222 | 8.0806 | 14.6245 |
| 1874 | 14.7811 | 13.6237 | 20.9640 | 12.4849 |
| 1875 | 6.4701 | 6.6692 | 18.6905 | 9.8865 |
| 1876 | -10.2293 | -10.3201 | 12.3892 | 8.0259 |
| 1877 | -0.3323 | -0.4158 | 12.3011 | 9.3202 |
| 1878 | 16.8731 | 16.3224 | 15.0100 | 10.1567 |
| 1879 | 50.9308 | 49.9959 | 13.1931 | 5.4534 |
| 1880 | 23.0261 | 22.4641 | 13.6401 | 4.1038 |
| 1881 | 6.9262 | 6.5156 | 4.4779 | 4.4706 |
| 1882 | 4.1747 | 4.0422 | 7.4999 | 8.1369 |
| 1883 | 0.5642 | 0.6330 | 10.5245 | 10.2063 |
| 1884 | -11.0700 | -11.2512 | 8.7887 | 8.3287 |
| 1885 | 27.5715 | 27.6272 | 12.3100 | 5.5239 |
| 1886 | 12.4034 | 12.6074 | 6.7327 | 4.3804 |
| 1887 | -3.5250 | -3.6520 | 2.1688 | 5.1022 |
| 1888 | 0.8642 | 1.0041 | 6.2311 | 4.6375 |
| 1889 | 8.2623 | 8.0208 | 6.0757 | 5.1545 |
| 1890 | -9.7122 | -9.6947 | 1.9007 | 5.9414 |
| 1891 | 23.0823 | 22.8047 | 6.4875 | 6.8919 |
| 1892 | 6.6753 | 6.3006 | 6.4453 | 4.6057 |
| 1893 | -13.5648 | -13.4206 | 7.9462 | 11.2802 |
| 1894 | 5.4545 | 5.6126 | 12.2191 | 7.1781 |
| 1895 | 6.2867 | 5.9829 | 6.2233 | 4.2503 |
| 1896 | 2.5582 | 2.3767 | 5.1706 | 7.3247 |
| 1897 | 18.1384 | 17.6809 | 8.8220 | 4.4311 |
| 1898 | 23.1789 | 23.0449 | 5.8744 | 4.1851 |
| 1899 | 9.9252 | 9.2760 | 2.7383 | 2.4879 |
| 1900 | 17.5738 | 17.1018 | 4.6731 | 3.8956 |
| 1901 | 18.9170 | 18.2917 | 3.0372 | 3.2105 |
| 1902 | 3.3593 | 3.1222 | 0.7706 | 2.9340 |
| 1903 | -16.0916 | -16.1799 | 0.7859 | 4.1080 |
| 1904 | 31.1982 | 31.0175 | 6.1764 | 5.1425 |
| 1905 | 19.5296 | 18.9670 | 3.4152 | 3.3743 |
| 1906 | 3.7555 | 3.3318 | -1.0133 | 2.4129 |
| 1907 | -30.6273 | -30.3586 | -2.4930 | 4.9451 |
| 1908 | 47.1419 | 46.7586 | 12.1413 | 8.1832 |
| 1909 | 18.0481 | 17.1230 | 2.1472 | 1.9491 |
| 1910 | -9.9858 | -9.8386 | 1.2576 | 3.3069 |
| 1911 | 4.7092 | 4.6691 | 3.1903 | 3.1687 |
| 1912 | 6.0642 | 5.7917 | 0.9882 | 2.2685 |
| 1913 | -11.3338 | -11.6766 | -1.1105 | 3.6323 |
| 1914 | -4.6513 | -4.4799 | 1.9575 | 4.6458 |
| 1915 | 32.8712 | 32.6643 | 5.2371 | 2.1541 |
| 1916 | -1.2358 | -2.3803 | -5.4964 | -7.5220 |
| 1917 | -36.2177 | -36.8044 | -20.5745 | -11.9815 |
| 1918 | 4.1051 | 3.7978 | -9.1086 | -11.9125 |
| 1919 | 4.3277 | 4.2541 | -14.4011 | -7.9592 |
| 1920 | -20.6200 | -20.4970 | -2.8123 | 4.9146 |
| 1921 | 28.1485 | 28.1277 | 30.8357 | 21.3192 |
| 1922 | 30.4867 | 30.0745 | 13.9797 | 7.6197 |
| 1923 | 0.9355 | 0.5967 | 2.4621 | 2.7586 |
| 1924 | 26.0240 | 25.6636 | 7.2737 | 4.9100 |
| 1925 | 24.4857 | 24.1295 | 2.4160 | 0.0495 |

APPENDIX TABLE 3 (CONTINUED)

| Year | CRSP | SPIS | Aaa Bonds | Com. Pap. |
|---|---|---|---|---|
| 1926 | 11.2512% | 13.3120% | 8.8450% | 6.1021% |
| 1927 | 36.2848 | 40.4080 | 10.0790 | 6.7443 |
| 1928 | 40.2463 | 45.0082 | 3.5586 | 5.5678 |
| 1929 | -14.5305 | -8.5935 | 3.7877 | 6.2097 |
| 1930 | -23.4716 | -20.0768 | 13.6107 | 11.3463 |
| 1931 | -38.4234 | -37.3720 | 4.1071 | 13.1074 |
| 1932 | 1.4172 | 2.3463 | 29.0098 | 15.7959 |
| 1933 | 56.9755 | 53.2082 | 5.3111 | 1.1730 |
| 1934 | 2.4644 | -3.4041 | 12.1756 | -0.7212 |
| 1935 | 40.1074 | 43.3888 | 5.9602 | -2.1007 |
| 1936 | 30.7389 | 32.3233 | 6.7462 | -0.4364 |
| 1937 | -36.5237 | -36.9818 | -1.0577 | -2.1719 |
| 1938 | 31.7207 | 34.8680 | 8.1606 | 3.8547 |
| 1939 | 2.6564 | 0.0658 | 5.7731 | 1.1105 |
| 1940 | -8.4226 | -10.6396 | 4.8585 | -0.3823 |
| 1941 | -17.5090 | -19.4209 | -7.8869 | -8.3629 |
| 1942 | 6.2449 | 10.1138 | -5.4711 | -7.9277 |
| 1943 | 24.1059 | 22.0409 | 0.6221 | -2.3824 |
| 1944 | 18.9166 | 17.2810 | 1.2203 | -1.3538 |
| 1945 | 35.3051 | 33.4319 | 1.8499 | -1.4527 |
| 1946 | -20.4558 | -22.2032 | -13.2048 | -14.7539 |
| 1947 | -5.1721 | -3.0256 | -9.2743 | -7.3827 |
| 1948 | -0.3835 | 2.7210 | 1.2953 | -1.3186 |
| 1949 | 22.3152 | 20.9738 | 7.7788 | 3.4948 |
| 1950 | 22.7687 | 24.5030 | -4.2083 | -4.2290 |
| 1951 | 14.1629 | 17.1353 | -7.8007 | -3.6633 |
| 1952 | 12.3326 | 17.3319 | 2.8271 | 1.5454 |
| 1953 | -0.3080 | -1.6041 | 0.5993 | 1.9952 |
| 1954 | 51.0239 | 53.3859 | 6.5805 | 2.5241 |
| 1955 | 24.8340 | 31.0718 | -0.8483 | 1.1880 |
| 1956 | 5.3773 | 3.5926 | -7.9008 | 0.3190 |
| 1957 | -13.1732 | -13.4005 | 1.7417 | 0.9030 |
| 1958 | 42.3022 | 40.8835 | -2.8543 | 0.9838 |
| 1959 | 11.4136 | 10.3011 | -3.7800 | 2.0229 |
| 1960 | -0.6103 | -0.9931 | 6.3421 | 3.2691 |
| 1961 | 26.5871 | 26.0416 | 2.4920 | 2.3240 |
| 1962 | -11.0474 | -9.8317 | 6.1075 | 2.1060 |
| 1963 | 19.4536 | 20.8096 | 0.7307 | 1.7771 |
| 1964 | 15.0140 | 15.1139 | 2.4361 | 2.8449 |
| 1965 | 11.9074 | 10.3294 | -1.1535 | 2.4459 |
| 1966 | -11.8070 | -12.9822 | -6.9619 | 1.9504 |
| 1967 | 23.0817 | 20.3149 | -7.8444 | 2.4848 |
| 1968 | 7.6688 | 6.0510 | -2.0258 | 1.2314 |
| 1969 | -15.0051 | -13.7162 | -13.5461 | 1.2030 |
| 1970 | -3.9890 | -1.4719 | 6.7170 | 4.0646 |
| 1971 | 12.0898 | 10.5983 | 7.6242 | 2.3543 |
| 1972 | 13.7605 | 15.0507 | 5.3989 | 1.1823 |
| 1973 | -23.6205 | -21.5624 | -8.0003 | -1.3318 |
| 1974 | -34.7149 | -34.4647 | -14.9826 | -1.1468 |
| 1975 | 28.6292 | 28.2102 | 4.0530 | 1.0924 |
| 1976 | 20.4564 | 18.1590 | 13.6982 | 1.3534 |
| 1977 | -10.8851 | -13.0694 | -2.7638 | -1.5459 |
| 1978 | -1.5260 | -2.2633 | -10.3421 | -1.8996 |
| 1979 | 7.5722 | 4.5311 | -17.7201 | -1.8102 |
| 1980 | 18.0397 | 17.8213 | -17.2012 | 0.1808 |
| 1981 | -12.0493 | -12.7243 | -6.8261 | 8.6573 |
| 1982 | 16.5456 | 16.8836 | 37.9608 | 11.1098 |
| 1983 | 18.6215 | 18.0330 | 1.3388 | 5.2930 |
| 1984 | 1.7687 | 2.2354 | 14.3426 | 7.5798 |
| 1985 | 26.4923 | 27.3477 | 32.4273 | 5.0233 |
| 1986 | 15.5359 | 17.1380 | 27.1369 | 6.3447 |
| 1987 | 1.8692 | 1.3242 | -11.4689 | 2.2908 |

Appendix Table 4. Inflation-Adjusted Cumulative Wealth Index, 1870-1987

| Year | CRSP | SPIS | Aaa Bonds | Com. Pap. |
|---|---|---|---|---|
| 1870 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 1871 | 1.1582 | 1.1552 | 1.1303 | 1.0938 |
| 1872 | 1.3134 | 1.3142 | 1.2385 | 1.2018 |
| 1873 | 1.2449 | 1.2574 | 1.3385 | 1.3776 |
| 1874 | 1.4289 | 1.4287 | 1.6191 | 1.5495 |
| 1875 | 1.5213 | 1.5240 | 1.9218 | 1.7027 |
| 1876 | 1.3657 | 1.3667 | 2.1599 | 1.8394 |
| 1877 | 1.3612 | 1.3610 | 2.4255 | 2.0108 |
| 1878 | 1.5908 | 1.5832 | 2.7896 | 2.2151 |
| 1879 | 2.4010 | 2.3747 | 3.1576 | 2.3359 |
| 1880 | 2.9539 | 2.9081 | 3.5884 | 2.4317 |
| 1881 | 3.1585 | 3.0976 | 3.7490 | 2.5404 |
| 1882 | 3.2903 | 3.2228 | 4.0302 | 2.7471 |
| 1883 | 3.3089 | 3.2432 | 4.4544 | 3.0275 |
| 1884 | 2.9426 | 2.8783 | 4.8459 | 3.2797 |
| 1885 | 3.7539 | 3.6735 | 5.4424 | 3.4608 |
| 1886 | 4.2196 | 4.1367 | 5.8088 | 3.6124 |
| 1887 | 4.0708 | 3.9856 | 5.9348 | 3.7968 |
| 1888 | 4.1060 | 4.0256 | 6.3046 | 3.9728 |
| 1889 | 4.4452 | 4.3485 | 6.6876 | 4.1776 |
| 1890 | 4.0135 | 3.9269 | 6.8147 | 4.4258 |
| 1891 | 4.9399 | 4.8225 | 7.2568 | 4.7308 |
| 1892 | 5.2697 | 5.1263 | 7.7246 | 4.9487 |
| 1893 | 4.5549 | 4.4383 | 8.3384 | 5.5070 |
| 1894 | 4.8033 | 4.6874 | 9.3573 | 5.9023 |
| 1895 | 5.1053 | 4.9679 | 9.9396 | 6.1531 |
| 1896 | 5.2359 | 5.0859 | 10.4535 | 6.6038 |
| 1897 | 6.1856 | 5.9852 | 11.3757 | 6.8964 |
| 1898 | 7.6193 | 7.3645 | 12.0440 | 7.1851 |
| 1899 | 8.3756 | 8.0476 | 12.3738 | 7.3638 |
| 1900 | 9.8475 | 9.4239 | 12.9520 | 7.6507 |
| 1901 | 11.7103 | 11.1477 | 13.3454 | 7.8963 |
| 1902 | 12.1037 | 11.4957 | 13.4483 | 8.1280 |
| 1903 | 10.1560 | 9.6357 | 13.5540 | 8.4619 |
| 1904 | 13.3245 | 12.6245 | 14.3911 | 8.8970 |
| 1905 | 15.9267 | 15.0190 | 14.8826 | 9.1972 |
| 1906 | 16.5249 | 15.5194 | 14.7318 | 9.4192 |
| 1907 | 11.4638 | 10.8079 | 14.3645 | 9.8850 |
| 1908 | 16.8680 | 15.8615 | 16.1085 | 10.6939 |
| 1909 | 19.9123 | 18.5775 | 16.4544 | 10.9023 |
| 1910 | 17.9239 | 16.7498 | 16.6614 | 11.2628 |
| 1911 | 18.7680 | 17.5318 | 17.1929 | 11.6197 |
| 1912 | 19.9061 | 18.5472 | 17.3628 | 11.8833 |
| 1913 | 17.6500 | 16.3815 | 17.1700 | 12.3150 |
| 1914 | 16.8291 | 15.6476 | 17.5061 | 12.8871 |
| 1915 | 22.3610 | 20.7588 | 18.4229 | 13.1647 |
| 1916 | 22.0846 | 20.2647 | 17.4103 | 12.1744 |
| 1917 | 14.0861 | 12.8064 | 13.8282 | 10.7158 |
| 1918 | 14.6643 | 13.2928 | 12.5687 | 9.4393 |
| 1919 | 15.2990 | 13.8582 | 10.7586 | 8.6880 |
| 1920 | 12.1443 | 11.0177 | 10.4561 | 9.1149 |
| 1921 | 15.5628 | 14.1167 | 13.6803 | 11.0582 |
| 1922 | 20.3073 | 18.3623 | 15.5927 | 11.9008 |
| 1923 | 20.4973 | 18.4719 | 15.9767 | 12.2291 |
| 1924 | 25.8315 | 23.2124 | 17.1387 | 12.8295 |
| 1925 | 32.1566 | 28.8135 | 17.5528 | 12.8359 |

APPENDIX TABLE 4 (CONTINUED)

| Year | CRSP | SPIS | Aaa Bonds | Com. Pap. |
|---|---|---|---|---|
| 1926 | 35.7746 | 32.6491 | 19.1054 | 13.6191 |
| 1927 | 48.7553 | 45.8419 | 21.0310 | 14.5377 |
| 1928 | 68.3775 | 66.4746 | 21.7794 | 15.3471 |
| 1929 | 58.4418 | 60.7621 | 22.6043 | 16.3001 |
| 1930 | 44.7246 | 48.5630 | 25.6809 | 18.1496 |
| 1931 | 27.5399 | 30.4141 | 26.7357 | 20.5285 |
| 1932 | 27.9302 | 31.1277 | 34.4916 | 23.7712 |
| 1933 | 43.8436 | 47.6901 | 36.3235 | 24.0500 |
| 1934 | 44.9240 | 46.0667 | 40.7461 | 23.8766 |
| 1935 | 62.9419 | 66.0545 | 43.1747 | 23.3750 |
| 1936 | 82.2895 | 87.4055 | 46.0873 | 23.2730 |
| 1937 | 52.2343 | 55.0814 | 45.5998 | 22.7675 |
| 1938 | 68.8034 | 74.2872 | 49.3211 | 23.6451 |
| 1939 | 70.6311 | 74.3361 | 52.1684 | 23.9077 |
| 1940 | 64.6821 | 66.4270 | 54.7030 | 23.8163 |
| 1941 | 53.3570 | 53.5263 | 50.3887 | 21.8246 |
| 1942 | 56.6890 | 58.9398 | 47.6319 | 20.0944 |
| 1943 | 70.3545 | 71.9307 | 47.9282 | 19.6157 |
| 1944 | 83.6632 | 84.3610 | 48.5130 | 19.3501 |
| 1945 | 113.2006 | 112.5645 | 49.4105 | 19.0690 |
| 1946 | 90.0445 | 87.5715 | 42.8859 | 16.2556 |
| 1947 | 85.3873 | 84.9220 | 38.9086 | 15.0555 |
| 1948 | 85.0599 | 87.2327 | 39.4125 | 14.8570 |
| 1949 | 104.0411 | 105.5287 | 42.4784 | 15.3762 |
| 1950 | 127.7300 | 131.3864 | 40.6908 | 14.7259 |
| 1951 | 145.8202 | 153.8999 | 37.5166 | 14.1865 |
| 1952 | 163.8036 | 180.5736 | 38.5773 | 14.4057 |
| 1953 | 163.2991 | 177.6771 | 38.8085 | 14.6931 |
| 1954 | 246.6207 | 272.5316 | 41.3622 | 15.0640 |
| 1955 | 307.8664 | 357.2122 | 41.0114 | 15.2430 |
| 1956 | 324.4214 | 370.0454 | 37.7711 | 15.2916 |
| 1957 | 281.6848 | 320.4576 | 38.4290 | 15.4297 |
| 1958 | 400.8437 | 451.4720 | 37.3321 | 15.5815 |
| 1959 | 446.5945 | 497.9785 | 35.9210 | 15.8967 |
| 1960 | 443.8691 | 493.0330 | 38.1991 | 16.4164 |
| 1961 | 561.8809 | 621.4266 | 39.1511 | 16.7979 |
| 1962 | 499.8078 | 560.3296 | 41.5422 | 17.1516 |
| 1963 | 597.0384 | 676.9321 | 41.8457 | 17.4564 |
| 1964 | 686.6777 | 779.2432 | 42.8651 | 17.9531 |
| 1965 | 768.4435 | 859.7340 | 42.3706 | 18.3922 |
| 1966 | 677.7131 | 748.1219 | 39.4209 | 18.7509 |
| 1967 | 834.1410 | 900.1021 | 36.3285 | 19.2168 |
| 1968 | 898.1100 | 954.5675 | 35.5926 | 19.4534 |
| 1969 | 763.3478 | 823.6370 | 30.7712 | 19.6875 |
| 1970 | 732.8981 | 811.5140 | 32.8381 | 20.4877 |
| 1971 | 821.5040 | 897.5204 | 35.3417 | 20.9700 |
| 1972 | 934.5469 | 1032.6039 | 37.2498 | 21.2180 |
| 1973 | 713.8025 | 809.9494 | 34.2697 | 20.9354 |
| 1974 | 466.0066 | 530.8024 | 29.1352 | 20.6953 |
| 1975 | 599.4205 | 680.5430 | 30.3160 | 20.9214 |
| 1976 | 722.0402 | 804.1230 | 34.4688 | 21.2045 |
| 1977 | 643.4454 | 699.0293 | 33.5162 | 20.8767 |
| 1978 | 633.6264 | 683.2083 | 30.0499 | 20.4802 |
| 1979 | 681.6056 | 714.1652 | 24.7250 | 20.1094 |
| 1980 | 804.5654 | 841.4385 | 20.4720 | 20.1458 |
| 1981 | 707.6212 | 734.3717 | 19.0746 | 21.8899 |
| 1982 | 824.7017 | 858.3599 | 26.3154 | 24.3218 |
| 1983 | 978.2737 | 1013.1476 | 26.6677 | 25.6091 |
| 1984 | 995.5760 | 1035.7954 | 30.4926 | 27.5502 |
| 1985 | 1259.3268 | 1319.0616 | 40.3805 | 28.9342 |
| 1986 | 1454.9741 | 1545.1222 | 51.3385 | 30.7700 |
| 1987 | 1482.1700 | 1565.5830 | 45.4506 | 31.4749 |

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# ENDNOTES

1. It would be desirable to have returns on U.S. government bonds and on Treasury bills to extend the Ibbotson and Sinquefield data in a manner comparable to stocks. However, Treasury bills were not issued until December 1929 (and were used sparingly until World War II), and the U.S. government securities market was non-existent in the early period. Therefore, we focus on high quality corporate bonds as a substitute for U.S. government securities, and on commercial paper, which seems to be the lowest risk asset for which data are available, as a substitute for Treasury bills.

2. There was only a small difference in real total returns between the two periods.

3. The average maturity of the Salomon Brothers bonds is around 25 years.

4. Although Cowles provides two other series of dividend yields, they are only on an annual basis, and not usable with monthly compounding.

5. Specifically, we spliced the Cowles data using the difference approach to obtain dividends to the CRSP data and the Cowles data using yield expectations to the S&P data. The latter is consistent with the Ibbotson-Sinquefield approach to estimating dividend yields.

6. From 1919 through 1928 the yields are unweighted arithmetic averages of high and low yields of five securities each in the Industrial, Rail, and Utility categories. From 1928 through 1986, there have been 10 securities in each of the three categories, for a total of 30 securities.

7. The average term to maturity of the Aaa bonds has varied over time but has been in the range of more or less 20 years.

8. Macaulay (1938), Table 10, pp. A141-A157, column 4.

9. Macaulay estimated a monthly geometric mean return for the bonds included in his series, and the number of bonds varied between 13 in 1857 up to 41 in 1919. Prior to 1900, no security was included that did not have at least 10 years to maturity, and from 1900 the minimum maturity was 14 years.

10. From December 1870 until 1934, the interest rates were average rates for the month. From 1934 through 1986, the interest rates are the values for the last week of the month. Several changes in definition in the Moody's coverage occurred between 1919 and 1987, which are documented in the Federal Reserve System sources cited in the Bibliography. Friedman and Schwartz also inflated the Macaulay series in splicing to Durand's yields (1982, p. 128).

11. We have examined Weil's assumption that the 4% coupon assumption makes little difference in total return relative to other coupon assumptions and that the maturity assumption is a more crucial factor. The average observed market yield on Aaa bonds over the period 1871-1987 is approximately 5.4%, which is higher than the assumed coupon of 4%. Using this coupon return instead of 4%, the results are as follows for total return:

| | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|
| 4's | .4446192 | 1.553689 | -12.3732 | 15.8604 |
| 5.4s | .4446124 | 1.452821 | -11.5121 | 14.7755 |

These results indicate that on a total return basis, the coupon assumption makes little difference. However, the choice of coupon does affect the allocation of total return between interest income and capital change. Nevertheless, because of the above analysis and the fact that comparable series have been calculated on the 4% coupon assumption, we continue to use that in our series.

12. The approximation was chosen to lighten the computational burden of dealing with 1404 monthly observations.

13. Historical Statistics reports the monthly interest rates in both original and seasonally adjusted form (1949, App. 26, pp. 346-347). Macaulay's rates reported in this paper are not seasonally adjusted.

14. Based on information in Historical Statistics (1949), Macaulay's 4.48% quote in February 1903, was changed to 4.84%.

15. From 1870-1934 the rates are averages for the month, and for the latter period are the averages for the last week in each month.

16. The rates are for high-quality paper quoted in New York City.

17. An additional caution about commercial paper rates is the possible understatement due to usury laws in New York in the early period, with the additional charge of "commissions" to circumvent the maximum rate charged. It seems that this problem is well handled by Macaulay in the sense that additional charges were accounted for in calculating the monthly interest rate (1938, Appendix E).

18. It is assumed that the paper is 5-month paper, with d=152.1875 at acquisition and after one month d=121.75.

19. There is also an element of approximation in these calculations. All months are not the same length, and indeed all years are not the same length. We have used average lengths for years and months, again to lighten the computational burden.

20. Of course, the Cowles results are identical for the first subperiod, 1871-1926.

21. For the 1870-1925 period, the appreciation return for the Cowles series is the same for both, and the difference is due solely to different dividend returns for the two series.

22. The results discussed here are not presented in the tables but are available from the authors upon request.

23. In December 1925, in terms of coverage of the different measures, the S&P included 90 securities, the Cowles 258, and the CRSP 503. By December 1926 the Cowles coverage had increased to 375 corporations, and the CRSP to 539. In 1938, the historical data for the S&P was still 90, the Cowles included 396, and the CRSP 775 securities.

24. Since all calculations of summary nominal returns have been based on the geometric mean because of compounding, and since the inflation rate is a compounding phenomena, subtraction of the inflation rate is incorrect.