2010 Ibbotson® Stocks, Bonds, Bills, and Inflation® Valuation Yearbook

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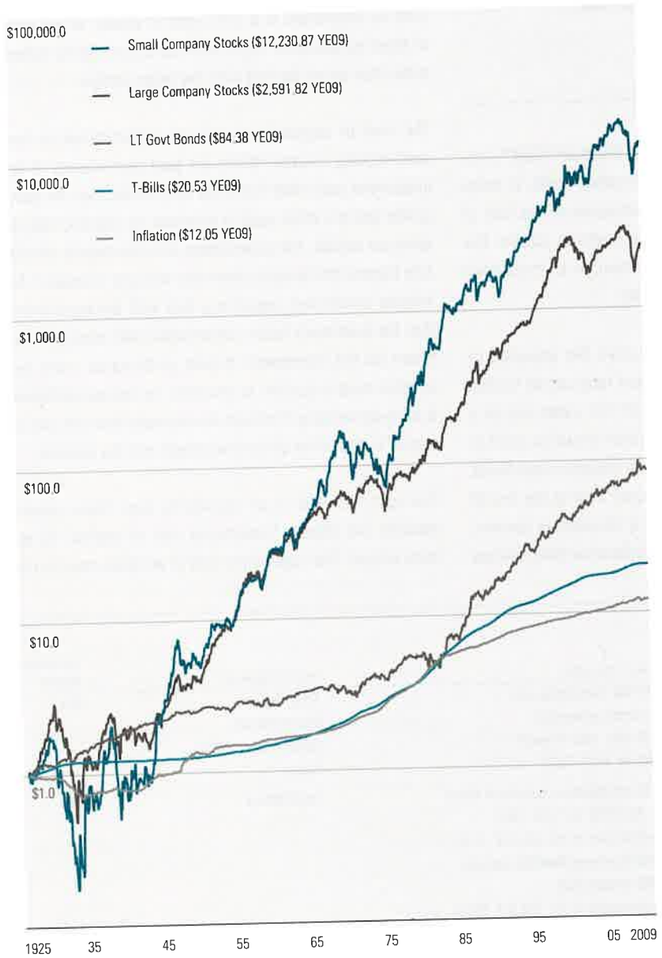
Graph 2-1: Wealth Indices of Investments in the U.S. Capital Markets
Index (Year-End 1925 = $1.00)



Data from 1925–2009

expected return that would be earned on the next best investment. In a competitive world with many investment choices, a given investment and the next best alternative have practically identical expected returns.

A Look at Historical Returns

Keeping in mind that the cost of capital is a forward-looking concept, historical returns can reveal important information about the return behavior of different investments. It is the relationship between these historic returns that can be exploited. Graph 2-1 depicts the growth of $1.00 invested in large company stocks, small company stocks, long-term government bonds, Treasury bills, and a hypothetical asset returning the inflation rate from the end of 1925 to the end of 2009. All results assume the reinvestment of dividends on stocks or coupons on bonds and no taxes. Transaction costs are not included, except in the small stock index starting in 1982.

The graph vividly illustrates that large and small company stocks were the big winners over the entire 84-year period: by year-end 2009 investments of $1.00 in these assets would have grown to $2,591.82 and $12,230.87, respectively. This phenomenal growth was earned by taking substantial risk. In contrast, long-term government bonds (with an approximate 20-year maturity) exposed the holder to much less risk and grew to only $84.38. The lowest-risk strategy over the past 84 years was to buy U.S. Treasury bills. Since Treasury bills tended to track inflation, the resulting real (inflation-adjusted) returns were just above zero for the entire 1926–2009 period.

It is also clear from Graph 2-1 that the higher returns of stocks over bonds and Treasury bills comes at a cost. There is considerably more volatility in the returns of stocks compared to the other investments. The large peaks and valleys in return index lines for both large and small company stocks are an indication of their higher risk or volatility. As will be discussed throughout this publication, the relationship between risk and return can be used to estimate expected returns or the cost of capital.

Summary Statistics for Basic Series

Table 2-1 presents summary statistics of annual returns, and where applicable, income and capital appreciation, for each asset class. The summary statistics presented here are geometric mean, arithmetic mean, standard deviation, and serial correlation. Again, it is clear the higher returns of the stock series, as compared to fixed income, are also accompanied by higher risk (as measured by standard deviation). Small stocks had the highest return over the period 1926–2009. Other asset classes are progressively less risky and have correspondingly lower average returns. Treasury bills were nearly riskless and had the lowest return. In general, risk is rewarded by a higher return over the long term.

Table 2-1: Total Returns, Income Returns, and Capital Appreciation of the Basic Asset Classes: Summary Statistics of Annual Returns

Series	Geometric Mean (%)	Arithmetic Mean (%)	Standard Deviation (%)	Serial Correlation
Large Company Stocks				
Total Returns	9.8	11.8	20.5	0.02
Income	4.1	4.1	1.6	0.90
Capital Appreciation	5.5	7.4	19.8	0.01
Ibbotson Small Company Stocks				
Total Returns	11.9	16.6	32.8	0.06
Mid-Cap Stocks*				
Total Returns	10.9	13.7	25.0	-0.04
Income	3.9	4.0	1.7	0.90
Capital Appreciation	6.7	9.5	24.3	-0.05
Low-Cap Stocks*				
Total Returns	11.3	15.2	29.4	0.02
Income	3.6	3.6	2.0	0.89
Capital Appreciation	7.5	11.4	28.7	0.01
Micro-Cap Stocks*				
Total Returns	12.1	18.2	39.2	0.07
Income	2.5	2.5	1.7	0.91
Capital Appreciation	9.5	15.6	38.6	0.06
Long-Term Corporate Bonds				
Total Returns	5.9	6.2	8.3	0.08
Long-Term Government Bonds				
Total Returns	5.4	5.8	9.6	-0.12
Income	5.1	5.2	2.7	0.96
Capital Appreciation	0.1	0.4	8.4	-0.26
Intermediate-Term Government Bonds				
Total Returns	5.3	5.5	5.7	0.13
Income	4.7	4.7	2.9	0.96
Capital Appreciation	0.5	0.6	4.5	-0.18
Treasury Bills				
Total Returns	3.7	3.7	3.1	0.91
Inflation	3.0	3.1	4.2	0.64

Data from 1926–2009. Total return is equal to the sum of three component returns: income return, capital appreciation return, and reinvestment return.

*Source: Morningstar and CRSP. Calculated (or Derived) based on data from CRSP US Stock Database and CRSP US Indices Database ©2010 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business. Used with permission.

Annual Total Returns

Annual and monthly total returns for large company stocks, small company stocks, long-term corporate bonds, long-term government bonds, intermediate-term government bonds, Treasury bills, and inflation rates are for the full 84-year time period presented in Appendix B. Those tables can be used to compare the performance of each asset class on both a monthly and an annual basis.

Real Rates versus Nominal Rates

The cost of capital embodies a number of different concepts or elements of risk. Two of the most basic concepts in finance are real and nominal returns. The nominal return includes both the real return and the impact of inflation.

The real rate of interest represents the exchange rate between current and future purchasing power. An increase in the real rate indicates that the cost of current consumption has risen in terms of future goods. It is the real rate of interest that measures the opportunity cost of foregoing consumption.

The relationship between real rates and nominal rates can be expressed in the following equation:

$$\text{Real} = \left[\frac{1+\text{Nominal}}{1+\text{Inflation}}\right] - 1$$

$$\text{Nominal} = \left[(1+\text{Real}) \times (1+\text{Inflation})\right] - 1$$

It is important to note that the conversion of nominal and real rates is not an additive process; rather, it is a geometric calculation. The arithmetic sum or difference is calculated by adding or subtracting one number from the other. As illustrated in the above equation, the real rate of return involves taking the geometric difference of the nominal rate of return and the rate of inflation. Conversely, the nominal rate of return can be determined by taking the geometric sum of the real rate of return and the rate of inflation. For example, if the real rate is 2.5 percent and the inflation rate is 5.0 percent, the nominal rate of interest is not 7.5 percent (2.5+5.0) but 7.625 percent, or [(1.025)×(1.05)−1]. Similarly, if the nominal rate is 7.625 percent and the inflation rate is 2.5 percent, the real rate is not 5.125 percent (7.625−2.5) but 5.0 percent, [(1.07625/1.025)−1].

Discount rates are most often expressed in nominal terms. That is, they usually have an inflation estimate included in them. Unless stated otherwise, the cost of capital data presented in this book are expressed in nominal terms.