9. Equity Financing and Stock Valuation. Dividends. Real options

1.1 Damodaran's Approach

- *discounted cash flow valuation,*
- *multiples, relative valuation*,
- *contingent claim (option pricing model).*

> Three groups (compare to 17 DCF methods x 10 methods of tax shield)

- *free cash flow to firm models, FCFF*,
- *free cash flow to equity models, FCFE*,
- *dividend discount models, DDM*.

> DCF methods depend on growth assumptions:

- *stable,*
- *moderate – two stage models*,
- *high – three stage models.*

1.2 DCF methods

Valuation of equity may be completed using all previously discussed valuation models (FCFF, FCFE, EVA, APV etc.). DDM (Dividend Discount Models, Discounted Dividend Valuation Models) models are special, because they use only dividends discounted at cost of equity.

1.3 Asset Value Methods

Asset value methods:
- Book Value (net worth)
- Reconstruction Value
- Adjusted Net Assets Value
- Liquidation Value

1.4 Multiples

Price multiples are ratios of a stock's price to some measure of value or cash flows per share (P/E, P/BV, P/CF, P/S). There are trailing (current) and leading (forward, prospective) ratios.

1.5 General DDM

The stock's expected (intrinsic, theoretical) price, P_0, is given by

$$(1) \qquad P_0 = \frac{D_1}{1 + R_E} + \frac{D_2}{(1 + R_E)^2} + ... + \frac{D_\infty}{(1 + R_E)^\infty}$$

or

$$(2) \qquad P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1 + R_E)^t}$$

where

D_t is dividend expected in year t,
R_E is discount rate (cost of equity).

1.5.1 Zero Dividend Growth Model

With zero growth, the value of a share of stock is equal to the value of a perpetual dividend dollar amount divided by the discount rate.

$$(3) \qquad P_0 = \frac{D}{R_E}$$

1.5.2 Constant Dividend Growth - Gordon Valuation Model

$$(4) \qquad P_0 = \frac{D_1}{1 + R_E} + \frac{D_2(1 + g)}{(1 + R_E)^2} + ... + \frac{D_1(1 + g)^\infty}{(1 + R_E)^\infty}$$

where g is the constant rate of growth in dividends.

When simplified, this equation becomes

$$(5) \qquad P_0 = \frac{D_1}{R_E - g}$$

The dividend growth rate can be calculated as

$$(6) \qquad g = \text{retention ratio} * ROE = (1 - \text{payout ratio}) * \text{book } ROE = (1 - \frac{\text{dividends}}{\text{net income}}) * \frac{\text{net income}}{\text{equity}}$$

The same result is obtained with the famous formula for sustainable growth rate:

$(7) \qquad g = PRAT$

where

P - net income / sales,
R - retention ratio (retained earnings / net income),
A - sales /assets,
T - assets / equity.

1.5.3 Growth Options

The current stock price of a company is related to its earnings per share and the growth options:

(8) $\quad P_0 = \dfrac{EPS}{R_E} + PVGO$ per share

PVGO present value of growth options

(9) $\quad P/E = \dfrac{P_0}{EPS} = \dfrac{1}{R_E} + \dfrac{PVGO \text{ per share}}{EPS}$

1.6 Contingent Claim Approach

According to the Black-Scholes model, the value of a call option is given as

(10) $\quad C = SN(d_1) - Ee^{-rT}N(d_2)$

where

$$d_1 = \frac{\ln(S/E) + (r + \sigma_s^2/2)T}{\sigma_s \sqrt{T}}$$

$$d_2 = d_1 - \sigma_s \sqrt{T}$$

σ_s^2 is the variance of the asset's returns

$N(x)$ is the cumulative probability for a unit normal variable calculated at a value of x.

1.7 Rights offering

A company can raise capital through a public issue of shares or through a private placement. Stockholders often have preemptive rights to purchase on a pro rata basis new issue of common stock.

Assume that a company has n_0 shares outstanding and the current market price per share is P_0. The company offers Δn_0 new shares to existing shareholders at the subscription price P_s. The market price of a share after the rights offering should be equal to the new company's total value of equity divided by the new number of shares, all else remaining the same:

(11) $\quad P_1 = \dfrac{n_0 P_0 + \Delta n_0 P_s}{n_0 + \Delta n_0}$

where

P_0 is the market price of the old, or no rights-on shares
P_s is the subscription price
n_0 is the number of shares outstanding before the offering
Δn_0 is the number of new shares

The new market price of a share is also equal to the subscription price plus the value of preemptive rights (number of rights per share times the price of a right):

(12) $\quad P_1 = P_s + n_r P_r$

P_r is the value of each right
n_r is the number of rights required to buy a new share

Thus, the following relationship exists

(13) $\quad \dfrac{n_0 P_0 + \Delta n_0 P_s}{n_0 + \Delta n_0} = P_s + n_r P_r$

The number of rights per new share is equal to the number of old shares divided by the number of new shares.

(14) $\quad n_r = \dfrac{n_0}{\Delta n_0}$

So the following relation exists

(15) $\quad \dfrac{n_r \Delta n_0 P_0 + \Delta n_0 P_s}{n_r \Delta n_0 + \Delta n_0} = P_s + n_r P_r$

and

(16) $\quad \dfrac{n_r P_0 + P_s}{n_r + 1} = P_s + n_r P_r$

The price of a right is given as

(17) $\quad P_r = \dfrac{P_0 - P_s}{n_r + 1}$

Of course the following relation between the new market price and the old market price exists.

(18) $\quad P_1 = P_0 - P_r$

2. Real Options

2.1 Real options

The DCF approach does not fully capture the value of an investment. Many investments have opportunities, such as abandonment, expansion, deferment that may change future cash flows. These options provide the flexibility to modify decisions in the future and they are often referred as flexibility options. Thus DCF values should be adjusted with real options values. The revised NPV is referred to as strategic NPV (static NPV + value of flexibility options). Option values are determined using BSM model or binomial model.

Huge differences between the DCF values and the market values of some companies (especially technology, internet-related, biotechnological and natural resource companies) are explained by the existence of flexibility options. Examples: Amazon, Cisco Systems, Lycos. Yahoo!.

Real Option Types

Option type	Description
Abandonment	The option to stop use of the assets and realize the salvage value.
Switch	The option to change output or input in response to changes in demand/supply or output.
Exit and re-enter	The option to exit and reenter the investment activity
Deferment	The option to delay investment cost and output.
Staged investment	The option to make investment in successive stages and to abandon the investment project.
Growth	The option to capitalize on an earlier investment and development.
Interacting options	Multiple options.

A call buyer expects the price of the underlying asset (extracted substance) to rise over the exercise price (production cost). If the current price exceeds the exercise price the option is „in-the-money". Options are not free.

1. Options have **fixed maturity**, they expire on a certain date. If the holder of the option does not exercise it before this maturity date, the option expires.
2. Options can be exercised at a specified price called the **exercise price** or **striking price**. An **American option** is one that can be exercised at any time before maturity. This contracts with a **European option** that can be exercised only at maturity.
3. Options **may or may not be exercised**.
4. Options do not affect the market value of the underlying asset. **Options derive their value from the underlying asset on which they are based**.

2.2 Valuation of Natural Resources

Mineral resources may be valued using option pricing model (binomial or BSM). The owners of natural resources have an option to exploit them if the price is higher than unit production cost or to close the mine.