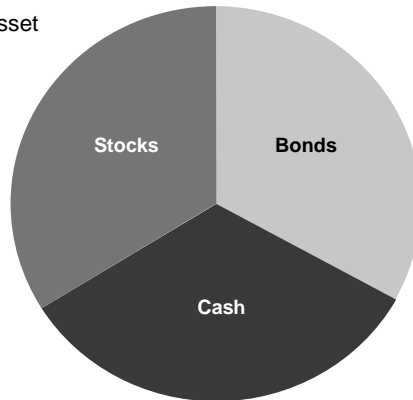


# Portfolio Diversification

## What is asset allocation?

Asset allocation is the process of combining asset classes such as stocks, bonds, and cash in a portfolio in order to meet your goals.



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## **What is asset allocation?**

The asset allocation decision is one of the most important factors in determining both the return and the risk of an investment portfolio.

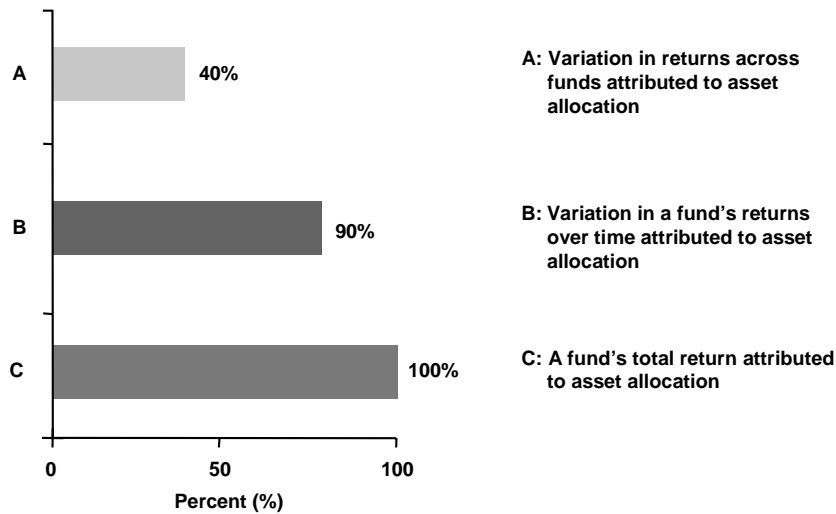
Asset allocation is the process of developing a diversified investment portfolio by combining different assets in varying proportions.

An asset is anything that produces income or can be purchased and sold, such as stocks, bonds, or certificates of deposit (CDs). Asset classes are groupings of assets with similar characteristics and properties. Examples of asset classes are large company stocks, long-term government bonds, and Treasury bills.

Every asset class has distinct characteristics and may perform differently in response to market changes. Therefore, careful consideration must be given to determine which assets you should hold and the amount you should allocate to each asset.

Factors that greatly influence the asset allocation decision are your financial needs and goals, the length of your investment horizon, and your attitude toward risk.

## How important is asset allocation policy?



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### How important is asset allocation policy?

A portfolio's long-term performance is determined primarily by the distribution of dollars among asset classes, such as stocks, bonds, and cash equivalents.

The asset allocation decision is one of the most important decisions you will make as an investor. To examine the influence of asset allocation policy, this image illustrates the results of a study by Ibbotson and Kaplan that answered the following three questions:

#### **A. How much of the variation of returns across funds is explained by asset allocation?**

It was found that 35% of the return difference from one pension fund to another was explained by asset allocation, while for mutual funds the result was 40%. For example, if one portfolio returns 5% more than the other, then on average, about 2% of the difference (40% of 5%) is attributable to the different asset allocations. The remaining 3% difference (60% of 5%) is explained by other factors such as asset class timing, security selection, and fees.

#### **B. How much of the movement in a fund's returns over time is explained by its asset allocation policy?**

The results confirm the results of earlier studies in that approximately 90% of the variability of a fund's return across time is explained by asset allocation—in this case 88% for pension funds and 81% for mutual funds.

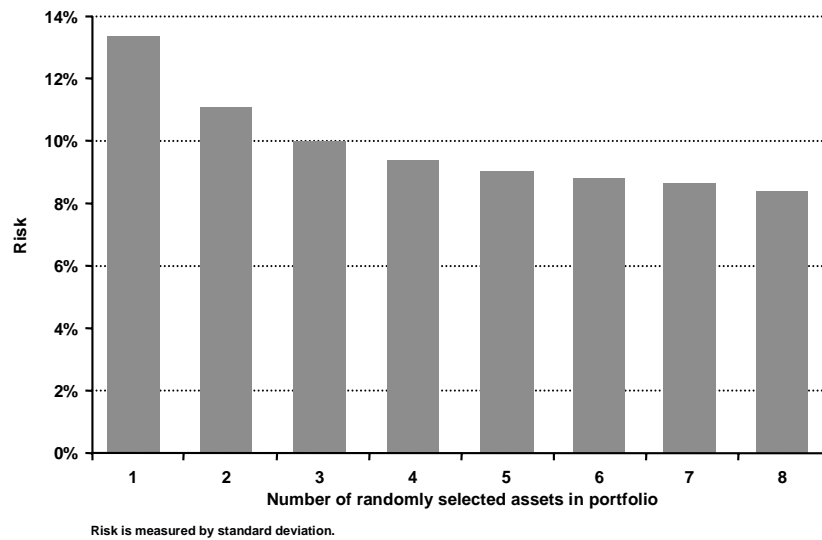
#### **C. What portion of total return is due to asset allocation?**

To answer the above question, the percent of fund return explained by asset allocation was calculated for each fund as the ratio of compound annual policy return divided by the compound annual total return. In other words, a portfolio of benchmark asset classes that matches a balanced fund's asset allocation policy was created and then divided by the fund's actual return. This ratio of compound returns serves as a performance measure. A fund that has stayed exactly at its asset allocation mix and has invested passively will have a ratio of 1.0 or 100%. A fund that has outperformed its asset allocation will have a ratio of less than one, while a fund that has underperformed its asset allocation policy will have a ratio of greater than one. Pension funds had a ratio of 99%, and mutual funds had a ratio of 104%. From these results, approximately 100% of a fund's return can be attributed to asset allocation.

The effect of asset allocation far exceeds the effects of both market timing and security selection, demonstrating that the asset allocation decision is the most important determinant of portfolio performance.

Source: Ibbotson, Roger G. and Paul D. Kaplan, "Does Asset Allocation Policy Explain 40 Percent, 90 Percent, or 100 Percent of Performance?," *Financial Analysts Journal*, January/February 2000.

## Reduction of portfolio risk



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## Reduction of portfolio risk

As the number of asset classes in a portfolio increases, the total risk or volatility of the portfolio decreases.

Diversification is the strategy of holding more than one asset class in a portfolio in order to reduce risk. This image depicts the relationship between portfolio volatility, measured by standard deviation, and the number of asset classes included in a portfolio. Standard deviation measures the fluctuation of returns around the arithmetic average return of the investment. The higher the standard deviation, the greater the variability (and thus risk) of the investment returns.

You can limit the effect that any individual security or asset class may have on the performance of your portfolio by investing in a combination of asset classes. As a result, declines in the total returns of one or two assets may be offset by increases in others. Notice that as the number of randomly selected assets in the portfolio increases, the risk level decreases. While it is impossible to completely eliminate risk, diversifying your investments can reduce the overall volatility experienced by your portfolio.

Diversification does not eliminate the risk of experiencing investment losses. The portfolios used in this image are created from equally weighted combinations of the following randomly selected asset classes over their common time period of 1985–2004:

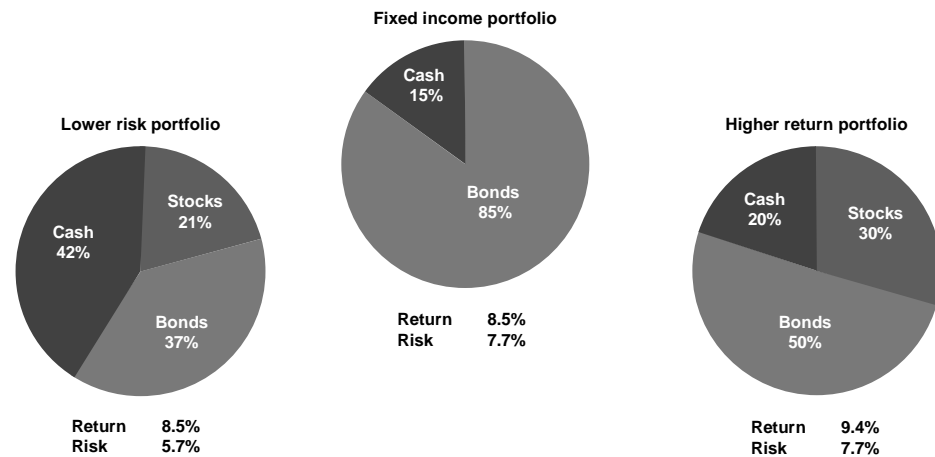
- |                               |                              |
|-------------------------------|------------------------------|
| 1. Small company stocks       | 5. Business real estate      |
| 2. Large company stocks       | 6. Long-term corporate bonds |
| 3. International stocks       | 7. Treasury bills            |
| 4. Long-term government bonds | 8. International bonds       |

Government bonds and Treasury bills are guaranteed by the full faith and credit of the United States government as to the timely payment of principal and interest, while stocks are not guaranteed and have been more volatile than the other asset classes. Furthermore, small company stocks are more volatile than large company stocks, are subject to significant price fluctuations and business risks, and are thinly traded. International securities involve special risks that investors should consider such as fluctuations in currency, foreign taxation, political instability, and differing securities regulations and accounting methods.

Source: Small Company Stocks—represented by the fifth capitalization quintile of stocks on the NYSE for 1926–1981 and the performance of the Dimensional Fund Advisors, Inc. (DFA) U.S. Micro Cap Portfolio thereafter; Large Company Stocks—Standard & Poor's 500®, which is an unmanaged group of securities and is considered to be representative of the stock market in general; International Stocks—Morgan Stanley Capital International Europe, Australasia, and Far East (EAFE®) Index; Long-Term Government Bonds—20-year U.S. Government Bond; Business Real Estate—Dow Jones Wilshire Real Estate Securities Index; Long-Term Corporate Bonds—Salomon Brothers Long-Term High-Grade Corporate Bond Index; Treasury Bills—30-day U.S. Treasury Bill; International Bonds—Citigroup Non-U.S. 1+ Year Government Bond Index.

**Potential to reduce risk or increase return**

1970–2004



Risk is measured by standard deviation. Return is the compound annual return. Risk and return are based on annual data over the period 1970–2004. Portfolios presented are based on modern portfolio theory.

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**Potential to reduce risk or increase return 1970–2004**

Historically, adding stocks to a portfolio of less volatile assets reduced risk without sacrificing return or increased return without assuming additional risk.

This image illustrates the risk-and-return profiles of three hypothetical investment portfolios. The lower risk portfolio, which included stocks, had the same return as the portfolio comprised entirely of fixed-income investments, but assumed less risk. The higher return portfolio had the same risk level as the fixed income portfolio, but produced an increased return.

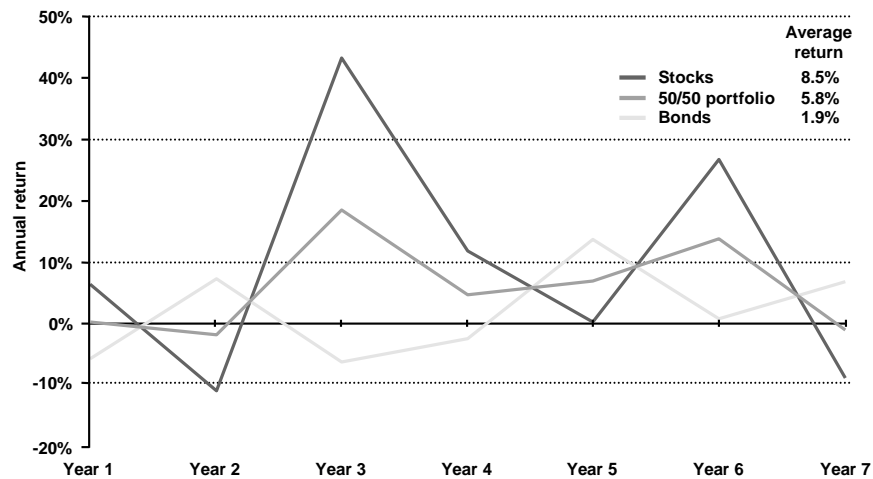
Although it may appear counterintuitive, diversifying a portfolio of fixed-income investments to include stocks reduced the overall volatility of a portfolio during the period 1970–2004. Likewise, it is possible to increase your overall portfolio return without having to take on additional risk.

Because stocks, bonds, and cash generally do not react identically to the same economic or market stimulus, combining these assets can often produce a more appealing risk-and-return trade-off.

Bonds represent an equally weighted portfolio of long-term government bonds and intermediate-term government bonds. All portfolios are rebalanced annually. Diversification does not eliminate the risk of experiencing investment losses. Risk is measured by standard deviation. Standard deviation measures the fluctuation of returns around the arithmetic average return of the investment. The higher the standard deviation, the greater the variability (and thus risk) of the investment returns. Government bonds and Treasury bills are guaranteed by the full faith and credit of the United States government as to the timely payment of principal and interest, while stocks are not guaranteed and have been more volatile than the other asset classes. The data assumes reinvestment of all income and does not account for taxes or transaction costs.

Source: Stocks—Standard & Poor's 500<sup>®</sup>, which is an unmanaged group of securities and considered to be representative of the stock market in general; Long-Term Government Bonds—20-year U.S. Government Bond; Intermediate-Term Government Bonds—5-year U.S. Government Bond; Cash—30-day U.S. Treasury Bill.

## The case for diversifying



Time period illustrated is from 1956–1962. This time period was chosen as a dramatic illustration of stock and bond return behavior and how their often opposite movements reduced portfolio volatility.

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### The case for diversifying

Diversifying your portfolio makes you less dependent on the performance of any single asset class.

Effective diversification requires combining assets that behave differently when held during changing economic or market conditions. Moreover, investing in assets that have dissimilar return behavior may insulate your portfolio from major downswings.

This image illustrates the annual returns of three different portfolios over a seven-year time period. Stocks represent a 100% investment in large company stocks. Bonds represent a 100% investment in long-term government bonds.

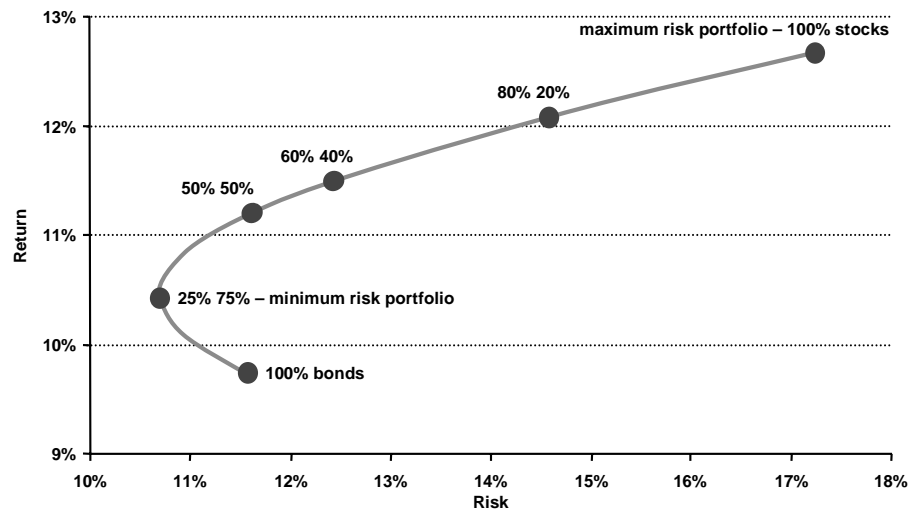
When the stock and bond asset classes were combined into an equally weighted portfolio, the portfolio experienced less volatility than stocks alone and still maintained an attractive return. Notice that stock returns were up at times when bond returns were down, and vice versa. These offsetting movements assisted in reducing portfolio volatility (risk).

Diversification does not eliminate the risk of experiencing investment losses. Annual rebalancing is assumed in the 50% stocks/50% bonds portfolio. Government bonds are guaranteed by the full faith and credit of the United States government as to the timely payment of principal and interest, while stocks are not guaranteed and have been more volatile than bonds. The data assumes reinvestment of all income and does not account for taxes or transaction costs.

Source: Stocks—Standard & Poor's 500®, which is an unmanaged group of securities and is considered to be representative of the stock market in general; Bonds—20-year U.S. Government Bond.

## Stocks and bonds: risk versus return

1970–2004



Risk is measured by standard deviation. Return is measured by arithmetic mean. Risk and return are based on annual data over the period 1970–2004. Portfolios presented are based on modern portfolio theory.

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### Stocks and bonds: risk versus return 1970–2004

An efficient frontier represents every possible combination of assets that maximizes return at each level of portfolio risk and minimizes risk at each level of portfolio return.

An efficient frontier is the line that connects all optimal portfolios across all levels of risk. An optimal portfolio is simply the mix of assets that maximizes portfolio return at a given risk level. This image illustrates an efficient frontier for all combinations of two asset classes: stocks and bonds.

Although bonds are considered less risky than stocks, the minimum risk portfolio does not consist entirely of bonds. The reason is that stocks and bonds are not highly correlated; that is, they tend to move independently of each other. Sometimes stock returns may be up while bond returns are down, and vice versa. These offsetting movements help to reduce overall portfolio volatility (risk).

As a result, adding just a small amount of stocks to an all-bond portfolio actually reduced the overall risk of the portfolio. However, including more stocks beyond this minimum point caused both the risk and return of the portfolio to increase.

Diversification does not eliminate the risk of experiencing investment losses. Risk is measured by standard deviation. Standard deviation measures the fluctuation of returns around the arithmetic average return of the investment. The higher the standard deviation, the greater the variability (and thus risk) of the investment returns. Government bonds are guaranteed by the full faith and credit of the United States government as to the timely payment of principal and interest, while stocks are not guaranteed and have been more volatile than bonds. The data assumes reinvestment of all income and does not account for taxes or transaction costs.

Source: Stocks—Standard & Poor's 500<sup>®</sup>, which is an unmanaged group of securities and considered to be representative of the stock market in general; Bonds—20-year U.S. Government Bond.

**Correlations by asset class**

1926–2004

	Small Stocks	Large Stocks	LT Corporate Bonds	LT Gov't Bonds	IT Gov't Bonds	Treasury Bills
Small Stocks	1.00	0.79	0.08	-0.02	-0.07	-0.10
Large Stocks	0.79	1.00	0.19	0.12	0.04	-0.02
LT Corporate Bonds	0.08	0.19	1.00	0.93	0.90	0.20
LT Gov't Bonds	-0.02	0.12	0.93	1.00	0.90	0.23
IT Gov't Bonds	-0.07	0.04	0.90	0.90	1.00	0.48
Treasury Bills	-0.10	-0.02	0.20	0.23	0.48	1.00

Correlation ranges from -1 to 1, with -1 indicating that the returns move perfectly opposite to one another, 0 indicating no relationship, and 1 indicating that the asset classes react exactly the same.

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**Correlations by asset class**

A well-diversified portfolio should consist of individual investments that behave differently.

It is possible to determine how closely two asset classes move together by evaluating their correlation. For example, small stocks and large stocks have risen and fallen to the same market conditions. Their high correlation suggests combining them may do little to lower the risk of a portfolio. In contrast, the low correlation of small stocks and intermediate term government bonds illustrates the potential for better diversification. Investments still need to be evaluated for investor suitability, but understanding asset class behavior may help enhance the diversification benefits of investor portfolios.

Government bonds and Treasury bills are guaranteed by the full faith and credit of the United States government as to the timely payment of principal and interest, while stocks are not guaranteed and have been more volatile than bonds. Furthermore, small company stocks are more volatile than large company stocks and are subject to significant price fluctuations, business risks, and are thinly traded. Diversification does not eliminate the risk of experiencing investment losses.

Source: Small Company Stocks—represented by the fifth capitalization quintile of stocks on the NYSE for 1926–1981 and the performance of the Dimensional Fund Advisors, Inc. (DFA) U.S. Micro Cap Portfolio thereafter; Large Company Stocks—Standard & Poor's 500<sup>®</sup>, which is an unmanaged group of securities and considered to be representative of the stock market in general; Corporate Bonds—Salomon Brothers Long-Term High-Grade Corporate Bond Index; Long-Term Government Bonds—20-year U.S. Government Bond; Intermediate-Term Government Bonds—5-year U.S. Government Bond; Treasury Bills—30-day U.S. Treasury Bill.

## Degree of correlation between equity sectors 1992–2004

● High  
○ Medium  
● Low

	Basic materials	Consumer cyclical	Consumer non-cyclical	Energy	Financial	Health care	Industrial	Technology	Telecom.	Utilities
Basic materials	—	●	○	○	○	●	●	○	○	○
Consumer cyclical	●	—	○	○	○	○	●	●	●	○
Consumer non-cyclical	○	○	—	○	●	○	○	●	○	○
Energy	○	○	○	—	○	○	○	○	●	○
Financial	○	○	●	○	—	○	●	○	○	○
Health care	●	○	○	○	○	—	○	○	○	○
Industrial	●	●	○	○	●	○	—	●	○	○
Technology	○	●	●	○	○	○	●	—	●	●
Telecommunications	○	●	○	●	○	○	○	●	—	○
Utilities	○	○	○	○	○	○	○	●	○	—

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### Degree of correlation between equity sectors 1992–2004

Combining sectors that behave differently from one another can be a driving force in improving diversification benefits.

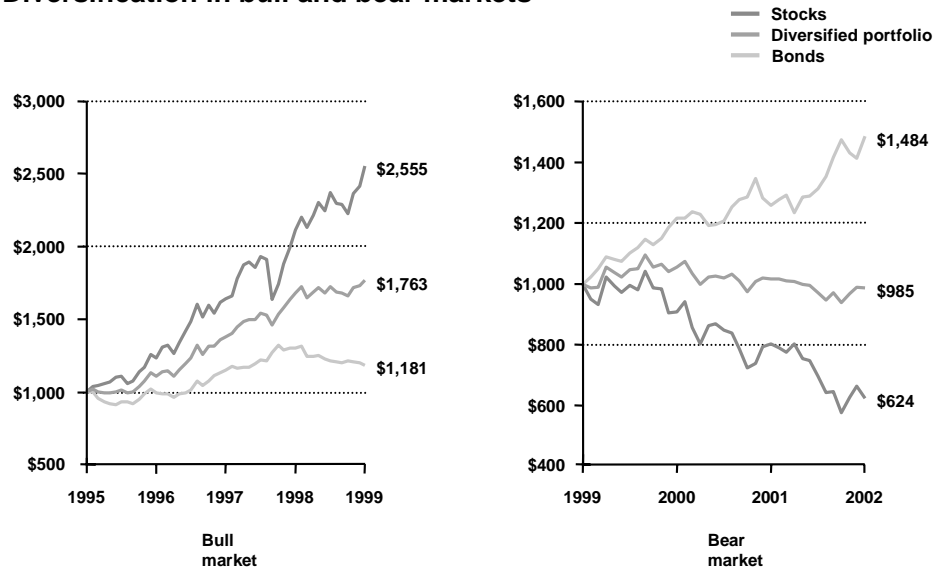
Diversification is a strategy to help investors reduce portfolio volatility. While the volatile nature of stocks has led investors to diversify with bonds, that alone may not be enough. Adding sectors to asset class portfolios can further enhance diversification benefits. A sector is a group of stocks in similar business lines that often react similarly to various market conditions.

It's possible to determine how closely two sectors move together by evaluating their correlation. For example, technology and telecommunications have risen and fallen to the same market conditions. Their high correlation suggests combining them may do little to lower the risk of a portfolio. In contrast, the low correlation of technology and utilities illustrates the potential for better diversification. Investments still need to be evaluated for investor suitability, but understanding sector behavior may help enhance the diversification benefits of investor portfolios.

Correlation is classified into high, medium, and low categories by monthly correlation coefficient. Low correlation sectors had a correlation coefficient below 0.33; medium correlation sectors were between 0.34 and 0.66; and high correlation sectors were between 0.67 and 1. Diversification does not eliminate the risk of experiencing investment losses.

Source: Dow Jones Global Indices world sector indices.

## Diversification in bull and bear markets



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### Diversification in bull and bear markets

Diversification is the strategy of combining distinct asset classes in a portfolio in order to reduce overall portfolio risk.

The graph on the left illustrates the hypothetical growth of \$1,000 in stocks, bonds, and in a 50% stock/50% bond diversified portfolio, from year-end 1995 to 1999. Stocks provide increased growth in bull markets. It is important to understand, however, that this greater wealth was achieved with considerable volatility in stocks compared to the diversified portfolio.

The significance of holding a diversified portfolio is most apparent when one or more asset classes is out of favor. The graph on the right illustrates the hypothetical growth of \$1,000 in stocks, bonds, and in a diversified portfolio, between year-end 1999 and 2002.

Notice that by diversifying among the two asset classes, the diversified portfolio experienced less severe monthly fluctuations than stocks or bonds alone. While bond prices tend to fluctuate less than stock prices, they are still subject to price movement. By investing in a mix of asset classes such as stocks, bonds, and Treasury bills, you may insulate your portfolio from major downswings in a single asset class.

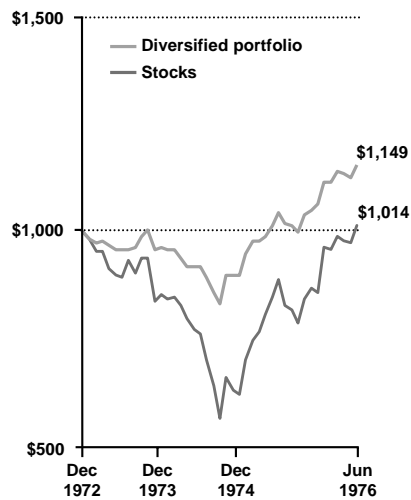
One of the main advantages of diversification is that it makes you less dependent on the performance of any single asset class.

Diversification does not eliminate the risk of experiencing investment losses. Government bonds and Treasury bills are guaranteed by the full faith and credit of the United States government as to the timely payment of principal and interest, while stocks are not guaranteed and have been more volatile than bonds. The data assumes reinvestment of income and does not account for taxes or transaction costs.

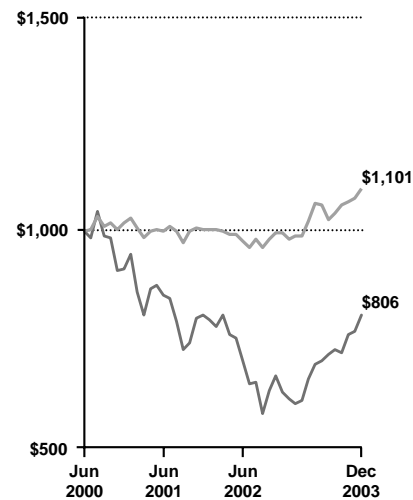
Source: Stocks—Standard & Poor's 500<sup>®</sup>, which is an unmanaged group of securities and is considered to be representative of the stock market in general; Bonds—20-year U.S. Government Bond.

## Diversified portfolios and bear markets

Mid-1970s recession



Early-2000s bear market



Diversified portfolio: 35% stocks, 40% bonds, 25% Treasury bills.  
Hypothetical value of \$1,000 invested at month-end December 1972 and June 2000, respectively.

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### Diversified portfolios and bear markets

Diversification can limit your losses during a severe market decline.

The benefits of diversification are most evident during bear markets. This image illustrates the growth of stocks versus a diversified portfolio during two of the worst performance periods in recent history.

The blue line illustrates the hypothetical growth of \$1,000 invested in stocks during the mid-1970s recession and the early 2000s bear market. The green line illustrates the hypothetical growth of \$1,000 invested in a diversified portfolio of 35% stocks, 40% bonds, and 25% Treasury bills during these same two periods.

Over the course of both time periods, the diversified portfolio lost less than the pure stock portfolio. Over longer periods of time, the more volatile single asset-class portfolio is likely to outperform the less volatile diversified portfolio. However, you should keep in mind that one of the main advantages of diversification is reducing risk, not necessarily increasing return, over the long run.

Mid-1970s recession: December 1972 through June 1976. Early 2000s bear market: June 2000 through December 2003. Diversification does not eliminate the risk of experiencing investment losses. Government bonds and Treasury bills are guaranteed by the full faith and credit of the United States government as to the timely payment of principal and interest, while stocks are not guaranteed and have been more volatile than the other asset classes. The data assumes reinvestment of income and does not account for taxes or transaction costs.

Source: Stocks—Standard & Poor's 500<sup>®</sup>, which is an unmanaged group of securities and is considered to be representative of the stock market in general; Bonds—20-year U.S. Government Bond; Treasury Bills—30-day U.S. Treasury Bill.