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BASIC INVESTMENT THEORY EXPLAINED

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Introduction

The S&P 500 Index dropped more than 40 percent between March 2000 and March 2003, and almost anyone who entrusted their retirement savings to the bull market of the late 1990s saw their portfolio shrink, often in dramatic fashion.[1] Now that the stock market is regaining some of its lost value, should people return to their bull market strategies and expect double-digit annual returns on their retirement savings?

In spite of the large fluctuations in the market, most investment advisors still offer the same guidance: consider both risk and return, determine one's tolerance for risk and reassess this tolerance periodically, and diversify the share of funds allocated to risky investments. These rules of thumb are effective because they are based on widely-accepted results of economic and financial theory. In fact, theory emphasizes that the typical investor should focus primarily on one decision: how much to invest in risky assets. This brief explains why.

Risk and Return

Any discussion of returns should be grounded in the fact that investment takes place amid uncertainty. If returns were certain, the optimal strategy would be simple: invest entirely in the asset that yields the highest return. The real world, however, is unpredictable and investors need to account for risk as they seek to increase the value of their assets.

Theorists use two basic measures to describe returns. The first is a portfolio's average return over some time period, which is straightforward to calculate. The second is the standard deviation of the return, which measures how much the rate of return varies over time. A larger standard deviation signals a greater likelihood that the actual return in any period will differ substantially from the average. For this reason, portfolios with large standard deviations are viewed as riskier and will, therefore, command a higher expected return to give investors a reason to purchase them.[2]

Based on historical data, stocks yield the highest average return and are the riskiest asset class (Table 1). Specifically, large company stocks have had an

TABLE 1: ANNUAL TOTAL RETURNS ON VARIOUS FINANCIAL INSTRUMENTS, 1926-2002

Financial Instrument	*Rate of Return (percent)*	*Standard Deviation*
Stocks	12.2	20.5
Long-term corporate bonds	6.2	8.7
Intermediate government bonds	5.6	5.8
U.S. Treasury bills	3.8	3.2
Cash	-3.1	4.4

Source: Ibbotson Associates (2003).

Note: Stocks refer to the returns on large company stocks. Over the same period, the return and standard deviation on small company stocks was somewhat higher: 16.9 percent return with a standard deviation of 33.2 percent.

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[1] Authors' calculations using on-line data from Standard & Poors. The S&P 500 Index was valued at 1,379 on March 15, 2000 and at 833 on March 14, 2003.

[2] While the suggestions discussed here are based on modern portfolio theory, financial theorists are not unanimous in their beliefs. Some theorists argue that, instead of considering the average asset return and its standard deviation, investors should consider both the likelihood and the severity of potential losses from stocks (Bodie 2002). These criteria would lead to substantially different asset allocations, with a much larger emphasis on risk-free bonds.

average annual return of 12.2 percent over the past 75 years, far exceeding those of corporate and government bonds. Stock returns, however, also have a standard deviation of 20.5 percentage points over that time. This means that about one third of the time annual returns are either below -8.3 or above 32.7 percent (that is, 12.2 percent minus or plus 20.5 percentage points).

Stocks and bonds exhibit different risk and return patterns, even if issued by the same company. A stock purchase is equivalent to acquiring an ownership share. Like any business owner, the stockholder can take his share of profits in the form of dividends, and may enjoy a capital gain if the company's value appreciates. In contrast, bondholders make a loan to the company, which agrees to pay back the principal at a given date and to make regular interest payments in the interim. The difference in risk can be seen most clearly in the case of bankruptcy: bondholders line up with the firm's other creditors to get their share of whatever assets remain, while stockholders may lose their entire investment. Bonds are therefore less risky, and have lower average returns as a result. Other assets, such as U.S. Treasury bills, are less volatile than bonds, and earn a low but guaranteed return.

Economists and financial theorists have classified risks according to the influences of each level of the economy (firm, industry, market). At the firm level, incidents such as the discovery of a new technology or the recall of a product may influence the stock price. Industry risk is at the next level, where an entire industry is affected by some event, such as the airlines following the attacks of September 11, 2001. At the broadest level is market risk and macroeconomic effects since changes in the broader economy can cause movements in an individual firm's stock price.

Two market-level risks in particular — inflation risk and currency risk — are especially important for a long-term investment like retirement savings. Inflation can eat away at the real value of an asset even if it is earning a nominal return. Inflation has not been a substantial threat to most stocks, however, since their expected returns are higher. Rather, inflation is more important for low-yielding bonds, since it can erase their nominal returns in real terms. Currency risk is similar — earnings on investments in foreign assets can be substantially reduced by movements in exchange rates.

Financial theory offers a two-part strategy for handling risk. The first part consists of deciding what percentage of funds to allocate to risky assets. The second part consists of decisions about the way risky assets should be invested.

How Much to Invest in Risky Assets?

The first — and most important — decision that an investor needs to make is what fraction of funds should be devoted to risky assets. An individual who strongly wished to avoid the possibility of negative outcomes might choose to put very little in risky assets and give up the prospect of robust investment returns. Alternatively, an individual could put more weight on positive outcomes and choose to invest a higher fraction of savings in risky assets. Of course, there is no "right" answer for everyone. The choice depends on an individual's savings goals, tolerance for risk, desire for large gains, and current risk profile.

Once individuals decide how much to invest in risky assets, they must then decide what risky assets to invest in. For the most part, this decision is not driven by individual preferences; rather, the optimal mix of risky assets can be determined objectively. Financial theory explains why.

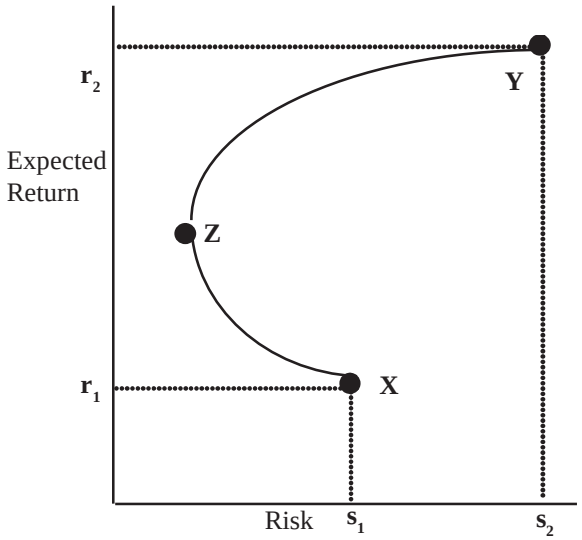
Diversifying Risky Assets

Portfolio theory, which won Harry Markowitz the 1990 Nobel Prize for Economics, provides the foundations for diversifying asset holdings in a variety of stocks and risk-bearing bonds. The theory rests on the idea that the returns of all assets do not move in lockstep and often move in opposite directions. For example, if an investor holds just one asset, such as shares of Company A, then the value of his entire portfolio will rise and fall with A's fortunes. Imagine another company, B, with the same expected return but different risks. If the investor splits his portfolio between the two companies, he can remove some risk while maintaining the same expected return. This occurs because the two assets do not perform identically; one may falter while the other gains.

Adding more securities to a portfolio will generally make it less risky, but choosing the assets that will give the best mix of risk and return can be more complicated. Economists start by considering all possible combinations of assets and then selecting portfolios that maximize expected returns for each level of risk. These portfolios are "efficient" because it is not possible to achieve a higher expected return without taking on additional risk.

For example, consider the two assets depicted in Figure 1. X has a low level of risk (s_1) and a low expected, or average, return (r_1); Y has a high risk level (s_2) and a high expected return (r_2). The points labeled X and Y in Figure 1 indicate the risk-return outcomes of portfolios that are invested entirely in one of these assets. Now, consider a portfolio with all assets in X. By shifting some assets from X to Y, the portfolio will move northwest along the curve, reducing risk and increasing expected returns at the same time. This is a win-win situation up to point Z, after which the portfolio will be more risky as expected returns increase. The curve formed between Z and Y is the efficient portfolio frontier for these two assets; risk-return combinations above the curve are not possible, and those below the curve make little sense, since one can improve the expected return for any risk level by investing in the mix of assets along the curve.

FIGURE 1: THE MINIMUM VARIANCE FRONTIER



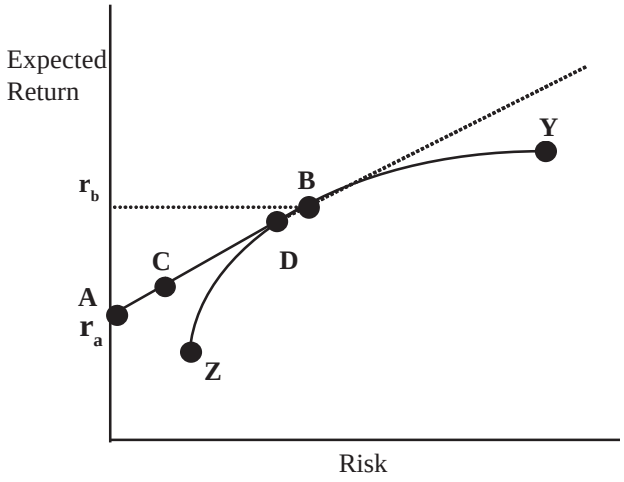
Source: Markowitz (1991).

Mutual funds, which often mimic broad market indices, greatly simplify the task of obtaining risk-return combinations on the efficient portfolio frontier. Therefore, it appears logical that many investors choose to reduce risk by owning mutual funds. In 2002, about one half of all U.S. households owned mutual funds, and about one quarter of the net financial assets they purchased were in mutual funds.[3] Mutual funds also make up a large component of retirement market assets. About 45 percent of 401(k) plan assets and 46 percent of IRA assets in the U.S. were invested in mutual funds at year-end 2002.[4]

So, the efficient frontier indicates the optimal mix of equities and risk-bearing bonds. It is based on an objective calculation of average returns and risk, and is independent of individual preferences; each type of investor should have the same proportion of stocks and bonds for those funds that are invested in risky assets.

The theoretical framework used to determine the efficienct frontier can be extended to include risk-return outcomes for the investor's primary decision — how much to invest in risky assets. The decision is shown graphically in Figure 2. The curve in the figure is analogous to the one between points Z and Y in Figure 1, only here it is based on the set of all risky assets as opposed to just two. Point A refers to the return associated with a risk-free investment. That is, a portfolio invested entirely in asset type A has a return of r_a with no risk. Therefore, the combinations of risk-return outcomes that result from mixing different proportions of the risk-free asset and the optimal mix of risky assets, as determined by the efficient portfolio frontier, is indicated by the line AB — the capital allocation line. As the investor shifts assets away from the risk-free investment into the optimal risky asset mix (i.e., moves from A towards B), expected returns increase along with risk. Risk-averse individuals will choose to have relatively more of their portfolio's assets in the risk-free asset (point C), compared to risk-loving individuals (point D).

FIGURE 2: THEORETICAL APPROACH TO CHOOSING AN OPTIMAL PORTFOLIO



Source: Markowitz (1991).

[3] Authors' calculations based on the Investment Company Institute (2003).

[4] Investment Company Institute (2003). This number may also reflect the often limited investment choices in 401(k) plans, as they typically offer few investment vehicles apart from mutual funds and company stock.

Reassessing Decisions over Time

Financial advisors often present the optimal composition of risky assets as a function of an investor's time horizon.[5] Jane Bryant Quinn, a columnist for *Newsweek*, sums up the typical explanation for such recommendations as "[y]ounger people should tip toward higher returns because they have time for their stocks to recover from any drop."[6] This explanation is not supported by the concepts described above, since the shape and position of the efficient portfolio frontier is not a function of any particular time horizon or individual preference.

Financial economists do, however, offer an alternative justification for altering the mix of risky assets as retirement approaches.[7] Because an individual's future labor income is uncertain, future earnings should be considered a risky asset. So, a young investor with a stable job should invest more heavily in stocks than an otherwise similar older investor, since the labor income he will earn over the next twenty or thirty years carries a low level of risk and occupies a large portion of the portfolio. As the investor ages, labor income constitutes a smaller part of the portfolio. The investor should, therefore, shift the mix of risky assets away from stocks towards less-risky corporate or government bonds to maintain the portfolio's optimal mix of risky assets.

What's more, the allocation decision across risky and risk-free investments is likely to change over time because preferences towards risk often change. For example, older individuals may feel less inclined to take chances with their savings and may therefore allocate a smaller fraction of their portfolio to risky assets. This change is illustrated in Figure 2 by a movement along the line AB, away from B and towards A.

Conclusion

Conventional wisdom states that investors should consider both risk and return, understand their risk tolerance, and diversify the portion of their portfolio that is invested in risky assets. The key question for the typical investor is how much of one's savings should be put into risky assets. Of course, there is no "right" answer for everyone. The choice depends on an individual's savings goals, tolerance for risk, desire for large gains, and current risk profile. In contrast, the optimal combination of risky assets — for the fraction of the portfolio put into risky investments — is guided primarily by factors unrelated to individual preferences. So, even with an improving stock market, investors should find themselves in the best position possible by putting into practice the basics of conventional investing wisdom.

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[5] Munnell and Sundén (2004).
[6] Quinn (1997), p. 589.
[7] Campbell and Viceira (2002).

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