Multi Stage Growth

Capital Budgeting

- Calculating Cash Flows
- Capital Rationing

Price to Earnings Ratio (P/E)

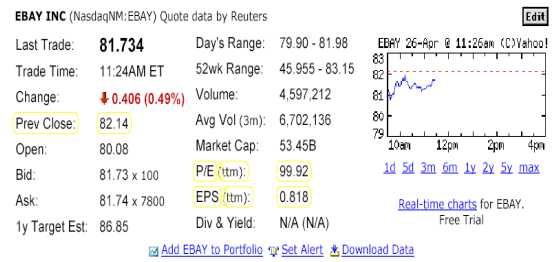
A P/E ratio ("share price" over "earnings per share") is often viewed as an indicator of how "good" a firm is.

Using the Gordon Growth Model,

$$\frac{P_0}{EPS_1} = \frac{1-b}{r-g}$$

- P/E ratios are primarily affected by the growth rate
  - Compare firms in the same risk class and plowback ratio, i.e. "r" and "b" are more or less the same. Then, a high "g" means a high P/E ratio.

Lets look at some examples: *EBAY, DELL and General Motors*



EBAY INC (NasdaqNM:EBAY) Quote data by Reuters — Edit

Last Trade:	81.734	Day's Range:	79.90 - 81.98
Trade Time:	11:24AM ET	52wk Range:	45.955 - 83.15
Change:	0.406 (0.49%)	Volume:	4,597,212
Prev Close:	82.14	Avg Vol (3m):	6,702,136
Open:	80.08	Market Cap:	53.45B
Bid:	81.73 x 100	P/E (ttm):	99.92
Ask:	81.74 x 7800	EPS (ttm):	0.818
1y Target Est:	86.85	Div & Yield:	N/A (N/A)

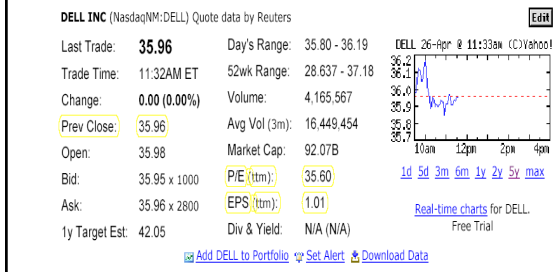
EBAY 26-Apr @ 11:26am (C)Yahoo!

1d 5d 3m 6m 1y 2y 5y max

Real-time charts for EBAY. Free Trial

Add EBAY to Portfolio | Set Alert | Download Data

EBAY's P/E ratio is 99.92



DELL INC (NasdaqNM:DELL) Quote data by Reuters — Edit

Last Trade:	35.96	Day's Range:	35.80 - 36.19
Trade Time:	11:32AM ET	52wk Range:	28.637 - 37.18
Change:	0.00 (0.00%)	Volume:	4,165,567
Prev Close:	35.96	Avg Vol (3m):	16,449,454
Open:	35.98	Market Cap:	92.07B
Bid:	35.95 x 1000	P/E (ttm):	35.60
Ask:	35.96 x 2800	EPS (ttm):	1.01
1y Target Est:	42.05	Div & Yield:	N/A (N/A)

DELL 26-Apr @ 11:33am (C)Yahoo!

1d 5d 3m 6m 1y 2y 5y max

Real-time charts for DELL. Free Trial

Add DELL to Portfolio | Set Alert | Download Data

DELL's P/E ratio is 35.60

GENERAL MOTORS (NYSE:GM) Quote data by Reuters — Edit

Last Trade:	49.92	Day's Range:	49.69 - 50.00
Trade Time:	11:29AM ET	52wk Range:	32.84 - 55.55
Change:	0.74 (1.50%)	Volume:	2,781,800
Prev Close:	49.18	Avg Vol (3m):	5,534,409
Open:	49.95	Market Cap:	28.06B
Bid:	N/A	P/E (ttm):	11.13
Ask:	N/A	EPS (ttm):	4.484
1y Target Est:	57.25	Div & Yield:	2.00 (4.07%)

GM 26-Apr @ 11:32am (C)Yahoo!

1d 5d 3m 6m 1y 2y 5y max

Real-time charts for GM. Free Trial

Add GM to Portfolio | Set Alert | Download Data

GM's P/E ratio 11.13

We will use the Gordon Growth Model to evaluate stocks of firms with time changing growth rates.

Multi Stage Growth

Example: Find the value of a firm for which:

- From year 1 through 12, ROE = 12%,and b=100% (high growth stage)
- From year 13 on, ROE =10% and b=40%
- BE_0 = \$50 and r=10%

Multi Stage Growth

The share price is the discounted value of dividends .

There are no dividend payments for the first 12 years. The first dividend payment is due at time 13.

So … the current stock price is the discounted future stock price at time 12,

Capital Budgeting:

Net Present Value (NPV)

Capital Budgeting: Net Present Value (NPV)

*Corporations will choose a project only if the PV of outflows is smaller than the PV of inflows, i.e. if the **NPV is positive**.*

The NPV of a project is: $$NPV = C_0 + \frac{C_1}{(1+r)^1} + \ldots + \frac{C_n}{(1+r)^n}$$

Where "Net" refers to the fact that C_0 (for example) may be negative (outflow) and represent the investment in the project.

Decision rule*:*

(1) In the case of a single project (or many independent projects): accept the project if and only if NPV>0.

(2) In the case of mutually exclusive projects, accept the project with the highest NPV, if that NPV>0.

Calculating Cash Flows

To get a valid NPV we discount the actual, after-corporate-tax, incremental cash flows, that we get from taking on a project.

Rule 1: Use actual cash flow attributed to the project
- Use incremental cash flows
- Forget sunk costs
- Include opportunity cost of using existing equipment, facilities, etc. as outflows.

Rule 2: Be consistent in the treatment of taxes.
- Discount after-tax cash flows with the after-tax interest rate.

Rule 3: Use actual cash flows – not accounting earnings.

Calculating Project Cash Flows

$\mathbf{C_t}$ = (Project Cash Inflows)$_t$ – (Project Cash Outflows)$_t$
= (Project Operating Revenues)$_t$
– (Project Operating Expenses Except Depreciation)$_t$
– (Project Capital Expenditures)$_t$ – (Project Income Taxes)$_t$

- We don't include accounting depreciation as an expense because it is not a real expense.
- However, depreciation does affect cash flows because it reduces tax payments.

(Project Income Taxes)$_t$ = (Tax Rate)$_t$ x (Project Revenues)$_t$
– (Tax Rate)$_t$ x (Project Expenses Except Depreciation)$_t$
– (Tax Rate)$_t$ x (Depreciation)$_t$

Calculating Project Cash Flows

<u>key equation for project cash flows</u>

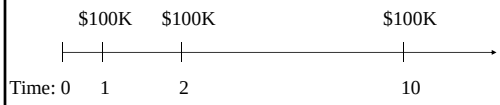
Taxable earnings = Project Operating Revenues – Operating Expenses – Depreciation

$\mathbf{C_t}$ = Project Operating Revenues – Operating Expenses – t(**Taxable earnings**) – Capital Expenditures

- Operating Expenses above are "Operating Expenses Except Depreciation" i.e. do **not** include Depreciation
- "t" is the corporation's marginal tax rate

Example: You have just purchased a machine for $1M with a life of 10 years. Each year it produces revenues of $300,000, and operating expenses of $100,000. Assume that the machine will be depreciated over 10 years using straight-line depreciation, and have no salvage value. The Corporate tax rate is 40%. What are your annual after-tax cash flows?

Depreciation schedule



Calculating Cash Flows:

Date 0: revenues are $0, expenses are $0, capital expenditures are $1M and depreciation is $0

Date 1-10: revenues are $300K, operating expenses are $100K, capital expenditures are $0 and depreciation is $100K

Working Capital

There are typically timing differences between the accounting measure "**Sales – Cost of Goods Sold**" and cash flows. This difference is "**Working Capital**",

Working Capital = Inventories + Accounts Receivable – Accounts Payable

- **Inventory**: An increase in inventory is a real cost – even if these goods are not sold in the current year.
- **Accounts Receivable**: If we haven't received payments we shouldn't count it as a cash flow.
- **Accounts Payable**: If we haven't paid suppliers yet we shouldn't count it as a cash flow.

Change in Working Capital should be treated as an expense

Example 1: You run a chain of stores that sells sweaters. At time 0 you buy 1M sweaters at a price of $30 each. At time 1 you sell 500K sweaters for $60 each and at time 2 you sell 500K sweaters for $60 each. The corporate tax rate is 40%. What are your after tax cash flows?

T	After tax [Sales – Cost of Goods Sold]	Inventory	Change in Working Capital	Cash flow
0				
1				
2				

Example 2: The United Sporting Goods Company (USG) is thinking of replacing its eight-year-old machine used to finish aluminum baseball bats. The new machine will put a satin finish on the bats. Should USG undertake the project?

- A marketing study that cost $200K concludes that the new finish will allow USG to sell the bats for $0.30 more than the old bats which currently wholesale for $8.50. Also sales are predicted to increase by 10% to 176K units per year.
- The new machine costs $280K and has operating costs of $17K per year. The annual operating costs of the old machine are $25K.
- The material, labor, general and administrative costs will remain at $7.00 per bat.
- The machine will require an increase in accounts receivable and inventory net of payables of $40K which will be recovered at the end of the project.

Example 2 (continued):

- The old machine has been completely depreciated. Its current market value is $48K and it is expected to last another 7 years at which time it will have no salvage value.
- The new machine is expected to last 7 years at which time it will have a salvage value of $14K. It will be depreciated for accounting purposes using straight line depreciation assuming no salvage value.
- USG faces corporate tax rate of 34% and the appropriate discount rate is 16%.

Should the project be executed?

Incremental cash revenue:

Incremental operating expenses:

Annual depreciation new machine:

Change in working capital:

Capital expenditure:

After tax interest rate:

	0	1-6	7
Incremental cash revenue			
Incremental operating expenses			
Capital expenditures			
Depreciation			
Other income			
Taxable earnings			
Taxes			
Change in WC			
After tax operating cash flow			

Capital Rationing

In general we would like to think that funds will be made available for any positive NPV>0 project, but in practice this is not the case,

- *It is difficult to raise additional external funds*
- *Banks impose limits on firms' credit lines*

Example: You are a manager with $1M to invest and you have the following possible independent projects:

Project	Cost	PV inflows	Profitability index	NPV
A	$200,000	$300,000		$100,000
B	$500,000	$620,000		$120,000
C	$400,000	$700,000		$300,000
D	$200,000	$275,000		$75,000
E	$100,000	$130,000		$30,000
F	$100,000	$140,000		$40,000

Capital Rationing

To answer this question we calculate the **Profitability Index (PI)**:

$$\text{PI} = \frac{\text{PV(future cash flows)}}{\text{Initial Investment}}$$

Decision rule:

(1) In the case of independent projects accept all projects with PI>1 (this is the same as accepting all projects with NPV>0)

(2) In the case of mutually exclusive projects, among projects with PI>1, start by choosing the one with the highest PI.

Example (continued):

Project	Cost	PV inflows	Profitability index	NPV
A	$200,000	$300,000	1.50	$100,000
B	$500,000	$620,000	1.24	$120,000
C	$400,000	$700,000	1.75	$300,000
D	$200,000	$275,000	1.38	$75,000
E	$100,000	$130,000	1.30	$30,000
F	$100,000	$140,000	1.40	$40,000

First rank the projects: