Valuation Issues

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Valuing Cash and its Equivalents

- Basic Proposition: Cash is different from other assets, insofar as
  - its value is known with certainty
  - it has no risk associated with it
- The easiest way to value cash (and marketable securities) is to separate them from other assets, and value them separately.
Steps involved in Valuing Cash:  
I. Estimating Non-Cash Income

- Step 1: Estimate the cash flows for the firm, as if it had no cash, i.e., take out any interest or other income that accrued from cash from the reported income. Thus, if the firm is being valued,
  
  \[
  \text{Adjusted EBIT} = \text{EBIT} - \text{Pre-tax Interest Income on Cash and Marketable Securities}
  \]
  
  - If equity is being valued,
    
    \[
    \text{Net Income} = \text{Net Income} - \text{Interest Income} \times (1 - \text{tax rate})
    \]}
II. Estimate the discount rate for non-cash assets

- **Step 2:** Estimate the discount rate for the firm, as if it had no cash.
  - **Step 2a:** Estimate the cash balance as a percentage of firm value during the period of the regression.
  - **Step 2b:** Estimate the unlevered beta for the firm, using the average debt/equity ratio during the period of the regression.
  - **Step 2c:** Note that this unlevered beta was a weighted average of the beta of cash (zero) and the beta of all other assets.

\[
\text{Unlevered Beta} = \text{Beta of all other Assets} \times (1 - \text{Cash as \% of Firm Value}) + 0 \times \text{Cash Balance as \% of Firm Value}
\]

- **Step 2d:** Solve for the beta of all other assets

\[
\text{Unlevered Beta w/o cash} = \frac{\text{Unlevered Beta}}{(1 - \text{Cash as \% of Firm Value})}
\]

- **Step 2e:** Calculate the new beta, using the firm’s current D/E ratio

\[
\text{New Beta for Stock} = \text{Unlevered Beta without Cash} \times (1 + (1- \text{tax rate}) \times \text{D/E})
\]

- **Step 2f:** Calculate the new cost of capital for the firm, using this new beta for cost of equity
III. Complete the Valuation

- Step 3: Value the assets of the firm using the cash flows adjusted (in step 1) and the re-estimated discount rates (in step 2)
- Step 4: Add the current cash balance
  
  \[ \text{Firm Value} = \text{Value of the Assets from step 3} + \text{Current Cash Balance} \]
- Step 5: Subtract out the total debt outstanding to get value of equity
  
  \[ \text{Value of Equity} = \text{Value of Firm} - \text{Value of Debt} \]
The Standard Practice (and what could be wrong with it)

The standard practice on Wall Street in valuations is to do a status quo valuation of the firm (using reported income and cost of capital) and compare it to the sum of value of equity and net debt (which is the difference between debt and cash). If the valuation is done using total income (including interest income from cash) and unadjusted cost of capital, this will lead to:

- Value of Firm > Market Value of Equity + Net Debt
- Value of Firm < Market Value of Equity + Net Debt
- Can lead to either

If the valuation is done using non-cash income and unadjusted cost of capital, this will lead to:

- Value of Firm > Market Value of Equity + Net Debt
- Value of Firm < Market Value of Equity + Net Debt
- Can lead to either
An Example: Valuing Chrysler in March 1996

Step 1: Estimate the income from non-cash assets in the firm.

<table>
<thead>
<tr>
<th></th>
<th>1995</th>
<th>Next Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT =</td>
<td>$4,444</td>
<td></td>
</tr>
<tr>
<td>Less Interest Income from Cash =</td>
<td>$800</td>
<td></td>
</tr>
<tr>
<td>EBIT without interest income =</td>
<td>$3,644</td>
<td>$3,826</td>
</tr>
<tr>
<td>EBIT (1-t) =</td>
<td>$2,332</td>
<td>$2,449</td>
</tr>
</tbody>
</table>
Chrysler: Estimating Cash Balance

Step 2: Estimate the discount rate, without the cash effects

- 2a: Estimate the cash balance as a percent of firm value for period of the regression

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>$3,035</td>
<td>$3,649</td>
<td>$5,095</td>
<td>$8,371</td>
<td>$8,125</td>
<td></td>
</tr>
<tr>
<td>MV of Equity</td>
<td>$3,435</td>
<td>$9,468</td>
<td>$18,834</td>
<td>$17,399</td>
<td>$20,854</td>
<td></td>
</tr>
<tr>
<td>Debt</td>
<td>$19,438</td>
<td>$15,551</td>
<td>$11,451</td>
<td>$13,106</td>
<td>$14,193</td>
<td></td>
</tr>
<tr>
<td>Firm Value</td>
<td>$22,873</td>
<td>$25,019</td>
<td>$30,285</td>
<td>$30,505</td>
<td>$35,047</td>
<td></td>
</tr>
<tr>
<td>Cash as % of Value</td>
<td>13.27%</td>
<td>14.58%</td>
<td>16.82%</td>
<td>27.44%</td>
<td>23.18%</td>
<td>19.06%</td>
</tr>
</tbody>
</table>
Chrysler: Estimating Debt/Equity Ratio and Unlevered Beta

2b: Estimate the unlevered beta for Chrysler, using the average debt equity ratio during the period of the regression:

\[
\text{Unlevered Beta for Chrysler} = \frac{\text{Beta for the Stock}}{1 + (1 - \text{tax rate}) \times \text{(Debt/Equity)}}
\]

\[
= \frac{1.20}{1 + 0.64 \times 1.87} = 0.55
\]

Unlevered Beta for Non-cash Assets at Chrysler

\[
0.55 = (0.81) X + (0.19) 0
\]

Where 0.81 and 0.19 represent the proportions of Chrysler’s value from non-cash assets and cash (over last 5 years)
Estimating Levered Beta and Cost of Capital

2e: Estimate the new levered beta

Levered Beta without Cash = 0.68 \times \left(1 + (1 - \text{tax rate}) \times \text{Current D/E ratio}\right)
= 0.68 \times \left(1 + 0.64 \times (0.68)\right) = 0.98

2f: Estimate the cost of capital

Cost of Equity = 6.5\% + 0.98 \times (5.5\%) = 11.87\%
Current Proportion of Equity = \frac{20854}{20854 + 14193} = 59.50\%
Cost of Debt = 7.5\% (based upon bond rating)
Current Proportion of Debt = \frac{14193}{20854 + 14193} = 40.50\%
Cost of Capital = 11.87\% \times (0.595) + 7.5\% \times (1-0.36) \times (0.405) = 9.00\%
Valuing the Non-Cash Assets

- Step 3: Value Chrysler’s non-cash assets.
  - Model Used: Stable Growth FCFF Model
  - Reasons: Firm is in stable growth; Cyclical Firm in a Mature Industry
- Estimated Free Cash Flow to Firm Next Year
  \[
  \text{EBIT} (1-t) = \$ 2,449 \\
  - \text{Net Capital Expenditure} = \$ 1,000 \\
  - \text{Change in Working Capital} = \$ 195 \\
  \text{Free Cashflow to Firm} = \$ 1,254
  \]
- Value of Chrysler’s non-cash assets
  \[
  = \frac{\text{Expected FCFF Next Year}}{(WACC - \text{Stable Growth Rate})} \\
  = \$ 1,254 / (.09 - .05) = \$ 31,344 \text{ million}
  \]
Valuing the Firm with Cash

- **Step 4:** Value all of Chrysler’s assets by adding back the cash
  
  Value of non-cash assets = $31,344 million
  + Cash & Marketable Securities = $8,125 million
  Value of Chrysler = $39,469 million

- **Step 5:** Subtract out the value of the outstanding debt, and estimate the value of equity.
  
  Value of Chrysler = $39,469 million
  - Value of Debt = $14,193 million
  - Value of Preferred Stock = $683 million
  Value of Equity = $24,413 million
  / Number of Shares = 382.56 million
  Value per Share = $63.82
How much cash is too much cash?

Cash as a Percentage of Value of Firm: US Firms in December 1997

Number of Firms

Cash % of Value

< 2.5% 2.5 - 5% 5 - 7.5% 7.5 - 10% 10 - 15% 15 - 20% 20 - 25% 25 - 30% > 30%
Implicitly, we are assuming here that the market will value cash at face value. Assume now that you are buying a firm whose only asset is marketable securities worth $100 million. Can you ever consider a scenario where you would not be willing to pay $100 million for this firm?

- Yes
- No

What is or are the scenario(s)?
Closed end funds are mutual funds, with a fixed number of shares. Unlike regular mutual funds, where the shares have to trade at net asset value (which is the value of the securities in the fund), closed end funds shares can and often do trade at prices which are different from the net asset value.

The average closed end fund has always traded at a discount on net asset value (of between 10 and 20%) in the United States.
Closed End Funds: Price and NAV

Closed End Equity Funds: December 31, 1997

Number of Funds

Premium or Discount on NAV
A Simple Explanation for the Closed End Discount

Assume that you have a closed-end fund that invests in ‘average risk’ stocks. Assume also that you expect the market (average risk investments) to make 11.5% annually over the long term. If the closed end fund underperforms the market by 0.50%, estimate the discount on the fund.
Some closed end funds trade at a premium on net asset value. For instance, the Thai closed end funds were trading at a premium of roughly 40% on net asset value and the Indonesian fund at a premium of 80%+ on NAV on December 31, 1997. Why might an investor be willing to pay a premium over the value of the marketable securities in the fund?
Berkshire Hathaway

![Berkshire Hathaway Graph](image)
Equity Value and Per Share Value: A Test

Assume that you have done an equity valuation of Microsoft. The total value for equity is estimated to be $170 billion and there are 1204 million shares outstanding. What is the value per share?
An added fact

On September 30, 1997, Microsoft had 258 million options outstanding, granted to employees over time. These options had an average exercise price of $42 (the current stock price is $140). Estimate the value per share.
The conventional way of getting from equity value to per share value is to divide the equity value by the number of shares outstanding. This approach assumes, however, that common stock is the only equity claim on the firm.

In many firms, there are other equity claims as well including:
- warrants, that are publicly traded
- management and employee options, that have been granted, but do not trade
- conversion options in convertible bonds
- contingent value rights, that are also publicly traded.

The value of these non-stock equity claims has to be subtracted from the value of equity before dividing by the number of shares outstanding.
Warrants

- A warrant is a security issued by a company that provides the holder with the right to buy a share of stock in the company at a fixed price during the life of the warrant.
- A warrant is therefore a long term call option on the equity of the firm and can be valued using option pricing models.
- Warrants and other equity options issued by the firm are claims on the equity of the firm and have to be treated as equity, which has relevance for:
  - estimating debt and equity for the leverage calculation
  - estimating per share value from total equity value
Warrants are priced based upon the implied volatility assigned to the underlying stock; the greater the volatility, the greater the value. To the degree that the market overestimates the firm’s volatility, the firm may gain by using warrants and option-like securities. Warrants, by themselves, create no cash obligations at the time of the issue. Consequently, issuing warrants is a good way for a high growth firm to raise funds, especially when current cash flows are low or non-existent. For financial officers who are sensitive to the dilution created by issuing common stock, warrants seem to provide the best of both worlds — they do not create any new additional shares currently, while they raise equity investment funds for current use.
A convertible bond is a bond that can be converted into a pre-determined number of shares, at the option of the bond holder.

While it generally does not pay to convert at the time of the bond issue, conversion becomes a more attractive option as stock prices increase.

A convertible bond can be considered to be made up of two securities - a straight bond and a conversion option.

Firms generally add conversions options to bonds to lower the interest rate paid on the bonds.
The Straight Bond Component

- Embedded in every convertible bond is a straight bond component.
- The easiest way to value the straight bond component is to act as if the conversion option does not exist and value the bond. This can be accomplished as follows:
  - Step 1: Obtain the coupon rate on the convertible bond (which will generally be low because of the conversion option)
  - Step 2: Estimate the interest rate that the company would have had to pay if it had issued a straight bond. This can be obtained either from other bonds that the company has outstanding or from its bond rating.
  - Step 3: Using the maturity of the convertible bond, the coupon rate and the market interest rate, estimate the value of the bond as:
    \[
    \text{Value of Bond} = \text{PV of coupons at market interest rate} + \text{PV of face value of bond at market interest rate}
    \]
- The straight bond component is clearly debt.
The Conversion Option

- In a typical convertible bond, the bondholder is given the option to convert the bond into a specified number of shares of stock. The conversion ratio measures the number of shares of stock for which each bond may be exchanged. Stated differently, the market conversion value is the current value of the shares for which the bonds can be exchanged. The conversion premium is the excess of the bond value over the conversion value of the bond.

- The conversion option in a convertible bond is equity.
Determinants of Value of Conversion Option

The conversion option is a call option on the underlying stock, and its value is therefore determined by the variables that affect call option values –

- the underlying stock price,
- the conversion ratio (which determines the strike price),
- the life of the convertible bond,
- the variance in the stock price and
- the level of interest rates.
Factors in Using Option Pricing Models to Value Convertibles and Warrants

- Option pricing models can be used to value the conversion option with three caveats –
  - conversion options are long term, making the assumptions about constant variance and constant dividend yields much shakier,
  - conversion options result in stock dilution, and
  - conversion options are often exercised before expiration, making it dangerous to use European option pricing models.

- These problems can be partially alleviated by using a binomial option pricing model, allowing for shifts in variance and early exercise, and factoring in the dilution effect.
Steps in Getting to Value Per Share

- Step 1: Value the firm, using discounted cash flow or other valuation models.
- Step 2: Subtract out the value of the outstanding debt to arrive at the value of equity. Alternatively, skip step 1 and estimate the value of equity directly.
- Step 3: Subtract out the market value (or estimated market value) of other equity claims:
  - Value of Warrants = Market Price per Warrant * Number of Warrants
    Alternatively estimate the value using OPM
  - Value of Conversion Option = Market Value of Convertible Bonds - Value of Straight Debt Portion of Convertible Bonds
- Step 4: Divide the remaining value of equity by the number of shares outstanding to get value per share.
An Example: Valuing Sterling Software

- Step 1: Value the firm
- Approach used: Three Stage FCFE Model
- Inputs used

<table>
<thead>
<tr>
<th>Phase</th>
<th>High Growth</th>
<th>Transition Phase</th>
<th>Stable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>5 years</td>
<td>3 years</td>
<td>Forever</td>
</tr>
<tr>
<td>Growth Rate</td>
<td>20%</td>
<td>Linear drop 6%</td>
<td></td>
</tr>
<tr>
<td>Cap Ex/Depreciation</td>
<td>2.00</td>
<td>2.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Working Capital</td>
<td>15% of Revs</td>
<td>15% of Revs</td>
<td>15% of Revenues</td>
</tr>
<tr>
<td>Beta</td>
<td>1.50</td>
<td>Linear drop 1.10</td>
<td></td>
</tr>
<tr>
<td>Debt Ratio</td>
<td>Current</td>
<td>Current</td>
<td>Current</td>
</tr>
</tbody>
</table>
Current Debt Ratio Calculation

- Convertible Debt has market value of $175 million; face value of $115 million; coupon rate of 5.75%; expires in 8 years;
  - Bond Rating is A-; Interest rate on comparable debt = 7.50%;
  - Coupon on Convertible Debt = 0.0575 * 115 million = $6.6125 million
  - Value of Straight Debt Portion of Convertible Debt = $6.6125 (PV of Annuity, 7.5%, 8 years) + $115 million/1.075^8 = $103.21 million
  - Value of Conversion Option in Debt = Market Value of Convertible Debt - Straight Debt Portion = $175 - $103 = $72 million
- Value of Warrants = Number of warrants * Warrant Price = 1.8 million warrants * $30 = $54 million
- Total Market Value of Equity = ($56 * 25.50 million shares) + $72 + $54 = $1554 million
- Value of Debt = $103 million
- Debt Ratio = $103/($103 + $1554) = 6.22%
Value Per Share: Sterling Software

Value of Equity from Three-Stage FCFE Model = $2,036 million
- Value of Equity in Convertible Debt = $72 million
- Value of Equity in Warrants = $54 million
Value of Equity in Common Stock = $1,910 million
/ Number of Shares outstanding = 25.50 million
Value per Share = $74.90