JOHNSON
Cornell University

NBA 5420: Investment and Portfolio Management

Class 6: Speculative Investing Part I

Professor Matt Baron

March 2, 2016

Speculative Investing

- Class 1:
  - Valuation: the Gordon growth model.
  - Portfolio evaluation: Market timing and stock selection. Evaluating portfolio performance while correctly accounting for risk.

- Class 2: Who beats the market?
  - Actively managed mutual funds, hedge funds, private equity, endowment and pension funds?
  - A review of the evidence.

Speculative Investing

- Class 3: The supply side of asset markets
  - Corporate finance (payouts and issuance, CEOs and governance, leverage, capital expenditure, M&A activity)
  - Implications for stock market investors.
  - Activist Investors.

VALUATION

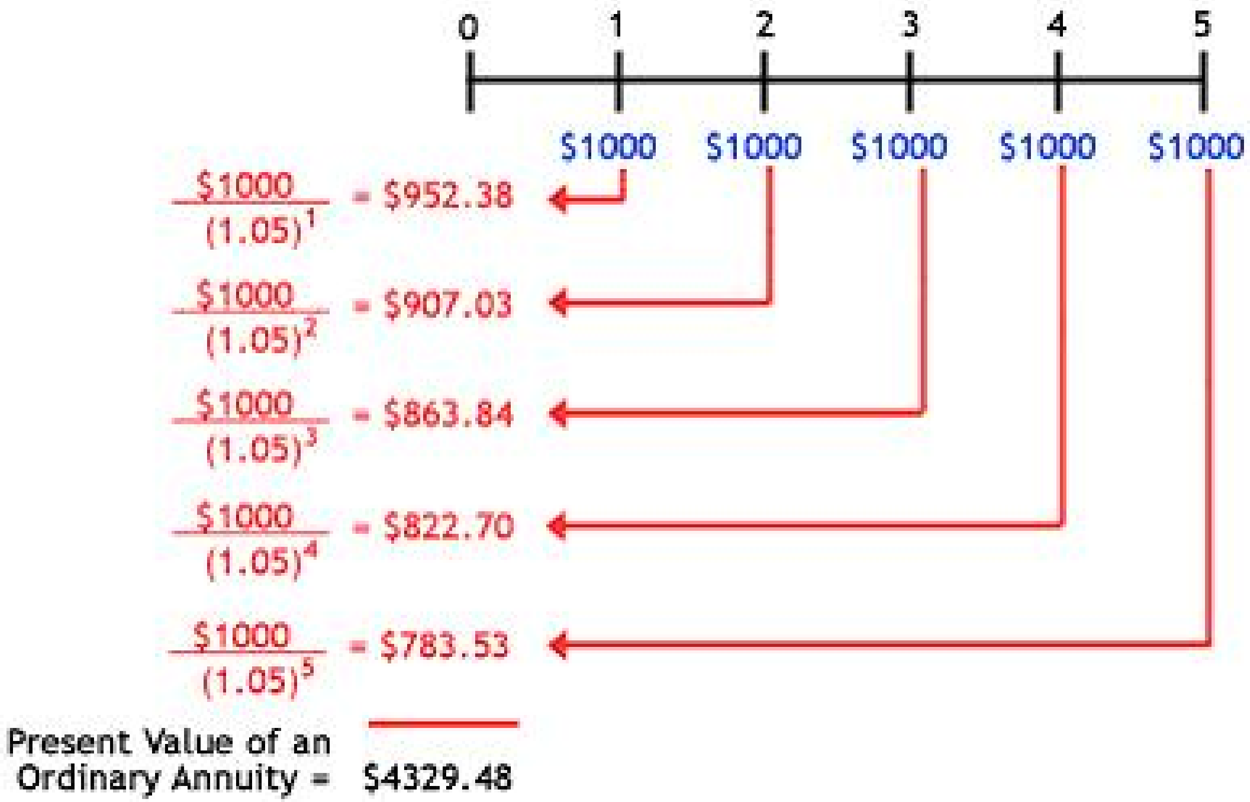
Models of Equity Valuation

1. Dividend Discount Models (Gordon Growth)
2. Price/Earnings Ratios
3. Cash Flow Models

- Basic idea behind all these methods:

$$Price = NPV = \frac{C_1}{(1+k)} + \frac{C_2}{(1+k)^2} + \cdots$$

Discounting



Dividend discount models

- Equity is a claim on future dividends
  - So calculate NPV based on future expected dividend growth

Recall infinite summation formulas

$$\boxed{\sum_{t=0}^{\infty} x^t = \left(\frac{1}{1-x}\right)}$$

$$\sum_{t=1}^{\infty} x^t = x\sum_{t=0}^{\infty} x^t = \boxed{x\left(\frac{1}{1-x}\right)}$$

Therefore, letting x = 1/(1+r):

$$\sum_{t=1}^{\infty}\left[\frac{1}{(1+r)}\right]^t = \frac{1}{(1+r)}\left(\frac{1}{1-\frac{1}{(1+r)}}\right) = \boxed{\frac{1}{r}}$$

Dividend discount models

- If dividends are constant:

$$Price = NPV = \frac{D}{(1+k)} + \frac{D}{(1+k)^2} + \cdots$$

$$= D \sum_{t=1}^{\infty} \left[\frac{1}{(1+k)}\right]^t = D \left[\frac{1}{k}\right]$$

$$\boxed{= \frac{D}{k}}$$

The Gordon Growth Model

- Assuming dividends grow at constant rate g:

$$\boxed{Price = NPV = \frac{D_1}{(1+k)} + \frac{D_1(1+g)}{(1+k)^2} + \frac{D_1(1+g)^2}{(1+k)^3} + \cdots}$$

$$= \frac{D_1}{(1+g)} \sum_{t=1}^{\infty} \left[\frac{(1+g)}{(1+k)}\right]^t$$

$$= \frac{1}{(1+r)} \left(\frac{1}{1 - \frac{(1+g)}{(1+r)}} \right)$$

$$\boxed{= \frac{D_1}{k-g}}$$

P/E Ratios

- Sometimes we want to express the final formula in terms of earnings (i.e., profits) instead of dividends

  – We assume a constant proportion (1-Φ) of the earnings are paid out as dividend:
    - $\boxed{D = (1-\Phi)\cdot E}$

  – Φ is reinvested in the company and is called the "plowback ratio". Thus,

$$P = \frac{(1-\Phi)E_1}{k-g}, \text{ or}$$

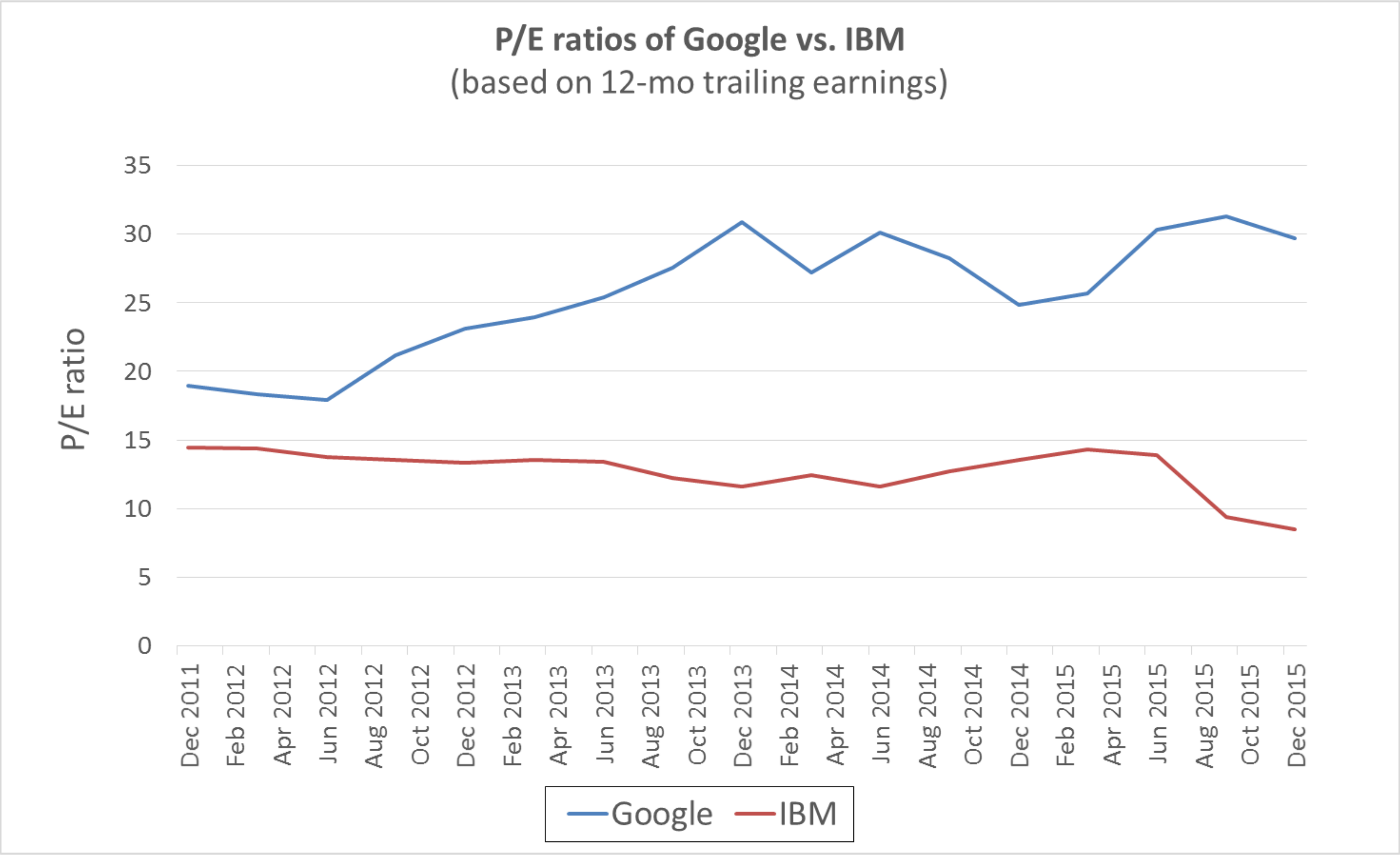
$$\boxed{\frac{P}{E} = \frac{(1-\Phi)}{k-g}}$$

A question

Which of these two stocks should you buy?

1. "Google" = a highly profitable, innovative company with **high** expected earnings growth
   - **high g**

2. "IBM" = a stable company with **little** expected earnings growth
   - **low g**


P/E ratios of Google vs. IBM
(based on 12-mo trailing earnings)
P/E ratio
35
30
25
20
15
10
5
0
Dec 2011
Feb 2012
Apr 2012
Jun 2012
Aug 2012
Oct 2012
Dec 2012
Feb 2013
Apr 2013
Jun 2013
Aug 2013
Oct 2013
Dec 2013
Feb 2014
Apr 2014
Jun 2014
Aug 2014
Oct 2014
Dec 2014
Feb 2015
Apr 2015
Jun 2015
Aug 2015
Oct 2015
Dec 2015
Google
IBM

P/E Ratios

- Sometimes we make the further assumption that:

$$g = ROE \cdot \Phi$$

  - Where ROE = "return on equity" = earnings / (book equity)
  - ROE · Φ is the growth in book equity, and the above formula assumes that dividends grow one-for-one with book equity
    - Which may not be true in certain contexts
    - But often a useful assumption when the company currently pays no dividends, because it helps predict what future dividends will look like

- Substituting this back in yields:

$$\boxed{\frac{P}{E} = \frac{(1 - \frac{g}{ROE})}{k - g}}$$

Cash flow methods

Free cash flow approach (when there are no dividends)

Step 1: Calculate Free Cash Flow (FCF) = EBIT (1-t) + Depreciation - Capital Expenditure

Step 2: Use that to calculate Firm value = FCF / k, where k is an appropriate discount rate

Step 3: Shareholder Equity = Firm Value - Debt Value

If you then want to calculate a P/E ratio:

P = Shareholder Equity from above

E = Shareholder Earnings = (1-t)(EBIT - Interest Expenses)

Valuation

- The Problem Set will walk you through some additional techniques
- One particular technique involves assuming:
  - Short run (first 10 years)
    - High earnings & dividend growth
    - And high discount rates
  - Long run (after 10 years)
    - Normal growth (either S&P average or GDP growth)
    - And normal discount rates (S&P average)
- Let’s try an Excel example

PORTFOLIO EVALUATION

Performance Measures

1. Sharpe ratio
2. Treynor ratio
3. Jensen’s alpha (the alpha from CAPM)
   – And other factor model alphas
4. Information ratio

Sharpe ratio

- Sharpe ratio = Excess return divided by risk

$$= \frac{\mu_p - r_f}{\sigma_p}$$

- Interpretation: the index measures a fund's excess return per unit of total risk
  - μ_p = Average return on the portfolio
  - r_f = Average risk free rate
  - σ_p = Standard deviation of portfolio return (total risk)

Treynor ratio

- Treynor ratio = Excess return / systematic risk

$$= \frac{\mu_p - r_f}{\beta_p}$$

- Interpretation: the index measures a fund's excess return per unit of systematic risk
  - μ_p = Average return on the portfolio
  - r_f = Average risk free rate
  - β_p = Market (CAPM) beta of portfolio return (systematic risk)

Factor model alphas

Run these regressions in the time-series (daily or monthly data)

- Jensen's (CAPM) alpha

$$(R_p - r_f) = \alpha_p + \beta_p \left(R_m - r_f\right) + e_p$$

- Four factor alpha

$$\begin{aligned}(R_p - r_f) = \alpha_p &+ \beta_i^{mkt}\left(R_m - r_f\right) \\ &+ \beta_p^{size}(R_{SMB}) \\ &+ \beta_p^{value}(R_{HML}) \\ &+ \beta_p^{momentum}(R_{MOM}) + e_p\end{aligned}$$

- More complicated factor models are possible, if you want to control for additional risk-factors

JOHNSON
Cornell University

Information ratio

Information Ratio = alpha / non-systematic risk

$$= \frac{\alpha_p}{S.D.(e_p)}$$

- Where α_p and $S.D.(e_p)$ -- the standard deviation of the residuals -- are estimated from the CAPM regression:

$$(R_p - r_f) \quad = \quad \alpha_p + \beta_p \left(R_m - r_f\right) + e_p$$

- Interpretation: alpha per unit of idiosyncratic risk (or also called here “tracking error” since it’s the deviation from market benchmark R_m)
  - Idiosyncratic risk (or “tracking error”) should ideally be zero, since (unlike for a single stock) mutual funds should be heavily diversified

Which measure is appropriate

<u>It depends on investment assumptions</u>

1. If the portfolio represents the entire investment for an individual:
   – Use the **Sharpe ratio**, because investors dislike total risk

2. If this portfolio is part of an individual's larger holdings, use **factor alphas** or the **Treynor** ratio because we only care about the systematic risk
   – The idiosyncratic part can be diversified away

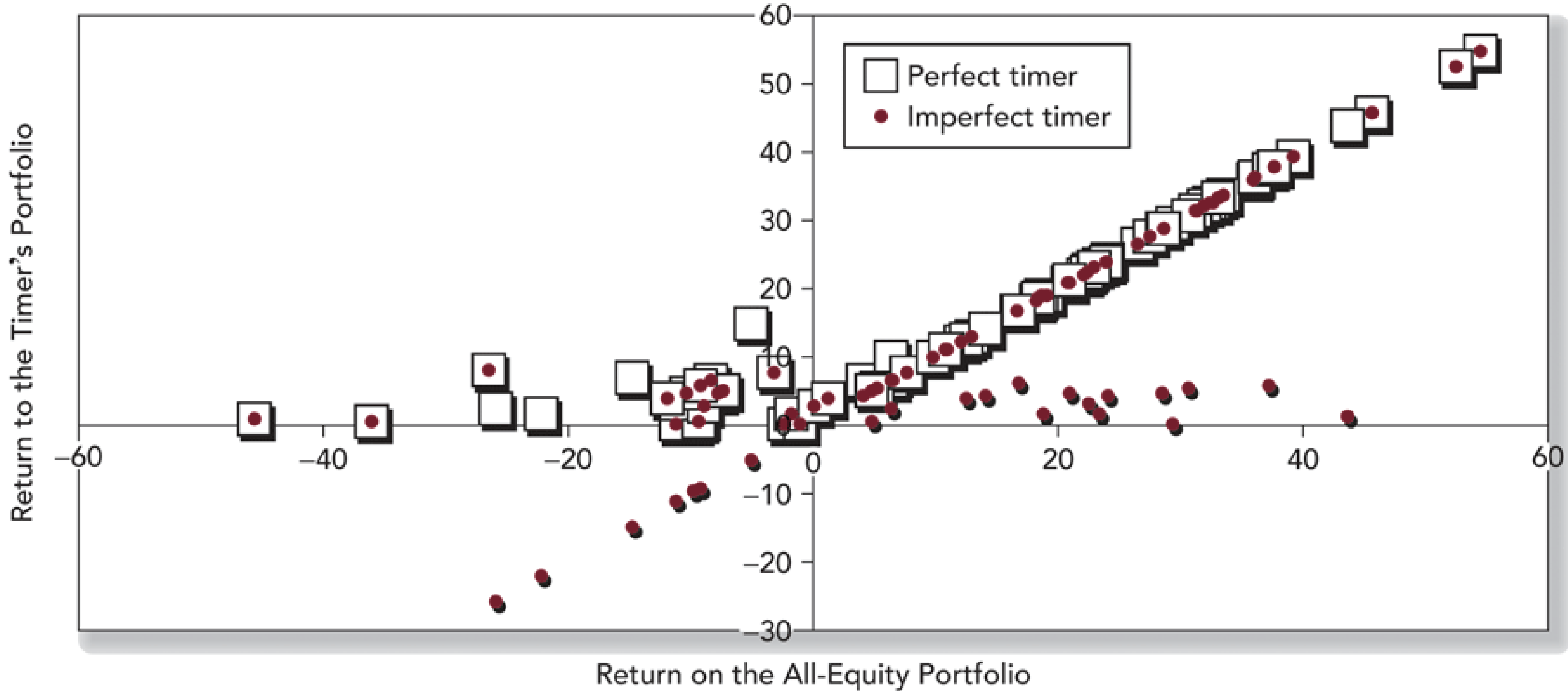
3. If we're compare fund managers who are trying to beat the same benchmark, use the **information ratio**:
   – Which manager can beat the benchmark the most *consistently*?

Which measure is appropriate

- Sharpe ratios and factor alphas are the most commonly used
  – Because they’re familiar and intuitive

Can Fund Managers Time the Market?

A test using regression analysis:



Can Fund Managers Time the Market?

Market timing regressions:

(Run these in the time-series for each fund)

1. Henriksson and Merton

$$r_P - r_f = a + b(r_M - r_f) + c(r_M - r_f)D + e_P$$

where D = +1 if the market goes up; 0 if it goes down

2. Treynor and Mazuy

$$r_P - r_f = a + b(r_M - r_f) + c(r_M - r_f)^2 + e_P$$

Can Fund Managers Time the Market?

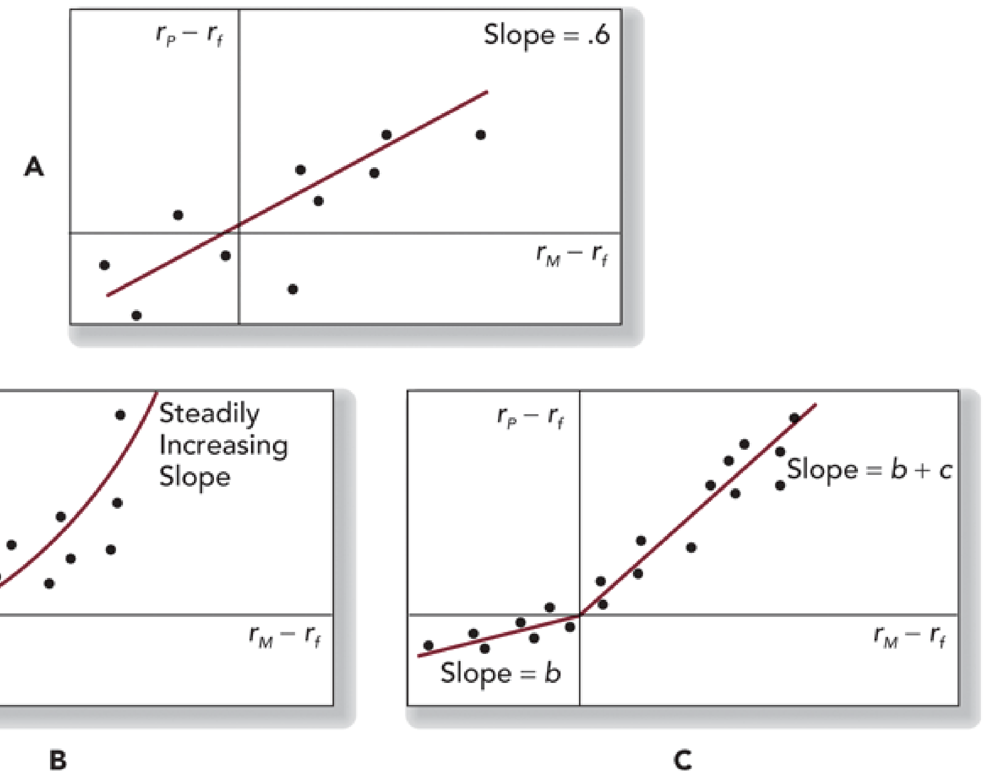


FIGURE 24.5 Characteristic lines. *Panel A:* No market timing, beta is constant. *Panel B:* Market timing, beta increases with expected market excess return. *Panel C:* Market timing with only two values of beta.