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Investment Return and Risk

The authors analyze data for 16 classes of investments for periods of 5, 10, and 50 years and produce several tentative conclusions that conflict with traditional valuation and investment assumptions. The ideas that most investors are risk averse to a substantial degree and that the rate of return is commensurate with the risk associated with a particular investment are challenged.

An article in *Barron's* by Andy Zipser, "Considering the Alternatives: Comparing the Performance of 16 Different Investments,"[1] discusses research by Barton Biggs and Eugene Chung at Morgan Stanley that provided the mean rate of return and the "volatility" of different investment opportunities for three time periods: 50 years, 10 years, and 5 years. Biggs and Chung concluded that the rates of return for the various investment categories were commensurate with the risks associated with the investments. While their conclusion supports traditional investment ideas, it raises two often-asked questions. First, what are the appropriate risk rates of return for each of the investment categories? Second, given a specific willingness to accept risk on the part of a willing investor, how well do each of the categories perform? To investigate these questions, the authors assume that risk is proportional to the coefficient of variation in the rate of return.[2]

In the *Barron's* article, volatility

1. Andy Zipser, "Considering the Alternatives: Comparing the Performance of 16 Different Investments," *Barron's* (May 20, 1991): 1.
2. J. Fred Weston and Eugene F. Brigham, *Managerial Finance*, 7th ed. (Hinsdale, Ill.: The Dryden Press, 1981), 107–110.

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is defined as equal to the standard deviation of the rate of return. The coefficient of variation (i.e., the standard deviation as a percentage of the mean rate of return) is easily derived from the volatility values given in the article and provides a better measure of the variance in the rates of return because it is directly related to the magnitude of the return.

The authors are not able take an additional step and examine the possibility of a portfolio of investments because data were not provided on the covariance of the investments. The capital asset pricing model (CAPM) indicates that a portfolio of investments rather than a single investment tends to reduce risk to the investor—a possibility that is not examined here.

DEFINING TERMS

To answer questions about the relative risks of various categories of investments and how well each category performs relative to a specific investor's criteria for risk, a number of terms must first be defined.

First, for the purposes of this article a willing investor understands that some risk is always incurred in any investment and has decided that the following criteria must be met.

1. An investment must return at least the rate of inflation most of the time.
2. "Most of the time" means 84% of the time. That is, a willing investor can accept that an investment will return less than the rate of inflation 16% of the time.

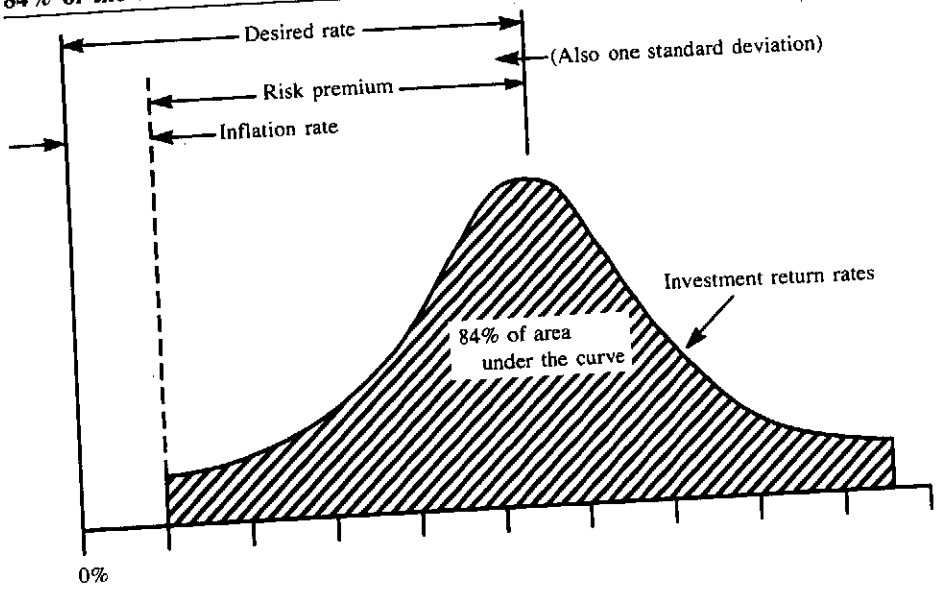
Because 16% is the area under the normal distribution curve lying to the left of the first standard deviation from the mean value of the distribution, using this figure in the definition of a willing investor greatly simplifies the calculations.

Given that it is known what our willing investor is prepared to accept in the way of risk, a risk premium and a desired rate of return can now be defined. The risk premium is the amount that must be paid to compensate the willing investor for the possibility that the volatility in the mean rate of return may result in an actual rate of return less than the rate of inflation. The desired rate of return is then the rate of inflation plus the risk premium. Figure 1 illustrates these definitions.

In Figure 1, the mean value of the normal distribution for the investment's rate of return has been shifted far enough to the right to place 84% of the area under the normal curve to the right of the rate of inflation. The amount of the right shift is equal to the risk premium and in this case is equal to the magnitude of the standard deviation in the rate of return. The desired rate of return is what is required of an investment that will provide a willing investor with a return at least equal to the rate of inflation 84% of the time. An investor will receive less than the rate of inflation 16% of the time on average.

Before proceeding, the issue of inflation must be considered. Specifically, the rate of inflation is not a constant and, although included in the rates of return for each investment category in the *Barron's* data, the rate of return for an investment traditionally lags behind changes in the rate of inflation. Inflation therefore has its own risks, which are qualitatively examined in the following analysis. Again, sufficient information is not available to examine the covariance between the rate of inflation and the investment rates of return and therefore it is assumed that infla-

FIGURE 1 Risk Premium and Mean Rate of Return Required to Cover Inflation 84% of the Time



tion is completely accounted for in the rate of return for a specific investment. Because average rates of return over relatively long periods of time are being used, this assumption should not prove particularly unrealistic.

Table 1 contains the *Barron's* data. It is important to note the standard deviation for each investment alternative. Standard deviations essentially measure the degree of dispersion between the mean value of a sample set and the ac-

TABLE 1 Mean Annual Rate of Return and Standard Deviations for the Marketplace

	50-Year Period		10-Year Period		5-Year Period	
	Annual Return (percentage)	Standard Deviation (percentage)	Annual Return (percentage)	Standard Deviation (percentage)	Annual Return (percentage)	Standard Deviation (percentage)
Inflation	4.60	3.90	4.50	1.90	4.10	1.60
Commercial paper	5.20	3.80	9.40	2.70	7.70	0.90
T-bills	4.40	3.40	8.50	2.50	6.80	1.10
Residential housing	7.70	4.00	4.40	6.00	4.80	1.50
Commercial real estate	7.50	4.90	8.80	4.30	5.20	2.10
U.S. farmland	9.80	7.50	2.80	5.70	7.40	4.00
Art	N/A	N/A	13.00	14.90	20.70	16.90
U.S. government bonds	4.50	9.40	13.70	13.40	10.80	9.40
S&P 500	11.60	16.10	13.90	12.60	13.20	11.90
Foreign bonds	N/A	N/A	11.80	16.10	15.40	16.30
Emerging growth stocks	14.10	28.80	8.30	13.40	7.90	11.10
EAFE*	N/A	N/A	15.10	25.10	17.50	28.50
Emerging market stocks	N/A	N/A	8.40	29.90	18.30	32.60
Venture capital	18.00	36.20	−2.40	17.90	−3.80	7.60
Japanese stocks	15.70	29.20	14.90	21.70	11.20	29.80
Gold	N/A	N/A	−1.90	15.20	3.70	14.70
Small stocks	15.60	28.70	9.30	18.00	0.60	15.50

*Europe, Australia, and Far East Index.

tual values of the sample points. For the purposes of this article, the standard deviation can be used to determine the probability that an investment will provide the indicated mean rate of return. The greater the dispersion, the less likely it is that the investment will achieve exactly the mean rate of return. Note that some of these dispersions (i.e., standard deviations) are rather large.

A common problem with rates of return on real estate investments that may also hold true for other investment categories is that published rates of return for real estate investments are often based on appraised values—particularly in the short run—rather than on actual sale prices. In a volatile market, this could result in an overstatement of the rate of return, reflected in the 5- and 10-year rate-of-return data. This problem is likely to have been mitigated to some extent in the 50-year data, because most of the properties would have been sold during that period.

THE RISK/RETURN ANALYSIS

Tables 2, 3, and 4 provide the coefficient of variation, the risk premium, the desired rate of return, the mean rate of return (from Table 1) and the rate differential for each of the 16 categories of investment plus inflation. The rate differential is defined as the mean rate of return for an investment minus the desired rate of return and expresses the amount by which the investment succeeds or fails to meet a willing investor's criteria. A failure to meet the investor's criteria is indicated by a negative rate differential. The tables are in the same investment opportunity order—from least volatile to most volatile for a 5-year investment as measured by their coefficient of variation.

The rate differential is designed to indicate the difference between the desired performance as represented by the desired rate and the actual performance of the invest-

TABLE 2 50-Year Investment Return Analysis

Investment	Coefficient of Variation	Risk Premium (one standard deviation)	Desired Rate (inflation + risk premium)	Mean Rate of Return (from Table 1)	Rate Differential (mean rate of return − desired rate of return)
Inflation	0.85	3.90	8.50	4.60	−3.90
Commercial paper	0.73	3.80	8.40	5.20	−3.20
T-bills	0.77	3.40	8.00	4.40	−3.60
Residential housing	0.52	4.00	8.60	7.70	−0.90
Commercial real estate	0.65	4.90	9.50	7.50	−2.00
U.S. farmland	0.77	7.50	12.10	9.80	−2.30
Art	N/A	N/A	N/A	N/A	N/A
U.S. government bonds	2.09	9.40	14.00	4.50	−9.50
S&P 500	1.39	16.10	20.70	11.60	−9.10
Foreign bonds	N/A	N/A	N/A	N/A	N/A
Emerging growth stocks	2.04	28.80	33.40	14.10	−19.30
EAFE	N/A	N/A	N/A	N/A	N/A
Emerging market stocks	N/A	N/A	N/A	N/A	N/A
Venture capital	2.01	36.20	40.80	18.00	−22.80
Japanese stocks	1.86	29.20	33.80	15.70	−18.10
Gold	N/A	N/A	N/A	N/A	N/A
Small stocks	1.84	28.70	33.30	15.60	−17.70

TABLE 3 10-Year Investment Return Analysis

Investment	Coefficient of Variation	Risk Premium (one standard deviation)	Desired Rate (inflation + risk premium)	Mean Rate of Return (from Table 1)	Rate Differential (mean rate of return − desired rate of return)
Inflation	0.42	1.90	6.40	4.50	−1.90
Commercial paper	0.29	2.70	7.20	9.40	2.20
T-bills	0.29	2.50	7.00	8.50	1.50
Residential housing	0.36	6.00	10.50	4.40	−6.10
Commercial real estate	0.49	4.30	8.80	8.80	0.00
U.S. farmland	2.04	5.70	10.20	2.80	−7.40
Art	1.15	14.90	19.40	13.00	−6.40
U.S. government bonds	0.98	13.40	17.90	13.70	−4.20
S&P 500	0.91	12.60	17.10	13.90	−3.20
Foreign bonds	1.36	16.10	20.60	11.80	−8.80
Emerging growth stocks	1.61	13.40	17.90	8.30	−9.60
EAFE	1.66	25.10	29.60	15.10	−14.50
Emerging market stocks	3.56	29.90	34.40	8.40	−26.00
Venture capital	7.46	17.90	22.40	−2.40	−24.80
Japanese stocks	1.46	21.70	26.20	14.90	−11.30
Gold	8.00	15.20	19.70	−1.90	−21.60
Small stocks	1.94	18.00	22.50	9.30	−13.20

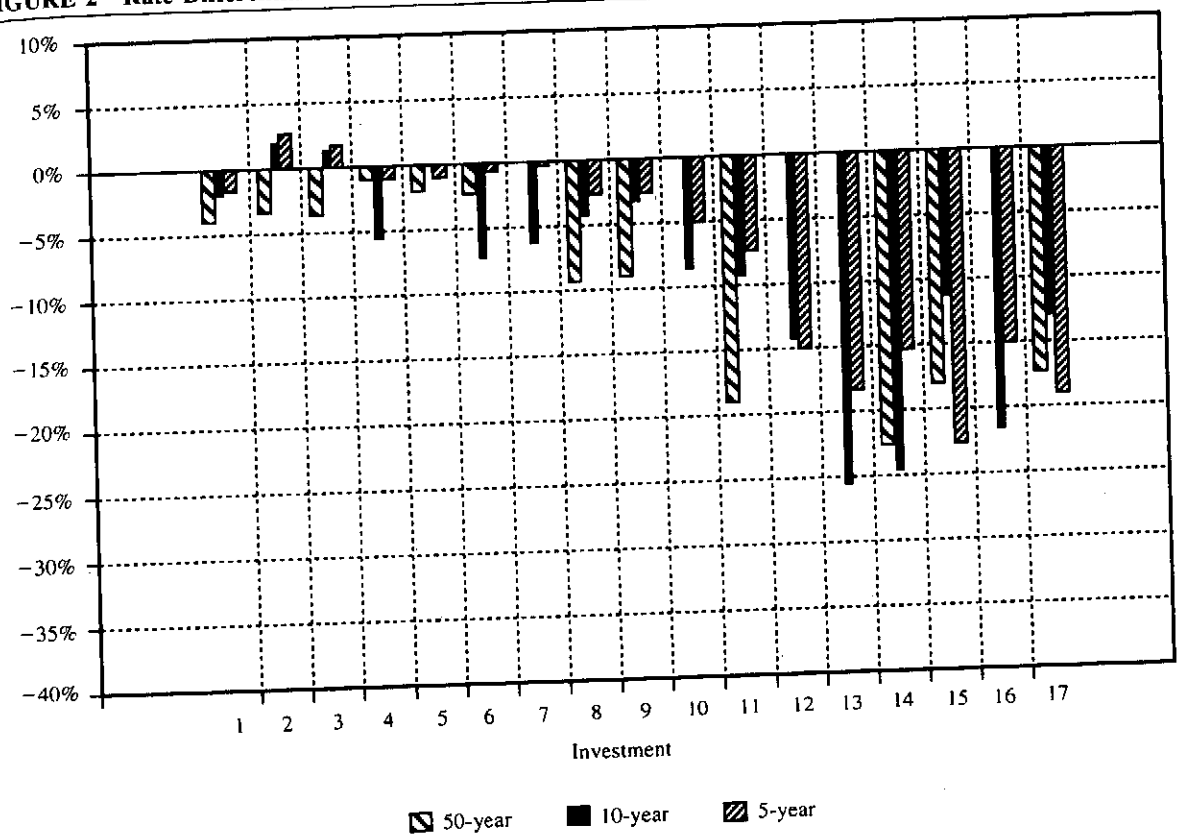
ment as indicated by the mean rate of return. For example, if the mean rate of return is 10% and the desired rate is 9%, the rate differential is 1% (i.e., 10% minus 9%) indicating that on average, the investment returns 1% more than the rate of inflation 84% of the time.

Some of the investments originally had a negative mean rate of return for a given time period, resulting in a strongly negative rate

TABLE 4 5-Year Investment Return Analysis

Investment	Coefficient of Variation	Risk Premium (one standard deviation)	Desired Rate (inflation + risk premium)	Mean Rate of Return (from Table 1)	Rate Differential (mean rate of return − desired rate of return)
Inflation	0.39	1.60	5.70	4.10	−1.60
Commercial paper	0.12	0.90	5.00	7.70	2.70
T-bills	0.16	1.10	5.20	6.80	1.60
Residential housing	0.31	1.50	5.60	4.80	−0.80
Commercial real estate	0.40	2.10	6.20	5.20	−1.00
U.S. farmland	0.54	4.00	8.10	7.40	−0.70
Art	0.82	16.90	21.00	20.70	−0.30
U.S. government bonds	0.87	9.40	13.50	10.80	−2.70
S&P 500	0.90	11.90	16.00	13.20	−2.80
Foreign bonds	1.06	16.30	20.40	15.40	−5.00
Emerging growth stocks	1.41	11.10	15.20	7.90	−7.30
EAFE	1.63	28.50	32.60	17.50	−15.10
Emerging market stocks	1.78	32.60	36.70	18.30	−18.40
Venture capital	2.00	7.60	11.70	−3.80	−15.50
Japanese stocks	2.54	29.80	33.90	11.20	−22.70
Gold	3.97	14.70	18.80	3.70	−15.10
Small stocks	25.83	15.50	19.60	0.60	−19.00

FIGURE 2 Rate Differential



Legend (X-axis)

1 = Inflation
2 = Commercial paper
3 = T-bills
4 = Residential housing
5 = Commercial real estate
6 = U.S. farmland
7 = Art
8 = U.S. government bonds
9 = S&P 500
10 = Foreign bonds
11 = Emerging growth stocks
12 = EAFE
13 = Emerging market stocks
14 = Venture capital
15 = Japanese stocks
16 = Gold
17 = Small stocks

differential. For example, the venture capital mean rate of return for a 5-year investment was −3.80% and the desired rate was 11.70%, resulting in a −15.50% rate differential. Thus, an investment in the average venture capital category for the 5-year period not only did not return the rate of inflation 84% of the time, but fell 15.50% below the rate of return required to achieve that goal.

Figures 2 and 3 provide in graphic form the results of Tables 2, 3, and 4 for the risk premium and the rate differential. These figures seem to indicate fairly bleak investment results, with even T-bills and U.S. Government bonds faring poorly. To some extent, however, such a conclusion may not be warranted. First, the willing investor hypothesized for this article is a conservative investor—one who expects to achieve a return greater than the rate of inflation most of the time (i.e., 84%)—and sometimes a rate much greater than the