Business Value

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A philosophical basis for Valuation

- Many investors believe that the pursuit of 'true value' based upon financial fundamentals is a fruitless one in markets where prices often seem to have little to do with value.

- There have always been investors in financial markets who have argued that market prices are determined by the perceptions (and misperceptions) of buyers and sellers, and not by anything as prosaic as cashflows or earnings.

Perceptions matter, but they cannot be all that matter.

- Asset prices cannot be justified by merely using the "bigger fool" theory.

Misconceptions about Valuation

- Myth 1: A valuation is an objective search for "true" value
  - Truth 1.1: All valuations are biased. The only questions are how much and in which direction.
  - Truth 1.2: The direction and magnitude of the bias in your valuation is directly proportional to who pays you and how much you are paid.
- Myth 2.: A good valuation provides a precise estimate of value
  - Truth 2.1: There are no precise valuations
  - Truth 2.2: The payoff to valuation is greatest when valuation is least precise.
- Myth 3: . The more quantitative a model, the better the valuation
  - Truth 3.1: One's understanding of a valuation model is inversely proportional to the number of inputs required for the model.
  - Truth 3.2: Simpler valuation models do much better than complex ones.

Approaches to Valuation

- **Discounted cashflow valuation:** Relates the value of an asset to the present value of expected future cashflows on that asset.
- **Relative valuation**: Estimates the value of an asset by looking at the pricing of 'comparable' assets relative to a common variable like earnings, cashflows, book value or sales.
- **Contingent claim valuation:** Uses option pricing models to measure the value of assets that share option characteristics.

Basis for all valuation approaches

- The use of valuation models in investment decisions (i.e., in decisions on which assets are under valued and which are over valued) are based upon
  - a perception that markets are inefficient and make mistakes in assessing value
  - an assumption about how and when these inefficiencies will get corrected
- In an efficient market, the market price is the best estimate of value. The purpose of any valuation model is then the justification of this value.

Efficient Market Hypothesis (EMH)

- **Definition 1**: A market is said to be efficient with respect to some information set, I_t, if it is impossible to make economic profits on the basis of information set I_t.
  - **Economic profits**: Profits after adjusting for risk and transaction costs (such as, brokerage fees, investment advisory fees).
    - Economic profits = Actual return - Expected return - Transaction costs
    - Expected Return: CAPM provides one estimate of expected return. Other estimates: Arbitrage Pricing Theory, Historical Industry Returns.

EMH continued:

Models of Expected Returns

- CAPM: Expected return on stock i = Riskfree rate + (Beta of i with respect to Market)*(Expected return on Market - Riskfree rate)

- APT: Expected return on stock i = Riskfree rate + (Beta of i with respect to Factor 1)*(Expected return on Factor 1 - Riskfree rate) + (Beta of i with respect to Factor 2)*(Expected return on Factor 2 - Riskfree rate) + ...

EMH continued

Models of Expected Returns

- Historical Industry Returns: Expected Return on stock i = Average historical return of other firms in the same industry as company i.

EMH continued:

- Information set:
  - Weak form of EMH : Past history of prices of the particular security.
  - Semistrong form of EMH: All publicly available information.
  - Strong form of EMH: All public and private information.

Efficient Market Hypothesis

- **Definition 2**: If capital markets are efficient then purchase or sale of any security at the prevailing market price is a zero-NPV transaction.

- **Definition 3** (Technical definition): The capital market is efficient with respect to an information set if and only if revealing that information to all investors would change neither equilibrium prices nor portfolios.

Discounted Cash Flow Valuation

- **What is it**: In discounted cash flow valuation, the value of an asset is the present value of the expected cash flows on the asset.
- **Philosophical Basis**: Every asset has an intrinsic value that can be estimated, based upon its characteristics in terms of cash flows, growth and risk.
- **Information Needed**: To use discounted cash flow valuation, you need
  - to estimate the life of the asset
  - to estimate the cash flows during the life of the asset
  - to estimate the discount rate to apply to these cash flows to get present value

Discounted Cashflow Valuation: Basis for Approach

$$\text{Value} = \sum_{t=1}^{t=n} \frac{CF_t}{(1+r)^t}$$

where,

n = Life of the asset

CF_t = Cashflow in period t

r = Discount rate reflecting the riskiness of the estimated cashflows

Advantages of DCF Valuation

- Since DCF valuation, done right, is based upon an asset's fundamentals, it should be less exposed to market moods and perceptions.
- If good investors buy businesses, rather than stocks (the Warren Buffett adage), discounted cash flow valuation is the right way to think about what you are getting when you buy an asset.
- DCF valuation forces you to think about the underlying characteristics of the firm, and understand its business. If nothing else, it brings you face to face with the assumptions you are making when you pay a given price for an asset.

Disadvantages of DCF valuation

- Since it is an attempt to estimate intrinsic value, it requires far more inputs and information than other valuation approaches
- These inputs and information are not only noisy (and difficult to estimate), but can be manipulated by the savvy analyst to provide the conclusion he or she wants.
- For example:
  - An entrepreneur can get a high valuation by overestimating cashflows and/or underestimating discount rates.
  - A venture capitalist can buy equity from an entrepreneur at a lower price by underestimating cashflows.
  - An entrepreneur and venture capitalist can get a higher price for their IPO by overestimating cashflows and/or underestimating discount rates.

Disadvantages of DCF valuation

- In an intrinsic valuation model, there is no guarantee that anything will emerge as under- or over-valued. Thus, it is possible in a DCF valuation model, to find every stock in a market to be over-valued. This can be a problem for
  - equity research analysts, whose job it is to follow sectors and make recommendations on the most under- and over-valued stocks in that sector
  - equity portfolio managers, who have to be fully (or close to fully) invested in equities

When DCF Valuation works best

- This approach is easiest to use for assets (firms) whose
  - cashflows are currently positive and
  - can be estimated with some reliability for future periods, and
  - where a proxy for risk that can be used to obtain discount rates is available.
- It works best for investors who either
  - have a long time horizon, allowing the market time to correct its valuation mistakes and for price to revert to "true" value or
  - are capable of providing the catalyst needed to move price to value, as would be the case if you were an activist investor or a potential acquirer of the whole firm

Relative Valuation

- **What is it?**: The value of any asset can be estimated by looking at how the market prices "similar" or 'comparable" assets.
- **Philosophical Basis**: The intrinsic value of an asset is impossible (or close to impossible) to estimate. The value of an asset is whatever the market is willing to pay for it (based upon its characteristics)
- **Information Needed**: To do a relative valuation, you need
  - an identical asset, or a group of comparable or similar assets
  - a standardized measure of value (in equity, this is obtained by dividing the price by a common variable, such as earnings or book value)
  - and if the assets are not perfectly comparable, variables to control for the differences
- **Market Inefficiency**: Pricing errors made across similar or comparable assets are easier to spot, easier to exploit and are much more quickly corrected.

Advantages of Relative Valuation

- Relative valuation is much more likely to reflect market perceptions and moods than discounted cash flow valuation. This can be an advantage when it is important that the price reflect these perceptions as is the case when
  - the objective is to sell a security at that price today (as in the case of an IPO)
- With relative valuation, there will always be a significant proportion of securities that are under- valued and over-valued.
- Since portfolio managers are judged based upon how they perform on a relative basis (to the market and other money managers), relative valuation is more tailored to their needs
- Relative valuation generally requires less information than discounted cash flow valuation (especially when multiples are used as screens)

Disadvantages of Relative Valuation

- A portfolio that is composed of stocks which are undervalued on a relative basis may still be overvalued, even if the analysts' judgments are right. It is just less overvalued than other securities in the market.
- Relative valuation is built on the assumption that markets are correct in the aggregate, but make mistakes on individual securities. To the degree that markets can be over or under valued in the aggregate, relative valuation will fail
- Relative valuation may require less information in the way in which most analysts and portfolio managers use it. However, this is because implicit assumptions are made about other variables (that would have been required in a discounted cash flow valuation). To the extent that these implicit assumptions are wrong the relative valuation will also be wrong.

Disadvantages of Relative Valuation

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- Value of Firm = $$V_0 = \frac{FCFF_1}{k - g}$$
- $FCFF_1$: expected free cash flow to the firm
- k: firm's cost of capital
- g: growth in the expected free cash flow to the firm

- Dividing both sides by $FCFF_1$ yields the Value/FCFF multiple for a stable growth firm:

- $$\frac{V_0}{FCFF_1} = \frac{1}{k - g}$$

- The Value/FCFF multiple for a stable growth firm:

$$\frac{V_0}{FCFF_1} = \frac{1}{k - g}$$

- Value/FCFF increases as g increases.
- Value/FCFF decreases as k increases.
- k is a function of the firm's line of business.

- The Value/FCFF multiple for a stable growth firm:

$$\frac{V_0}{FCFF_1} = \frac{1}{k - g}$$

- Hence, picking a certain number for the Value/FCFF ratio implies certain assumptions about k and g.

- Similarly, for
- Price/Earnings,
- Price/Sales,
- Price/EBITDA, etc.

When relative valuation works best..

- This approach is easiest to use when
  - there are a large number of assets comparable to the one being valued
  - these assets are priced in a market
  - there exists some common variable that can be used to standardize the price
- This approach tends to work best for investors
  - who have relatively short time horizons
  - are judged based upon a relative benchmark (the market, other portfolio managers following the same investment style etc.)
  - can take actions that can take advantage of the relative mispricing; for instance, a portfolio manager specializing in technology stocks can buy the under valued and sell the over valued assets

Financial Data about Companies

2017 Financial

	Facebook	Microsoft	Google	Industry Median	Market Median1
Current Ratio	5.12	2.60	5.92	4.33	1.44
Quick Ratio	4.96	2.41	5.70	24.18	4.83
Leverage Ratio	1.48	1.83	1.25	1.31	5.46
Total Debt/Equity	0.16	0.18	0.07	0.09	0.98
Interest Coverage	11.51	59.60	167.87	3.12	6.13

2017 Valuation

	Facebook	Microsoft	Google	Industry Median	Market Median1
Price/Sales Ratio	10.87	3.57	5.36	5.18	1.19
Price/Earnings Ratio	121.95	15.48	20.83	27.10	17.12
Price/Book Ratio	3.06	3.91	3.57	3.46	1.90
Price/Cash Flow Ratio	26.74	8.33	14.62	16.29	7.78

Price/Cash Flow Ratio for different **k** (in bold) and *g* (in italics)

k -->	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
g											
0.5%	10.53	9.52	8.70	8.00	7.41	6.90	6.45	6.06	5.71	5.41	5.13
1.0%	11.11	10.00	9.09	8.33	7.69	7.14	6.67	6.25	5.88	5.56	5.26
1.5%	11.76	10.53	9.52	8.70	8.00	7.41	6.90	6.45	6.06	5.71	5.41
2.0%	12.50	11.11	10.00	9.09	8.33	7.69	7.14	6.67	6.25	5.88	5.56
2.5%	13.33	11.76	10.53	9.52	8.70	8.00	7.41	6.90	6.45	6.06	5.71
3.0%	14.29	12.50	11.11	10.00	9.09	8.33	7.69	7.14	6.67	6.25	5.88
3.5%	15.38	13.33	11.76	10.53	9.52	8.70	8.00	7.41	6.90	6.45	6.06
4.0%	16.67	14.29	12.50	11.11	10.00	9.09	8.33	7.69	7.14	6.67	6.25
4.5%	18.18	15.38	13.33	11.76	10.53	9.52	8.70	8.00	7.41	6.90	6.45
5.0%	20.00	16.67	14.29	12.50	11.11	10.00	9.09	8.33	7.69	7.14	6.67
5.5%	22.22	18.18	15.38	13.33	11.76	10.53	9.52	8.70	8.00	7.41	6.90
6.0%	25.00	20.00	16.67	14.29	12.50	11.11	10.00	9.09	8.33	7.69	7.14
6.5%	28.57	22.22	18.18	15.38	13.33	11.76	10.53	9.52	8.70	8.00	7.41
7.0%	33.33	25.00	20.00	16.67	14.29	12.50	11.11	10.00	9.09	8.33	7.69
7.5%	40.00	28.57	22.22	18.18	15.38	13.33	11.76	10.53	9.52	8.70	8.00
8.0%	50.00	33.33	25.00	20.00	16.67	14.29	12.50	11.11	10.00	9.09	8.33
8.5%	66.67	40.00	28.57	22.22	18.18	15.38	13.33	11.76	10.53	9.52	8.70
9.0%	100.00	50.00	33.33	25.00	20.00	16.67	14.29	12.50	11.11	10.00	9.09

Contingent Claim (Option) Valuation

- Options have several features
  - They derive their value from an underlying asset, which has value
  - The payoff on a call (put) option occurs only if the value of the underlying asset is greater (lesser) than an exercise price that is specified at the time the option is created. If this contingency does not occur, the option is worthless.
  - They have a fixed life
- Any security or project that shares these features can be valued as an option.

Direct Examples of Options

- **Listed options**, which are options on traded assets, that are issued by, listed on and traded on an option exchange.
- **Warrants**, which are call options on traded stocks, that are issued by the company. The proceeds from the warrant issue go to the company, and the warrants are often traded on the market.

Indirect Examples of Options

- Equity in a deeply troubled firm - a firm with negative earnings and high leverage - can be viewed as an option to liquidate that is held by the stockholders of the firm. Viewed as such, it is a call option on the assets of the firm.
- The reserves owned by natural resource firms can be viewed as call options on the underlying resource, since the firm can decide whether and how much of the resource to extract from the reserve,
- The patent owned by a firm or an exclusive license issued to a firm can be viewed as an option on the underlying product (project). The firm owns this option for the duration of the patent.

Advantages of Using Option Pricing Models

- Option pricing models allow us to value assets that we otherwise would not be able to value. For instance, equity in deeply troubled firms and the stock of a small, bio-technology firm (with no revenues and profits) are difficult to value using discounted cash flow approaches or with multiples. They can be valued using option pricing.
- Option pricing models provide us fresh insights into the drivers of value. In cases where an asset is deriving its value from its option characteristics, for instance, more risk or variability can increase value rather than decrease it.

Disadvantages of Option Pricing Models

- When real options (which includes the natural resource options and the product patents) are valued, many of the inputs for the option pricing model are difficult to obtain. For instance, projects do not trade and thus getting a current value for a project or a variance may be a daunting task.
- The option pricing models derive their value from an underlying asset. Thus, to do option pricing, you first need to value the assets. It is therefore an approach that is an addendum to another valuation approach.

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