

Ec 136, Financial Economics

Lecture 2

September 1

Outline for today

1. Nominal and real returns
2. Portfolios

www.econ.berkeley.edu/~szeidl/ec136/ec136index.htm

Readings for this week: BKM Chapter 3.

1. Nominal and real returns

- Recall definition of return

$$1 + R = \frac{\text{payoff tmw}}{\text{price today}}$$

- If purchasing power of dollar changes over time, need to measure payoff and price in real terms.
- Consumer Price Index, $CPI_t =$ dollar price of given consumption bundle on date t .
 - Growth rate in CPI is **inflation rate** Π_{t+1} .

- The real return on a stock is

$$\begin{aligned} \frac{(P_{t+1} + D_{t+1})/CPI_{t+1}}{P_t/CPI_t} &= \frac{1 + R_{t+1}}{1 + \Pi_{t+1}} \\ &= 1 + \frac{R_{t+1} - \Pi_{t+1}}{1 + \Pi_{t+1}} \approx 1 + R_{t+1} - \Pi_{t+1}. \end{aligned}$$

- Real return \approx nominal return minus inflation rate.

All Vanguard funds

Click a fund name to view standardized returns, after-tax returns, fees, and expense ratio information.

Set my default

Performance

Price & Yield

Table View

view:

Performance

Price & Yield

Distributions

Attributes & Expense Ratio

› Average Annual Month-End | Cumulative | Quarterly | Yearly

Name	Ticker	Asset Class	YTD as of 08/28/2009	Average Annual Returns as of		
				1 Year	5 Year	10 Year
<input type="checkbox"/> 500 Index	VFINX	Stock - General	15.95%	-19.91%	-0.22%	-1.26%
<input type="checkbox"/> Diversified Equity	VDEQX	Stock - General	21.34%	-18.75%	—	—
<input type="checkbox"/> Dividend Appreciation Index	VDAIX	Stock - General	9.43%	-14.34%	—	—
<input type="checkbox"/> Dividend Growth	VDIGX	Stock - General	10.15%	-14.99%	3.11%	0.66%
<input type="checkbox"/> Equity Income	VEIPX	Stock - General	8.53%	-17.89%	1.20%	1.73%
<input type="checkbox"/> FTSE Social Index	VFTSX	Stock - General	25.30%	-21.29%	-2.97%	—
<input type="checkbox"/> Growth and Income	VQNPX	Stock - General	12.39%	-23.19%	-1.41%	-1.38%
<input type="checkbox"/> Growth Index	VIGRX	Stock - General	21.80%	-19.15%	0.75%	-2.36%
<input type="checkbox"/> High Dividend Yield Index	VHDYX	Stock - General	10.35%	-18.52%	—	—
<input type="checkbox"/> Large-Cap Index	VLACX	Stock - General	16.71%	-19.92%	0.41%	—
<input type="checkbox"/> Morgan Growth	VMRGX	Stock - General	21.68%	-21.68%	1.19%	-0.45%
<input type="checkbox"/> Total Stock Market Index	VTSMX	Stock - General	17.76%	-19.83%	0.60%	-0.27%
<input type="checkbox"/> U.S. Growth	VWUSX	Stock - General	21.86%	-17.50%	0.57%	-6.41%
<input type="checkbox"/> U.S. Value	VUVLX	Stock - General	7.63%	-25.03%	-2.10%	—
<input type="checkbox"/> Value Index	VIVAX	Stock - General	11.80%	-20.68%	-0.08%	0.16%
<input type="checkbox"/> Windsor	VWNDX	Stock - General	23.02%	-16.41%	-1.07%	1.91%
<input type="checkbox"/> Capital Value	VCVLX	Stock - Aggressive	59.10%	-4.85%	0.41%	—
<input type="checkbox"/> Explorer	VEXPX	Stock - Aggressive	23.73%	-20.58%	1.11%	4.37%
<input type="checkbox"/> Extended Market Index	VEXMX	Stock - Aggressive	25.03%	-21.01%	2.59%	2.56%
<input type="checkbox"/> Mid-Cap Growth Index	VMGIX	Stock - Aggressive	26.23%	-27.10%	—	—
<input type="checkbox"/> Mid-Cap Index	VIMSX	Stock - Aggressive	25.53%	-22.36%	2.37%	5.32%

2. Portfolios

- Vanguard offers various mutual funds for the investing public.
- All these funds are **portfolios**: they are combinations of various securities (stocks, bonds, etc.)
- To measure performance of a portfolio, recall

$$1 + R_{t+1} = \frac{P_{t+1} + D_{t+1}}{P_t} = \frac{\text{payoff tmw}}{\text{price today}}.$$

- Assume you buy a_1 shares of stock 1 and a_2 shares of stock 2. The price at time t is

$$a_1 P_{1t} + a_2 P_{2t}.$$

- Next period, your portfolio is worth

$$a_1 (P_{1,t+1} + D_{1,t+1}) + a_2 (P_{2,t+1} + D_{2,t+1}).$$

- The portfolio return is

$$1 + R_{p,t+1} = \frac{a_1 (P_{1,t+1} + D_{1,t+1}) + a_2 (P_{2,t+1} + D_{2,t+1})}{a_1 P_{1t} + a_2 P_{2t}}$$

- The first term on the RHS can be written as

$$\frac{a_1 P_{1t}}{a_1 P_{1t} + a_2 P_{2t}} \cdot \frac{P_{1,t+1} + D_{1,t+1}}{P_{1t}}$$

- Let w_{1t} be wealth share invested in stock 1, then

$$1 + R_{p,t+1} = w_{1t} (1 + R_{1,t+1}) + w_{2t} (1 + R_{2,t+1})$$

- The portfolio return is a **weighted average** of the individual stock returns, where the weights are the shares of wealth invested in each stock.

- E.g., invest 40% of wealth in MSFT, 60% in GE. If $R_{MSFT} = 12.5\%$ and $R_{GE} = 25\%$, then

$$R_{\text{portfolio}} = 0.4 \cdot 12.5\% + 0.6 \cdot 25\% = 5\% + 15\% = 20\%.$$

Stock Indexes

- Indexes are portfolios thought to represent the general stock market.
- Indexes are described by the number and identity of stocks included, and the portfolio weights placed on them.
- Alternative weighting schemes:

1. **Equal weighted:**

$$w_i = 1/n.$$

Invest equal amount of dollars in all assets.

2. **Price weighted:**

$$w_i = P_i / (P_1 + \dots + P_n)$$

E.g.: Dow Jones Industrial Average: a portfolio of 30 major stocks in America, including Boeing, Intel, Microsoft, Wal-Mart and others.

3. Value weighted:

$$w_i = V_i / (V_1 + \dots + V_n)$$

where V_i is the total market value of company i , $V_i = P_i M_i$ where M_i is the number of shares outstanding.

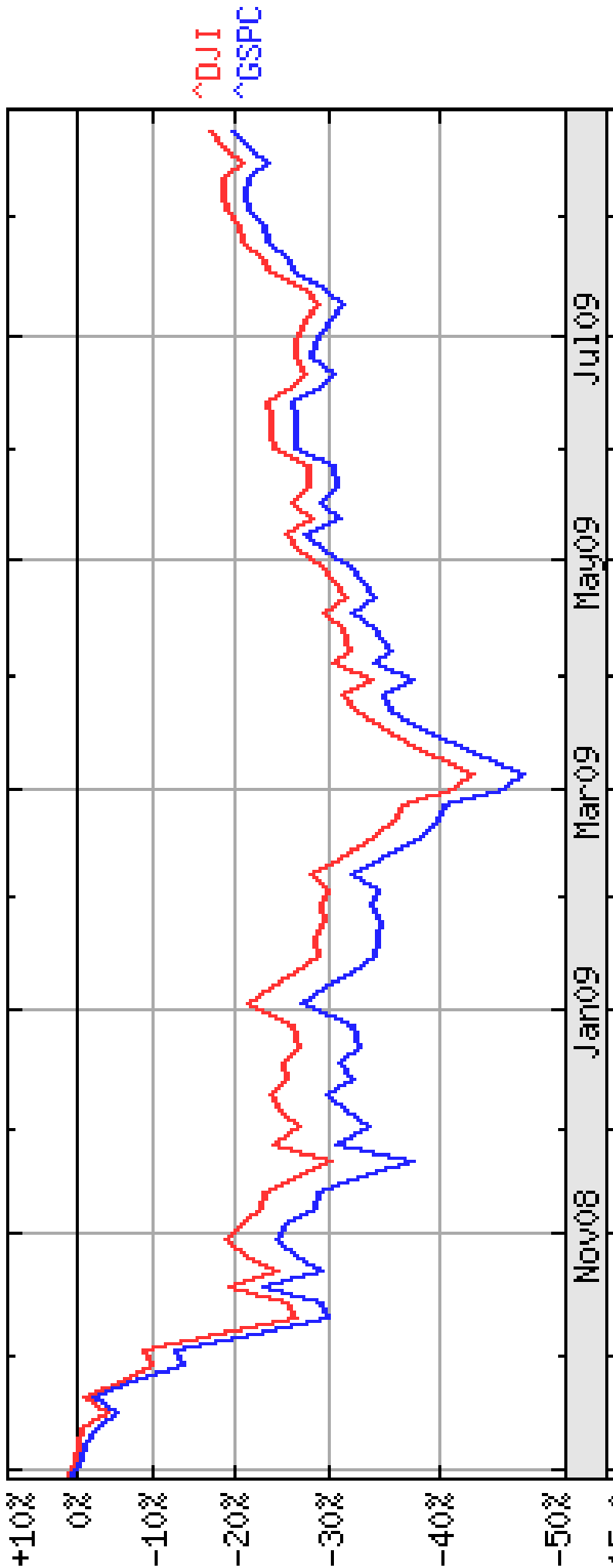
- You invest more in companies with bigger market value.

E.g.: Standard and Poor's 500: Index of 500 leading companies in the U.S.

4. Free float weighted. Same as value weighted, except shares held privately or by the government are excluded from the calculation.

E.g.: Morgan Stanley Capital International indexes of foreign stocks.

S&P 500 INDEX, RTH as of 27-Aug-2009



Portfolio weights in practice

- Suppose you have \$100, and consider the following stock market data

Name	Price in 2005	Price in 2006	No. shares
Historic Co.	\$40	\$45	100
Present Ltd.	\$20	\$33	50

- How do the equal-weighted, price-weighted and value-weighted portfolios look like?

1. Equal-weighted:

- Wealth shares are $1/2$ - $1/2$.
- Spend \$50 on Historic and \$50 on Present.
- Buy $5/4$ shares of Historic and $5/2$ shares of Present.

2. Price weighted:

- Wealth shares are 40/60 and 20/60
- Spend \$66.6 on Historic and \$33.3 on Present.
- Buy 1.66 shares of Historic and 1.66 shares of Present.
- **Lesson:** price-weighted means equal number of shares!
- Formally, number of shares 1 you buy:

$$\frac{P_1}{P_1 + P_2} \cdot W \cdot \frac{1}{P_1} = \frac{W}{P_1 + P_2}$$

while number of shares 2 you buy

$$\frac{P_2}{P_1 + P_2} \cdot W \cdot \frac{1}{P_2} = \frac{W}{P_1 + P_2}$$

- Can track performance of portfolio simply by adding prices of assets.

3. Value-weighted:

- Market capitalizations are $\$40 \cdot 100 = \4000 and $\$20 \cdot 50 = \1000 .
 - Wealth shares: $4/5$ and $1/5$.
 - Spend $\$80$ on Historic and $\$20$ on Present.
 - Buy 2 shares of Historic and 1 share of Present.
 - Corresponds to holding 2% of entire market.
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- Suppose that you want to maintain an equal-weighted, price-weighted or value-weighted portfolio in 2006 as well. Do you have to rebalance?

Historical review of returns

- What have nominal and real annual returns been like historically?
- Consider broad value-weighted portfolio of stocks, as well as Treasury bonds and Treasury bills:

Nominal returns			
period	T-Bills	T-Bonds	Stocks
1802-1870	5.2%	4.9%	7.1%
1871-1925	3.8%	4.3%	7.2%
1926-2002	3.9%	5.4%	9.8%

Real returns			
period	T-Bills	T-Bonds	Stocks
1802-1870	5.1%	4.8%	7.0%
1871-1925	3.2%	3.7%	6.6%
1926-2002	0.7%	2.2%	6.6%

- The equity premium during 1926-2002 was 5.9%.