

How Data Powers the Weather Market



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Different uses of Weather Data drive the requirements

- Weather-based contracts settle **directly** upon an index based upon specific weather data values
 - Accuracy and consistency are critical
 - Weather is highly variable, but participants have the expectation of consistency in its measurement
- The weather data provider exists to provide:
 - Easier access to data from a wide variety of sources
 - An independent source to monitor data integrity for all stakeholders

Why Weather Data Providers Exist

- Provide weather data, forecasts, analytics, consulting
- Data sources are varied and complicated
 - Provide a bridge between technical and logistical issues and needs of weather-based financial contracts
- Understand nuances of each data source
 - Recommend reliable data sources
 - Monitor data for problems (which occur frequently)
 - Ensure timely turnaround for ongoing monitoring and settlements
- Plenty of businesses can provide weather data
 - WRMA directory highlights those committed to understanding the specific issues critical to the weather risk industry

Data and Forecasts - Usage in Weather Markets

- Historical observations and forecasts
 - 10 to 30 year history commonly used for burn analysis
 - Understand climatological mean and variability that form the basis for pricing
 - Historical forecasts can be used to analyze historical market movements
- Ongoing observations and forecasts
 - Used ~15 days before and through risk period
 - Daily marking of portfolio value and analysis of potential trading opportunities
 - Form the basis of settlement values (observations only)

Data for Weather Contracts are Specific

- Weather traded on a **specific** station, parameter, and data reporting standard
 - E.g., LaGuardia HDD (CME contract)
 - Location = KLGA, 14732
 - Parameter = Heating Degree Days, computed from Max and Min Air Temperatures
 - Data Standard = US Climate Data
 - Reported by the National Weather Service
 - Based upon calendar day (24h starting at 12am Eastern Standard Time)

Data Standards

Climate Data

- **Official** climate record of a station from National Meteorological Agencies
 - E.g., US National Weather Service, UK Met Office, Meteo France, Australian Bureau of Meteorology
 - Most consistent data sources
 - Usually have multiple levels of QC (raw, preliminary, edited) delivered with varying lags
 - Final edited values may be published months after the fact
- Time convention varies among countries (but is well documented)

Data Standards

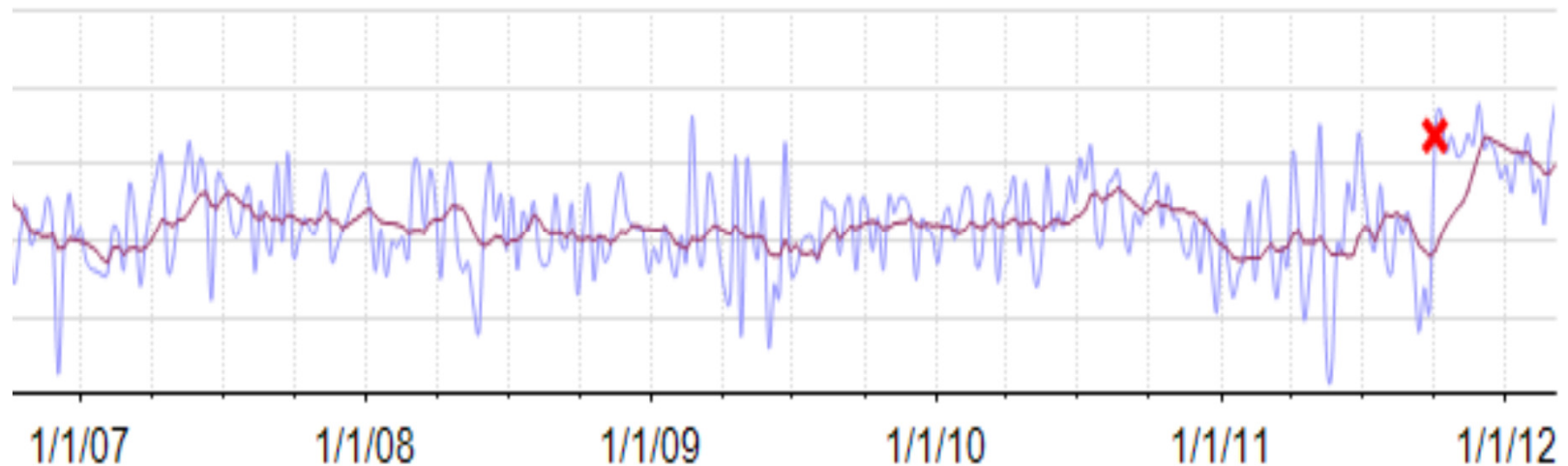
Other Data

- Synoptic data
 - Data with **real-time focus** designed to balance accuracy with timeliness
 - Requirement is support of meteorological analyses and forecast models
 - Reporting format and time convention consistent within designated meteorological regions
- Other data source
 - GSOD, Mesonets, Gridded Analyses
 - Variable quality, consistency, and conventions
 - Evaluate each source **carefully** for a given use

Data Processing

- Raw, Preliminary, Edited Data
 - Quality control by the NMS (or other original data collector)
 - Raw data quality varies, while preliminary and edited are generally very good
- Cleaned Data
 - Additional quality control by the weather data vendor
 - Removes clear errors and replaces missing values with estimates
 - Attempts to anticipate the edited value in a more timely manner
 - The **standard** for weather contract settlements
- Data corrected for discontinuities (Enhanced/Recalibrated)
 - Caused by sensor changes, land use changes, station relocations
 - Used to price historic data in present (settlement) context
 - Used to monitor sensors leading to and during risk period

Discontinuity Example



Sensor shows clear discontinuity in Sept 2012

If this situation persists, sensor would be expected to read 15-30 degrees warmer per month on average than historical data would indicate

Forecasts

- Seasonal – May be used as a tool in long-lead contracts
 - Skill is positive, but a given year can be very wrong
 - Forecasts may point to factors to watch through the season
- Short-term – 15 day forecasts actively used in markets
 - Pricing and trading contracts leading to and during risk period
 - Used to establish a baseline for market activity
 - Day-to-day variability can cause volatility in the market
- Many desks use multiple forecasts to understand the views of other market participants
- Many desks trade based upon variability in forecast solutions and the daily change in forecasts

Forecast Types and Sources

- 15-day forecasts most common baseline
 - Hourly forecasts also growing in usage
- Sources
 - Global Weather Models
 - GFS (American) – 00, 06, 12, 18 UTC
 - ECMWF (European) – 00, 12 UTC
 - Human forecasts
 - “Super-Ensemble” forecasts
 - Include multiple models (potentially including human input)
- Markets can be dramatically affected by model output, regardless of accuracy of a given model
 - E.g., US markets move sharply on the 12 UTC GFS

Basic Analytics

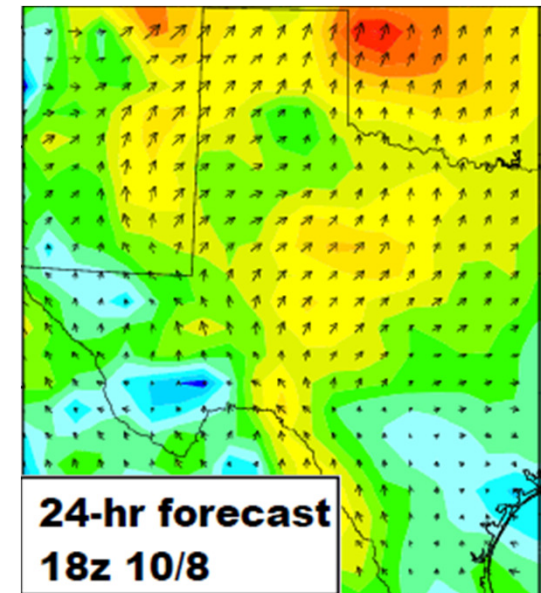
- Internally developed tools (spreadsheets and GUIs) or Third party applications
 - Burn analysis
 - Simple Mean and Standard Deviation based upon history
 - Detrending
 - Remove trends at the station due to regional/global changes
 - Modeling (Stochastic Methods)
 - Attempt to quantify events that have not happened (tails)
 - A lot of money made and lost in the tails

Advanced Analytics

- Portfolio management
 - Correlations (+ and -) of weather parameters can be to the advantage/detriment of portfolio
 - Software considering entire portfolio and interplay of contracts can be important in developing a truly diversified portfolio
- Database management
 - Weather data (including revisions)
 - Portfolio tracking
 - Back office activities

Emerging Activities

- Traditional trading dominated by HDD, CDD
- Growth in alternatives
 - Rainfall
 - Snowfall
 - Hurricane
 - Wind
- Opportunity for unique contracts
 - Any combination of weather and/or other quantifiable data can be used to structure a contract



Summary

- Weather markets offer great opportunities for risk management and portfolio diversification
 - Weather data is the heart of weather index contracts
 - Understand the details of underlying data on your deal
- Weather data providers offer
 - Expertise on available data sources
 - Impartial checks on data integrity for all stakeholders

Thank you!



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