MBA Student Investment Management Fund

Semi-Annual Presentation

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I. Investment Thesis

II. Strategy Implementation
Investment Thesis
Equity of a firm with debt in its capital structure is analogous to a call option written on the assets of the firm.

Graphical Representation of Equity as a Call Option

Equity Value ($) vs. Firm Asset Value ($)

Pay off to equity holder

Firm asset value = Face Value of Debt

Call Option Replicated

Traditional valuation models do not adequately reflect the embedded option that equity holders enjoy.

Traditional model

\[
Equity = Assets - Debt
\]

Structural model

\[
Equity = Assets + Put Option - Safe Debt
\]
Eisdorfer, Goyal, and Zhdanov hypothesize that if investors do not value the default option, misvaluation can occur.

<table>
<thead>
<tr>
<th>Valuation Type</th>
<th>High Default Option</th>
<th>Low Default Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional Valuation (e.g. DCF)</td>
<td>Misvalued</td>
<td>Appropriate Valuation</td>
</tr>
<tr>
<td>Valuation with Default Option</td>
<td>Appropriate Valuation</td>
<td>Appropriate Valuation</td>
</tr>
</tbody>
</table>

Valuation of Equity in the Model

There are two components to valuing equity within the model, 1) value to the equity holders (if they were to operate into perpetuity), 2) value of default option.

\[ \text{Value of Equity} = \text{Value to Equity Holders} + \text{Value of Default Option} \]

Value of Default Option

The default option can be deconstructed into two parts: 1) discounting the cash flows of a firm until an optimal stopping time, 2) discounting the cash flows of a firm into perpetuity.

\[
\text{Default option} = \sup_{T_{x,T(t)}} \mathbb{E}^Q \int_0^{T_{x,T(t)}} e^{-rt} CF_{it} dt - \mathbb{E}^Q \int_0^\infty e^{-rt} CF_{it} dt \geq 0
\]

Comparing Model Value to Market Value

Stocks are sorted into deciles according to the ratio of the equity value implied by the valuation model to the actual equity value.

\[
\frac{5 \text{ B}}{2.5 \text{ B}} = 2.0 \quad \text{Undervalued}
\]

\[
\frac{2.5 \text{ B}}{5 \text{ B}} = 0.5 \quad \text{Overvalued}
\]
Characteristics of firms with high default option

- Higher distress probability
- High volatility
- Low profitability

Implementation
Portfolio Construction Process Overview

Source accounting and return data

Calculate the theoretical equity value

Calculate model equity/current equity value

Sort ratios into deciles and invest in the 9th and 8th decile

*CRSP/Compustat till 2018, supplemented with Bloomberg for current info
Portfolio Construction: Inputs & Assumptions

**Model Inputs**

- Current liabilities
- Long-term liabilities
- Revenue
- Fixed Costs
- Volatility
- Risk-free rate
- COGS
- WAAC
- CAPEX
- Depreciation
- Leverage
- SIC Code

**Model Equity Value**

<table>
<thead>
<tr>
<th>SG&amp;A</th>
<th>Proxy for fixed costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIC Codes</td>
<td>Used to calculate industry averages for Depreciation &amp; CAPEX</td>
</tr>
<tr>
<td>Return on Assets</td>
<td>Equals WACC</td>
</tr>
</tbody>
</table>
### Decile Details and Construction

<table>
<thead>
<tr>
<th></th>
<th>Decile 1</th>
<th>Decile 5</th>
<th>Decile 10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size</strong></td>
<td>21,419</td>
<td>9,828</td>
<td>5,768</td>
</tr>
<tr>
<td></td>
<td>833</td>
<td>2,034</td>
<td>436</td>
</tr>
<tr>
<td><strong>Market-to-Book</strong></td>
<td>12.50</td>
<td>3.85</td>
<td>5.51</td>
</tr>
<tr>
<td></td>
<td>2.69</td>
<td>1.96</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>Stdev of Returns</strong></td>
<td>2.3</td>
<td>2.1</td>
<td>5.1</td>
</tr>
<tr>
<td></td>
<td>4.2</td>
<td>2.9</td>
<td>4.9</td>
</tr>
</tbody>
</table>

*Paper data an average of 1983 – 2012, our data a snapshot of October 2019*
Filtering for Investable Universe

Russell 3000

$1 - $6 billion market cap

Decile 9th and 8th

News check

Investable Universe

Final # of Stocks: 69
Sector Weighting Comparison

**Russel 3000**
- Basic Materials: 24%
- Consumer Cyclical: 12%
- Financial Services: 11%
- Real Estate: 12%
- Consumer Defensive: 7%
- Healthcare: 11%
- Utilities: 14%
- Communication Services: 2%
- Energy: 0%
- Industrials: 2%
- Technology: 7%
- Cash: 0%

**Our Portfolio**
- Basic Materials: 24%
- Consumer Cyclical: 12%
- Financial Services: 11%
- Real Estate: 12%
- Consumer Defensive: 7%
- Healthcare: 11%
- Utilities: 14%
- Communication Services: 2%
- Energy: 0%
- Industrials: 2%
- Technology: 7%
- Cash: 0%
### Sector Weighting Comparison

<table>
<thead>
<tr>
<th>Asset</th>
<th>Russel 3000</th>
<th>Portfolio</th>
<th>Number of Stocks</th>
<th>Allocation per equity</th>
<th>Average Market Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Materials</td>
<td>2.44%</td>
<td>2.31%</td>
<td>3</td>
<td>0.8%</td>
<td>$2.7B</td>
</tr>
<tr>
<td>Consumer Cyclic</td>
<td>12.05%</td>
<td>11.62%</td>
<td>12</td>
<td>1.0%</td>
<td>$2.7B</td>
</tr>
<tr>
<td>Financial Services</td>
<td>12.47%</td>
<td>12.03%</td>
<td>11</td>
<td>1.1%</td>
<td>$2.5B</td>
</tr>
<tr>
<td>Consumer Defensive</td>
<td>6.76%</td>
<td>6.51%</td>
<td>7</td>
<td>0.9%</td>
<td>$2.6B</td>
</tr>
<tr>
<td>Healthcare</td>
<td>14.45%</td>
<td>13.92%</td>
<td>6</td>
<td>2.3%</td>
<td>$2.1B</td>
</tr>
<tr>
<td>Communication Services</td>
<td>10.51%</td>
<td>10.13%</td>
<td>5</td>
<td>2.0%</td>
<td>$2.9B</td>
</tr>
<tr>
<td>Energy</td>
<td>1.91%</td>
<td>1.81%</td>
<td>3</td>
<td>0.6%</td>
<td>$1.7B</td>
</tr>
<tr>
<td>Industrials</td>
<td>9.15%</td>
<td>8.82%</td>
<td>9</td>
<td>1.0%</td>
<td>$3.3B</td>
</tr>
<tr>
<td>Technology</td>
<td>23.70%</td>
<td>22.84%</td>
<td>13</td>
<td>1.9%</td>
<td>$2.4B</td>
</tr>
</tbody>
</table>
Rebalancing

Pull Latest Data
We will pull the most updated data on Bloomberg as companies’ report financial information.

Avoid Bankrupt Companies
We will have a dedicated team to monitor that the securities are not under bankruptcy.

Rebalance Accordingly
We shall rebalance our portfolio monthly using sector weights of Russell 3000.
Task Allocation Process

Each team member will rotate positions throughout the semester. This will ensure all team members are exposed to every aspect of the investment process.
Thank You!

Questions?
Value of Default Option Continued

\[ CF_{it} = \left[ (1 - \tau)(x_{it} - I_{it} - F_{i}) + \tau Dep_{it} - Capex_{it} \right] \times \left[ 1 + \eta \mathbf{1}_{(1-\tau)(x_{it}-I_{it}-F_{i})+\tau Dep_{it}-Capex_{it}<0} \right] - D_{it} \]

*In incurred when a firm incurs negative cash flows.