Executive Compensation

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Long Term Compensation Plans

• Restricted Share Units (RSU)
  – Receive 1 share after T-year vesting period

• Executive Stock Options (ESO)
  – Receive 1 American call after T-year vesting period
  – Strike price = closing Stock price on issue date
  – Option expires after $T + \tau$ years
  – Discussion centered on early exercise behavior

• Market-Leveraged Stock Units (MSU)
ESO Early Exercise Behavior

• Modelling approaches
  – Utility based (Carpenter and many others)
  – Ad hoc exercise rules (Hull & White)

• Proposed model
  – \( P_X = a + b \times D + c \times (S/K) \)
  – D is a dummy variable that is 1 in the four months following vesting
Empirical Data

Number of Exercises

Time from Issue (months)

Number of Exercises

Time from Issue (months)
Fitted Model
An Example of Group Differences

<table>
<thead>
<tr>
<th></th>
<th>US vs. non-US</th>
<th>Low vs. High Salary</th>
<th>Age 49- vs. 50+</th>
<th>Male vs. Female</th>
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</thead>
<tbody>
<tr>
<td>Diff. t Stat</td>
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<tr>
<td>$a'$</td>
<td>0.00075 2.71</td>
<td>-0.00248 -3.26</td>
<td>-0.00173 -1.72</td>
<td>0.00222 1.39</td>
</tr>
<tr>
<td>$b'$</td>
<td>0.00326 2.39</td>
<td>-0.00799 -9.50</td>
<td>-0.00548 -6.79</td>
<td>0.00434 1.96</td>
</tr>
<tr>
<td>$d'$</td>
<td>0.00460 6.32</td>
<td>0.00043 0.89</td>
<td>-0.00047 -1.33</td>
<td>-0.00145 -1.00</td>
</tr>
</tbody>
</table>

- Non-US employees tend to exercise earlier
- High salary employees tend to exercise later
- Older employees tend to exercise later
Market-Leveraged Stock Units (MSU)

• Receive \( n \) shares at the end of \( T \)-year vesting period
• The number of share receive, \( n \), is \( \frac{S_T}{S_0} \)
• On the vesting date the value of the MSU is \( \left( \frac{S_T}{S_0} \right) \times S_T \)
• An MSU is a power option with a zero strike
• An RSU is a regular option with a zero strike
Caps and Floors

• Often the number of shares received is subject to a cap and or floor

• Let $M_1$ be the lower bound on the number of shares issued and $M_2$ be the upper bound

• Payoff is: 
  \[
  \begin{align*}
  M_1 S_T & \quad \text{if} \quad S_T < M_1 S_0 \\
  \left( \frac{S_T}{S_0} \right) S_T & \quad \text{if} \quad M_1 S_0 \leq S_T \leq M_2 S_0 \\
  M_2 S_T & \quad \text{if} \quad S_T > M_2 S_0
  \end{align*}
  \]

• MSU is portfolio of asset-or-nothing power options
Payoffs

Payoffs

\[ M_1 = 0.5 \]
\[ M_2 = 1.5 \]
\[ K = S_0 = 100 \]
Objectives of Long-Term Compensation

• Usual arguments are:
  – To provide an incentive to increase the stock price, the delta effect
  – To provide an incentive to increase the stock volatility, the vega effect

• RSUs satisfy the first
• ESOs satisfy both as long as they are not too far out-of-the-money
• MSUs satisfy both
Generalized MSU

• Number of shares received is \( m(S_T) \)
• For an RSU \( m(S_T) = 1 \)
• For an MSU \( m(S_T) = \frac{S_T}{S_0} \)

For an ESO

\[
m(S_T) = \begin{cases} 
0 & S_T \leq K \\
1 - \frac{K}{S_T} & S_T > K 
\end{cases}
\]

• Which of these is ‘best’?
Work in Progress

• A state preference world in which each state has a different stock price
• Utility maximizing manager who can generate a positive alpha and/or modify the variance of future state stock prices
• Manager is offered a contract in which he receives a number of shares that depends on the stock price
• Wealth maximizing investor who pays for the contract by ceding some of his equity