Overview of Financial Valuation Models

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Key Definitions

- Valuation – the estimation of an asset’s value based either on variables perceived to be related to future investment returns or on comparisons with similar assets.
- Intrinsic value – the value of the asset given a hypothetically complete understanding of the asset’s investment characteristics.
- Rational efficient markets formulation – investors will not incur expenses of gathering information unless they expect to be rewarded by higher gross returns.

Source: Equity Asset Valuation – 3rd Edition
The Valuation Process

- Understanding the business – industry and competitive analysis, financial statement analysis.
- Forecasting company performance – forecasts of sales, earnings, dividends, and financial position – provides inputs to models.
- Selecting the appropriate valuation model – very important as not all models are effective on a universal basis.
- Converting the forecasts to a valuation – this involves judgment in addition to entering the historical data.
- Applying the valuation conclusions to:
  - A particular stock,
  - Providing an opinion about the price of a transaction, or
  - Evaluating the economic merits of a potential strategic investment.

Source: Equity Asset Valuation – 3rd Edition
Earnings Quality – Accrual Ratios

- The purpose of this ratio analysis is to identify the cash component of earnings versus the accrual component.
  - These ratios are referred to as "scaled measures" that analysts can use as simple measures they can readily compute and use in their evaluation of a firm's quality of earnings.
  - Typically these calculations are completed using "standardized formats" (e.g., financial statements from Compustat, Thomson, FactSet, or other providers of financial data).
  - A key advantage of using this standard data is that it facilitates cross-sectional comparisons across companies.
  - Net operating assets (NOA) is the difference between operating assets (total assets less cash) and operating liabilities (total liabilities less total debt).
  - Cash is excluded (defined as cash and short-term investments) and debt as they measures are essentially discretion free. ("t" refers to time period and "t - 1" is the prior year).

Earnings Quality – Accrual Ratios

- The first scaled measure, the balance-sheet-based accruals ratio is defined as:

\[
\text{Accruals ratio, } B/S = \frac{\text{NOA} (t) - \text{NOA} (t-1)}{\frac{\text{NOA} (t) + \text{NOA} (t-1)}{2}}
\]

- From a cash flow perspective, a measure of aggregate accruals can be defined as follows:

\[
\text{Aggregate accruals - Cash Flow} = [\text{NI}_t - (\text{CFO}_t + \text{CFI}_t)]
\]

- The ratio above is the **cash-flow-statement aggregate accruals**.

- The scaled measure is called as the **cash-flow statement-based accruals ratio**. This ratio is defined as follows:

\[
\text{Accruals Ratio - Cash Flow} = \frac{[\text{NI}_t - (\text{CFO}_t + \text{CFI}_t)]}{\frac{\text{NOA} (t) + \text{NOA} (t-1)}{2}}
\]

Definitions – NOA = Net Operating Assets; NI = Net Income; CFO = Cash Flow from Operations; CFI = Cash Flow from Investing; \( t \) = current period; and \( t - 1 \) equals prior period.

Beneish M-Score Model – Ratio Definitions

- **Days Receivable Index (DSRI)** is:
  \[ DSRI = \frac{\text{Net Receivables}_t}{\text{Sales}_t} \div \frac{\text{Net Receivables}_{t-1}}{\text{Sales}_{t-1}} \]

- **Gross Margin Index (GMI)** is:
  \[ GMI = \frac{(\text{Sales}_{t-1} - \text{COGS}_{t-1})}{\text{Sales}_{t-1}} \div \frac{(\text{Sales}_t - \text{COGS}_t)}{\text{Sales}_t} \]

- **Asset Quality Index (AQI)** is:
  \[ AQI = \frac{1 - \frac{\text{Current Assets}_t + \text{PP&E}_t + \text{Securities}_t}{\text{Total Assets}_t}}{1 - \frac{\text{Current Assets}_{t-1} + \text{PP&E}_{t-1} + \text{Securities}_{t-1}}{\text{Total Assets}_{t-1}}} \]

- **Sales Growth Index (SGI)** is:
  \[ SGI = \frac{\text{Sales}_t}{\text{Sales}_{t-1}} \]

- **Depreciation Index (DEPI)** is:
  \[ DEPI = \frac{\text{Depreciation}_{t-1}}{\text{PP&E}_{t-1} + \text{Depreciation}_{t-1}} \div \frac{\text{Depreciation}_t}{\text{PP&E}_t + \text{Depreciation}_t} \]

- **SG&A Expense Index (SGAI)** is:
  \[ SGAI = \frac{\text{SG&A Expense}_t}{\text{Sales}_t} \div \frac{\text{SG&A Expense}_{t-1}}{\text{Sales}_{t-1}} \]

- **Leverage Index (LVGI)** is:
  \[ LVGI = \frac{\text{Current Liabilities}_t + \text{Total Long Term Debt}_t}{\text{Total Assets}_t} \div \frac{\text{Current Liabilities}_{t-1} + \text{Total Long Term Debt}_{t-1}}{\text{Total Assets}_{t-1}} \]

- **Total Accruals to Total Assets (TATA)** is:
  \[ TATA = \frac{(\text{Income from Continuing Operations}_t - \text{Cash Flows from Operations}_t)}{\text{Total Assets}_t} \]
# Beniesh M-Score Definitions

<table>
<thead>
<tr>
<th>Definitions</th>
<th>Acronym</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Year</td>
<td>CY</td>
</tr>
<tr>
<td>Previous year</td>
<td>PY</td>
</tr>
<tr>
<td>Cash</td>
<td>C</td>
</tr>
<tr>
<td>Accounts Receivable</td>
<td>AR</td>
</tr>
<tr>
<td>Cost of Goods sold</td>
<td>COGS</td>
</tr>
<tr>
<td>Current assets</td>
<td>CA</td>
</tr>
<tr>
<td>Current Liabilities</td>
<td>CL</td>
</tr>
<tr>
<td>Working Capital</td>
<td>WC</td>
</tr>
<tr>
<td>Depreciation and Amortization Expense</td>
<td>D&amp;A</td>
</tr>
<tr>
<td>Depreciation Expense</td>
<td>DE</td>
</tr>
<tr>
<td>Property Plant and equipment</td>
<td>PPE</td>
</tr>
<tr>
<td>Sales, General and Administrative Expense</td>
<td>SGA</td>
</tr>
<tr>
<td>Total Assets</td>
<td>TA</td>
</tr>
<tr>
<td>Income taxes payable</td>
<td>TP</td>
</tr>
<tr>
<td>Current Portion of Long-term Debt</td>
<td>CP LT DEBT</td>
</tr>
<tr>
<td>Long-Term Debt</td>
<td>LTD</td>
</tr>
</tbody>
</table>
Beneish M-Score Ratio Interpretation

Formula
Based on an eight factor model that gives a score.

\[
M \text{ Score} = -4.840 + 0.920 \times DSRI + 0.528 \times GMI + 0.404 \times AQ + 0.892 \times SGI + 0.115 \times DEPI - 0.172 \times SGAI - 0.327 \times LVGI + 4.697 \times TATA
\]

Note: if \( M > -2.22 \), firm is likely to be a manipulator

<table>
<thead>
<tr>
<th>Ratio Descriptions</th>
<th>Acronym</th>
<th>Analysis Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Days Sales in Receivables Index</td>
<td>DSRI</td>
<td>Greater than 1 indicates inflated revenue</td>
</tr>
<tr>
<td>2 Gross Margin Index</td>
<td>GMI</td>
<td>Greater than 1 indicates a deterioration in the margin</td>
</tr>
<tr>
<td>3 Asset Quality Index</td>
<td>AQI</td>
<td>Great than 1 indicates cost deferral and a reduction in asset quality</td>
</tr>
<tr>
<td>4 Sales Growth Index</td>
<td>SGI</td>
<td>Greater than 1 indicates fast growth that induces manipulation</td>
</tr>
<tr>
<td>5 Depreciation Index</td>
<td>DEPI</td>
<td>Greater than 1 indicates upward revision of a companies PPE which increases income</td>
</tr>
<tr>
<td>6 Sales, General and Administrative Expenses Index</td>
<td>SGAI</td>
<td>A large increase in sales growth to SGAI indicates negative indication</td>
</tr>
<tr>
<td>7 Total Accruals to Total Assets Index</td>
<td>TATA</td>
<td>Large accruals are associated with earnings manipulation</td>
</tr>
<tr>
<td>8 Leverage Index</td>
<td>LVGI</td>
<td>Greater than 1 indicates too much leverage</td>
</tr>
</tbody>
</table>
Streams of Expected Cash Flows - DDM

- Differences in cash flow may be caused by differences in:
  - Business risk,
  - Operating risk (use of fixed assets in production), or
  - Financial risk or leverage (use of debt in the capital structure).

- Three alternative definitions of cash flow:
  - Dividend discount model
  - Free cash flow model
  - Residual income model

- The dividend discount model (DDM) accounts for reinvested earnings when it takes all future dividends into account.

- The relative stability of dividends makes the DDM less volatile than alternative DCF models.

- Dividend policy practices have international differences, and change through time even in one market.

- A lower percentage of U.S. companies pay dividends.

- For non-dividend paying companies – analysts usually prefer a model that defines returns at the company level (free cash flow or residual income) rather than at the stockholder level.

Source: Equity Asset Valuation – 3rd Edition
Streams of Expected Cash Flows - DDM

- Using stylized growth patterns
  - Constant growth forever (the Gordon growth model)
  - Two-distinct stages of growth (the two-stage growth model and the H model)
  - Three distinct stages of growth (the three-stage growth model)
- Forecast dividends for a visible time horizon, and then handle the value of the remaining future dividends either by:
  - Assigning a stylized growth pattern to dividends after the terminal point
  - Estimate a stock price at the terminal point using some method such as a multiple of forecasted book value or earnings per share
- The stock’s DDM value is then found by discounting the dividends (and forecasted price, if any) back to the present.
- The challenge is to:
  - Choose an appropriate model for the stock’s future dividends, and
  - Develop quality inputs to that model.
Streams of Expected Cash Flows – FCFF & FCFE

- Free Cash Flow to the Firm (FCFF) is cash flow from operations minus capital expenditures.
- Capital expenditures are defined as reinvestment in new assets and includes both fixed assets (FCI) and working capital (WCI) investment.
- The value of common equity (FCFE) is the present value of FCFF (total value of the company) minus the market value of outstanding debt.
- Free Cash Flow to Equity (FCFE) is cash flow from operations minus capital expenditures.
- The FCFF model may be easier to apply when the company’s debt structure is expected to change significantly over time.
- FCFF or FCFE can be calculated for any company.
- FCFE can be:
  - Used with non-dividend paying companies
  - Viewed as what a company can afford to pay in dividends
  - Appropriate for investors who want to take a control perspective.

Source: Equity Asset Valuation – 3rd Edition
Streams of Expected Cash Flows – FCFF & FCFE

- Defining returns as free cash flows and using the FCFE (and FCFF) models are most suitable when:
  - The company is not dividend paying
  - The company is dividend paying, but dividends significantly exceed or fall short of free cash flow to equity.
  - The company’s free cash flows align with the company’s profitability within a forecast horizon with which the analyst is comfortable.
  - The investor takes a control perspective.
- FCFF is a **pre-debt** cash flow concept
- FCFE is a **post-debt** cash flow concept

Source: Equity Asset Valuation – 3rd Edition
Forecasting Free Cash Flow – FCFF from Net Income

- Free cash flow to the firm (FCFF) is the cash flow available to the firm’s suppliers of capital after all operating expenses (including taxes) have been paid and operating investments have been made. The firm’s suppliers of capital include creditors, bondholders and common stockholders (and occasionally preferred stockholders that we will ignore until later).

- Free cash flow to the firm is:

\[
FCFF = \text{Net income available to common shareholders} \\
\text{Plus: Net Non-Cash Charges (NCC aka DDA)} (1) \\
\text{Plus: Interest Expense times (1 – Tax rate)} \\
\textbf{Less: Investment in Fixed Capital (FCI)} \\
\textbf{Less: Investment in Working Capital (WCI)}
\]

(1) Common non-cash charges represent depreciation, depletion, and amortization expenses, but see slide 21 for other examples.

Source: Equity Asset Valuation – 3rd Edition
Forecasting Free Cash Flow – FCFF from Net Income

- This equation can be written more compactly as: (Where $\text{Inv(FC)} = \text{FCI}$ and $\text{Inv(WC)} = \text{WCI}$)

$$\text{FCFF} = \text{NI} + \text{NCC} + \text{Int}(1 - \text{Tax rate}) - \text{Inv(FC)} - \text{Inv(WC)}$$

or

$$\text{FCFF} = \text{NI} + \text{NCC} + \text{Int}(1 - \text{Tax rate}) - \text{FCI} - \text{WCI}$$

- **Discussion on adjustments**
  - Add back preferred stock dividends to arrive at FCFF
  - FCI can also include items such as intangible assets; e.g., trademarks
  - FCI is adjusted for cash proceeds when assets acquired in a transaction are subsequently sold.
  - FCI – non-cash transactions (stock or debt exchanges) do not affect historical FCFF, the analyst needs to consider this in forecasting future FCFF.
  - Working capital excludes cash, short-term debt, notes payable, and the current portion of long-term debt. (Excluding cash this represents net borrowing.)
  - Typically changes in working capital occur in A/R, inventory, A/P and accrued expenses.
  - Cash and Cash equivalents are excluded because the change in cash is what is being explained.
FCFF and FCFE - Non-Cash Charges

- The best place to find historical non-cash charges is to review the firm’s statement of cash flows.
- Some common non-cash charges and the adjustments to net income to get cash flow are:

<table>
<thead>
<tr>
<th>Non-Cash Item</th>
<th>Adjustment to NI to arrive at CF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depreciation</td>
<td>Added Back</td>
</tr>
<tr>
<td>Amortization of intangibles</td>
<td>Added Back</td>
</tr>
<tr>
<td>Restructuring Charges (expense)</td>
<td>Added Back</td>
</tr>
<tr>
<td>Restructuring Charges (income resulting from reversal)</td>
<td>Subtracted</td>
</tr>
<tr>
<td>Losses</td>
<td>Added Back</td>
</tr>
<tr>
<td>Gains</td>
<td>Subtracted</td>
</tr>
<tr>
<td>Amortization of long-term bond discounts</td>
<td>Added Back</td>
</tr>
<tr>
<td>Amortization of long-term bond premium</td>
<td>Subtracted</td>
</tr>
<tr>
<td>Deferred taxes</td>
<td>Added back, but calls for special attention</td>
</tr>
</tbody>
</table>
Residual Income Models

- The third definition of returns is residual income – the earnings for a given period in excess of the investor’s required rate of return on beginning-of-period investment (stockholder’s equity).
- Opportunity cost for investing in the stock is the required rate of return for the highest expected rate of return investors forgo when investing in the stock.
- Residual income contrasts to accounting income:
  - Attempts to match profits to the time period in which they are earned, not necessarily realized as cash.
  - Attempts to measure the value added in excess of opportunity costs.
- Residual income values a firm based on:
  - Its book value per share plus;
  - The present value of future expected earnings.
- Book value per share = common stockholder’s equity divided by the number of common shares outstanding.
- The residual income model can be viewed as a restatement of the dividend discount model using a company-level return concept.
Residual Income Models

- Analyst’s can use a residual income approach for companies with negative expected free cash flows within their comfortable forecast horizon.
- A detailed knowledge of accrual accounting is required in order to use the residual income model, so this is frequently the reason that analysts use the DDM’s if they can.
- A high quality of earnings makes it easier to calculate residual income by making the appropriate adjustments.
- The definition of returns and use of the residual income model is most suitable when:
  - The company is not paying dividends – an alternative to FCFF or FCFE
  - The company’s expected free cash flows are negative within the analyst’s forecast horizon.

Source: Equity Asset Valuation – 3rd Edition
Price Multiples

- Price multiples are ratios of a stock’s market price to some measure of fundamental value per share.
- Enterprise value multiples relate the total market value of all sources of a company’s capital to a measure of fundamental value for the entire company.
- The intuition behind a multiple is to determine whether a stock is:
  - Fairly valued,
  - Overvalued, or
  - Undervalued
- Multiples are simple in use and ease of communication.
- A multiple summarizes in a single number the relationships between the market value of a company’s stock (or its total capital) and some fundamental quantity, such as sales, earnings, or book value (owner’s equity based on accounting values).

Source: Equity Asset Valuation – 3rd Edition
Price Multiples - Key Questions to be Answered

• Questions to consider in making the correct use of multiples as valuation tools:
  ◦ What accounting issues affect particular price and enterprise value multiples, and how can analysts address them?
  ◦ How do price multiples relate to fundamentals, such as earnings growth rates, and how can analysts use this information when making valuation comparisons among stocks?
  ◦ For which types of valuation problems is a particular price or enterprise value multiple appropriate or inappropriate?
  ◦ What challenges arise in applying price and enterprise value multiples internationally?

• **Momentum indicators** typically relate either price or fundamentals (such as earnings) to the time series of its own past values or in some cases, to its expected value.

• These types of indicators may provide some information on future patterns of return.

Source: Equity Asset Valuation – 3rd Edition
Price and Enterprise Value Multiples in Valuation

**The method of comparables**

- Valuation of an asset based on multiples of comparable or similar assets.
- Alternative terms for similar assets:
  - Comparables,
  - Guideline assets, or
  - Guideline companies
- Choices for the benchmark value of a multiple include the multiple of a closely matched individual stock, and the average or median value of the multiple for the stock’s peer group of companies or industry.
- The economic rationale underlying the method of comparables is the **law of one price** — the economic principle that two identical assets should sell at the same price.
Rationales for and Drawbacks of P/E ratios

**Rationales which support** the use of P/E multiples in valuation:
- Earning power is a chief driver of investment value. Earnings per share (EPS), the denominator of the price/earnings ratio, is perhaps the chief focus of security analysts’ attention.
- The price/earnings ratio is widely recognized and used by investors.
- Differences in price/earnings ratios may be related to differences in long-run average returns, according to empirical research.

**Drawbacks** based on nature of EPS:
- EPS can be **negative**. The P/E ratio does not make economic sense with a negative denominator.
- The components of earnings that are on-going or **recurrent** are most important in determining intrinsic value. However, earnings often have volatile, **transient components**, making the analyst’s task difficult.
- Management can exercise its discretion within allowable accounting practices to distort earnings per share as an accurate reflection of economic performance.
- Distortions can **affect the comparability** of P/E ratios across companies.

Source: Equity Asset Valuation – 3rd Edition
## Summary of Price and Inverse Price Ratios

<table>
<thead>
<tr>
<th>Price Ratio</th>
<th>Inverse Price Ratio</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price-to-earnings (P/E)</td>
<td>Earnings yield (E/P)</td>
<td>Both forms commonly used.</td>
</tr>
<tr>
<td>Price-to-book (P/B)</td>
<td>Book-to-market (B/P)*</td>
<td>Book value is less commonly negative than EPS.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Book-to-market is favored in research but not common in practitioner usage.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(book-to-market (B/M) is more commonly used than B/P)</td>
</tr>
<tr>
<td>Price-to-sales (P/S)</td>
<td>Sales-to-price (S/P)</td>
<td>S/P is rarely used except when all other ratios are being stated in the form of inverse price ratios; sales is not zero or negative in practice for going concerns.</td>
</tr>
<tr>
<td>Price-to-cash flow (P/CF)</td>
<td>Cash flow yield (CF/P)</td>
<td>Both forms are commonly used.</td>
</tr>
<tr>
<td>Price-to-dividends (P/D)</td>
<td>Dividend yield (D/P)</td>
<td>Dividend yield is much more commonly used because P/D is not calculable for non-dividend paying stocks, but both D/P and P/D are used in discussing index valuation.</td>
</tr>
</tbody>
</table>
Valuation Based on Comparables

- The benefits of using financial ratios to analyze differences between the subject company’s multiple and the benchmark value include:
  - A company’s ability to meet short-term financial obligations (liquidity ratios).
  - The efficiency with which assets are being used to generate sales (asset turnover ratios).
  - The use of debt in financing the business (leverage ratios).
  - The degree to which fixed charges, such as interest on debt, are being met by earnings or cash flow (coverage ratios).
  - Profitability (profitability ratios).

- The following sections discuss:
  - Cross-sectional P/Es derived from industry groups,
  - P/Es derived from comparison assets that are less closely matched to the stock,
  - Historical P/Es derived from the company’s own history, and finally
  - How both fundamentals and comparables-driven models for P/E can be used to calculate the terminal value in a multistage DCF valuation.
Peer-Company Multiples

- The key advantage – constituent companies are typically similar in business mix to the company being analyzed.
- Basic concept – similar assets should sell at similar prices – the law of one price.
- Multiplying the benchmark P/E by the company’s EPS provides an estimate of the stocks’ value that can be compared to the stock’s market price.
- The analyst can determine if differences from the benchmark can be explained by differences in fundamental factors.
- P/E relationships which hold all else being equal:
  - If the subject stock has higher-than-average (or higher-than median) expected earnings growth, a higher P/E than the benchmark P/E is justified.
  - If the subject stock has a higher-than-average (or higher-than-median) risk (operating or financial), a lower P/E than the benchmark is justified.

Source: Equity Asset Valuation – 3rd Edition
## Other Enterprise Value Multiples

### Exhibit 20

<table>
<thead>
<tr>
<th>Free Cash Flow to the Firm</th>
<th>=</th>
<th>Net Income</th>
<th>Plus interest expense</th>
<th>Minus tax savings on interest</th>
<th>Plus depreciation</th>
<th>Plus amortization</th>
<th>Less investment in working capital (WCI)</th>
<th>Less investment in fixed capital (FCI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBITDA</td>
<td></td>
<td>Net Income</td>
<td>Plus interest expense</td>
<td>Plus taxes</td>
<td>Plus depreciation</td>
<td>Plus amortization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBITA</td>
<td>=</td>
<td>Net Income</td>
<td>Plus interest expense</td>
<td>Plus taxes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBIT</td>
<td>=</td>
<td>Net Income</td>
<td>Plus interest expense</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Alternative Denominators in Enterprise Value Multiples

- As one moves down the rows of Exhibit 20 above the measures incorporate increasingly less precise information about a company’s tax position and its capital investments, although each measure has a rational.
- An analyst may also find it appropriate to examine enterprise value multiples based on a nonfinancial measurement that is specific to that industry or sector:
  - Subscribers for cable TV
  - Oil and gas reserves

Source: Equity Asset Valuation – 3rd Edition