Stock Valuation and Risk

Chapter Objectives

- explain methods of valuing stocks
- explain how to determine the required rate of return on stocks
- explain how to measure the risk of stocks

Valuation Models

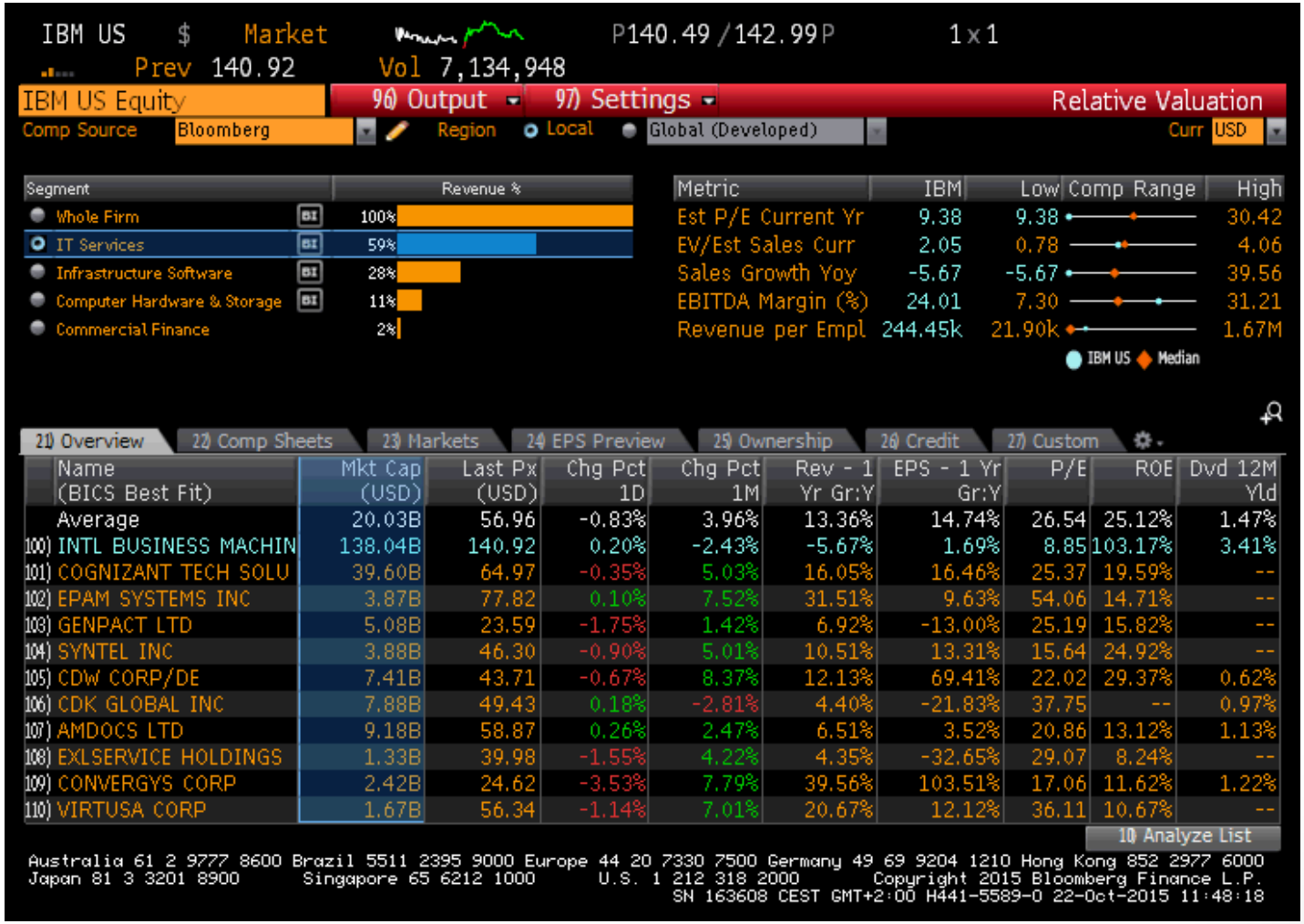
Absolute Valuation Models

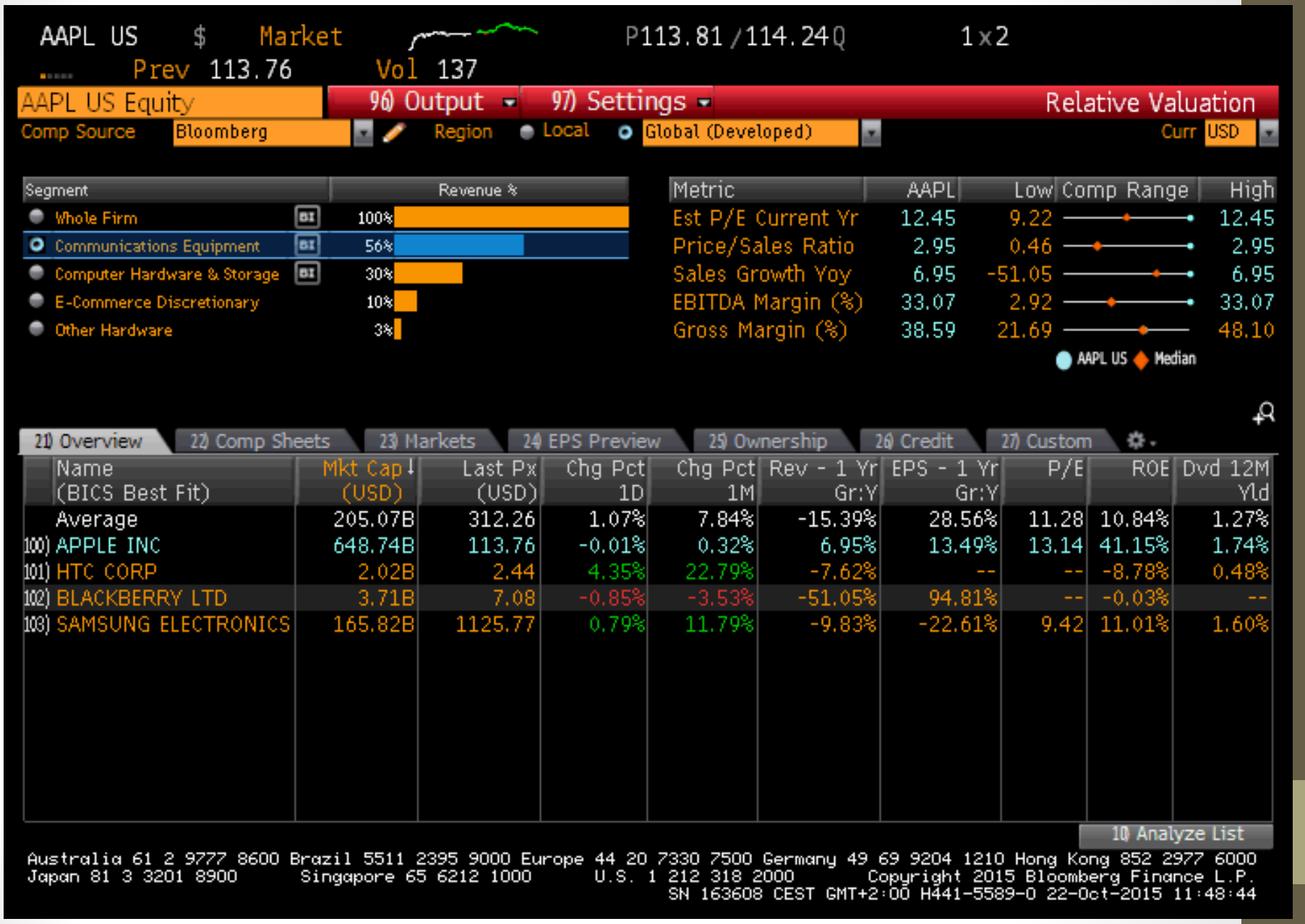
- Present value models
  - Dividend discount models
  - Free cash flow to equity
  - Free cash flow to the firm
  - Residual income
- Asset-based models

Relative Valuation Models

- Price ratios
  - Price-to-earnings ratio
  - Price-to-book-value ratio
  - Price-to-cash-flow ratio
- Enterprise value multiples

Relative Valuation method




AAPL US $ Market
P113.81 / 114.24Q 1x2
Prev 113.76 Vol 137
AAPL US Equity
96) Output
97) Settings
Relative Valuation
Comp Source Bloomberg
Region Local Global (Developed)
Curr USD
Segment
Revenue %
Whole Firm 100%
Communications Equipment 56%
Computer Hardware & Storage 30%
E-Commerce Discretionary 10%
Other Hardware 3%
Metric AAPL Low Comp Range High
Est P/E Current Yr 12.45 9.22 12.45
Price/Sales Ratio 2.95 0.46 2.95
Sales Growth Yoy 6.95 -51.05 6.95
EBITDA Margin (%) 33.07 2.92 33.07
Gross Margin (%) 38.59 21.69 48.10
AAPL US Median
21) Overview
22) Comp Sheets
23) Markets
24) EPS Preview
25) Ownership
26) Credit
27) Custom
Name (BICS Best Fit) | Mkt Cap (USD) | Last Px (USD) | Chg Pct 1D | Chg Pct 1M | Rev - 1 Yr Gr:Y | EPS - 1 Yr Gr:Y | P/E | ROE | Dvd 12M Yld
Average 205.07B 312.26 1.07% 7.84% -15.39% 28.56% 11.28 10.84% 1.27%
100) APPLE INC 648.74B 113.76 -0.01% 0.32% 6.95% 13.49% 13.14 41.15% 1.74%
101) HTC CORP 2.02B 2.44 4.35% 22.79% -7.62% -- -- -8.78% 0.48%
102) BLACKBERRY LTD 3.71B 7.08 -0.85% -3.53% -51.05% 94.81% -- -0.03% --
103) SAMSUNG ELECTRONICS 165.82B 1125.77 0.79% 11.79% -9.83% -22.61% 9.42 11.01% 1.60%
10) Analyze List
Australia 61 2 9777 8600 Brazil 5511 2395 9000 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2015 Bloomberg Finance L.P.
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Choice of Discounted Cash Flow Models

Dividend Discount Models	• History of dividend payments • Dividends related to earnings • Noncontrolling perspective
Free Cash Flow Models	• Small or zero dividends • Positive cash flow related to earnings • Controlling perspective
Residual Income Models	• Small or zero dividends • Negative free cash flows • High-quality accounting disclosures

Valuing Common Stock Using a Multi-period DDM

$$V_0 = \sum_{t=1}^{n} \frac{D_t}{(1+r)^t} + \frac{P_n}{(1+r)^n}$$

Dividend Discount Model

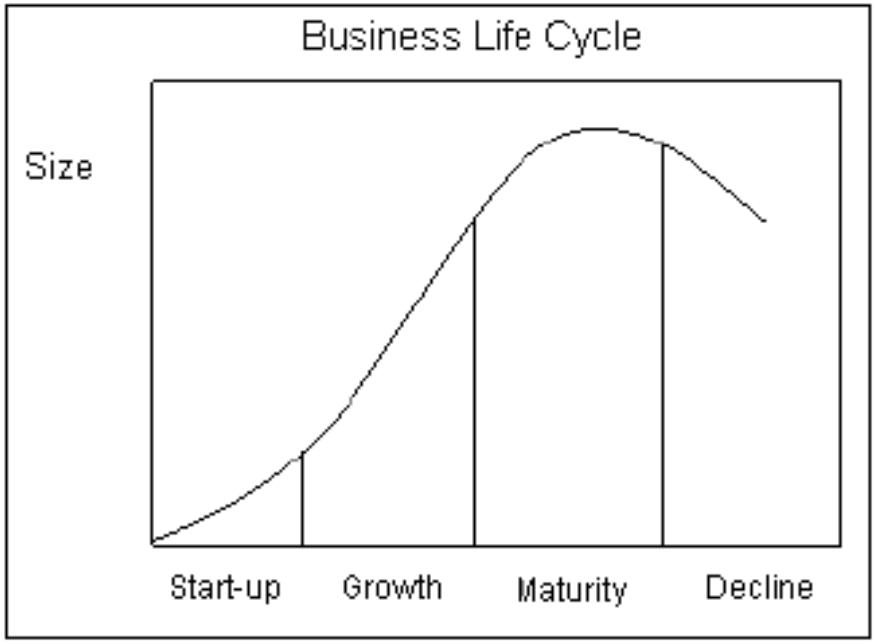
$$P = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t} = \frac{D1}{(r-g)}$$

where t = period

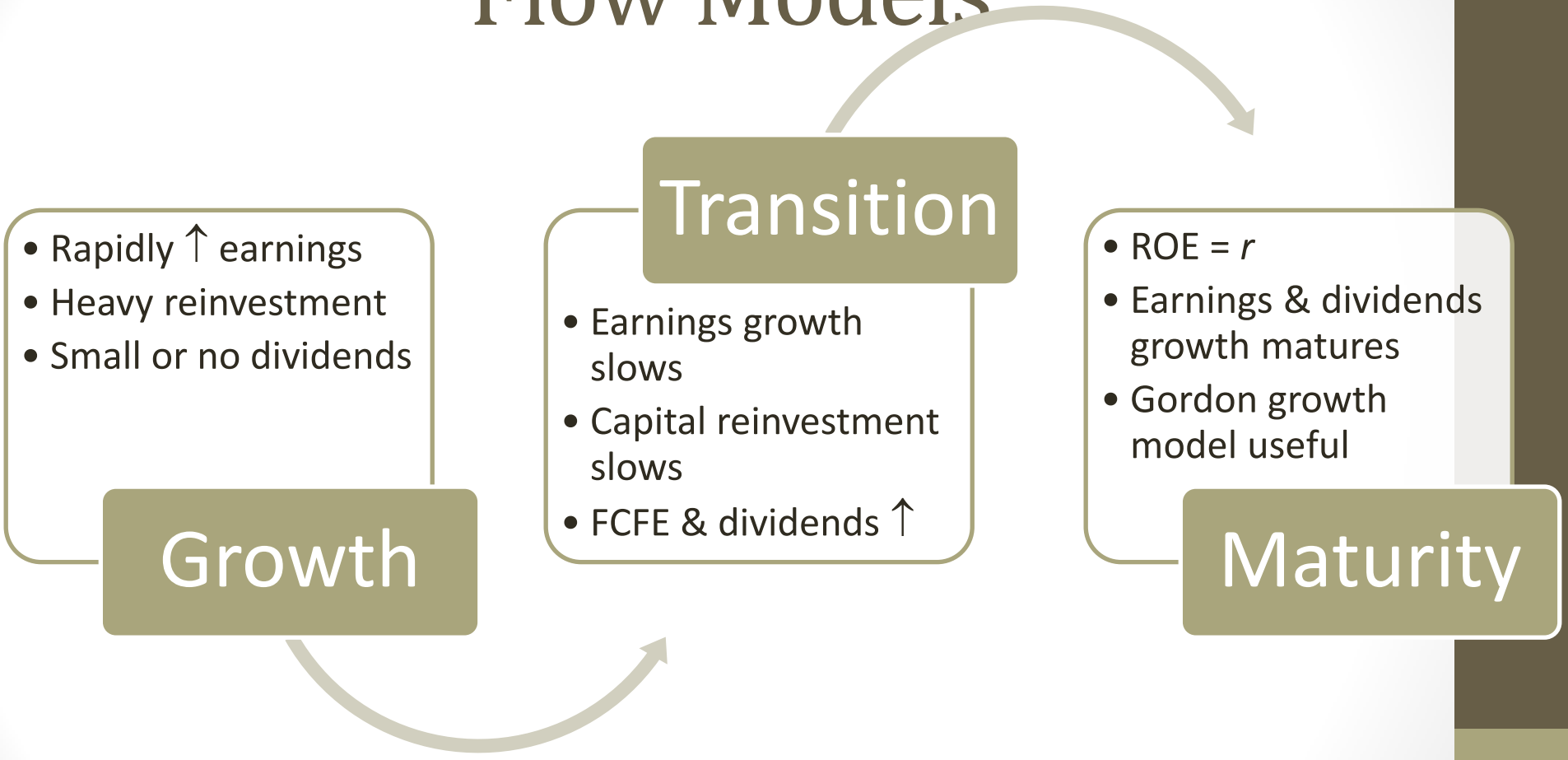
D_t = dividend in period t

r = discount rate

Business Life Cycle and Dividend Policy



Choice of Discounted Cash Flow Models



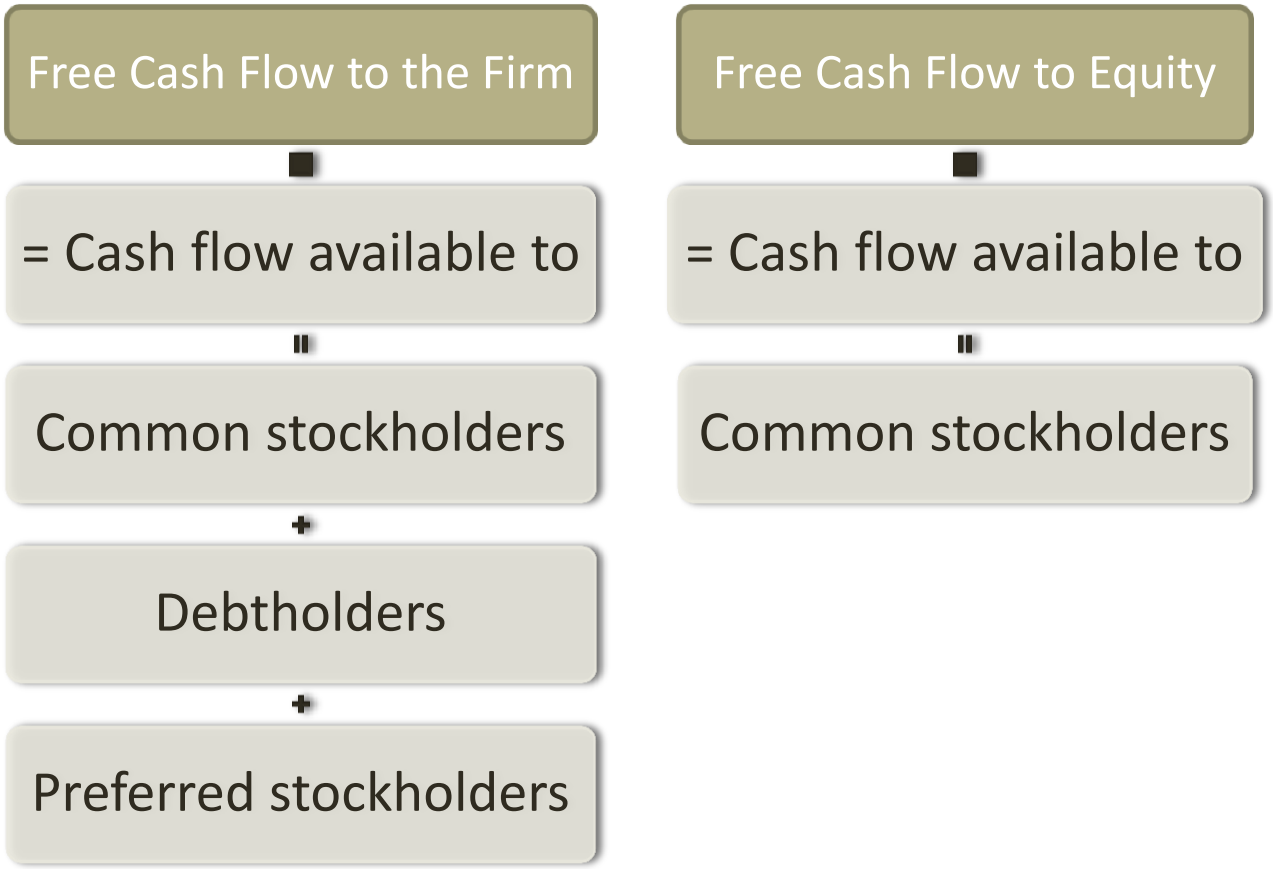
General Two-Stage DDM

$$V_0 = \sum_{t=1}^{n} \frac{D_0 \left(1+g_S\right)^t}{\left(1+r\right)^t} + \frac{D_0 \times \left(1+g_S\right)^n \times \left(1+g_L\right)}{\left(1+r\right)^n \times \left(r-g_L\right)}$$

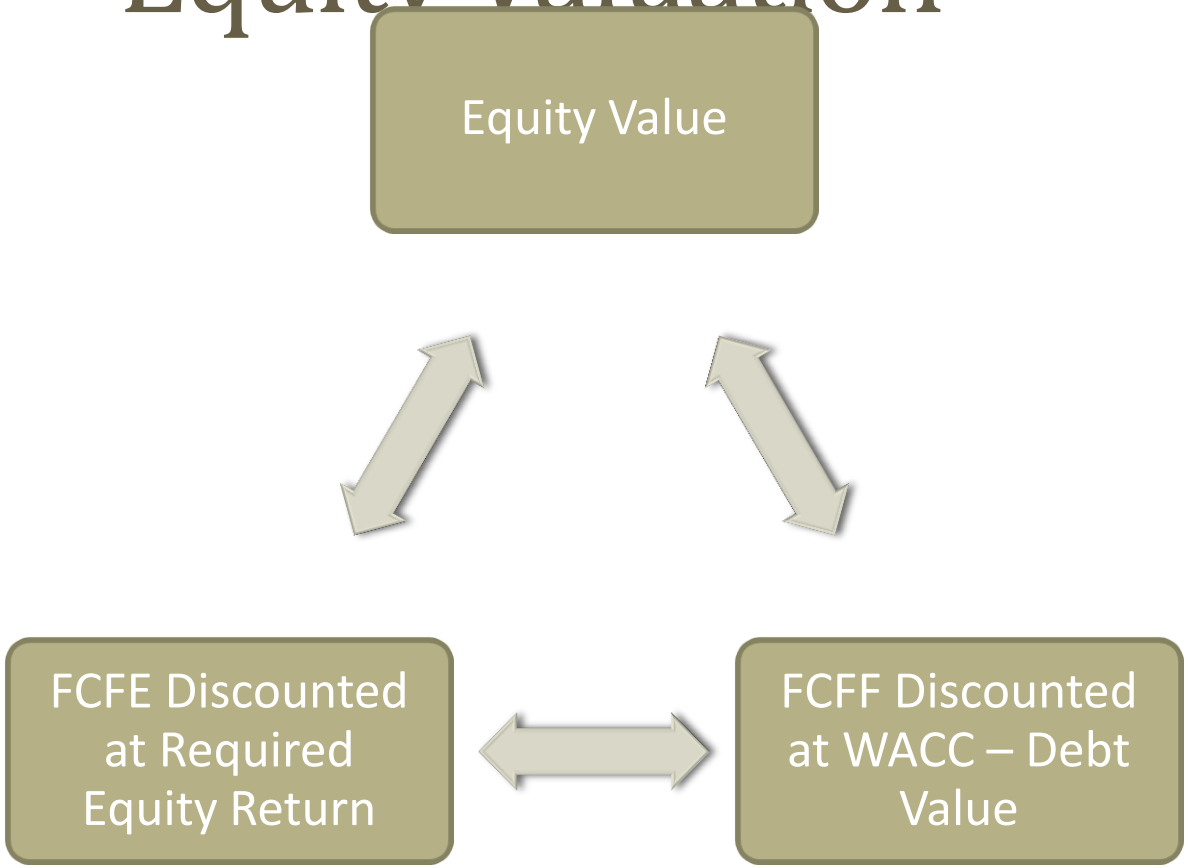
Two-Stage H-Model

$$V_0 = \frac{\left[D_0 \times \left(1 + g_L\right)\right] + \left[D_0 \times H\left(g_S - g_L\right)\right]}{r - g_L}$$

Free Cash Flow



FCFF vs. FCFE Approaches to Equity Valuation



Free Cash Flow to the Firm (for firm's that follow IFRS)

- FCFF = NI + NCC + [Int x (1-tax rate)] – FCInv – WCInv

  Where:
  NI = Net Income
  NCC = Non-cash Charges (depreciation and amortization)
  Int = Interest Expense
  FCInv = Fixed Capital Investment (total capital expenditures)
  WCInv = Working Capital Investments (Change in Net working Capital)

Free Cash Flow to Equity

- FCFE = FCFF - [Int x (1-tax rate)] + Net Borrowing
- FCFE = Net Income - Net Capital Expenditure - Change in Net Working Capital + New Debt - Debt Repayment

FCFF vs. FCFE Approaches to Equity Valuation

$$\text{Firm value} = \sum_{t=1}^{\infty} \frac{\text{FCFF}_t}{(1+\text{WACC})^t}$$

$$\text{Equity value} = \text{Firm value} - \text{Debt value}$$

$$\text{Equity value} = \sum_{t=1}^{\infty} \frac{\text{FCFE}_t}{(1+r)^t}$$

Single-Stage Free Cash Flow Models

$$\text{Firm value} = \frac{\text{FCFF}_1}{\text{WACC} - g}$$

$$\text{Equity value} = \text{Firm value} - \text{Debt value}$$

$$\text{Equity value} = \frac{\text{FCFE}_1}{r - g}$$

Required Rate of Return on Stocks I

- Capital Asset Pricing Model
- Sometimes used to estimate the required rate of return for any firm with publicly traded stock.
- The only important risk of a firm is systematic risk.
- Suggests that the return of a stock (Rj) is influenced by the prevailing risk-free rate (Rf), the market return (Rm), and the beta (Bj):

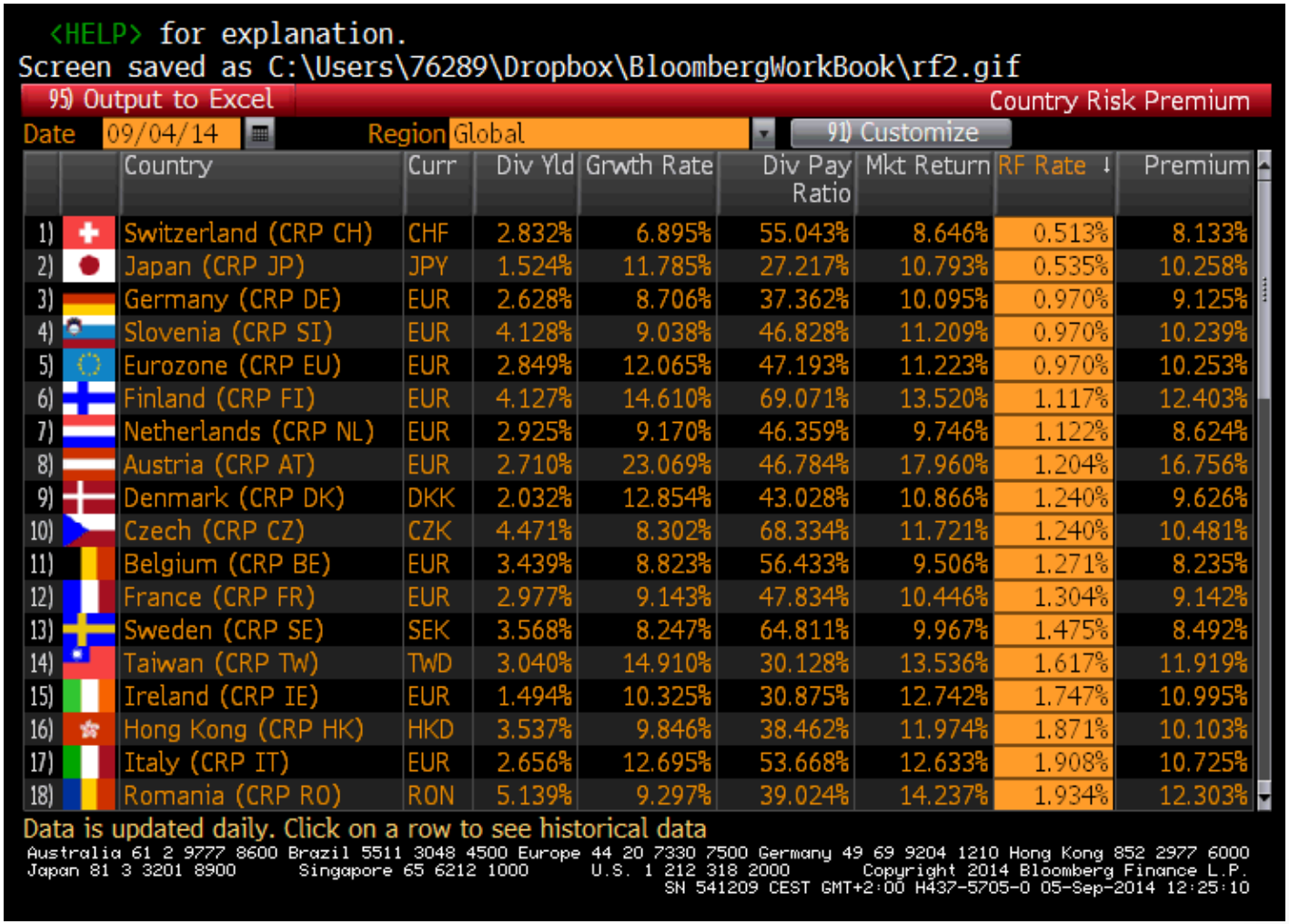
$$Rj = Rf + betaj(Rm - Rf)$$

where betaj is measured as the covariance between Rj and Rm, which reflects the asset's sensitivity to general stock market movements.

Required Rate of Return on Stocks

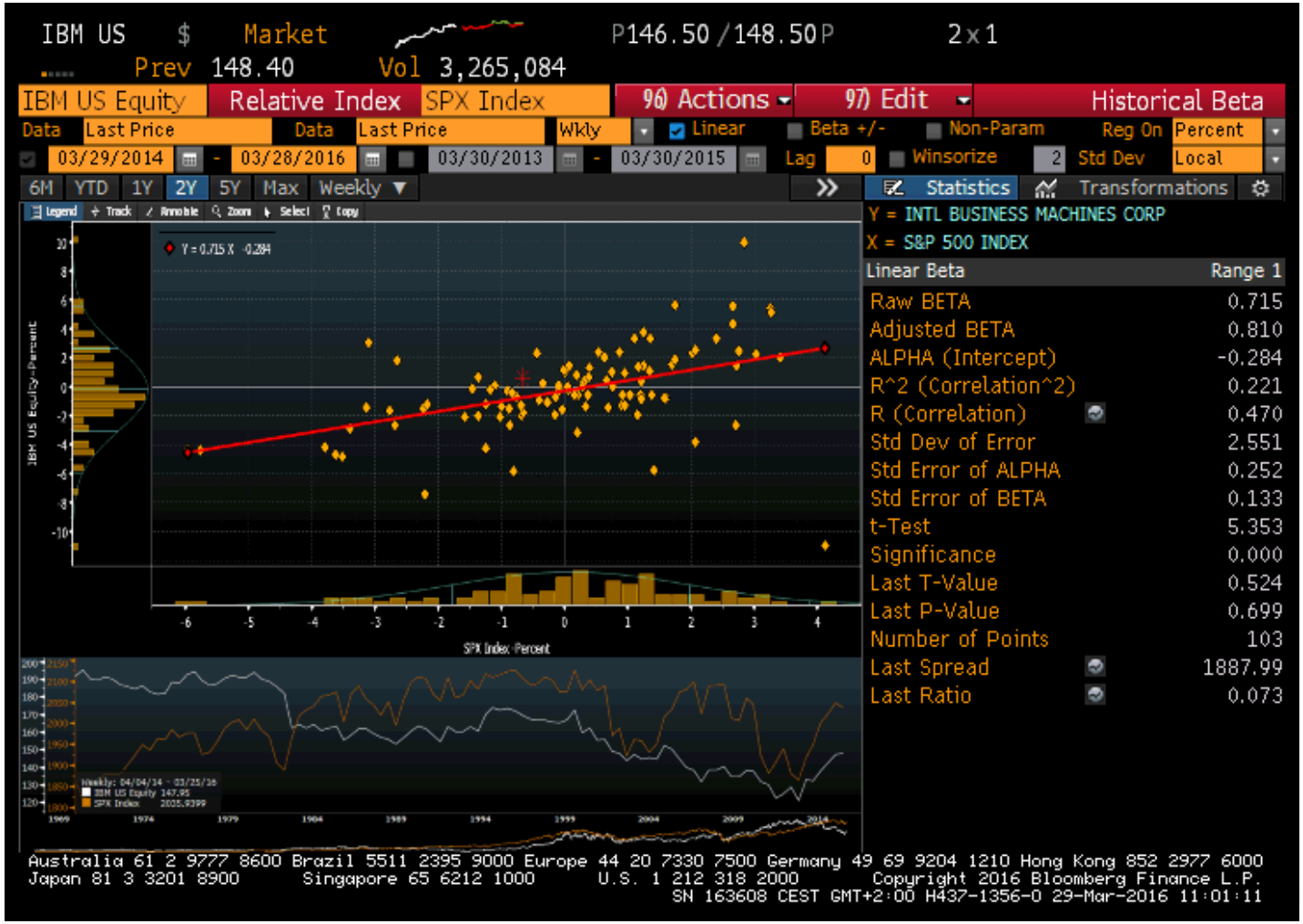
- Capital Asset Pricing Model (Cont.)
- Estimating the Market Risk Premium
  - The yield on newly issued Treasury bonds is commonly used as a proxy for the risk-free rate.
  - The term, (Rm – Rf), is the market risk premium: the return of the market in excess of the risk-free rate.
  - Historical data for 30 or more years can be used to determine the average market risk premium over time.
- Estimating the Firm's Beta - typically measured by applying regression analysis to determine the sensitivity of the asset's return to the market return based on monthly or quarterly data.

Country Risk Premium



	Country	Curr	Div Yld	Grwth Rate	Div Pay Ratio	Mkt Return	RF Rate ↓	Premium
1)	Switzerland (CRP CH)	CHF	2.832%	6.895%	55.043%	8.646%	0.513%	8.133%
2)	Japan (CRP JP)	JPY	1.524%	11.785%	27.217%	10.793%	0.535%	10.258%
3)	Germany (CRP DE)	EUR	2.628%	8.706%	37.362%	10.095%	0.970%	9.125%
4)	Slovenia (CRP SI)	EUR	4.128%	9.038%	46.828%	11.209%	0.970%	10.239%
5)	Eurozone (CRP EU)	EUR	2.849%	12.065%	47.193%	11.223%	0.970%	10.253%
6)	Finland (CRP FI)	EUR	4.127%	14.610%	69.071%	13.520%	1.117%	12.403%
7)	Netherlands (CRP NL)	EUR	2.925%	9.170%	46.359%	9.746%	1.122%	8.624%
8)	Austria (CRP AT)	EUR	2.710%	23.069%	46.784%	17.960%	1.204%	16.756%
9)	Denmark (CRP DK)	DKK	2.032%	12.854%	43.028%	10.866%	1.240%	9.626%
10)	Czech (CRP CZ)	CZK	4.471%	8.302%	68.334%	11.721%	1.240%	10.481%
11)	Belgium (CRP BE)	EUR	3.439%	8.823%	56.433%	9.506%	1.271%	8.235%
12)	France (CRP FR)	EUR	2.977%	9.143%	47.834%	10.446%	1.304%	9.142%
13)	Sweden (CRP SE)	SEK	3.568%	8.247%	64.811%	9.967%	1.475%	8.492%
14)	Taiwan (CRP TW)	TWD	3.040%	14.910%	30.128%	13.536%	1.617%	11.919%
15)	Ireland (CRP IE)	EUR	1.494%	10.325%	30.875%	12.742%	1.747%	10.995%
16)	Hong Kong (CRP HK)	HKD	3.537%	9.846%	38.462%	11.974%	1.871%	10.103%
17)	Italy (CRP IT)	EUR	2.656%	12.695%	53.668%	12.633%	1.908%	10.725%
18)	Romania (CRP RO)	RON	5.139%	9.297%	39.024%	14.237%	1.934%	12.303%

Firm's Beta


IBM US $ Market P146.50 / 148.50P 2 x 1
Prev 148.40 Vol 3,265,084
IBM US Equity Relative Index SPX Index 96) Actions 97) Edit Historical Beta
Data Last Price Data Last Price Wkly Linear Beta +/- Non-Param Reg On Percent
03/29/2014 - 03/28/2016 03/30/2013 - 03/30/2015 Lag 0 Winsorize 2 Std Dev Local
6M YTD 1Y 2Y 5Y Max Weekly Statistics Transformations
Y = INTL BUSINESS MACHINES CORP
X = S&P 500 INDEX
Linear Beta Range 1
Raw BETA 0.715
Adjusted BETA 0.810
ALPHA (Intercept) -0.284
R^2 (Correlation^2) 0.221
R (Correlation) 0.470
Std Dev of Error 2.551
Std Error of ALPHA 0.252
Std Error of BETA 0.133
t-Test 5.353
Significance 0.000
Last T-Value 0.524
Last P-Value 0.699
Number of Points 103
Last Spread 1887.99
Last Ratio 0.073
SPX Index Percent
Australia 61 2 9777 8600 Brazil 5511 2395 9000 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
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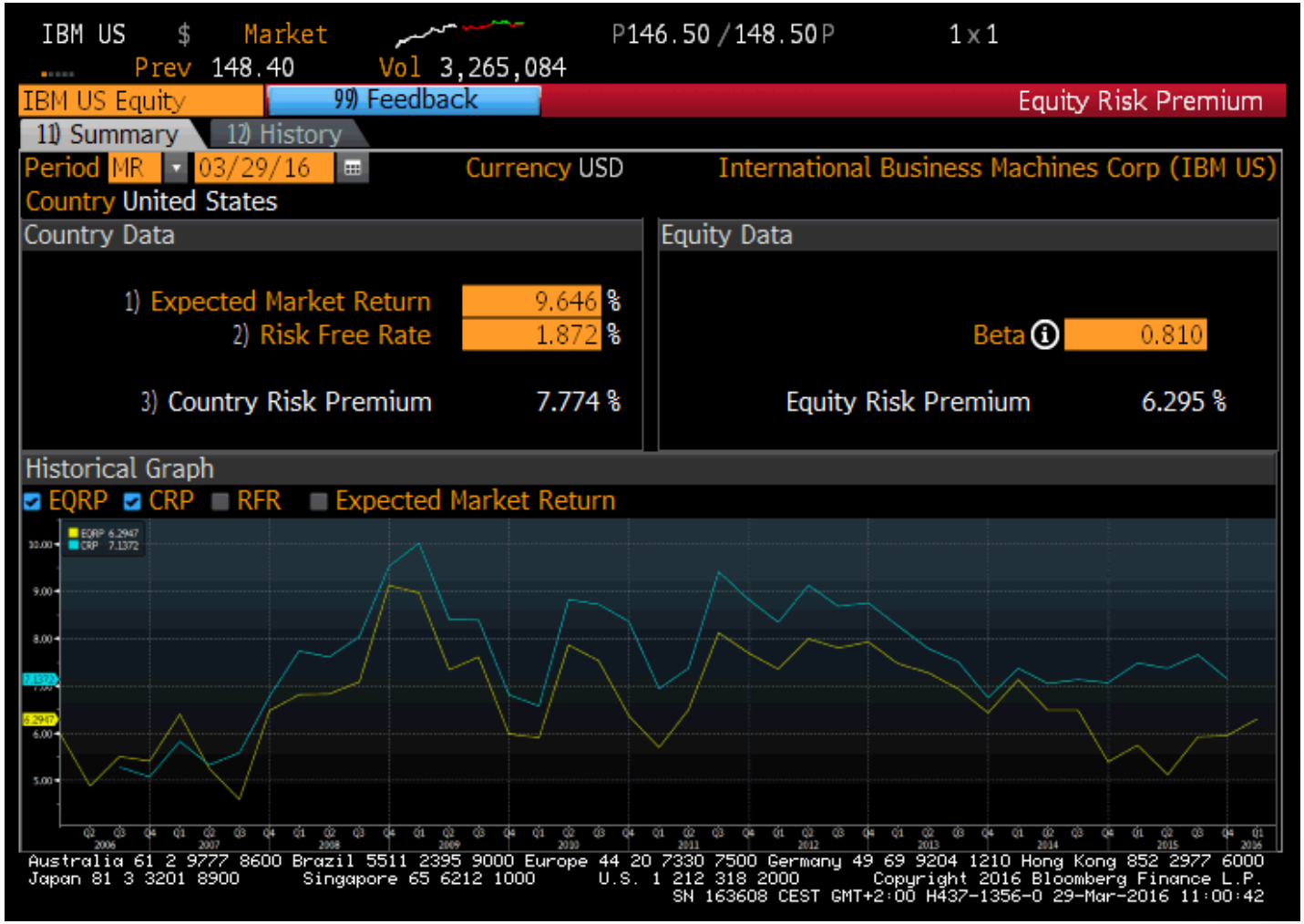
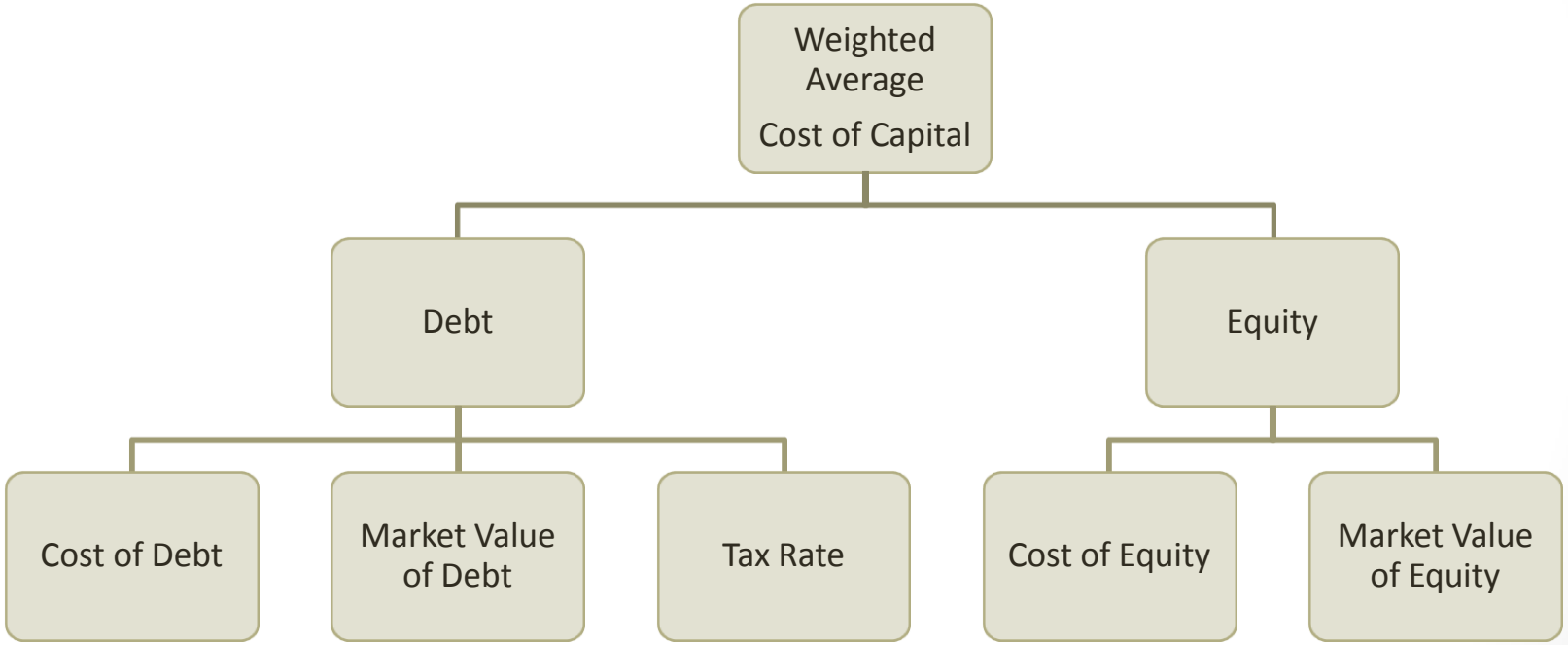
Equity Risk Premium



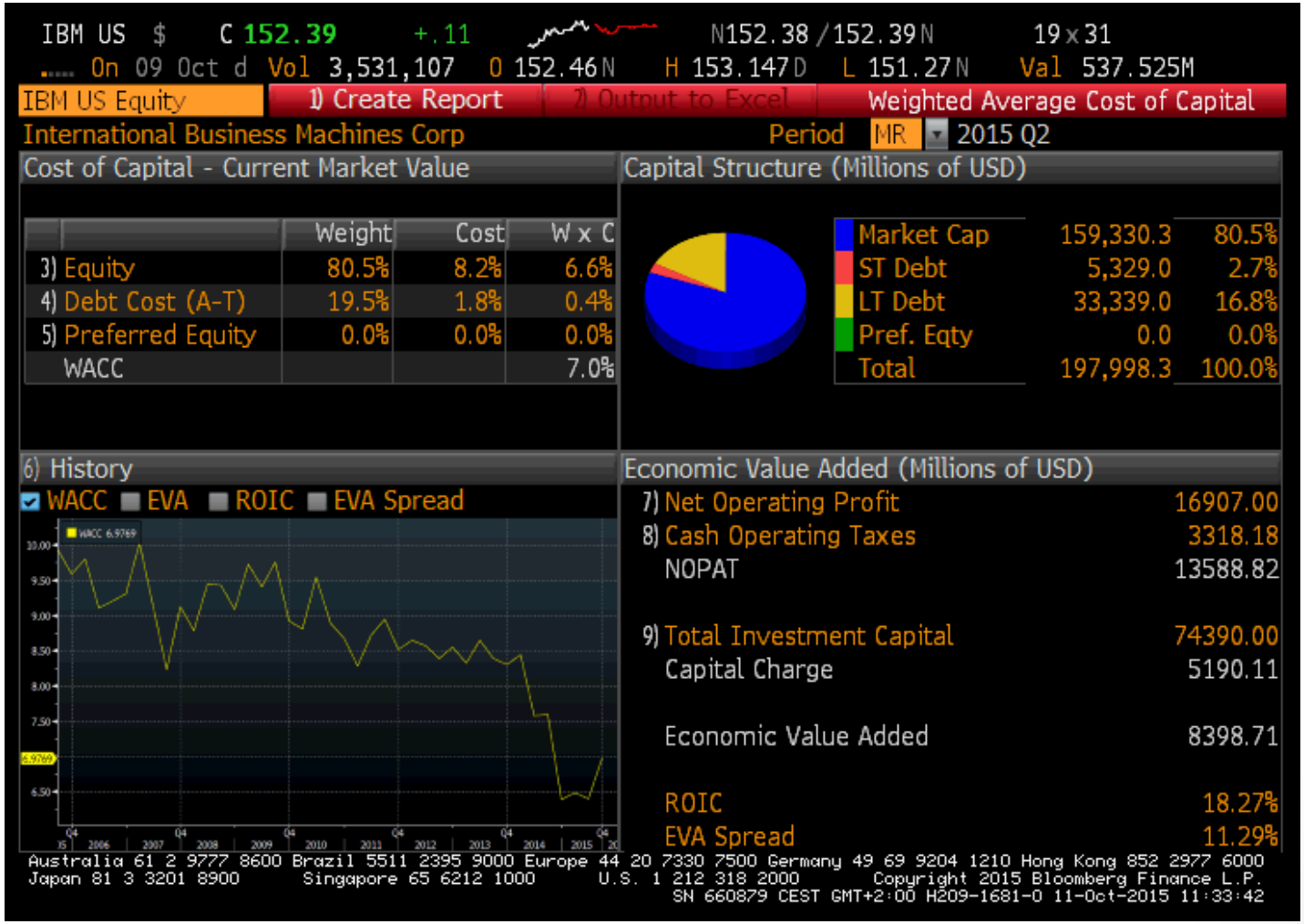
Required Rate of Return on Stocks I

- Capital Asset Pricing Model (Cont.)
- Application of the CAPM
  - Given the risk-free rate as well as estimates of the firm's beta and the market risk premium, it is possible to estimate the required rate of return from investing in the firm's stock.
  - At any given time, the required rates of return estimated by the CAPM will vary across stocks because of differences in their risk premiums, which are due to differences in their systematic risk (as measured by beta).

Required Rate of Return on Stocks II
Weighted Average Cost of Capital



WACC - IBM


IBM US $ C 152.39 +.11 N152.38 / 152.39 N 19 x 31
On 09 Oct d Vol 3,531,107 O 152.46 N H 153.147 D L 151.27 N Val 537.525M
IBM US Equity
1) Create Report
2) Output to Excel
Weighted Average Cost of Capital
International Business Machines Corp
Period MR 2015 Q2
Cost of Capital - Current Market Value
Weight Cost W x C
3) Equity 80.5% 8.2% 6.6%
4) Debt Cost (A-T) 19.5% 1.8% 0.4%
5) Preferred Equity 0.0% 0.0% 0.0%
WACC 7.0%
Capital Structure (Millions of USD)
Market Cap 159,330.3 80.5%
ST Debt 5,329.0 2.7%
LT Debt 33,339.0 16.8%
Pref. Eqty 0.0 0.0%
Total 197,998.3 100.0%
6) History
WACC EVA ROIC EVA Spread
Economic Value Added (Millions of USD)
7) Net Operating Profit 16907.00
8) Cash Operating Taxes 3318.18
NOPAT 13588.82
9) Total Investment Capital 74390.00
Capital Charge 5190.11
Economic Value Added 8398.71
ROIC 18.27%
EVA Spread 11.29%
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Weighted Average Cost of Capital

$$\frac{\text{MVD}}{\text{MVD}+\text{MVCE}} r_d (1-\text{Tax Rate}) + \frac{\text{MVCE}}{\text{MVD}+\text{MVCE}} r_e,$$

- **Where**
  - MVD = Current market value of debt
  - MVCE = Current market value of common equity
  - r_d = Before-tax cost of debt (which is transformed into the after-tax cost by multiplying it by 1 – Tax rate)
  - r_e = Cost of equity

Example: Weighted Average Cost of Capital

Risk-free rate	3.0%
Equity risk premium	5.0%
Beta	1.20
YTM of long-term bond	6.1%
Long-term debt/Total capital at market value	40%
Tax rate	30%

Example: Weighted Average Cost of Capital

$$r_e = R_F + \beta_i[E(R_m) - R_F]$$

$$r_e = 3\% + 1.2(5\%) = 9.0\%$$

$$\text{WACC} = \frac{\text{MVD}}{\text{MVD} + \text{MVCE}} r_d (1 - \text{Tax Rate}) + \frac{\text{MVCE}}{\text{MVD} + \text{MVCE}} r_e$$

$$= 0.40(6.1\%)(1 - 0.30) + 0.60(9.0\%)$$

$$= 7.11\%$$

Stock Risk

- The return from investing in stock over a particular period is measured as

$$R = \frac{(SP - INV) + D}{INV}$$

$$\text{where } INV = \text{initial investment}$$

$$D = \text{dividend}$$

$$SP = \text{selling price of the stock}$$

- The risk of a stock can be measured by using its price volatility, its beta, and the value-at-risk method.

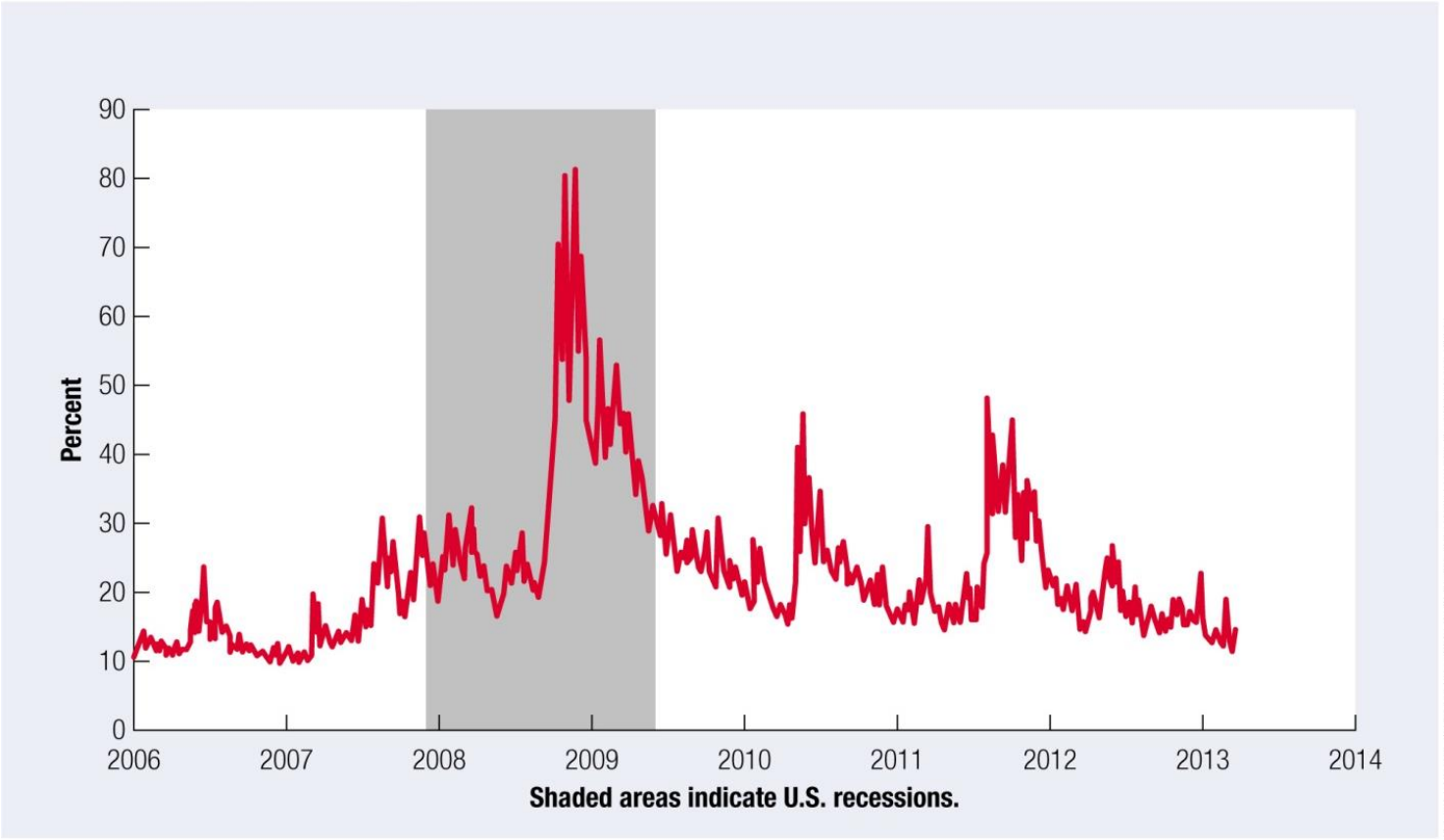
Stock Risk

- Volatility of a Stock or total risk serves as a measure of risk because it may indicate the degree of uncertainty surrounding the stock's future returns.
- Using Standard Deviation to forecast Stock Price Volatility
  - Using the historical method: a historical period is used to derive a stock's standard deviation of returns, and that estimate is then used as the forecast over the future.
- Using Implied Volatility to Forecast Stock Price Volatility
  - Derive a stock's implied standard deviation from a stock option pricing model.

Stock Risk

- Volatility of a Stock (cont.)
- Forecasting Stock Price Volatility of the Stock Market
  - Monitor the volatility index (VIX) derived from stock options on the S&P 500 stock at a given point in time.
  - The VIX measures investors' expectation of the stock market volatility over the next 30 days. (Exhibit 11.3)

Exhibit 11.3 Implied Volatility Index for U.S. Stocks over Time



Stock Risk

- Volatility of a Stock (Cont.)
  - Volatility of a Stock Portfolio - The portfolio's volatility can be measured by the standard deviation:

$$\sigma_p = \sqrt{w_i^2\sigma_i^2 + w_j^2\sigma_j^2 + \sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j \sigma_i \sigma_j CORR_{ij}}$$

where

σ_i = standard deviation of returns of the *i*th stock

σ_j = standard deviation of returns of the *j*th stock

$CORR_{ij}$ = correlation coefficient between the *i*th and *j*th stocks

w_i = proportion of funds invested in the *i*th stock

w_j = proportion of funds invested in the *j*th stock

Stock Risk

- Beta of a Stock - measures the sensitivity of its returns to market (Exhibit 11.4)
- Beta of a Stock Portfolio can be measured as the weighted average of the betas of stocks that make up the portfolio

$$\beta_p = \sum w_i \beta_i$$

- High-beta stocks are expected to be relatively volatile because they are more sensitive to market returns over time. Likewise, low-beta stocks are expected to be less volatile because they are less responsive to market returns.

Risk-Adjusted Stock Performance

- Sharpe Index
- The reward-to-variability ratio, or Sharpe Index, measures risk-adjusted returns when total variability is the most appropriate measure of risk.

$$\text{Sharpe Index} = \frac{\overline{R} - \overline{R_f}}{\sigma}$$

$$\text{where } \overline{R} = \text{average return on the stock}$$

$$\overline{R_f} = \text{average risk - free rate}$$

$$\sigma = \text{standard deviation of the stock's return}$$

- This index measures the excess return above the risk-free rate per unit of risk.

Risk-Adjusted Stock Performance

Treynor Index

The Treynor Index measures risk-adjusted returns when **beta** is the most appropriate measure of risk.

$$\text{Treynor Index} = \frac{\overline{R} - \overline{R_f}}{\beta}$$

$$\text{where } \overline{R} = \text{average return on the stock}$$

$$\overline{R_f} = \text{average risk - free rate}$$

$$\beta = \text{stock's beta}$$

Thank you for your attention