# EE432 Monetary Theory and Policy

**Lecture 2 Present Value, Interest Rate and Risk**

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# Supplement

# Definition of a Bond

A **bond** is a security that ***obligates*** the ***issuer*** to ***make specified interest*** and ***principal payments*** to the holder ***on specified dates***.

- **Coupon rate**
- **Face value** (or par)
- **Maturity** (or term)

Bonds are sometimes called **fixed income securities**.

# Fixed-income securities

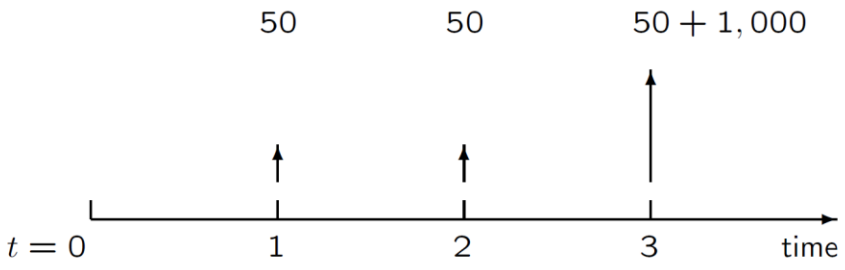
**Fixed-income securities** are ***financial claims*** with ***promised cash flows*** of fixed amount ***paid at fixed dates***.

Cash Flow and Valuation of Fixed-Income Securities

Cash flow:

1. Maturity
2. Principal
3. Coupon.

**Example**. A 3-year bond with principal of \$1,000 and annual coupon payment of 5% has the following cash flow:



# Types of Bonds

**Pure Discount or Zero-Coupon Bonds**

- Pay ***no coupons*** *prior to maturity*.
- ***Pay the bond's face value*** at maturity.

**Coupon Bonds**

- ***Pay a stated coupon*** at periodic *intervals* prior to maturity.
- ***Pay the bond's face value*** at maturity.

# What Are Bonds?

- **Liabilities**
- Also called "fixed income securities" since **payments tend to be fixed amounts**
- Borrower agrees to ***pay a fixed amount of interest*** over a specified period of time
- Borrower agrees to ***repay a fixed amount of principal*** at a predetermined maturity date

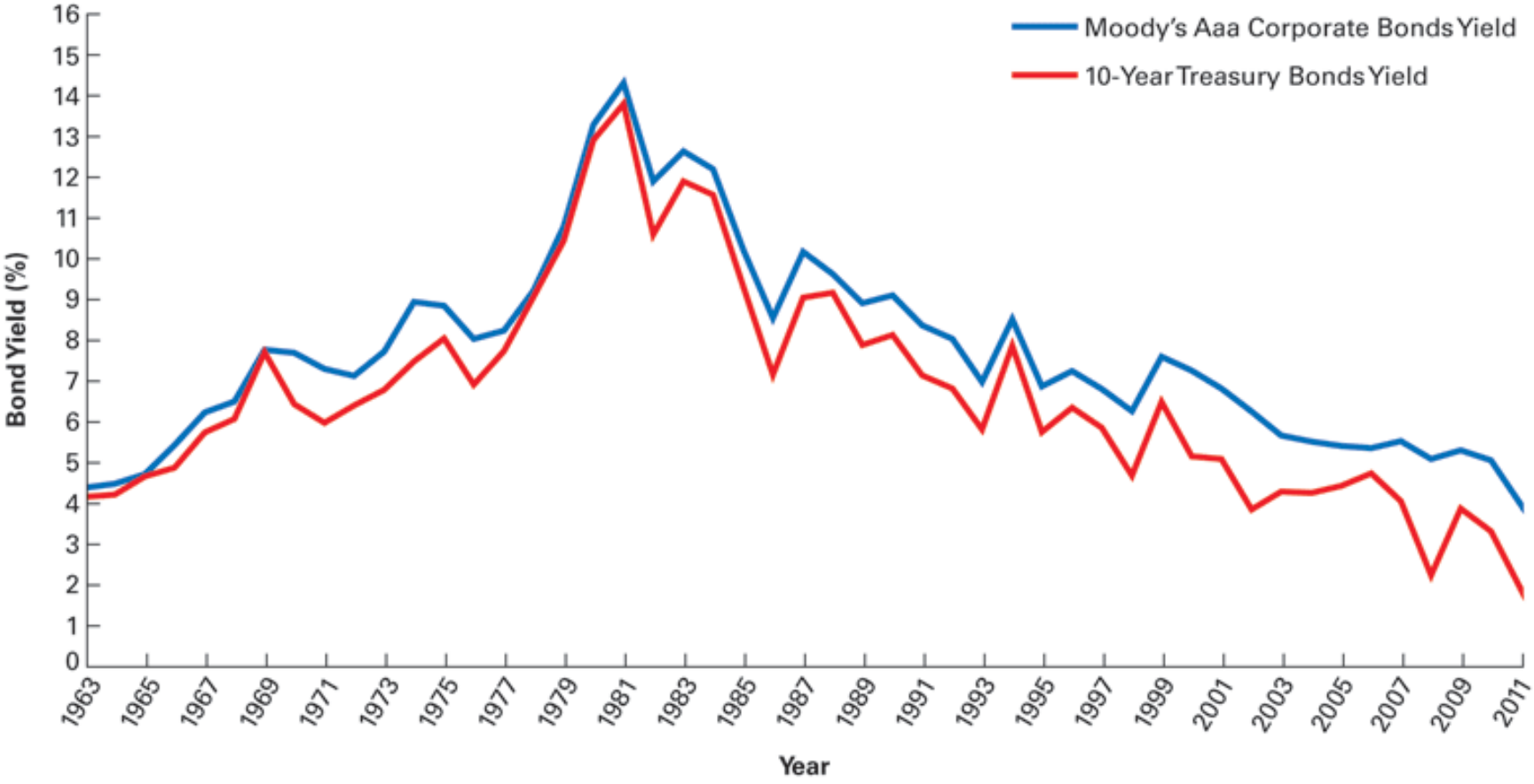
# Why Invest in Bonds?

- They can ***provide current income*** for *conservative investors*
- At times, they can ***provide capital gains*** (or losses) for more *aggressive investors*

# Interest Rates and Bonds

- **Interest rates** and **bond prices** move in ***opposite directions***
- When ***interest rates rise***, ***bond prices fall***
- When ***interest rates drop***, ***bond prices move up***
- *Bond* markets are **bullish** (rising price) when *interest rates are low or falling*
- *Bond* markets are **bearish** when *interest rates are high or rising*

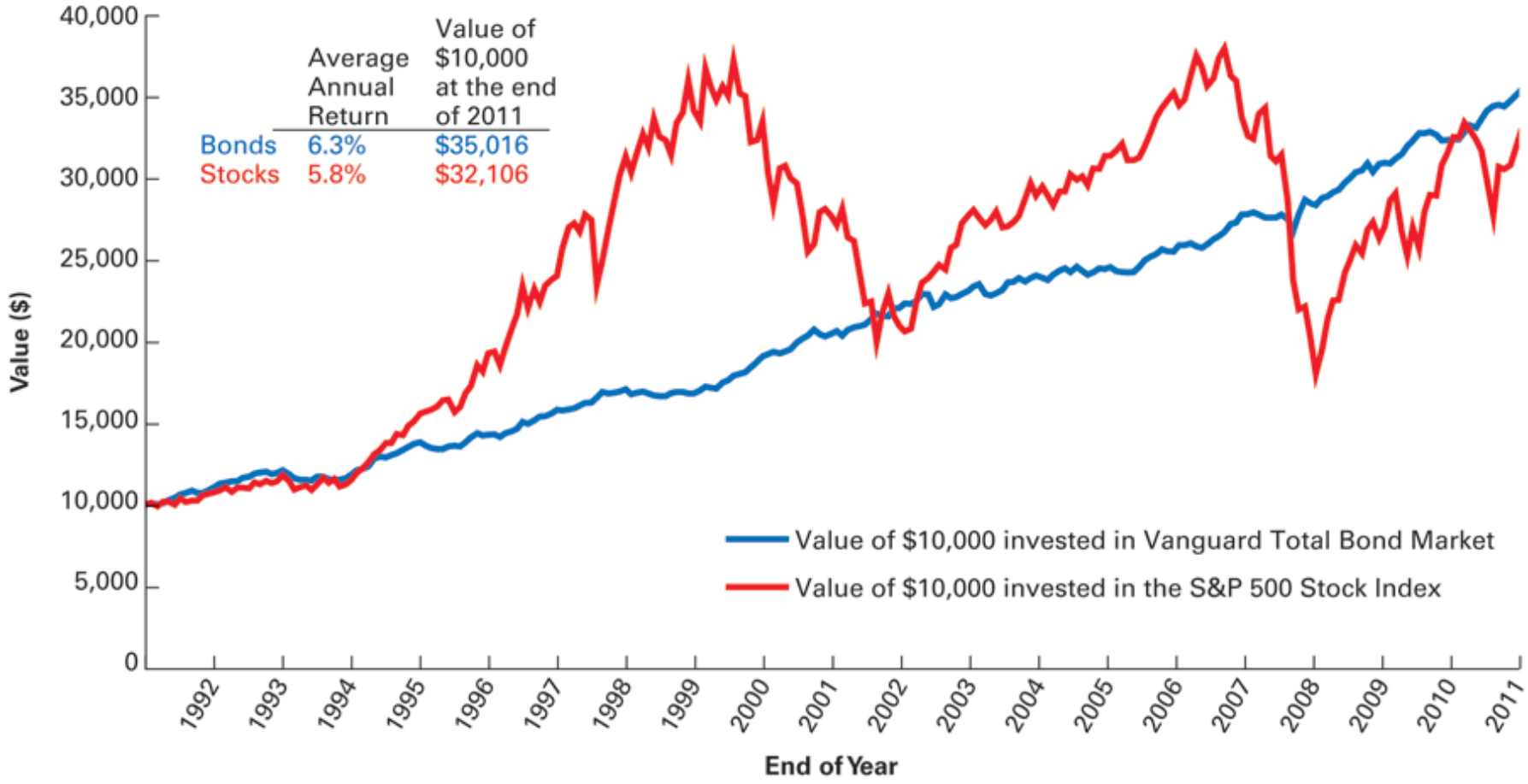
# Behavior of Interest Rates Over Time (1962–2011)



# Bonds Versus Stocks

- Compared to **stocks**, ***bonds offer lower returns***
- **Main benefits of bonds** in portfolio:
  - ***Lower risk*** and level of stability
  - ***High levels of current income***
  - ***Diversification***
- Bonds *add* an element of ***stability*** *to a portfolio*

# Comparative Performance of Stocks and Bonds (1992-2011)



# Government Bonds

Treasury Bills

- **No coupons** (*zero coupon security*)
- Face value paid at maturity
- Maturities up to one year

Treasury Bonds

- **Coupons** paid semiannually
- Face value paid at maturity
- Maturities from 2-30 years

- **No default risk**. Considered to be **risk-free**.

# Corporate Bonds

- **Issued by corporations**
- Provide **higher returns** than government bonds due to higher risk of default
- Wide *variety of bond quality*

# Types of Corporate Bond

- **Secured debt is backed by *guaranteed collateral***
- *Senior bonds* are backed by legal *claim to specific assets*
- *Mortgage bonds* are backed by *real estate*.
- **Unsecured debt** (Junior bonds) **is backed only by the *promise of the company to pay***

# Junk Bonds (High-Yield Bonds)

- Highly speculative, usually ***subordinated debentures***
- Have ***low, sub-investment grade ratings*** *(BB or lower)*
- Typically **offer very high yields**
- *Prices* tend to *behave more like stocks* than bonds

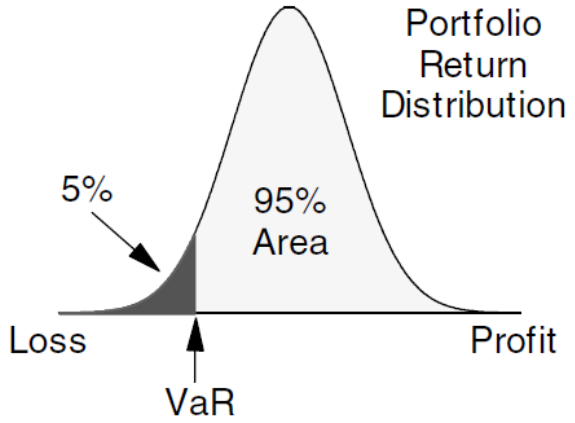
# Supplement

# Value at Risk

- **VaR** is defined as the ***predicted worst-case loss*** *at a specific confidence level (e.g., 95%)* over a *certain period of time* (e.g., 1 day).
- J.P. Morgan takes a snapshot of its global trading positions to estimate its ***Daily-Earnings-at-Risk (DEaR)***, which is a *95% confidence worst-case loss over the next 24 hours* due to *adverse market movements*.

# Value at Risk

- The **maximum shortfall of earnings**, *relative to a specified target*, that could be experienced due to the impact of market risk




Assuming **95% confidence** and **a 1-day horizon**, a **VaR of $11 million** means that, *on average, only 1 day in 20 (or 5%)* would you ***expect to lose*** *more than $11 million* due to market movements.

# Value at Risk

| Portfolio | VaR*, % | Benchmark† | Relative VaR*, % |
|---|---|---|---|
| U.S. Equities | 10 | S&P 500 Index | 3 |
| Global Equities | 11 | MS EAFE Index | 1 |
| Global Fixed Income | 5 | JPM GBI+ Index | 4 |
| Total Portfolio | 8 | Custom Global Index‡ | 3 |

* 1-month horizon, 99% confidence.

† Refers to the investment manager's target benchmark index used to evaluate relative performance.

‡ Fund managers can have custom benchmarks (e.g., a specific mix of existing benchmarks).

- For example, for the U.S. Equities portfolio, ***the worst-case loss at 99% confidence*** *is equal to* ***10% of the portfolio's current market value,*** in other words, *1% probability that losses exceed 10% of market value*
- The worst-case monthly underperformance, *relative to the portfolio's S&P 500 benchmark*, is ***only 3%***

# Value at Risk

- The key problem for the ***construction of a risk measurement system*** is the *joint distribution of the percentage changes of asset return (profit and loss) value*
- The simplest hypothesis is a multivariate ***normal distribution***
- Distributional hypothesis: What asset return model: normal, lognormal, t-distribution,...
- How to ***estimate parameters***: GARCH - generalized autoregressive conditional heteroscedasticity, to take into account ***volatility***