Quantifying Weather Risks & Designing a Weather Insurance Contract - I

Weather Risk Management Services Ltd
www.weather-risk.com
What is Weather Risk Management?

- Financial weather risk is the occurrence of an observable weather event or variability in a measurable weather index that causes losses either to property or profits for an individual, government or corporation.

- Weather risk management products – packaged as either (re)insurance or derivatives – are settled off of the same index that has been determined to cause losses and reduces weather risk through mitigating payouts.
Weather Impacts volume

\[ \text{PRICE} \times \text{VOLUME} = \text{REVENUE} \]

- PRICE RISK MANAGEMENT
- WEATHER RISK MANAGEMENT
- LOWER EARNINGS VOLATILITY
Weather Insurance Vs. Weather Derivative

- Both have similar objectives and pricing philosophy
- However, they differ in
  - Insurable Interest
  - Event-Loss Relationship
  - Frequency of Occurrence
  - Intensity of Loss
Traditional Insurance Vs. Weather Insurance

- Proof of Loss – Indemnity
- Loss of Profit can only be consequential to loss of Asset
Weather Impacting Economics - Ludhiana Temperature

Upward Trend in Minimum Temperature
Yet Extreme Events are increasing
Extreme Event Counts

Significant increase in extreme events in recent years

Extreme Count

Weathering Weather Securing Smiles

Weather Risk
“Both 1997 and 1998 fiscal results were impacted by extremely harsh winter patterns that flooded over 41,000 acres of the Company’s Corcoran farming districts causing a decrease of $1,000 per acre or $41 million in gross revenues. Additionally, cold and wet spring weather delayed cotton planting by up to six-weeks which resulted in some of the worst farming conditions management has ever seen.”
“Weather was an important factor affecting cement demand, with unusually high precipitation levels in August and September, when compared to the same months of 2002.”
REDDY ICE – LARGEST US ICE MANUFACTURER

“Cool or rainy weather can decrease sales, while extremely hot weather may increase our expenses, each resulting in a negative impact on our operating results and cash flow.”
What About Indian Companies?

- EID Parry sales, net down 86 pc on monsoon failure. - The Hindu, Jan 17, 2003

- The Company's business is seasonal in nature and the performance can be impacted by weather conditions - Notes to Accounts, Syngenta (I) Ltd.

- Monsanto India continued its strong profit growth on the back of positive all-round business performance aided by a good monsoon. - Annual Report 2003-04, Monsanto Ltd

- The delayed monsoon has hit the fertilizer stocks badly. - Analyst, Hindu Business Line
Where Weather Insurance is Required?

- Property Loss
  - Bad Weather
  - Traditional Insurance

- Profit Loss
  - Weather Insurance
Event Loss Correlation

- Whether it Exists?
  - Strong Obvious Correlation
  - Latent relationship not easily visible
- Which Weather Event?
  - Rainfall, Temperature, Humidity, Wind, Hurricane, Snow, Fog, Frost, Sunlight, Cloud, River flow
- What is the Nature of Relationship?
  - Linear
  - Non-Linear
Retail, Entertainment, Restaurant

Bad Weather

Footfalls

HOLIDAYS would result in more Loss
Construction

Will Reduce the Construction Work Days thus Prolonging Project
Travel

Aviation Fog: Results in Loss of Flying hours
Salt Pans

Dilution of Brine Content resulting in elongation of salt production cycle
Agriculture

- Drought
- Unseasonal Rainfall
- Overheating
- Frost
- Disease Conducive Weather Conditions
Weather & Agri-Value Chain

Credit Risk

Farmer

Fertilizers

Seed

Pesticides

Fertilizers

Seed

Pesticides

Farmer

Weather Risk

Value Destruction - Weather

Higher Inventory

Loss of sales opportunity
Product Design – Core conflict

Insured’s Perspective

- Need
- Affordability
- Willingness

Insurer’s Perspective

- Insurability
- Profitability
- Deliverability

Weather Risk
Institutional Insurance – Core Problem

Results in

Adversely Impacts

Affordability
Need
Willingness

Moral Hazard
Adverse Selection
Poor Infrastructure

High Claims Cost
High administrative Cost
Inadequate coverage
Product Design – Basic Principles

- Event – Loss Relationship
  - Is data to establish the relationship correct
  - Is available data sufficient to establish relationship
  - Is data of the correct location
  - Has it completely covered all aspects of relationship

- Low Basis Risks
  - Basis Risk of Product Design
  - Spatial Basis Risk

- Simplicity
  - Conflict between simplicity and accuracy
  - Choice would depend upon who is paying the premium
    - Farmers – Simple and Easily Understandable Product
    - Bank – Complex product with very low design basis risks
    - Govt – Catastrophic Weather Insurance

- Higher weight to most important weather risk (80:20 principle)
High Basis Risk

- No relief when needed
- Still defaulting on loans

• Claims when not required
• Increases the cost of Insurance

Higher the basis risk, higher is the insurance failure
Limitations of Weather Insurance

- Coverage for Weather Related Perils Only
- Existence of historical weather data limits its usage
- Limitations in covering micro-climatic risk
- Modeling errors can lead to failed insurance program
- Can be costly Initially – Potential for Risk Layering
- Requires investment in setting up and maintenance of weather infrastructure
Layering of Weather Risk

Prevention: A role for technology innovations

Frequent Less Severe Risk, Independent Losses
A role for savings and lending

Less Frequent, Moderate Risk
A role for local insurers with global reinsurers

Correlated Losses from Excess Rainfall
A role for global reinsurers / public sector

Source: Jerry Skees
Risk Management Framework Under Climate Change Scenario

Prevention
Contingency Finance
Retention
Parametric Insurance

Risk Mgmt Framework

Severity

Weather Risk