Discounted Dividend Valuation

Discounted Cash Flow Models

Dividend Discount Models

Free Cash Flow Models

- Free cash flow to the firm
- Free cash flow to equity

Residual Income Models

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

IBM US $ Market P146.05 / 147.20 P 3 x 1

Prev 146.48 Vol 37

IBM US Equity

Dividend/Split Summary

International Business Machines Corp

Range 2007 - 2017 Adjust for Capital Change Currency As Reported

12 Month Yield	3.96%
Indicated Yield	4.10%
1 Yr Dividend Growth	7.41%
3 Yr Dividend Growth	12.26%
5 Yr Dividend Growth	12.63%
Last Price	USD 146.48
Payment Frequency	Quarterly

Type All 1) Color Legend Show Comparative BDVD Forecasts

	Declaration	Ex Date↓	Record	Payable	Curr	Amount	Type
16)	07/26/16	08/08/16	08/10/16	09/10/16	USD	1.40	Regular Cash
17)	04/26/16	05/06/16	05/10/16	06/10/16	USD	1.40	Regular Cash
18)	01/26/16	02/08/16	02/10/16	03/10/16	USD	1.30	Regular Cash
19)	10/27/15	11/06/15	11/10/15	12/10/15	USD	1.30	Regular Cash
20)	07/28/15	08/06/15	08/10/15	09/10/15	USD	1.30	Regular Cash
21)	04/28/15	05/06/15	05/08/15	06/10/15	USD	1.30	Regular Cash
22)	01/27/15	02/06/15	02/10/15	03/10/15	USD	1.10	Regular Cash
23)	10/28/14	11/06/14	11/10/14	12/10/14	USD	1.10	Regular Cash
24)	07/29/14	08/06/14	08/08/14	09/10/14	USD	1.10	Regular Cash
25)	04/29/14	05/07/14	05/09/14	06/10/14	USD	1.10	Regular Cash
26)	01/28/14	02/06/14	02/10/14	03/10/14	USD	.95	Regular Cash
27)	10/29/13	11/06/13	11/08/13	12/10/13	USD	.95	Regular Cash
28)	07/30/13	08/07/13	08/09/13	09/10/13	USD	.95	Regular Cash
29)	04/30/13	05/08/13	05/10/13	06/10/13	USD	.95	Regular Cash

AAPL US $ C 156.41 -0.69 Q156.41 / 156.42 Q 8 x 20

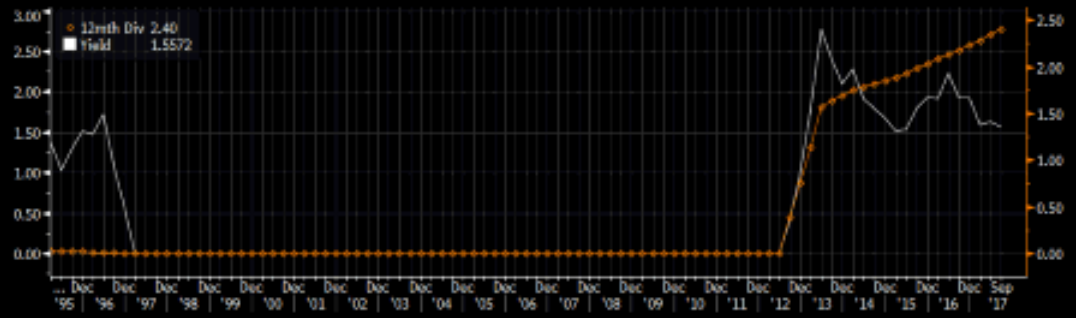
On 25 Oct d Vol 21,207,098 O 156.91 P H 157.55 K L 155.27 B Val 3.316B

AAPL US Equity — Dividend/Split Summary

Apple Inc

Range 1995 - 2017 ☑ Adjust for Capital Change Currency As Reported

12 Month Yield	1.53%
Indicated Yield	1.61%
1 Yr Dividend Growth	10.09%
3 Yr Dividend Growth	9.83%
5 Yr Dividend Growth	44.68%
Last Price	USD 156.41
Payment Frequency	Quarterly



Type All 1) Color Legend ☐ Show Comparative BDVD Forecasts

	Declaration	Ex Date ↓	Record	Payable	Curr	Amount	Type
11)	11/02/17	11/10/17			USD	.63	BDVD Forecast
12)	08/01/17	08/10/17	08/14/17	08/17/17	USD	.63	Regular Cash
13)	05/02/17	05/11/17	05/15/17	05/18/17	USD	.63	Regular Cash
14)	01/31/17	02/09/17	02/13/17	02/16/17	USD	.57	Regular Cash
15)	10/25/16	11/03/16	11/07/16	11/10/16	USD	.57	Regular Cash
16)	07/26/16	08/04/16	08/08/16	08/11/16	USD	.57	Regular Cash
17)	04/26/16	05/05/16	05/09/16	05/12/16	USD	.57	Regular Cash
18)	01/26/16	02/04/16	02/08/16	02/11/16	USD	.52	Regular Cash
19)	10/27/15	11/05/15	11/09/15	11/12/15	USD	.52	Regular Cash
20)	07/21/15	08/06/15	08/10/15	08/13/15	USD	.52	Regular Cash
21)	04/27/15	05/07/15	05/11/15	05/14/15	USD	.52	Regular Cash
22)	01/27/15	02/05/15	02/09/15	02/12/15	USD	.47	Regular Cash
23)	10/20/14	11/06/14	11/10/14	11/13/14	USD	.47	Regular Cash
24)	07/22/14	08/07/14	08/11/14	08/14/14	USD	.47	Regular Cash

VOW GR € ↑ 148.15 +0.347 S148.157 / 148.193 S 100 x 100

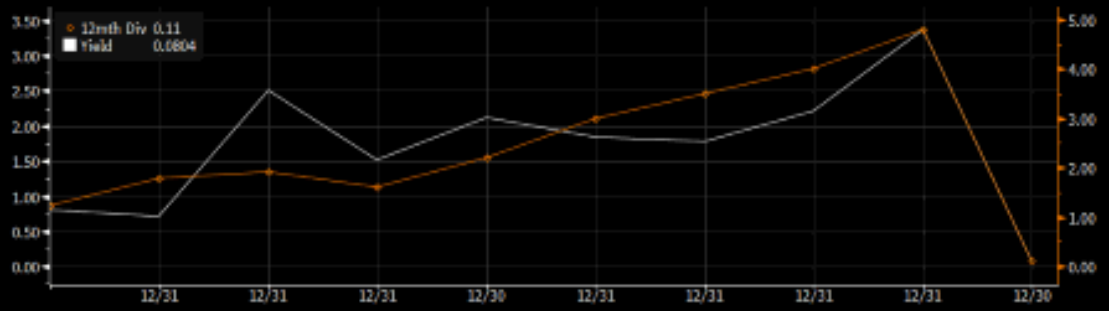
At 11:51 d Vol 29,063 O 147.92 B H 149.262 S L 147.50 I Val 4.317M

VOW GR Equity — Dividend/Split Summary

Volkswagen AG

Range 2007 - 2017 Adjust for Capital Change Currency As Reported

12 Month Yield	1.35%
Indicated Yield	1.35%
3 Yr Dividend Growth	-20.63%
5 Yr Dividend Growth	-7.79%
Last Price	EUR 148.15
Payment Frequency	Annual



Type All 1) Color Legend Show Comparative BDVD Forecasts

	Declaration	Ex Date↓	Record	Payable	Curr	Amount	Type
11)	03/13/18	05/10/18			EUR	3	BDVD Forecast
12)	02/27/17	05/11/17	05/12/17	05/15/17	EUR	2	Regular Cash
13)	04/22/16	06/23/16	06/22/16	06/23/16	EUR	.11	Regular Cash
14)	02/27/15	05/06/15	05/05/15	05/06/15	EUR	4.80	Regular Cash
15)	02/21/14	05/14/14	05/13/14	05/14/14	EUR	4	Regular Cash
16)	02/22/13	04/26/13	04/25/13	04/26/13	EUR	3.50	Regular Cash
17)	02/24/12	04/20/12	04/19/12	04/20/12	EUR	3	Regular Cash
18)	02/25/11	05/04/11	05/03/11	05/04/11	EUR	2.20	Regular Cash
19)	02/26/10	04/23/10	04/22/10	04/23/10	EUR	1.60	Regular Cash
20)	03/23/10	03/31/10	03/30/10	04/13/10		6 per 37	Rights Issue
21)	03/02/09	04/24/09	04/23/09	04/24/09	EUR	1.918823	Regular Cash
22)	02/29/08	04/25/08	04/24/08	04/25/08	EUR	1.789576	Regular Cash
23)	02/20/07	04/20/07	04/19/07	04/20/07	EUR	1.242761	Regular Cash

Coca-Cola Bottling Company and Hormel Foods

Exhibit 1. COKE and HRL: The Earnings and Dividends Record

	COKE			HRL		
Year	EPS ($)	DPS ($)	Payout Ratio (%)	EPS ($)	DPS ($)	Payout Ratio (%)
2012	3.08	1.00	32	1.86	0.60	32
2011	3.08	1.00	32	1.74	0.51	29
2010	3.94	1.00	25	1.51	0.42	28
2009	3.56	1.00	28	1.27	0.38	30
2008	1.77	1.00	56	1.04	0.37	36
2007	2.17	1.00	46	1.07	0.30	28
2006	2.55	1.00	39	1.03	0.28	27
2005	2.53	1.00	40	0.91	0.26	29
2004	2.41	1.00	41	0.78	0.23	29
2003	3.40	1.00	29	0.67	0.21	31
2002	2.56	1.00	39	0.68	0.20	29
2001	1.07	1.00	93	0.65	0.19	29
2000	0.71	1.00	141	0.61	0.18	30
1999	0.37	1.00	270	0.54	0.17	31
1998	1.75	1.00	57	0.41	0.16	39

Source: The Value Line Investment Survey, sec.edgar-online.com.

Valuing Common Stock Using a Multiperiod DDM

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

Example: Valuing Common Stock Using a MultIperiod DDM

	0	1	2	3
D		$1.00	$1.05	$1.10
P				$20.00

Example: Valuing Common Stock using a Multperiod DDM

$$V_0 = \frac{\$1.00}{1.10} + \frac{\$1.05}{1.10^2} + \frac{\$21.10}{1.10^3}$$

$$V_0 = \$17.63$$

Valuing Common Stock Using the Gordon Growth Model

$$V_0 = \frac{D_0(1+g)}{r-g} = \frac{D_1}{r-g}$$

Example: Valuing Common Stock Using the Gordon Growth Model

Risk-free rate	3.0%
Equity risk premium	6.0%
Beta	1.20
Current dividend	$2.00
Dividend growth rate	5.0%
Current stock price	$24.00

Valuing Common Stock Using the Gordon Growth Model

$$\text{CAPM: } r = 3\% + 1.2(6\%) = 10.2\%$$

$$V_0 = \frac{\$2.00(1+0.05)}{0.102-0.05} = \frac{\$2.10}{0.102-0.05} = \$40.38$$

Example: Valuing Preferred Stock

$$V_0 = \frac{\$2.00}{0.102 - 0} = \$19.61$$

Example: Calculating the **Implied** Growth Rate Using the Gordon Growth model

Using the previous common stock example and the current stock price of $24, what is the implied growth rate?

$$\$24 = \frac{\$2.00(1+g)}{0.102-g}$$

$$2.448 - 24g = 2.00(1+g)$$

$$-26g = -0.448$$

$$g = 1.72\%$$

Calculating the **Implied** Required Return Using the Gordon Growth Model

$$V_0 = \frac{D_1}{r - g}$$

$$r = \frac{D_1}{P_0} + g$$

Using the Gordon Growth Model to Derive a Justified Leading P/E

$$V_0 = \frac{D_1}{r - g}$$

$$\frac{P_0}{E_1} = \frac{D_1 / E_1}{r - g}$$

$$\frac{P_0}{E_1} = \frac{1 - b}{r - g}$$

Using the Gordon Growth Model to Derive a Justified Trailing P/E

$$V_0 = \frac{D_0(1+g)}{r-g}$$

$$\frac{P_0}{E_0} = \frac{D_0(1+g)/E_0}{r-g}$$

$$\frac{P_0}{E_0} = \frac{(1-b)(1+g)}{r-g}$$

Example: Using the Gordon Growth Model to Derive a Justified P/E

Stock price	$50.00
Trailing earnings per share	$4.00
Current dividends per share	$1.60
Dividend growth rate	5.0%
Required return on stock	9.0%

Example: Using the Gordon Growth Model to Derive a Justified Leading P/E

$$\frac{P_0}{E_1} = \frac{1-b}{r-g}$$

$$\frac{P_0}{E_1} = \frac{\$1.60/\$4.00}{0.09-0.05} = 10.0$$

Example: Using the Gordon Growth Model to Derive a Justified Trailing P/E

$$\frac{P_0}{E_0} = \frac{(1-b)(1+g)}{r-g}$$

$$\frac{P_0}{E_0} = \frac{(\$1.60 / \$4.00)(1.05)}{0.09-0.05} = 10.50$$

Actual P/E = \$50.00/\$4.00 = 12.50

Issues Using the Gordon Growth Model

Strengths

- Simple and applicable to stable, mature firms
- Can be applied to entire markets
- g can be estimated using macro data
- Can be applied to firms that repurchase stock

Limitations

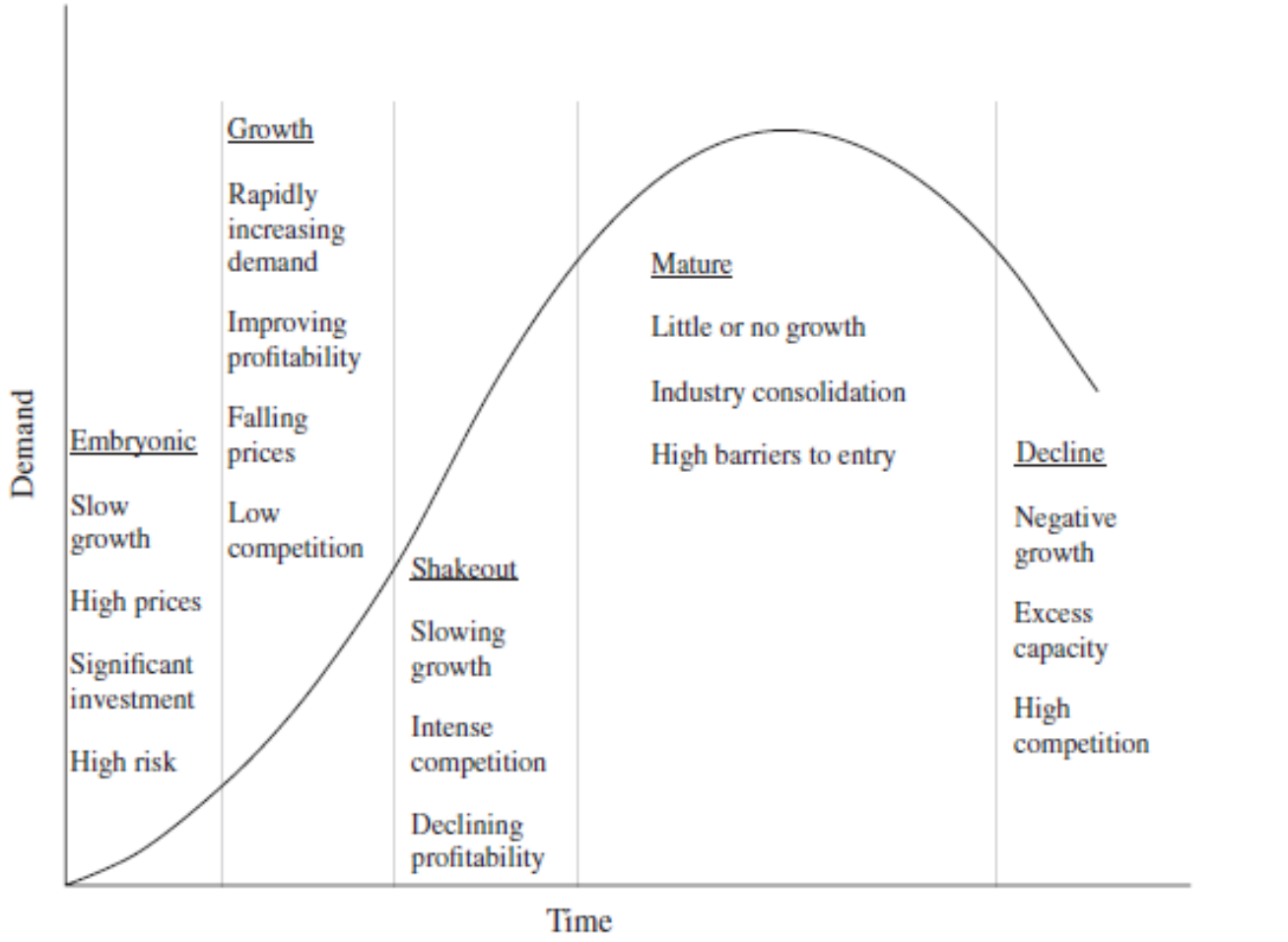
- Not applicable to non-dividend-paying firms
- g must be constant
- Stock value is very sensitive to $r - g$
- Most firms have nonconstant growth in dividends

Exhibit 2. Average Annual Real GDP Growth Rates: 1983–2012 (in Percent)

	Time Period		
Country	**1983–1992**	**1993–2002**	**2003–2012**
Australia	3.4%	3.8%	2.4%
Canada	2.7	3.5	1.9
Denmark	2.1	2.4	0.6
France	2.3	2.0	1.1
Germany	3.0	1.4	1.2
Italy	2.5	1.6	0.0
Japan	4.3	0.8	0.9
Netherlands	2.9	3.0	1.1
Sweden	1.9	2.7	2.3
Switzerland	2.1	1.3	1.9
United Kingdom	2.6	3.4	1.4
United States	3.5	3.4	1.7

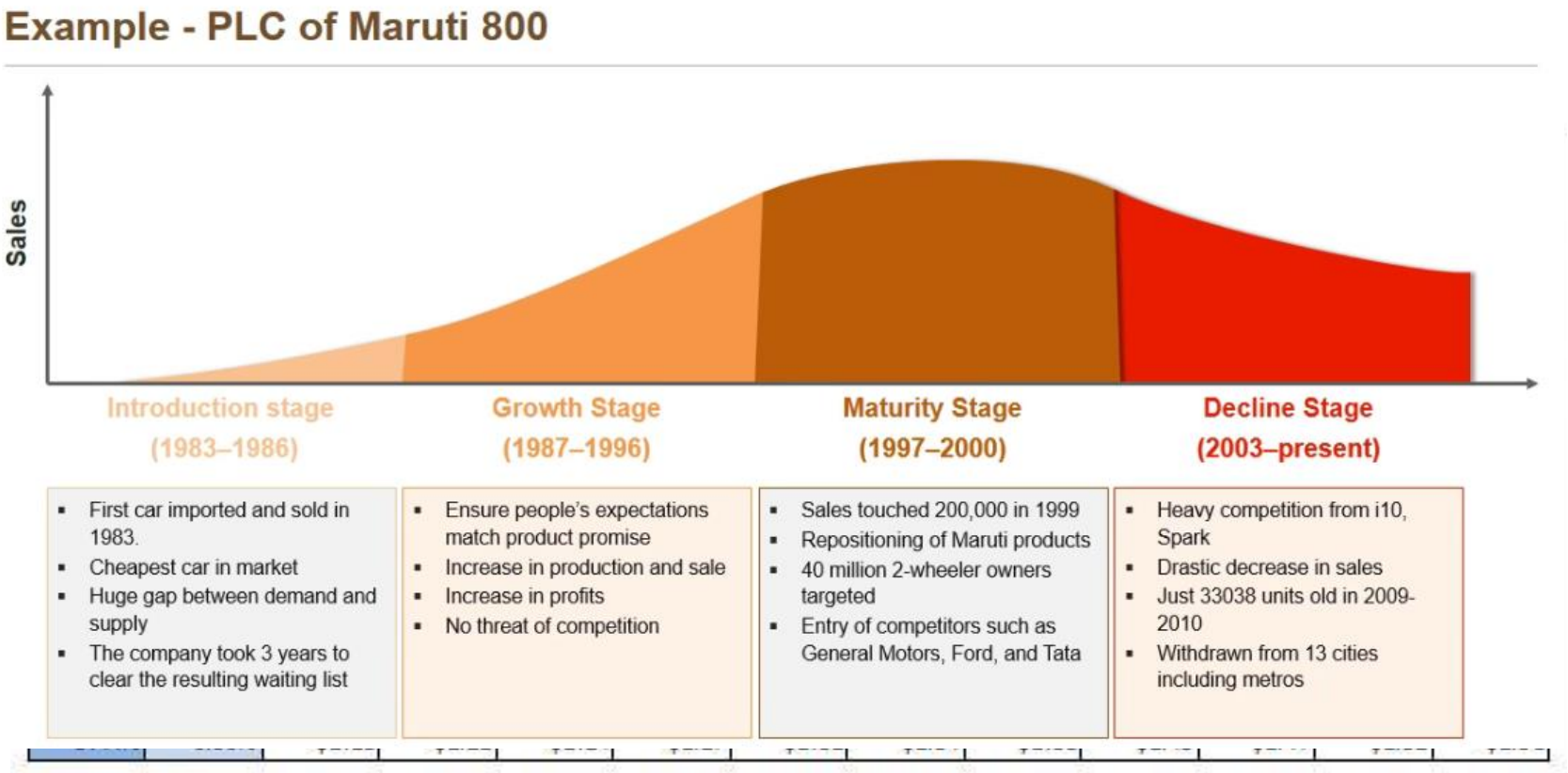
Source: OECD.

EXHIBIT 6 An Industry Life-Cycle Model

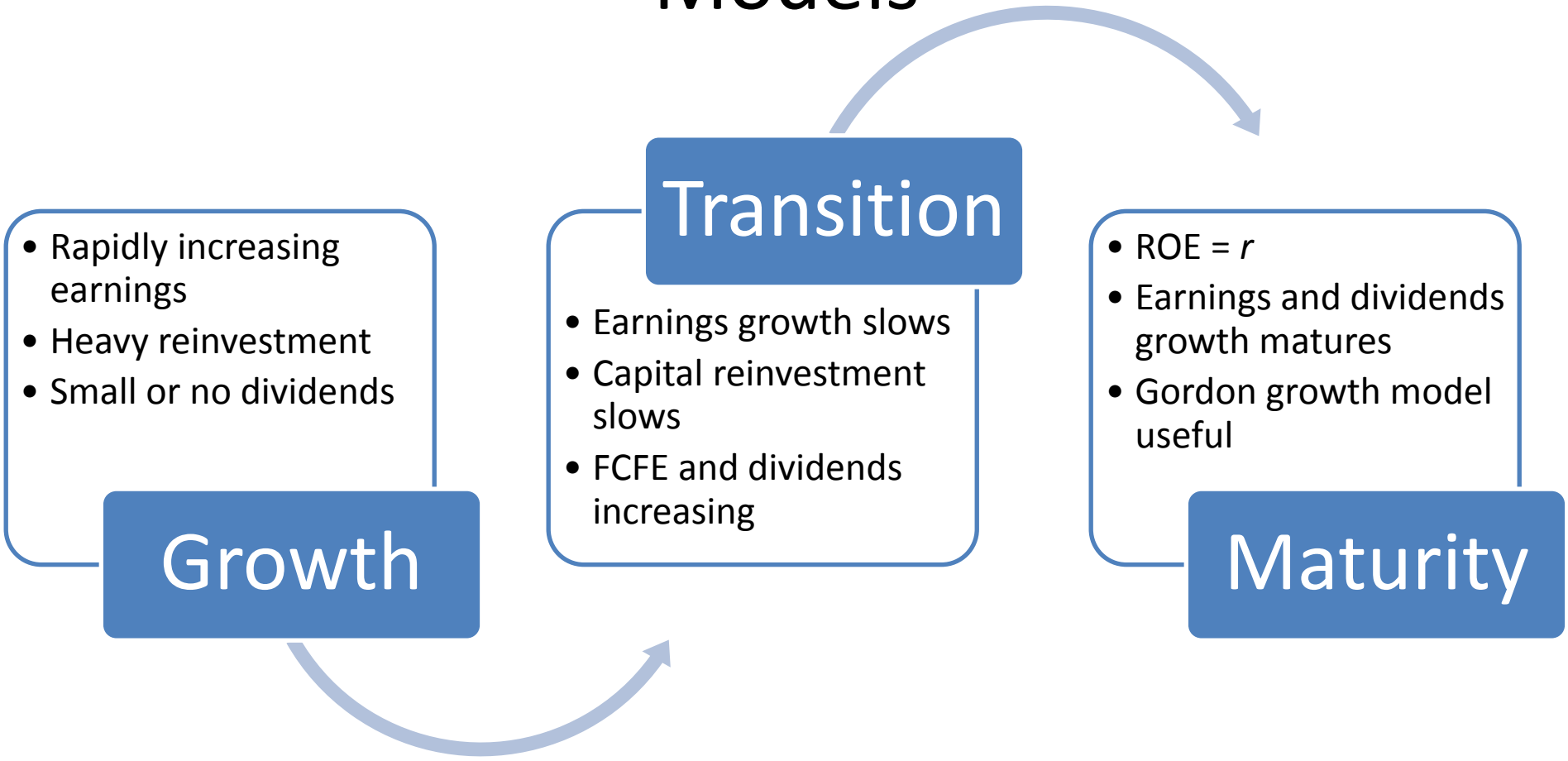


Source: Based on Figure 2.4 in Hill and Jones (2008)

Sensitivity Analysis



Choice of Discounted Cash Flow Models



General Two-Stage Dividend discount model (DDM)

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

Example: General Two-Stage DDM

Current dividend = $2.00

Growth for next three years = 15 percent

Long-term growth = 4 percent

Required return = 10 percent

Example: General Two-Stage DDM

Step 1: Calculate the first three dividends:

- D1 = $2.00 x (1.15) = $2.30
- D2 = $2.30 x (1.15) = $2.6450
- D3 = $2.6450 x (1.15) = $3.0418

Step 2: Calculate the Year 4 dividend:

- D4 = $3.0418 x (1.04) = $3.1634

Step 3: Calculate the value of the constant growth dividends:

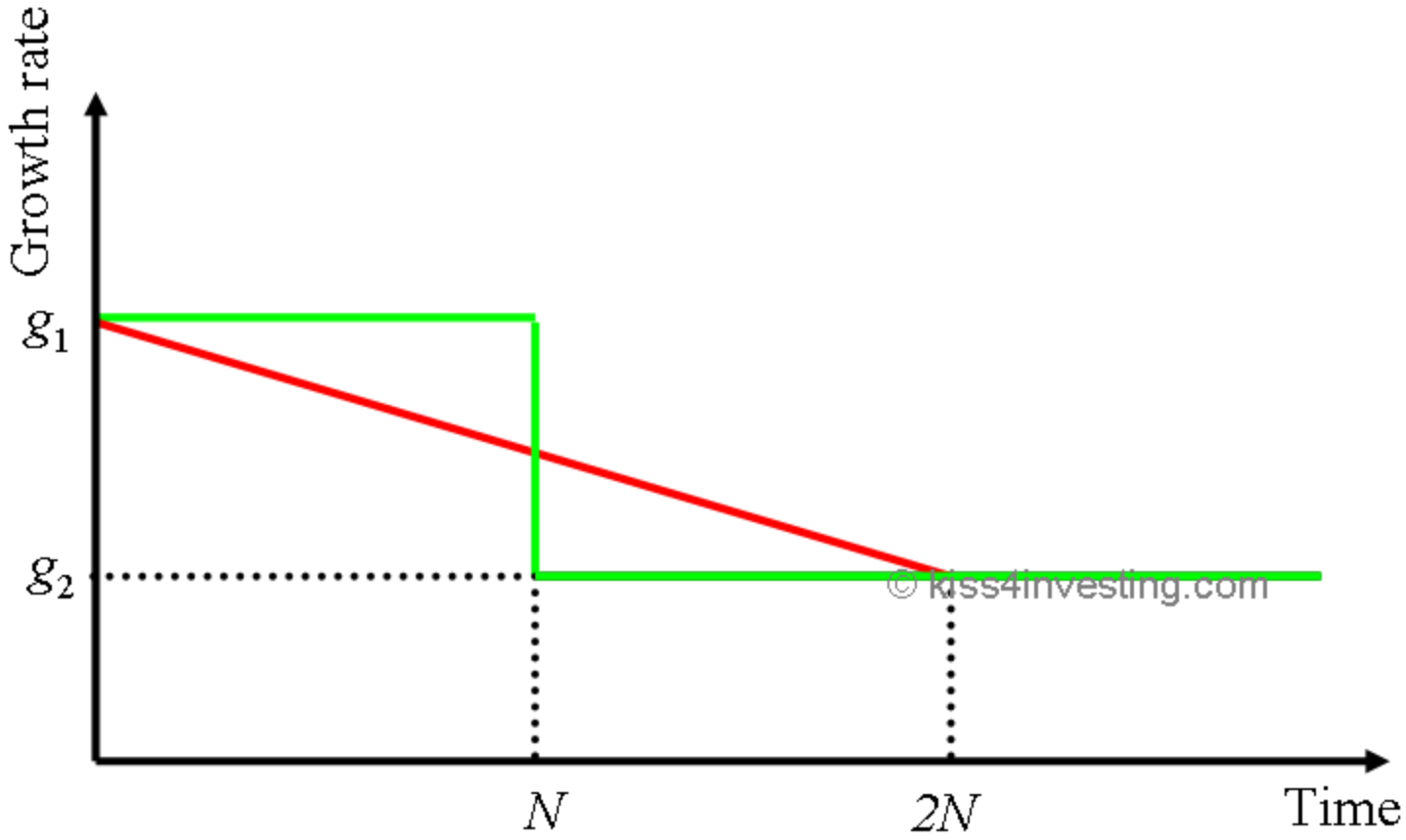
- V3 = $3.1634 / (0.10 – 0.04) = $52.7237

Example: General Two-Stage DDM

$$V_0 = \frac{\$2.30}{1.10} + \frac{\$2.6450}{1.10^2} + \frac{\$3.0418}{1.10^3} + \frac{\$52.7237}{1.10^3}$$

$$V_0 = \$46.17$$

Two-Stage DDM x H-Model



Two-Stage H-Model

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

where:

$H = \left(\frac{t}{2}\right)$ = half-life (in years) of high-growth period

t = length of high growth period

g_S = short-term growth rate

g_L = long-term growth rate

r = required return

Example: Two-Stage H-Model

Current dividend	\$3.00
g_s	20%
g_L	6%
H	5
Required return on stock	10%
Current stock price	\$120

Example: Two-Stage H-Model

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

$$V_0 = \frac{\left[\$3 \times \left(1 + 0.06\right)\right] + \left[\$3 \times 5\left(0.20 - 0.06\right)\right]}{0.10 - 0.06}$$

$$V_0 = \$79.50 + \$52.50 = \$132.00$$

Example: Three-Stage Model

- Firm pays a current dividend of $1.00
- Growth rate is 20% for next two years
- Growth then declines over six years to a stable rate of 5%
- Required return is 10%
- Current stock price is $50

Three-Stage Model

Assumes three distinct growth stages:

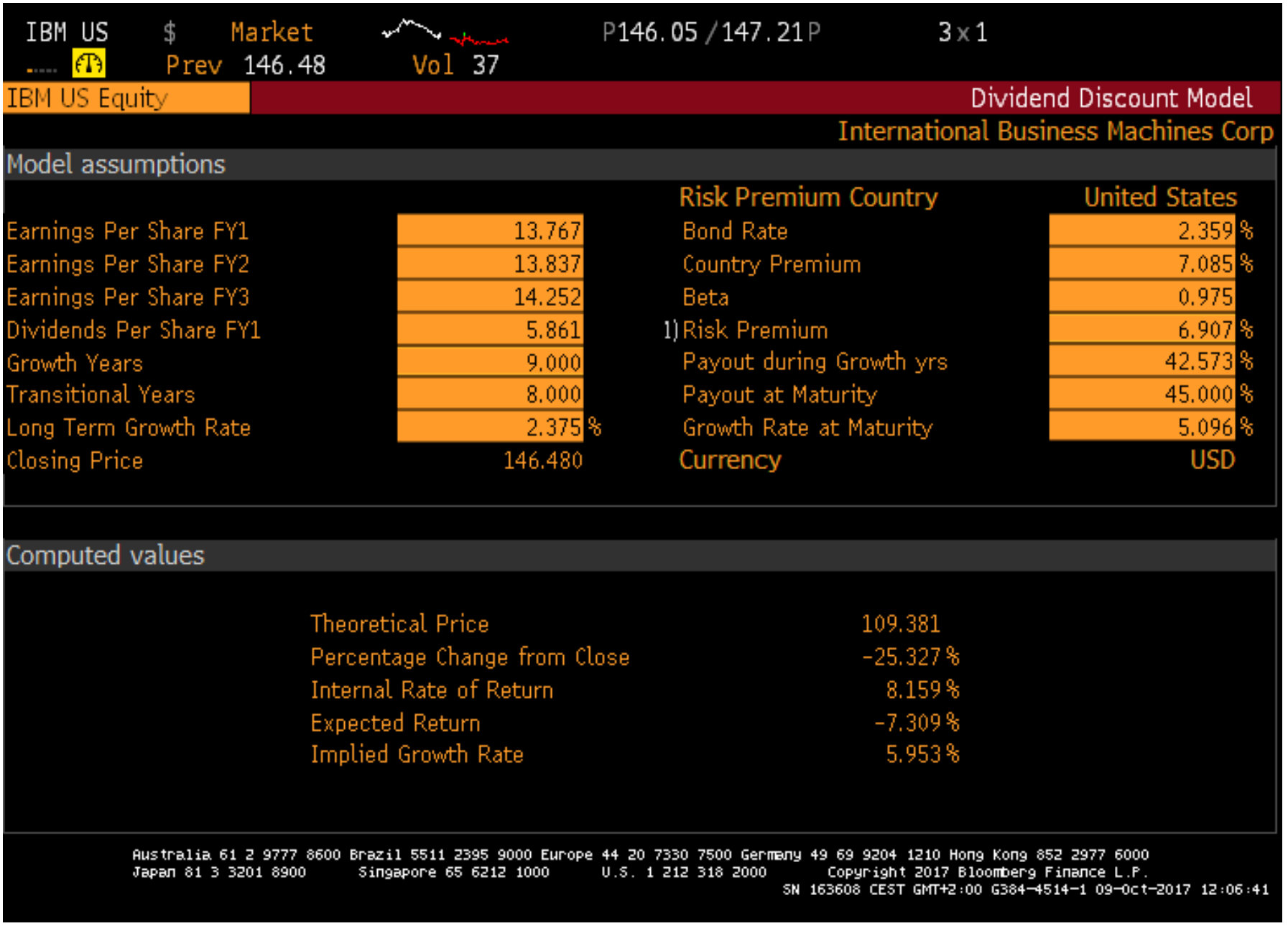
- First stage of growth
- Second stage of growth
- Stable phase of growth

H-model can be used for last two stages if growth declines linearly

THREE-STAGE MODEL EXAMPLE

$$V_0 = \frac{\$1\times\left(1.20\right)}{1.10^1} + \frac{\$1\times\left(1.20\right)^2}{\left(1.10\right)^2} + \frac{\$1\times\left(1.20\right)^2\times\left(\frac{6}{2}\right)\times\left(0.20-0.05\right)}{\left(1.10\right)^2\times\left(0.10-0.05\right)} + \frac{\$1\times\left(1.20\right)^2\times1.05}{\left(1.10\right)^2\times\left(0.10-0.05\right)}$$

$$V_0 = \$1.09+\$1.19+\$10.71+\$24.99 = \$37.98$$


IBM US $ Market P146.05 / 147.21P 3 x 1
Prev 146.48 Vol 37
IBM US Equity
Dividend Discount Model
International Business Machines Corp
Model assumptions
Earnings Per Share FY1 13.767
Earnings Per Share FY2 13.837
Earnings Per Share FY3 14.252
Dividends Per Share FY1 5.861
Growth Years 9.000
Transitional Years 8.000
Long Term Growth Rate 2.375 %
Closing Price 146.480
Risk Premium Country United States
Bond Rate 2.359 %
Country Premium 7.085 %
Beta 0.975
1) Risk Premium 6.907 %
Payout during Growth yrs 42.573 %
Payout at Maturity 45.000 %
Growth Rate at Maturity 5.096 %
Currency USD
Computed values
Theoretical Price 109.381
Percentage Change from Close -25.327 %
Internal Rate of Return 8.159 %
Expected Return -7.309 %
Implied Growth Rate 5.953 %
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 2017 Bloomberg Finance L.P.
SN 163608 CEST GMT+2:00 G384-4514-1 09-Oct-2017 12:06:41

IBM US $ Market P146.05 / 147.21P 3 x 1

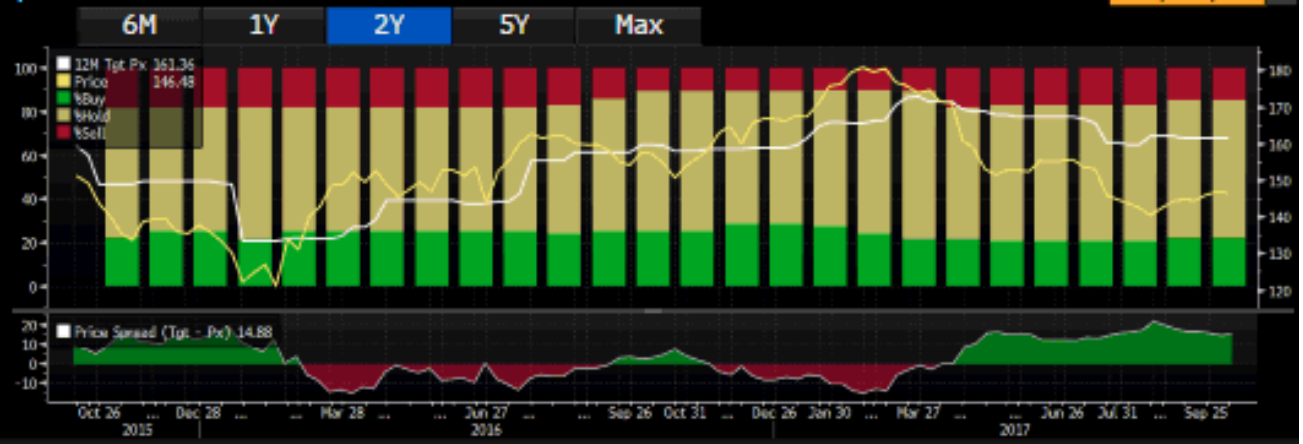
Prev 146.48 Vol 37

IBM US Equity | Actions | Alert | Analyst Recommendations

International Business Machines Corp

As of 10/09/17

Consensus Rating		3.11
Buys	22.2%	6
Holds	63.0%	17
Sells	14.8%	4
12M Tgt Px	22/31	161.36
Last Price		146.48
Pricing Currency		USD
Return Potential		10.2%
LTM Return		-2.3%



Showing 30 of 33 sources

	Firm	Analyst	Recommendation	Tgt Px	Date	1 Yr Rtn	BARR	Rank
1)	Goldman Sachs	James Schneider	neutral/neutral	170	10/09/17	0.00%	4	
2)	Bernstein	Toni Sacconaghi	market perform	150	10/09/17	0.00%	4	1
3)	Cantor Fitzgerald	Joseph D Foresi	neutral	154	10/06/17	0.00%	4	2
4)	Stifel	David M Grossman	buy	182	10/05/17	-2.34%	5	8
5)	Morningstar, Inc	Andrew Lange	hold		09/29/17	0.00%	4	
6)	Guggenheim Securities	Robert Cihra	neutral		09/27/17	0.00%	4	
7)	KeyBanc Capital Markets	Arvind Ramnani	sector weight		09/25/17			
8)	Wedbush	Moshe Katri	neutral	155	09/18/17			
9)	Morgan Stanley	Kathryn Lynn Hube..	Overwt/Cautious	192	09/11/17	-2.34%	5	
10)	BMO Capital Markets	Keith F Bachman	market perform	167	09/10/17	0.00%	4	
11)	Independent Research Gm..	Markus Friebel	hold	162	09/08/17	0.00%	4	
12)	CM Research	Cyrus Mewawalla	buy	178	09/08/17	-2.34%	5	

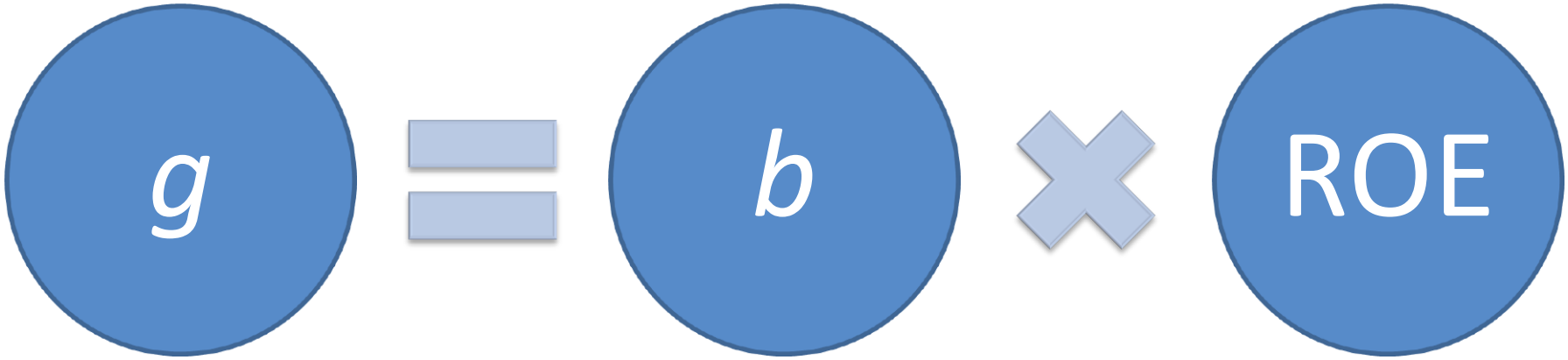
Estimating the Growth Rate

Industry or Macroeconomic Average

$g = b \times \text{ROE}$

- DuPont formula
- ROE = r
- ROE = industry ROE

The Sustainable Growth Rate



The DuPont Model

$$\text{ROE} = \left(\frac{\text{Net income}}{\text{Total assets}}\right)\left(\frac{\text{Total assets}}{\text{Shareholders' equity}}\right)$$

$$\text{ROE} = \left(\frac{\text{Net income}}{\text{Sales}}\right)\left(\frac{\text{Sales}}{\text{Total assets}}\right)\left(\frac{\text{Total assets}}{\text{Shareholders' equity}}\right)$$

$$g = \left(\frac{\text{Net income} - \text{Dividends}}{\text{Net income}}\right) \times \left(\frac{\text{Net income}}{\text{Sales}}\right) \times \left(\frac{\text{Sales}}{\text{Total assets}}\right) \times \left(\frac{\text{Total assets}}{\text{Equity}}\right)$$

Example: DuPont Model

Net profit margin	5.00%
Total asset turnover	1.5
Equity multiplier	2.0
Retention ratio	60%

Example: DuPont Model

$$g = \left(\frac{\text{Net income} - \text{Dividends}}{\text{Net income}}\right) \times \left(\frac{\text{Net income}}{\text{Sales}}\right) \times \left(\frac{\text{Sales}}{\text{Total assets}}\right) \times \left(\frac{\text{Total assets}}{\text{Equity}}\right)$$

$$g = (0.60) \times (5\%) \times (1.5) \times (2.0)$$

$$g = 9.0\%$$

Summary

Choice of Discounted Cash Flow Models

- Dividend discount models, free cash flow models, residual income models
- Dividend models most appropriate for
  - Mature, profitable, dividend-paying firms
  - Noncontrolling shareholder perspective

Gordon Growth Model

- Assumes constant g and $r > g$
- Applicable to mature, stable firms
- Estimated value very sensitive to $r - g$ denominator

Summary

Uses of Gordon Growth Model

- Preferred stock valuation where $g = 0$
- PVGO – Value from future growth
- Justified leading and trailing P/Es
- Implied r and g

Phases of Growth

- Growth
- Transition
- Maturity

Summary

Multistage Models

- General two-stage model: growth abruptly declines
- H-model: growth gradually declines
- Three-stage model: can use general or H-model

Sustainable Growth Rate

- g = Retention ratio × ROE
- DuPont analysis:
  - ROE = Profit margin × Asset turnover × Equity multiplier