Risk Handling Techniques:
Loss Control, Risk Transfer, and Loss Financing

RM Statement of Objectives and Principles
- Distinguish between pre-loss and post-loss objectives
- Pre-loss objectives
  - Survival and growth
    - Cash flow to fund stakeholders returns plus investments
  - Compliance with government regulations
  - Efficiency
  - Procedures and principles are implemented and followed

Risk Handling Techniques

FIGURE 4-1 Methods of Handling Risk
### Table 4-1: The Selection of Risk-handling Techniques, Based on Frequency and Severity

<table>
<thead>
<tr>
<th>Severity</th>
<th>Frequency</th>
<th>Low Severity</th>
<th>High Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Low</td>
<td>Self-insurance (for larger firms) and loss control</td>
<td>Avoidance (if possible) and loss control</td>
</tr>
<tr>
<td>Low</td>
<td>High</td>
<td>Risk assumption and loss control</td>
<td>Insurance and loss control</td>
</tr>
</tbody>
</table>

### Selecting the Risk Management Technique

<table>
<thead>
<tr>
<th>Low Severity</th>
<th>High Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Frequency</td>
<td>High Frequency</td>
</tr>
<tr>
<td>Assume loss prevention</td>
<td>Loss Prevention assume risk</td>
</tr>
<tr>
<td>Insure risk transfer</td>
<td>Avoid loss prevention loss reduction</td>
</tr>
</tbody>
</table>

### Loss of Income

- Sources of Loss
- Problems
  - Can be seasonal in nature
  - Difficult to measure
  - Best measurement still can only be an estimate
Measure (evaluation)

- Frequency
- Severity
- Expected Loss
- Variance/standard deviation
- Maximum possible loss
- Maximum probable loss

Importance of Indirect Losses

- Large losses can cause indirect losses:
  - Lost profits
  - Clean-up costs
  - Costs of raising capital
  - Foregone investment opportunities
  - Bankruptcy costs

- Thus, reducing probability of large losses (MPL) can reduce indirect losses

Importance of Indirect Losses

- Main point: need to consider reduction in expected indirect losses when making risk management decisions

- Diversification does not change expected direct losses,
  - Reduces maximum probable loss
  - Therefore reduces expected indirect losses
Types of Loss Control

- Loss control:
  - Expenditures of time, money, or effort to reduce expected losses
  - Loss Prevention – reduce probability of loss
  - Loss Reduction – reduce severity of loss

Losses

- Loss Prevention:
  - Activities that prevent losses.
  - Must be cost-efficient.
  - Some losses will occur regardless. Hence:
- Loss Reduction
  - Aim is to minimize impact when losses occur.
  - Duplication and Separation.

Loss Control - Prevention

**Always engage in, if beneficial**

- Loss Prevention
  - Take various steps to reduce the probability of losses occurring
- How do you value the loss of life in the cost/benefit equation?
Loss Control - Reduction

**Always engage in, if beneficial**

- **Loss Reduction**
  - Steps designed to reduce the severity
  - Take steps to reduce the damage before and after a loss

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**How Loss Control Affects a Probability Distribution**

- How would the probability distribution for property losses change if:
  - Install a sprinkler system?
  - Replace old wiring?

- **Loss Distribution**:

<table>
<thead>
<tr>
<th>Property Losses for the coming Year</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.000 million</td>
<td>0.01</td>
</tr>
<tr>
<td>$0.500 million</td>
<td>0.05</td>
</tr>
<tr>
<td>$0.250 million</td>
<td>0.10</td>
</tr>
<tr>
<td>$0.100 million</td>
<td>0.20</td>
</tr>
</tbody>
</table>

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**Cost – Benefit Analysis**

- Should compare costs and benefits of loss control

- Identifying costs and benefits
  - Example: Safer work environment
    - What are the costs?
    - What are the benefits?
Cost – Benefit Analysis - Example

Example:
- Average Loss Severity = $20,000.
- Total number of employees = 5,000

<table>
<thead>
<tr>
<th>Safety Expenditure</th>
<th>Annual Accident Frequency per Employee</th>
<th>Expected Accident Costs per Employee</th>
<th>Total Expected Accident Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.100</td>
<td>0.80</td>
<td>0.000</td>
</tr>
<tr>
<td>500,000</td>
<td>0.080</td>
<td>0.070</td>
<td></td>
</tr>
<tr>
<td>1,000,000</td>
<td>0.066</td>
<td>0.060</td>
<td></td>
</tr>
<tr>
<td>1,500,000</td>
<td>0.050</td>
<td>0.050</td>
<td></td>
</tr>
<tr>
<td>2,000,000</td>
<td>0.040</td>
<td>0.040</td>
<td></td>
</tr>
</tbody>
</table>

Identifying Costs and Benefits in Practice

- Benefits of loss control can be difficult to estimate
- Can use historical data on your own firm
- Use industry data
  - Hire consultants, brokers
- Get estimates of insurance premium reductions
  - Brokers and insurers

Valuing Life

- Loss control decision may change the probability of death
- How do you value a life?
  - One approach: Use wage differentials for jobs with different probabilities of death
    - (actual studies are more complex)
    - Estimates: ~$5MM, range is $4-9MM
Valuing Life

- How do you value a life?
  - Example:
    - Job 1 has .0002 higher probability of death on the job per year
    - Job 1 has $1,000 wage premium per year, holding all else equal
  - Employees willing to receive $1,000 for a .0002 increased chance of dying.
    - $1,000 = .0002 x (Value of Life)
    - \[ \text{Value of Life} = \frac{1,000}{.0002} = 5 \text{ million} \]

Diversification by Segregating Assets

- No segregation:
  - 1 plant worth $100 million,
  - Probability of complete loss = 0.05
  - Expected direct loss =

- Segregation:
  - 2 plants each worth $50 million,
  - Probability of complete loss at each plant = 0.05
  - Outcome at each plant are independent of the other
  - What is the probability distr for total losses:
    - Expected direct loss =

Diversification by Segregating Assets

- Now assume an indirect loss equal to $10 million occurs if a $100 million direct loss occurs
  - No segregation ➔ expected indirect loss =
  - Segregation ➔ expected indirect loss =

- Main Point: diversification that reduces probability of high losses, can reduce expected indirect losses

Risk Transfer

- Methods:
  - Risk-bearing financial institutions – Take on financial risk for a fee
  - Contractual transfer agreements - transfers risk to another party
  - Hold harmless agreements - transfer of risk through a contract
  - Limited Liability – provided to the owners of certain types of business organizational forms

Loss Financing - 1

- Insurance:
  - Transfer of risk to an insurer for a premium
  - Appropriate when loss-frequency is low, but potential severity is high
  - Also has financial advantages: Tax Issues
  - Moral Hazard and Deductibles
Risk Assumption

Deliberate decision:
- Size of firm
- Not always a choice
- Funded Risk assumption.

Or not:
- Ignorance?

What is self-insurance?

Why do companies self-insure?
- Save money
- Better control
  - Loss prevention incentives
  - Improved claims settlement
  - Profitability and investment earnings
- Difference between self-insurance and risk assumption

Captive Insurance Companies

A method of self-insuring
A company formed to write insurance for a parent company

Motives for starting a captive
- Save the overhead and profits of the insurance company
- Earn investment income on the premium
- Tax advantages
Government Safety Programs

- Examples:
  - OSHA
  - EPA
  - CPSC

- Why have safety regulations?
  - Firms may not consider all benefits of loss control if workers or customers are not fully informed
  - Avoids duplication of expenditures on safety research

Government and Loss Control

- Occupational Safety and Health Act of 1970 (OSHA)
- Consumer Product Safety Act of 1972 (CPSA)
- Comprehensive Environmental Response, Compensation Liability Act of 1980 (CERCLA) (Superfund)
- Food and Drug Administration (FDA)
- The Clean Air Act
- The Water Pollution Control Act

Government Safety Regulations

- Estimated costs and benefits of safety regulation
  (Source: K. Viscusi, Pricing Environmental Risks, 1992)

<table>
<thead>
<tr>
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<th>Passed</th>
<th>Agency</th>
<th>Cost per life saved (1984$ mil)</th>
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<tr>
<td>Unvented space heaters</td>
<td>1980</td>
<td>CPSC</td>
<td>$0.10</td>
</tr>
<tr>
<td>Passive restraints/belts</td>
<td>1984</td>
<td>NHTSA</td>
<td>$0.30</td>
</tr>
<tr>
<td>Crane suspended personnel platform</td>
<td>1988</td>
<td>OSHA</td>
<td>$1.00</td>
</tr>
<tr>
<td>Grain dust</td>
<td>1987</td>
<td>OSHA</td>
<td>$5.30</td>
</tr>
<tr>
<td>Uranium mill tailings (inactive)</td>
<td>1983</td>
<td>EPA</td>
<td>$27.60</td>
</tr>
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<td>Asbestos</td>
<td>1989</td>
<td>EPA</td>
<td>$104.20</td>
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Remember: Review and Update

- Regularly review and update the process
  - New assets or disposal of assets
  - Valuation changes
  - New products and processes, materials
  - New personnel
  - Law changes
  - Currency fluctuations
  - New contractual relationships