



## Weather Risk Management - Applications

*prepared for*

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RenRe

## The Influence of Weather

“70 % of US companies are affected by weather.”

- US Department of Commerce

“An era is coming when businesses will be required to manage weather-linked risks as a matter of common sense.”

- *Official at Industrial Bank of Japan*

## The Influence of Weather

- Companies have profits/costs that are weather dependent. Achieving financial predictability is nearly impossible due to weather's chaotic and increasingly volatile nature. Increasing volatility and interdependence of weather and the commodity markets create new risks and opportunities.
- Despite its magnitude, there is little that can be done to eliminate weather risk. Climate is what you expect, weather is what you get ...
  - Weather can't be avoided
  - Weather can't be prevented from occurring
- Until recently, companies typically retained their weather risk, or attempted to hedge with traditional financial or commodity products, often not meeting desired results.

## The Influence of Weather

Industry	Temperature	Precipitation
Agriculture	Cold, Heat	Rainfall
Airlines	Cold	Snow, Rainfall
Amusement Parks	Cold	Rainfall
Automotive Insurance	Cold	Snow, Rainfall
Car washes	Cold	Rainfall
Construction	Cold, Heat	Snow, Rainfall
Food & Beverage	Cool Summers	Rainfall
Hydroelectric Generation	Heat	Streamflow
Natural gas	Cool Summers, Warm Summers	
Propane	Warm Winters	
Restaurants	Cold	Snow, Rainfall
Retail	Cold	Snow, Rainfall

## Weather in the News

“Warmer weather can lead to lower margins from fewer volumes of natural gas being sold or transported. Colder weather that increases the volumes of natural gas sold to weather-sensitive customers can result in the inability of some of our customers to pay their bills. Either warm or cold weather that is outside the normal range of temperatures can lead to less operating cash flow, thereby increasing short-term borrowings to meet current cash requirements.”

*- Piedmont Natural Gas Co Inc. Quarterly report*

“AMR said its profit amounted to \$317 million, or \$1.08 a share, compared with \$291 million, or \$1.14 per share, a year earlier. The average Wall Street estimate was \$1.18 per share, according to Reuters Estimates. Revenue slipped 1.6% to \$5.88 billion, hurt by weather disruptions that reduced revenue by \$50 million and lowered profit by 12 cents a share.”

*- Reuters – July 18, 2007*

“Canadian Tire warns warm weather to hurt earnings. Canadian Tire Corp. is the latest company to say that the warm December weather in Central and Eastern Canada hurt business. The home improvement retailer said Friday that it expects 2006 operating earnings will be in the range of \$4.20 to \$4.28 per share. The latest estimate is below consensus earnings estimate of six analysts surveyed by Thomson Financial.”

*- CBC News - January 19, 2007*

“Smith & Wesson cites warm weather in earnings shortfall. Unseasonably warm weather has been blamed for recent tough elk seasons, late deer ruts, and changes in waterfowl migrations, has been cited as a cause of an earnings.”

*- TOPIX - December 15, 2007*

“Cinergy’s third quarter earnings impacted by mild weather. Milder than normal weather reduced third quarter earnings by \$0.05, as compared with the same quarter a year ago.” *- Business Wire - October 22, 2006*

## Weather Risk Management Products

- Market-based financial protection from weather conditions that adversely affect earnings. A method to reduce risks associated with adverse or unexpected, non-catastrophic weather conditions.
- Solutions designed to absorb exact portion of exposure, leaving a residual risk that is commensurate with risk tolerance with strikes at or away from the mean.
- A contract of differences (mathematical objectivity), not an indemnity contract. Wide variety of available structures - Swaps, Calls, Puts, Collars, Exotics, Baskets, etc
- Hedging programs should maintain the objective of mitigating price volatility and providing demand stability.
- No guarantee of the lowest price ... makes the unknown known. Locking in demand / price meets the objective of offsetting exposures to future demand / price movements



*Applications*

## Famous Risk Managers / Hedgers

"We all grumble about the weather, but--but--but, nothing is done about it."

- *Mark Twain*

"Whilst some people are weather wise, most are otherwise."

- *Benjamin Franklin*



## Airlines

An airline had continually struggled with the expense incurred due to seasonal weather delays. Previously the airline retained this risk, assuming that it would normalize from year to year. This method fails when the actual weather events are more extreme than “normal.”

### **Challenge**

The airline's hub was at Chicago O'Hare, and a strong correlation was found between precipitation at the hub and total weather delay minutes for the rest of the network. Using this knowledge, the airline chose to cover precipitation at the hub rather than the entire network.

### **Structure**

The airline estimated that for each .25" precipitation the airline realized an expense of \$500,000 due to operational inefficiencies. The 10-year annual precipitation average for Chicago O'Hare is 35" and the 10-year standard deviation is 5". Since the airline chose to manage for extreme years, the structure pays \$1,000,000 per .25" over 40" of precipitation.

## Agriculture

Farmers and the agricultural industry face financial risk from yield variability due to excessive/insufficient rain. Depending on the stage of development, weather interaction with crop expected yield varies. A call option, based on a weighted-average precipitation basket (“Basket”), will provide a payment if rainfall exceeds a predetermined level.

Structure:	Weighted Average Precipitation Call Option
Term:	June 2012 - August 2012
Weather Station:	33% Grand Island (Coop #253395, WBAN #14935), Nebraska 33% Hastings (Coop #253660), Nebraska 34% Kearney (Coop #254335), Nebraska
Strike:	12.65 inches of cumulative precipitation
Tick Size:	\$335,656 per inch
Limit:	\$2,000,000

## Snow Removal

Businesses use various metrics to budget for annual snowfall removal costs. Regardless of how the budget is set, each year the actual weather can cause these budgets to succumb to overruns, resulting in the need to utilize reserve funds or divert funds from other planned uses.

We can provide snow coverage that helps to protect against excessive snow removal costs. For example, if the sum of the daily snowfall during the coverage period exceeds the level defined in the contract, a payment is made to the contract buyer. That payment is calculated by multiplying the payment per inch amount and the number of inches of snow that exceeded the predetermined level of snow. You choose the total amount of snow that will place your budgeted funds in jeopardy, as well as the amount of funds-per-inch of snow for which you desire coverage.

Description:	Cumulative Snow Call
Period:	December 2012 - March 2013
Station:	Columbus (OH) Port Columbus IAP, WBAN 14821
Buyer:	Snow Co.
Strike:	35 inches of cumulative snow
Tick Size:	\$25,000/inch
Limit:	\$250,000

## Entertainment – Amusement Parks

Rain can put a damper on outdoor activities. If business depends on those activities for its revenue, excessive rain may be the last thing you need. A rain contract can help to stabilize income and help protect weather-sensitive revenues.

You choose the total amount of rain that will impact your activity over the coverage days and/or hours, of your event, or over the course of your operating season.

You may consider a rain-accumulation contract that has a maximum daily amount ... or perhaps you want to have coverage that protects against a certain number of “rainy days”, with the amount of rain defining a rainy day.

Structure:	Precipitation Call
Deal Term:	May 2012 – September 2012
Weather Location:	Atlanta Hartsfield Intl AP, WBAN 13874
Rainy Day:	Day with > 2 inches of precipitation during a day
Rainy Day Index:	Total number of Rainy Days during the period
Strike:	4 Rainy Days
Tick:	\$1MM/Critical Day
Payout:	(Rainy Day Index-Strike)*Tick

## Heating Oil

Heating Oil distribution companies are affected by milder than average temperatures. They rely on cold winters so customers will need to heat their homes and businesses. A warm winter will lead to decreases in demand, which translates into lower revenues and lost profits.

One possible solution ... a Swap:

Structure:	Cumulative HDD Swap
Term:	November 2012 - March 2013
Seller:	HeatCo.
Buyer:	Renaissance Trading Ltd. (RTL)
Weather Station:	Boston (WBAN #14739)
Strike:	4342 HDDs
Tick Size:	\$25,000/HDD
Limit:	\$10,000,000

(RTL pays below 4342 HDDS; HeatCo. pays above 4342 HDDs)

## Natural Gas

A natural gas distributor may be concerned that in times of extreme cold (i.e. increased heating demand), he may not have enough purchased gas to meet his customers needs. In this case, it is likely that natural gas costs have risen due to increased demand. Therefore, to protect himself against a potential high cost environment, the distributor buys a product that mitigates high prices.

Structure:	Weather Contingent <i>Gas Daily</i> daily vs. FOM Calls
Deal Term:	December 2012 – March 2013
Weather Location:	Atlanta Hartsfield Intl AP, WBAN 13874
Weather Condition:	Day Ahead, Forecasted Min Temperature $\leq 25^{\circ}\text{F}$
Gas Daily Index:	Henry Hub, LA
Gas FOM Index:	Henry Hub, LA
Daily Volume:	20,000 MMBtu

Note: Each day weather condition met, Client owns natural gas calls on 20,000 MMBtu.



## Conclusion

Unpredictable weather no longer means unmanageable risks:

- Volumetric risk is economically significant, with weather serving as its proxy.
- Weather is a commodity and can be managed via a robust market.
- Structures only limited by creativity (i.e. mitigate warm winter exposure through sale of calls ... monetize inherent long position).

Benefits for using a global risk management market include:

- Stabilized Cash Flow and margins.
- Reduced risk.
- Further strengthening of the balance sheet.
- Maintenance of adequate liquidity via improved and predictable cash flow.

## Questions?

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