### **Equity Valuation Models**

### Valuation by Comparables

- FA
  - Identification of mispriced stocks
    - Relative to some "true value"
      - Derived from financial data
  - http://www.sec.gov/edgar.shtml
    - All public comapnies
      - Except foreign companies and companies with less than \$10 million in assets and 500 shareholders

### Table 18.1Financial Highlights for Microsoft Corporation, March 8,

#### $\mathbf{\wedge}\mathbf{\wedge}\mathbf{\wedge}\mathbf{\wedge}$

TABLE 18.1	Current Qtr Ended:	- Dec. 2005	Current Year Ended:	Jun. 2005					
Financial highlights	Miscellaneous								
for Microsoft Corpo-	Current price	26.910000	Comn sharehldrs (actual)	149668					
ration, March 8, 2006	Comn shares outstdg (mil)	10384.000	Employees (actual)	61000					
	Market capitalization (mil)	279433.440	S&P issuer credit rating						
	Latest 12 Months	Company	1 Yr Chng (%)						
	Sales (mil) 41359.000 7.5								
	EBITDA (mil)	17935.000	8.1						
	Net income (mil)	13057.000	30.6						
	EPS from ops	1.25	12.6						
	Dividends/share								
	Valuation	Company	Industry Avg						
	Price/EPS from ops	21.5							
	Price/book	6.3	4.1						
	Price/sales	6.8	6.0						
	Price/cash flow	19.8	18.8						
	Profitability (%)								
	Return on equity	29.5	18.5						
	Return on assets	19.4	12.1						
	Oper profit margin	40.9	37.8						
	Net profit margin	31.6	27.6						
	Financial Risk								
	Debt/equity		5.8						
	Cash flow/share	1.4	27.5						
	Interest coverage		98.9						

Source: COMPUSTAT Company Profiles, March 8, 2006. Copyright © 2006 Standard & Poor's, a division of the McGraw-Hill Companies, Inc. All rights reserved.

### Models of Equity Valuation

- Balance Sheet Models
  - Book Value
- Dividend Discount Models
- Price/Earning Ratios

### Limitations of Book Value

- Book value is an application of arbitrary accounting rules
- Can book value represent a floor value?
- Better approaches
  - Liquidation value
    - Amount of money that can be realized when company breaking up
  - Replacement cost
    - Assets less liabilities
    - Tobin's q

### Intrinsic Value and Market Price

- Intrinsic Value
  - Self assigned Value
  - Variety of models are used for estimation
- Market Price
  - Consensus value of all potential traders
- Trading Signal
  - -IV > MP Buy
  - IV < MP Sell or Short Sell
  - IV = MP Hold or Fairly Priced

- Assessing value
  - Return of cash dividends and capital gains or losses
  - ABC company
    - 1-year holding period
    - Exp. Dividens per share 4
    - Current price per share 48
    - Price at the and of year 52
    - Expected holding-period return
      - 16.7 %
    - ??? Required rate of return
      - E.g. CAPM model
- Compare intrinsic value with market price
   Alfa factor

### Dividend Discount Models: General Model

$$V_{o} = \sum_{t=1}^{\infty} \frac{D_{t}}{(1+k)^{t}} + \frac{P_{t}}{(1+k)^{t}}$$

$$V_o = \sum_{i=1}^{\infty} \frac{D_i}{\left(1+k\right)^i}$$

 $V_0$  = Value of Stock  $D_t$  = Dividend k = required return

### No Growth Model



Stocks that have earnings and dividends that are expected to remain constant. Preferred Stock

## No Growth Model: Example $V_{o} = \frac{D}{k}$ $E_1 = D_1 = $5.00$ k = .15 $V_0 = $5.00 / .15 = $33.33$

### **Constant Growth Model**

$$V o = \frac{D \circ (1 + g)}{k - g}$$

#### g = constant perpetual growth rate

### Constant Growth Model: Example

$$V o = \frac{D o (1 + g)}{k - g}$$

 $E_1 = \$5.00$  b = 40% k = 15% (1-b) = 60% D<sub>1</sub> = \$3.00 g = 8%  $V_0 = 3.00 / (.15 - .08) = \$42.86$ 

### **Specified Holding Period Model**

# $V_{0} = \frac{D_{1}}{(1+k)^{1}} + \frac{D_{2}}{(1+k)^{2}} + \frac{D_{N} + P_{N}}{(1+k)^{2}}$

- $P_N$  = the expected sales price for the stock at time N
- N = the specified number of years the stock is expected to be held

### Stock Prices and Investment Opportunities

- p: dividend payment ratio
- b: earning retention ratio
  - Plowback ratio
- p + b = 1 or p + b = 100
- Low reinvestment plan
- High reinvestment plan
  - ROE
- PVGO present value of growth opportunities
  - P0 = No-growth value per share + PVGO
    - ROE > k

### Estimating Dividend Growth Rates $g = ROE \times b$

g = growth rate in dividends
ROE = Return on Equity for the firm
b = plowback or retention percentage rate (1- dividend payout percentage rate)

### Figure 18.1 Dividend Growth for Two Earnings Reinvestment



### Partitioning Value: Example ROE = 20% d = 60% b = 40% $E_1 = $5.00 D_1 = $3.00 k = 15\%$ $g = .20 \times .40 = .08 \text{ or } 8\%$

#### Partitioning Value: Example

$$V_{o} = \frac{3}{(.15 - .08)} = \$42.86$$

$$N G V_{o} = \frac{5}{.15} = \$33.33$$

$$P V G O = \$42.86 - \$33.33 = \$9.52$$

V<sub>o</sub> = value with growth NGV<sub>o</sub> = no growth component value PVGO = Present Value of Growth Opportunities

### Life Cycle and Multistage Growth Models

• g - constant forever

Different dividend profiles

### Table 18.2 Financial Ratios in Two Industries

ABLE 18.2		Return on Assets	Payout Ratio	Growth Rate 2005-2008
		Return on Assets	Tayout Ratio	
inancial ratios	Computer Software			
n two industries	Adobe Systems	21.5%	1.0%	8.2%
	Cognizant	19.0	0.0	22.8
	Compuware	10.5	0.0	17.6
	Intuit	19.0	0.0	8.0
	Microsoft	31.5	35.0	15.4
	Novell	8.5	0.0	51.8
	Oracle	33.0	0.0	18.6
	Red Hat	17.0	0.0	17.6
	Parametric Tech	20.0	0.0	33.9
	SAP	22.5	18.0	13.8
	Median	19.5%	0.0	17.6%
	Electric Utilities			
	Central Hudson G&E	6.0%	78.0%	5.1%
	Central Vermont	7.5	60.0	8.0
	Consolidated Edison	5.0	75.0	1.0
	Duquesne Light	8.0	85.0	7.7
	Energy East	6.0	74.0	4.1
	Northeast Utilities	5.0	59.0	14.0
	Nstar	8.5	61.0	3.2
	Pennsylvania Power	11.0	52.0	9.3
	Public Services Enter.	7.0	62.0	1.7
	United Illuminating	5.0	113.0	1.3
	Median	6.5%	68.0%	4.6%

Source: Value Line Investment Survey, 2006. Reprinted with permission of Value Line Investment Survey. © 2006 Value Line Publishing, Inc. All rights reserved.

### Figure 18.2 Value Line Investment Survey Report on Hewlett Packard

SAFETY	NESS 1 Y 3	Raised 8	/26/05 7/26/96	High: Low	12.8 9.0	24.2 12.3	28.8 18.4	36.5 24.1	41.2 23.5	59.2 31.7	77.8 29.1	37.9 12.5	24.1 10.8	23.9 14.2	26.3 16.1	30.3 18.9			Target 2008	Price 2009	R
TECHNI BETA 1	ICAL 3	Lowered = Market	1/6/06	LEGEN	13.0 x "Cas Belative Pri	sh Flow" p	sh 📃						F								+
200	38-10 PP	OJECTIC	INS	2-for-1 Sp 2-for-1 Sp	lit 4/95 Jit 7/96						1111.12	for-1									
	Price	Gain	nn'l Total Return	2-for-1 Sp Options: Y	lit 10/00 /es		-			L IIII	1.00										-4
High Low	55 (- 35 (	+85%) +20%)	17% 5%	Shaded	area indicate	rs recession	ullum 1	Hand Haller	HI I			HIII.		-			•				+3
Insider	Decision	M	ASO				He dini						-	1111	հրհուն	HIII.					-
to Buy Options	000	000		_		վես								ih.							
to Sell Instituti	0 1 0 ional Dec	4 4 0 1 cisions	010	<mark>ղկ<sup>ր</sup>կլի</mark>	Inter .		·											% то	T. RETUR THIS	VL ARITH	-8
to Buy	102005 339	202005 327	302005 415	Percent	t 9 -						hulli			udin.		hall		1 yr.	<b>STOCK</b> 38.3	INDEX 6.8	
to Sell Hid's(mi	521 III.) 2014	485 2056	423 2012	traded	3 -								••					3 уг. 5 уг.	72.4	85.4 70.4	F
1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	VALU	JE LINE PU	JB., INC.	08-
6.26	6.78	7.20	8.18	10.05	12.26	15.45	18.94 1.96	20.60	23.17	21.09	25.05 2.53	23.32	23.77	24.01	27.45	30.40	32.50	Sales p "Cash F	er sh " low" per sh		42
.44	.38	.38	.44	.58	.77	1.16	1.27	1.48	1.44	1.50	1.73	.89	.79	1.16	1.33	1.62	1.70	Earning	is per sh <sup>B</sup>	. C.	2
.05	.05	.00	.09	.70	.13	.10	1.09	1.12	.30	.56	.32	.32	.56	.66	.32	.32	1.00	Cap'l S	pending per	sh	1
2.86	3.26	3.61	3.74	4.21	4.87	5.80	6.63	7.76	8.33	9.11	7.30	7.20	11.91	12.40	12.90	13.05	14.15	Book V	alue per sh	i n D	17
15.0	13.8	15.1	18.6	15.7	13.4	14.2	18.2	19.5	2030.8	2009.1	33.3	31.7	22.4	16.3	15.9	14.1	2000.0	Avg An	n'L P/E Ratio	) A	200
1.14	1.02	.96	1.13	.93	.88	.95	1.14	1.12	1.10	1.58	2.16	1.62	1.22	.93	.83	.74		Relativ Avg An	e P/E Ratio n'I Div'd Yie	Id	1
CAPITA	L STRUC	CTURE a	s of 10/3	31/05	mill	31519	38420	42895	47061	42370	48782	45226	72346	73061	79905	86696	91000	Sales (	\$mill) <sup>A</sup>		106
LT Debi	t \$3392 m	nill. L1	linteres	st \$145.0	mill.	14.9%	13.4%	13.7%	12.5%	11.9%	10.8%	7.6%	7.3%	9.776	9.3%	9.1%	9.5%	Operati	ing Margin	)	11.
('17) cor	nvertible in	nto comm	on at 15.	09 shares	per	2433.0	2670.0	3119.0	3065.0	3125.0	3561.0	1739.0	2409.0	3557.0	4067.0	4708.0	4860	Net Pro	fit (\$mill)	/	6
holders'	or compa	iny's optio	n for cas	h or stock	of Cap'll	33.0%	30.3% 6.9%	30.0%	28.1% 6.5%	26.0% 7.4%	23.0% 7.3%	21.9% 3.8%	23.7%	22.0% 4.9%	18.7% 5.1%	16.9% 5.4%	20.0% 5.3%	Net Pro	fit Margin		20.
Pension	n Assets	-10/04 \$	47) 10.4 bill.	Oblig. \$	12.5 bill	5295.0	7368.0	9728.0	8111.0	7321.0	8047.0	7341.0	11765	14366	14313	11874	13285	Workin	g Cap'l (\$mi erm Debt (\$	II) mill)	15
Commo	on Stock	2,864,99	0,033 sh:	S.		11839	13438	16155	16919	18295	14209	13953	36262	37746	37584	37176	39640	Shr. Eq	uity (\$mill)		42
Options	Exercis	able 13.2	2% on (Laro	ie Can)		20.6%	17.2%	16.6%	16.4%	15.8%	20.8%	10.2%	5.9% 6.6%	8.5% 9.4%	9.9%	12.0%	11.5% 12.5%	Return	on Shr.Equi	ty	16
CURRE	NT POS	ITION :	2003	2004	10/31/05	17.5%	16.5% 17%	16.0% 17%	14.4% 20%	13.5% 21%	20.6%	8.0% 36%	4.4%	6.8% 27%	8.2% 24%	10.0% 20%	10.0% 19%	Retaine	ed to Com E	l of	13
Cash / Receiv Invente Other Currer Accts I Debt D Other	Assets /ables ory (FIF nt Asset: Payable Due	·O) s 2	1886 6065 8454 10996 9285 1080 6265	12974 13171 7071 <u>9685</u> 42901 9377 2511 16700	13929 12454 6877 <u>10074</u> 43334 10223 1831 19406	and in Rev. Printi Enter (19% (d3%	naging contribu ng, 29 prise St I; Finan I. R&D	Hewlett solution ution (ar % (57' corage & icing, 2% 4.0% of	-Packar s and se nd % of %); Pe Server % (4%); '05 revs	or Comp op. ea irsonal s, 19% Softwa	any pro Operate rnings) System (13%); H re, 1%	ovides s in six in '05: 1 ns, 30% HP Serv (d1%); 1	computin segment maging 6 (11% ices, 18 Other, 19	ig Foi s. Co & Em ); Dir % cha % Inc 650	reign sa mpaq iployees ectors airman: .: DE. A 0-857-15	Compute Compute wn 0.7 Patricia dd.: 300 501. Inte	of 704 or 5/02 000; st 7% of C. Dun 00 Hand rnet: w	rev. 04 . Agile ockhold stock (2 n; CEO ver St., vw.hp.co	dep. rate: nt Tech. ers: 158,2 2/05 proxy) and Presic Palo Alto, ( om.	spun off 45. Offic Non-ex lent: Mark CA 94304	ers ecution Hur
Currer ANNU of chang Sales "Cash	nt Liab. AL RAI je (per sh) Flow" nds Moluce	FES Pas ) 10 95 65 65 111 111	26630 st Pa Yrs. 5 Y 5% -3. 5% -5. 5% -5. 5% 2. 5% 8. ALES (\$	28588 st Est' 'rs. to 0% 5% 5% 0% 0%	31460 d '02-'04 '08-'10 9.0% 13.5% 15.5% 7.5% 5.5% Full	Fisc be than first net com this net	a be n is a blush isn't pany s year,	06 (b tter ppare 1, our very started which	egan year ent fr foreca imp d to ex trims	Nove for om a st of a pressiv spense 13 cent	mber Hewle quick a 5% g e. H the conts fro	1st) s ett-Pa k glan gain in oweve ost of om our	should ackard ace. An a share options share	l di l ex t po e it e ha s th on a an	gital pand rtfolio will rdwar e olde going d a l	photo its rea of so contin re, alt er line margi ikely	prin ich in ftware iue to hough es. Tr n pre furth	service offer offer it wi ssure er sal	It also ces, and ings. And r a wid ll phase here wil owing to es-mix s	intend to wide d, of co e rang out sor l surel compet hift to	s t n it urse ne c y b itio war
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### Price Earnings Ratios

- P/E Ratios are a function of two factors
  - Required Rates of Return (k)
  - Expected growth in Dividends
- Uses
  - Relative valuation
  - Extensive Use in industry

### P/E Ratio: No Expected Growth

$$P_{0} = \frac{E_{1}}{k}$$

$$\frac{P_{0}}{E_{1}} = \frac{1}{k}$$

- E<sub>1</sub> expected earnings for next year
   E<sub>1</sub> is equal to D<sub>1</sub> under no growth
- k required rate of return

### P/E Ratio with Constant Growth

$$P_{0} = \frac{D_{1}}{k - g} = \frac{E_{1}(1 - b)}{k - (b \times ROE)}$$
$$\frac{P_{0}}{E_{1}} = \frac{1 - b}{k - (b \times ROE)}$$

b = retention ratio
ROE = Return on Equity

### Numerical Example: No Growth

$$E_0 = $2.50 ext{ g} = 0 ext{ k} = 12.5\%$$
  
 $P_0 = D/k = $2.50/.125 = $20.00$   
 $PE = 1/k = 1/.125 = 8$ 

### Numerical Example with Growth

b = 60% ROE = 15% (1-b) = 40%  
E<sub>1</sub> = 
$$2.50 (1 + (.6)(.15)) = 2.73$$
  
D<sub>1</sub> =  $2.73 (1-.6) = 1.09$   
k = 12.5% g = 9%  
P<sub>0</sub> = 1.09/(.125-.09) =  $31.14$   
PE =  $31.14/2.73 = 11.4$   
PE =  $(1 - .60) / (.125 - .09) = 11.4$ 

### Table 18.3 Effect of ROE and Plowback on Growth and the P/E Ratio

<b>TABLE 18.3</b>			Plowback Rate ( <i>b</i> )						
Effect of ROE and plowback on growth and the P/E ratio	ROE	0	.25	.50	.75				
	A. Growth rate, g								
	10%	0	2.5%	5.0%	7.5%				
	12	0	3.0	6.0	9.0				
	14	0	3.5	7.0	10.5				
		B. P/E ratio							
	10%	8.33	7.89	7.14	5.56				
	12	8.33	8.33	8.33	8.33				
	14	8.33	8.82	10.00	16.67				

### Pitfalls in P/E Analysis

- Use of accounting earnings
  - Earnings Management
  - Choices on GAAP
- Inflation
- Reported earnings fluctuate around the business cycle.

## Figure 18.6 P/E Ratios for Different Industries, 2006



### Other Comparative Value Approaches

- Price-to-book ratio
- Price-to-sales ratio
- Price-to-cash-flow ratio

### Figure 18.7 Market Valuation Statistics

