CORPORATE RISK PROFILING – INSIGHTS FROM SECTORAL CASE STUDIES

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What Is Required to Quantify a Company’s Risk Premium?

- Our approach:
  - Overlays the Cambridge risk framework of threats over a company’s footprint
  - To model the frequency and severity of losses and revenue disruption to a company

- Global enterprise representing real case studies from multiple sectors
- Physical products and consumables
- Site-specific assets – vulnerable to physical threats
- Business and information flows

$1 billion annual revenue
Operational in 50 countries
5,000 employees
Developing an Integrated Risk Profile

### Corporate Footprint
- Asset locations and revenue sources
- Business network & activity matrix

### Internal Risk Register
- Company-specific identification of threats

### External Risk Register
- Framework of global threats to business and economic activity

### Integrated Risk Profile
- Probability
- $\$

### Outputs and Applications
- Annual report risk declarations
  - 10K and other reporting
- Regulatory risk reporting
  - Long-term viability statements
- Crisis & continuity management
  - Management stress tests
- Emergency risk monitoring & stress test design
- Monitoring of risk metrics for business units
- Insurance purchasing strategy
# Corporate Internal Risk Register

**Risks identified in avocado’s 2017 annual report**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market restrictions &amp; indirect tax</td>
<td>Fiscal pressures &amp;/or failure to address growth in anti-alcohol sentiment</td>
</tr>
<tr>
<td>Economic change</td>
<td>Local volatility or upheaval, uncertainty or failure to react, including Brexit</td>
</tr>
<tr>
<td>Critical industry developments</td>
<td>Failure to shape/participate in critical industry developments</td>
</tr>
<tr>
<td>Non-compliance with laws &amp; regulations</td>
<td>Non-compliance with local laws/regulations, or breach of internal global policies &amp; standards &amp; internal control breakdown</td>
</tr>
<tr>
<td>Sustainability &amp; responsibility</td>
<td>Failure to manage key sustainability risks or meet key sustainability goals</td>
</tr>
<tr>
<td>Business acquisitions</td>
<td>Failure to deliver value from acquisitions &amp;/or integrate into company</td>
</tr>
<tr>
<td>Cyber threat</td>
<td>Theft, loss and misappropriation of digital assets</td>
</tr>
<tr>
<td>Political instability &amp; terrorism</td>
<td>Impacts from political instability &amp; security threats incl. terrorism in key markets</td>
</tr>
<tr>
<td>Data privacy</td>
<td>Breach of laws or regulations</td>
</tr>
<tr>
<td>International tax</td>
<td>Changes to international tax environment</td>
</tr>
</tbody>
</table>
Mapping Framework of Threats to a Corporate

**Threats to Business Output**
(Supply shock)

**A. Site-specific threats to key facilities & assets**
- Earthquake
- Tropical Windstorm
- Flood
- Tsunami
- Volcanic Eruption
- Fire & Explosion
- Terrorism
- Power Outage
- Water Shortage
- Nuclear Accident
- Heatwave
- Freeze

**B. Risks that affect the whole company**
Idiosyncratic – i.e. unlikely to affect other businesses at the same time
- Cyber Attack
- Reputational Risk
- Liability Issues
- Competition Risk
- Regulatory Risk
- Company Specific

**C. Systemic risks for sectors or all businesses**
Will this business be affected more than average for sector?
- Market Crash
- Commodity Prices
- Sovereign Crisis
- Human Pandemic
- Solar Storm

**Threats to a Company’s Market**
(Demand shock)

**D. Threats to demand in a national market**
- Sovereign Crisis
- Interstate Conflict
- Separatism
- Social Unrest
- Terrorism
- Human Epidemic
- Heatwave
- Freeze
- Solar Storm
- Plant Epidemic

**E. Threats to demand in regional or global markets**
- Market Crash
- Commodity Prices
- Human Pandemic
- Regional Conflict

**F. Trend risks that affect the company business model**
- Climate Change
- Artificial Intelligence
Geographical Footprint of a Corporate

- **Company Data**
  
  **avocado**

**Site A: Merak, Indonesia**

- Manufacturing plant for PTA
- 530,000 tons per year
- A raw material for Polyester
Global Geography of Cambridge External Risk Register

- Earthquake
- Volcano
- Windstorm
- Flood
- Tsunami
- Drought
- Freeze/Heatwave
- Human Epidemic
- Plant Epidemic
- Market Crash
- Sovereign Default
- Oil Price Shock
- Interstate War
- Separatism
- Terrorism
- Social Unrest
- Power Outage
- Cyber Attack
- Solar Storm
- Nuclear Meltdown
## Potential Outage for Facility at Marek, Indonesia

<table>
<thead>
<tr>
<th>Threat Type</th>
<th>Scenario</th>
<th>Days of Outage</th>
<th>Annual Probability</th>
<th>Return Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.7 Tsunami</td>
<td>Tsunami 6m runup</td>
<td>1800</td>
<td>0.0009</td>
<td>1,075</td>
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<tr>
<td>3.1 Interstate War</td>
<td>Strategic bombing destroys facilities</td>
<td>1800</td>
<td>0.0012</td>
<td>869</td>
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<tr>
<td>6.1 Accidental Fire</td>
<td>Accidental Large Explosion</td>
<td>720</td>
<td>0.0012</td>
<td>826</td>
</tr>
<tr>
<td>1.2 Volcano</td>
<td>1m Ash layer</td>
<td>360</td>
<td>0.0013</td>
<td>752</td>
</tr>
<tr>
<td>1.7 Tsunami</td>
<td>Tsunami 3m run-up</td>
<td>320</td>
<td>0.0043</td>
<td>231</td>
</tr>
<tr>
<td>1.5 Flood</td>
<td>Flood 6m depth, highly polluted waters</td>
<td>300</td>
<td>0.0045</td>
<td>221</td>
</tr>
<tr>
<td>3.3 Terrorism</td>
<td>Major Weapon/WMD Terrorist Attack</td>
<td>300</td>
<td>0.0046</td>
<td>220</td>
</tr>
<tr>
<td>1.1 Earthquake</td>
<td>MMI X</td>
<td>270</td>
<td>0.0046</td>
<td>217</td>
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<tr>
<td>6.1 Accidental Fire</td>
<td>Accidental Explosion (PML)</td>
<td>180</td>
<td>0.0050</td>
<td>198</td>
</tr>
<tr>
<td>1.1 Earthquake</td>
<td>MMI IX</td>
<td>90</td>
<td>0.0060</td>
<td>166</td>
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<tr>
<td>3.2 Civil War and Separatism</td>
<td>Civil war heavy weaponry fighting</td>
<td>80</td>
<td>0.0064</td>
<td>155</td>
</tr>
<tr>
<td>1.3 Wind Storm</td>
<td>Cat 5 Hurricane</td>
<td>75</td>
<td>0.0070</td>
<td>143</td>
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<tr>
<td>4.2 Cyber</td>
<td>Cyber attacks on power grid</td>
<td>75</td>
<td>0.0076</td>
<td>131</td>
</tr>
<tr>
<td>1.2 Volcano</td>
<td>5cm Ash layer</td>
<td>60</td>
<td>0.0076</td>
<td>131</td>
</tr>
<tr>
<td>4.2 Cyber</td>
<td>Cyber-Physical Attack</td>
<td>50</td>
<td>0.0094</td>
<td>106</td>
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<tr>
<td>5.1 Human Pandemics</td>
<td>Pandemic with high fatality disease</td>
<td>48</td>
<td>0.0101</td>
<td>99</td>
</tr>
<tr>
<td>3.2 Civil War and Separatism</td>
<td>Sectarian fighting between private militias</td>
<td>40</td>
<td>0.0113</td>
<td>89</td>
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<tr>
<td>3.4 Social Unrest</td>
<td>Strikes prevent workers attending</td>
<td>36</td>
<td>0.0148</td>
<td>68</td>
</tr>
<tr>
<td>1.1 Earthquake</td>
<td>MMI VII</td>
<td>30</td>
<td>0.0154</td>
<td>65</td>
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<tr>
<td>4.3 Solar Storm</td>
<td>SS3</td>
<td>30</td>
<td>0.0160</td>
<td>62</td>
</tr>
<tr>
<td>5.1 Human Pandemics</td>
<td>Pandemic influenza infects 43% of pop</td>
<td>28</td>
<td>0.0183</td>
<td>55</td>
</tr>
<tr>
<td>4.2 Cyber</td>
<td>Cyber breach - major data exfiltration</td>
<td>25</td>
<td>0.0363</td>
<td>28</td>
</tr>
<tr>
<td>2.2 Sovereign Default</td>
<td>Country defaults</td>
<td>24</td>
<td>0.0382</td>
<td>26</td>
</tr>
<tr>
<td>1.3 Wind Storm</td>
<td>Cat 3 Hurricane</td>
<td>21</td>
<td>0.0396</td>
<td>25</td>
</tr>
<tr>
<td>3.1 Interstate War</td>
<td>Missile attack or aerial bombardment</td>
<td>21</td>
<td>0.0400</td>
<td>25</td>
</tr>
<tr>
<td>3.2 Civil War and Separatism</td>
<td>Civil Unrest riots and protests</td>
<td>20</td>
<td>0.0400</td>
<td>25</td>
</tr>
<tr>
<td>4.1 Electrical Power Outage</td>
<td>All power lost for 10 days</td>
<td>20</td>
<td>0.0412</td>
<td>24</td>
</tr>
<tr>
<td>6.1 Accidental Fire</td>
<td>Accidental Fire (EML)</td>
<td>20</td>
<td>0.0562</td>
<td>18</td>
</tr>
<tr>
<td>1.5 Flood</td>
<td>Flood 1m depth, low velocity water</td>
<td>14</td>
<td>0.0581</td>
<td>17</td>
</tr>
<tr>
<td>5.1 Human Pandemics</td>
<td>Localized epidemic of new emergent disease (e.g. SARS)</td>
<td>14</td>
<td>0.0587</td>
<td>17</td>
</tr>
<tr>
<td>1.3 Wind Storm</td>
<td>Cat 1 Hurricane</td>
<td>10</td>
<td>0.0639</td>
<td>16</td>
</tr>
<tr>
<td>3.3 Terrorism</td>
<td>2 ton truck bomb Terrorist attacks</td>
<td>10</td>
<td>0.0679</td>
<td>15</td>
</tr>
<tr>
<td>4.1 Electrical Power Outage</td>
<td>All power lost for 5 days</td>
<td>10</td>
<td>0.0702</td>
<td>14</td>
</tr>
<tr>
<td>4.3 Solar Storm</td>
<td>SS2</td>
<td>10</td>
<td>0.0722</td>
<td>14</td>
</tr>
</tbody>
</table>
Consider examples of shocks exceeding a **severe distress threshold**:  
- In this case, loss of around 25% of its annual revenue

<table>
<thead>
<tr>
<th>Shock</th>
<th>% of Annual Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miss Quarterly Earnings by 10%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Total Earnings for a Quarter</td>
<td>1.5%</td>
</tr>
<tr>
<td>Cancellation of Annual Dividend</td>
<td>2.9%</td>
</tr>
<tr>
<td>Credit Rating Downgrade</td>
<td>10.0%</td>
</tr>
<tr>
<td>Destruction of all Property</td>
<td>16.0%</td>
</tr>
<tr>
<td>50% Reduction of Investment Portfolio</td>
<td>19.6%</td>
</tr>
<tr>
<td><strong>Loss of 25% of Revenue</strong></td>
<td><strong>25.0%</strong></td>
</tr>
<tr>
<td>Loss of 50% of Revenue</td>
<td>50.0%</td>
</tr>
<tr>
<td>Loss Exceeds Total Assets</td>
<td>55.3%</td>
</tr>
</tbody>
</table>
Supply Shock Exceedance Probability Curve

Disruption to output due to external shock scenarios

Annual Probability of Exceedance

- Financial, Trade & Business
- Political, Crime & Security
- Natural Catastrophe & Climate
- Technology & Space
- Health & Environmental

% of Annual Output Lost

Severe distress threshold

1% (1-in-100)

0.1% (1-in-1000)

10% (1-in-10)

100%

1000%
Key Takeaways

- Corporate valuations are not holistic, and undervalue external risks
- An integrated risk profile allows:
  - A comprehensive assessment of probability and loss severity of all risks a corporate is exposed to
  - Development of management/mitigation strategies to make a company more resilient
- Application to corporates in variety of other sectors