Weather Risk Management Association
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Swiss Re

Managing the Financial Impact of Increasingly Volatile Weather

Weather and Commodity Related Product Innovations

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Agenda

- Swiss Re Environmental and Commodity Markets Group
- Weather volatility
- Weather and Commodity Market implications
- Emissions
- Insurance Linked Securities

Swiss Re's Environmental & Commodity Markets team

- Environmental & Commodity Markets
  - worldwide responsibility for weather, energy and emissions business
  - Staff in New York, Zurich, Mumbai

Focus areas:

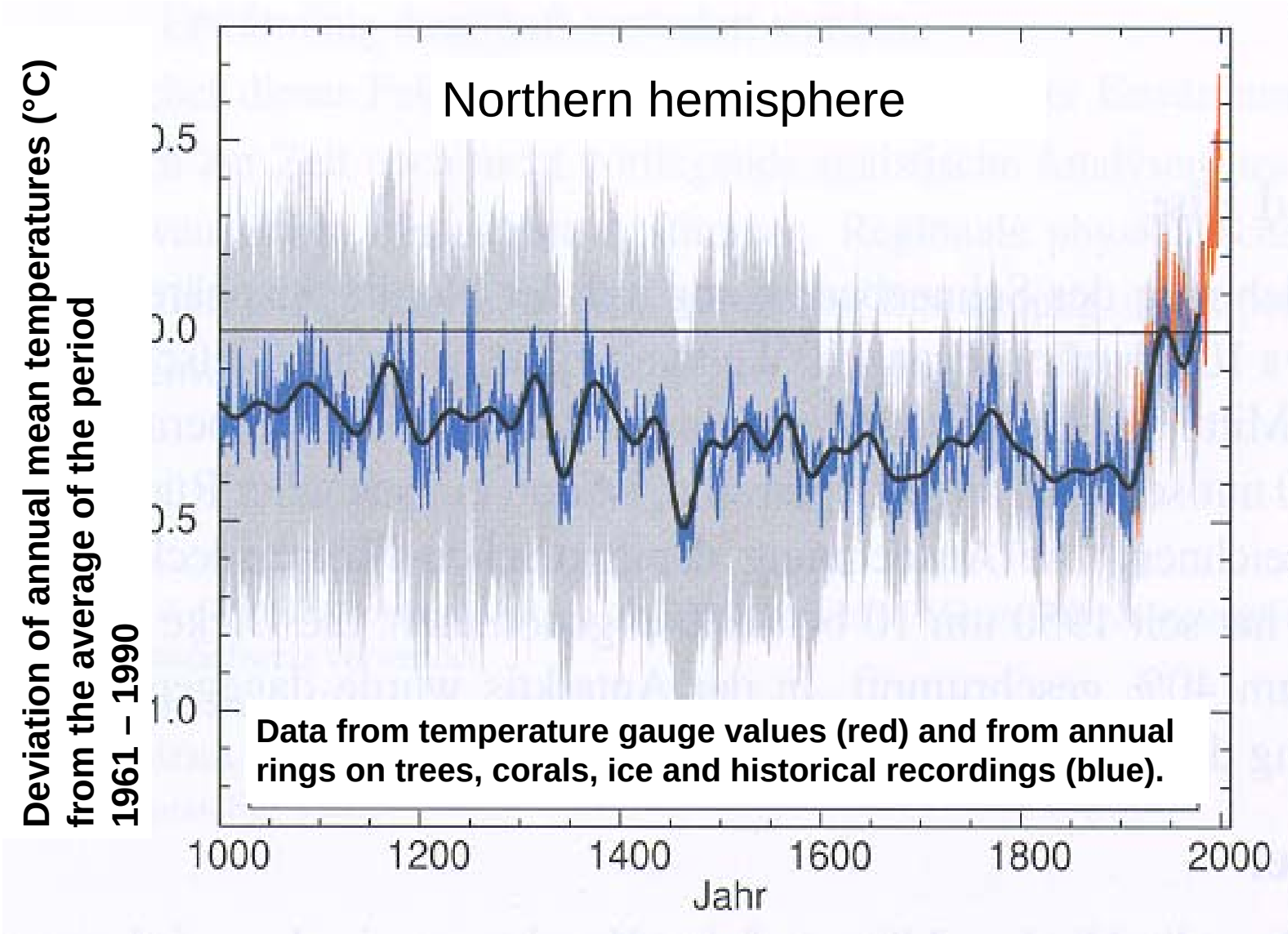
Weather and Commodity

  - temperature, precipitation, and wind standalone or in combination with natural gas, power, heating oil, and propane
  - 30%+ market share in end user business, one of the most active participants in secondary market
  - 2006 industry recognition by Environmental Finance as best weather dealer in North America and runner up in both Europe and Asia
  - Agricultural risk (yield, revenue, input hedges and trading)

- **Power outage -** contingent power price options

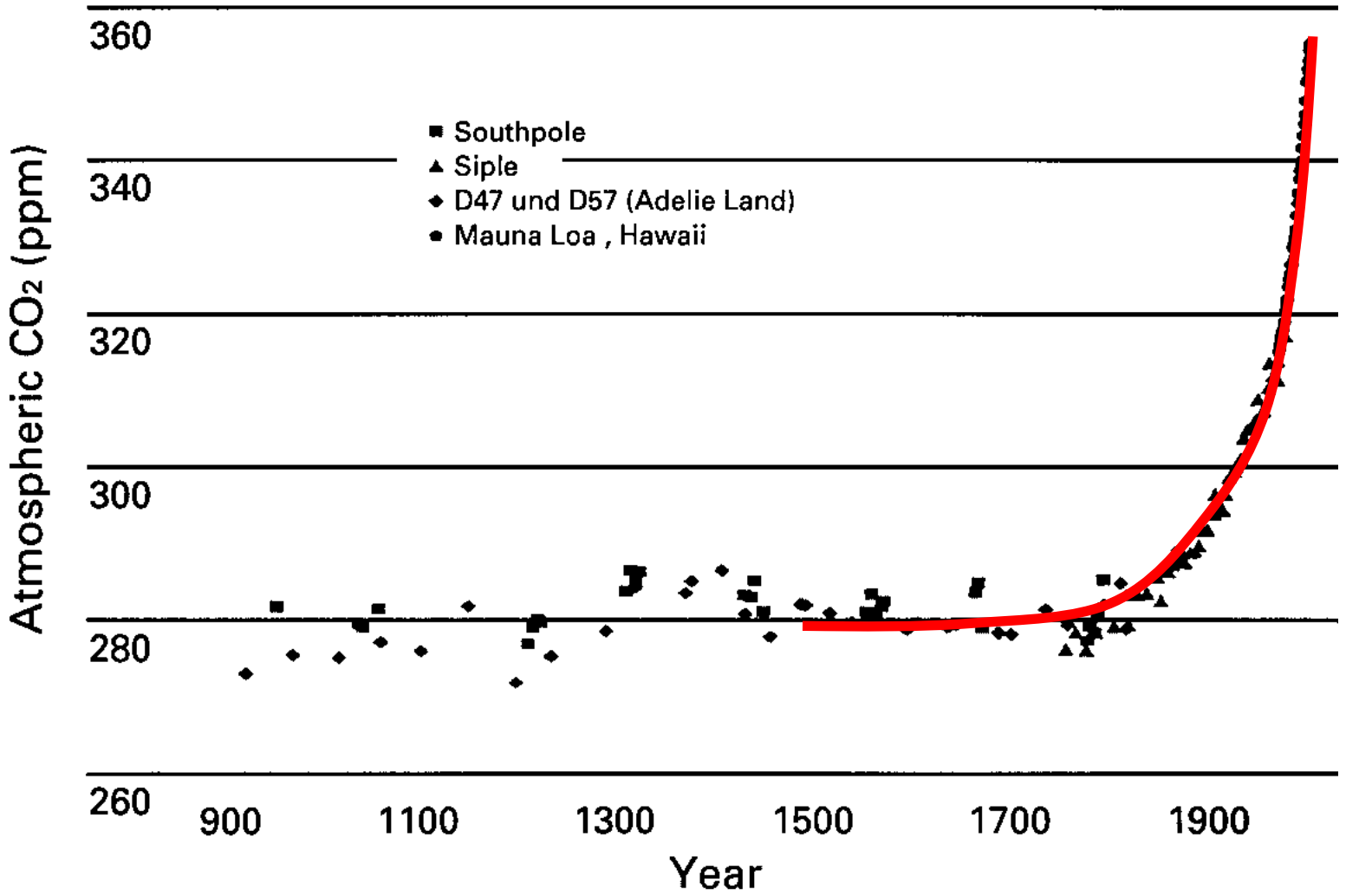
- **Emissions**
  - structured insurance products, trading and investments

Weather Volatility
Observed global warming



Source: IPCC 2001

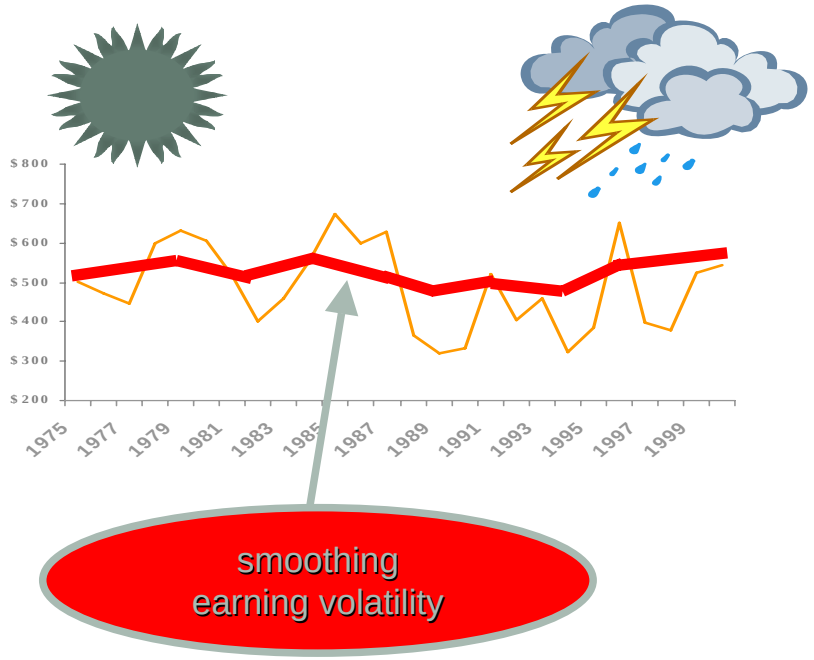
Atmospheric CO_2 increase



Source: IPCC 2001

Weather Definition and Value Proposition

- Contracts cover weather-related uncertainty in demand/supply volume and related cash flows (sales income and/or costs) on time scales of months to years.



Advantages:

- Decreased volatility allows a more efficient use of equity
- Stakeholders (i.e. government, investors, financial markets) honor more predictable cash flows by increasing the market value of a company
- Potential for lower debt costs and higher advance rates

Weather and Commodity Trading Opportunities

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- Weather has a significant impact on price action in the commodity complex, particularly energy and agriculture. The increasing volatility and interdependence of weather and the commodity markets is creating new risks and opportunities.
- Energy and agricultural markets have key weather sensitivities — heat, cold, drought, storm tracks,….
- Weather impacts on prices
  - Weather forecasts
  - Market fundamentals and technicals
  - Energy price relationships on global and regional basis
  - Global and regional crop conditions and weather implications
- Weather and commodity trading provide a unique return stream attracting insurers, hedge funds, banks and energy firms
- Creates additional liquidity and transparency for weather market with great depth of established commodity markets.

Total Notional Value of weather risk contracts: 2000/1-2005/6

(in millions of U.S. dollars)

Price Waterhouse Coopers market survey

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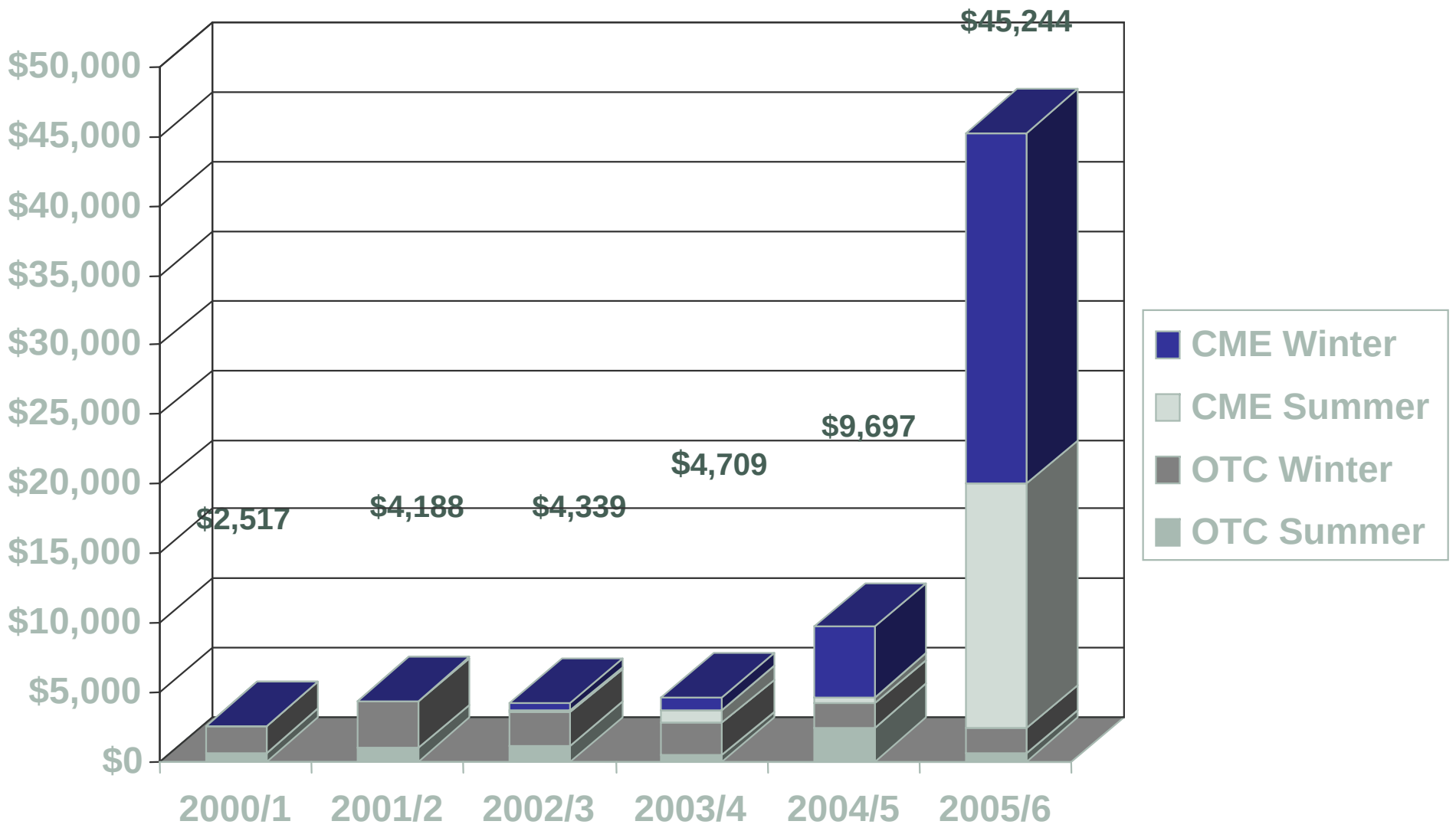

Chicago Mercantile Exchange Initiatives

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- CME is helping to drive weather market growth
  - Temperature contracts in the US trade in conjunction with energy as well as agriculture
  - CME provides price transparency, liquidity and creditworthiness (TLC) through its clearing platform for its weather contracts
- CME and NYMEX
  - CME electronic listing/trading of NYMEX energy with cross margining to weather
- CME and potential CBOT merger
  - Tremendous opportunity between weather and agricultural contracts

Energy Distributor Exposed to Price and Volume Risk

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- Heating oil distributor offering a fixed price program to their customers is exposed to volume and price of heating oil during the course of the winter.
- Traditionally, they tend to hedge their price and volume risk separately, which leaves them with an increased basis risk and higher costs.
  - If they choose to purchase a fixed priced contract on the expected volume of heating oil (based on an average winter), they would be exposed to the risk that in a cold winter they would have to provide a larger than expected volume of heating oil at high market prices.
  - In a warmer than normal winter, they may be required to sell heating oil at low market price as they have already contracted to purchase a fixed amount of heating oil at a higher price and their customers consume less heating oil.
- The heating oil distributor can hedge this exposure by purchasing weather triggered heating oil quanto put and call options. They will need to analyze their historical customer data to determine their exposure to each heating degree day (HDD). The average HDDs over a winter (Nov-Mar) for a location such as New York is approx 3750.

Energy Distributor Exposed to Price and Volume risk

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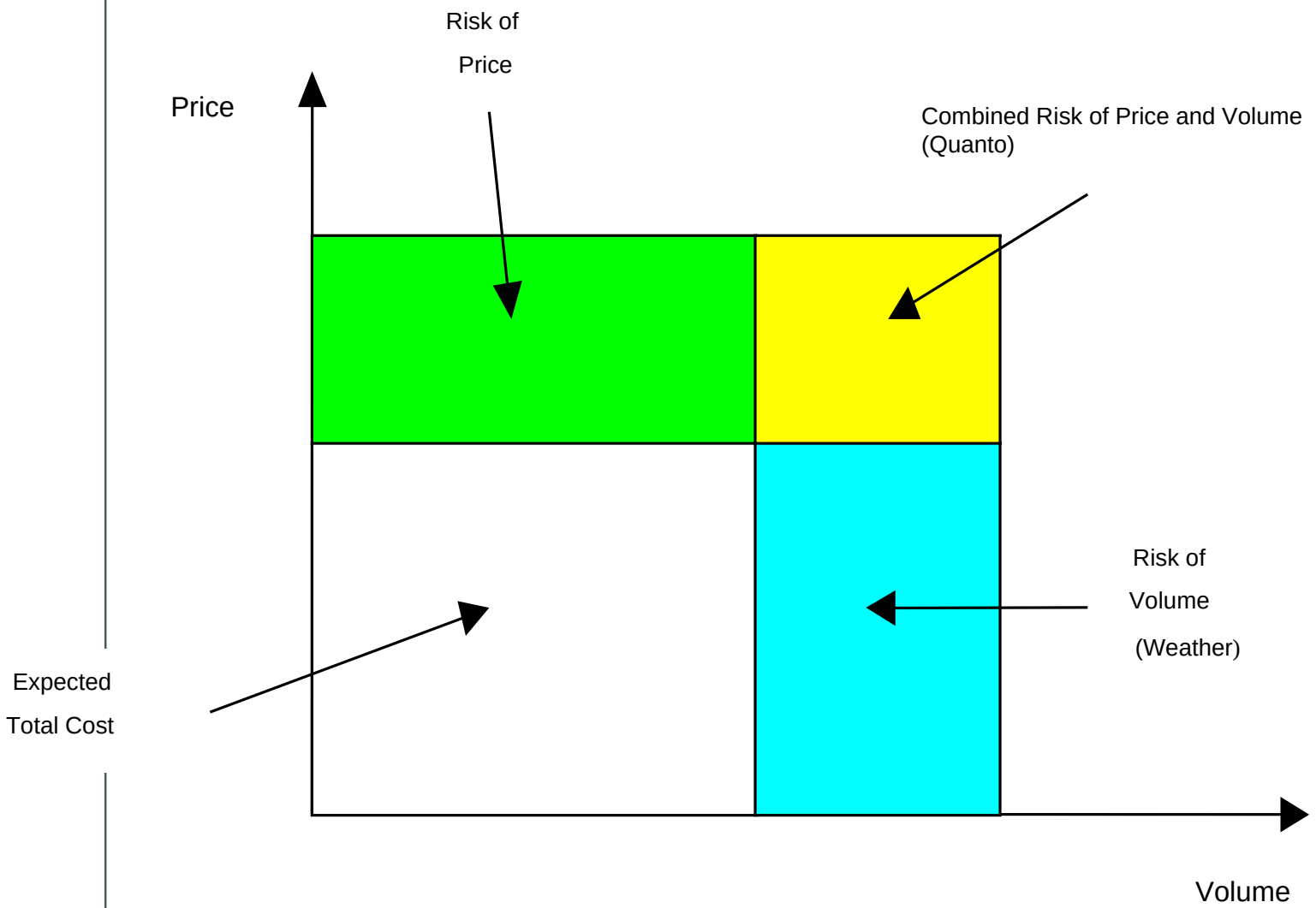
- Assume that a heating oil distributor calculates its exposure to be 10,000 gallons/HDD.
- Purchase an at the money put option on heating oil with the volume based on the number of HDDs below normal during the winter and a notional equal to 10,000 gallons/HDD.
- If the price of heating oil dropped by $0.5/gallon and due to a warm winter, the temperature trigger settles 400 HDDs below normal, the heating oil distributor would receive a payment of $0.5/gallon x 400 HDD x 10,000 gallons/HDD = $2 million. A similar structure can be used to protect their exposure to a colder than normal winter.
- The net cost of such double-triggered quanto hedges is generally between 30 to 60% of the individual price and volume hedges that the heating oil distributor would normally purchase, while providing them the necessary protection.

Quanto Structure

Price and Volume Risk



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Trading Opportunities

Weather Contract Trading

- Weather contracts can be attractive investment opportunities on a stand alone basis
  - Good data, due to market maturity, may have higher margins
  - Strong non-correlated returns
  - Combine, actuarial, trading and forecast skill
  - May be complementary or hedge of commodity positions

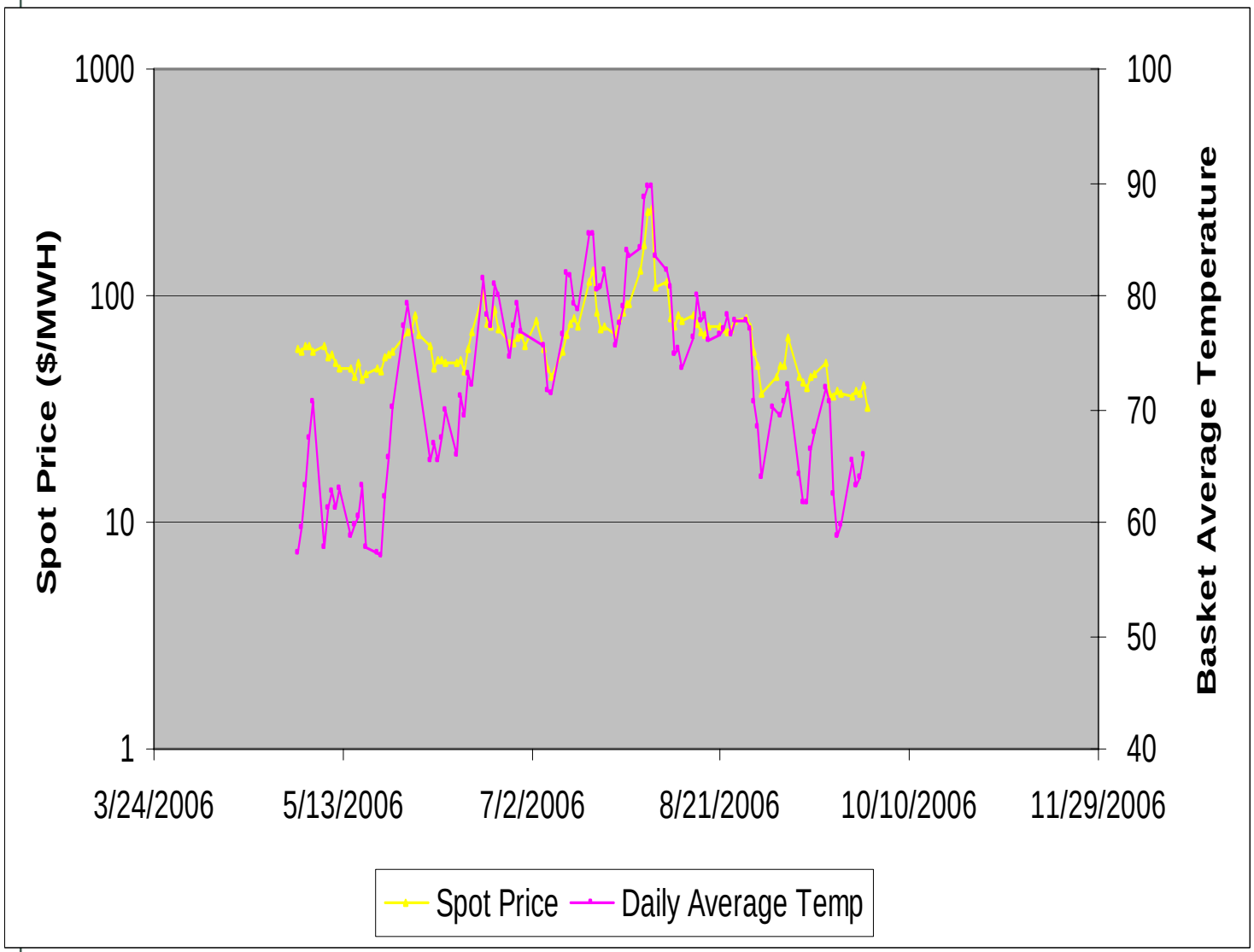
Weather/Commodity Relative Value

- Because of market dynamics, the weather or commodity markets may have higher risk margins/returns at any particular point in time.

- Relative volatility strategies can be developed to exploit anomalies in the weather and commodity markets.

PJM Day Ahead Power vs Weather

(source National Weather Service and Bloomberg)



Weather and Energy Strategies

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- Anyone trading energy has weather exposure and vice versa
- Combining weather trades with energy trades is a natural result
- If the weather market is trading to the warm side for the winter, there could be a bearish tone to the natural gas market
- The weather market over a season tends to be mean reverting. The energy markets have more exponential returns

Weather and Commodity Strategies

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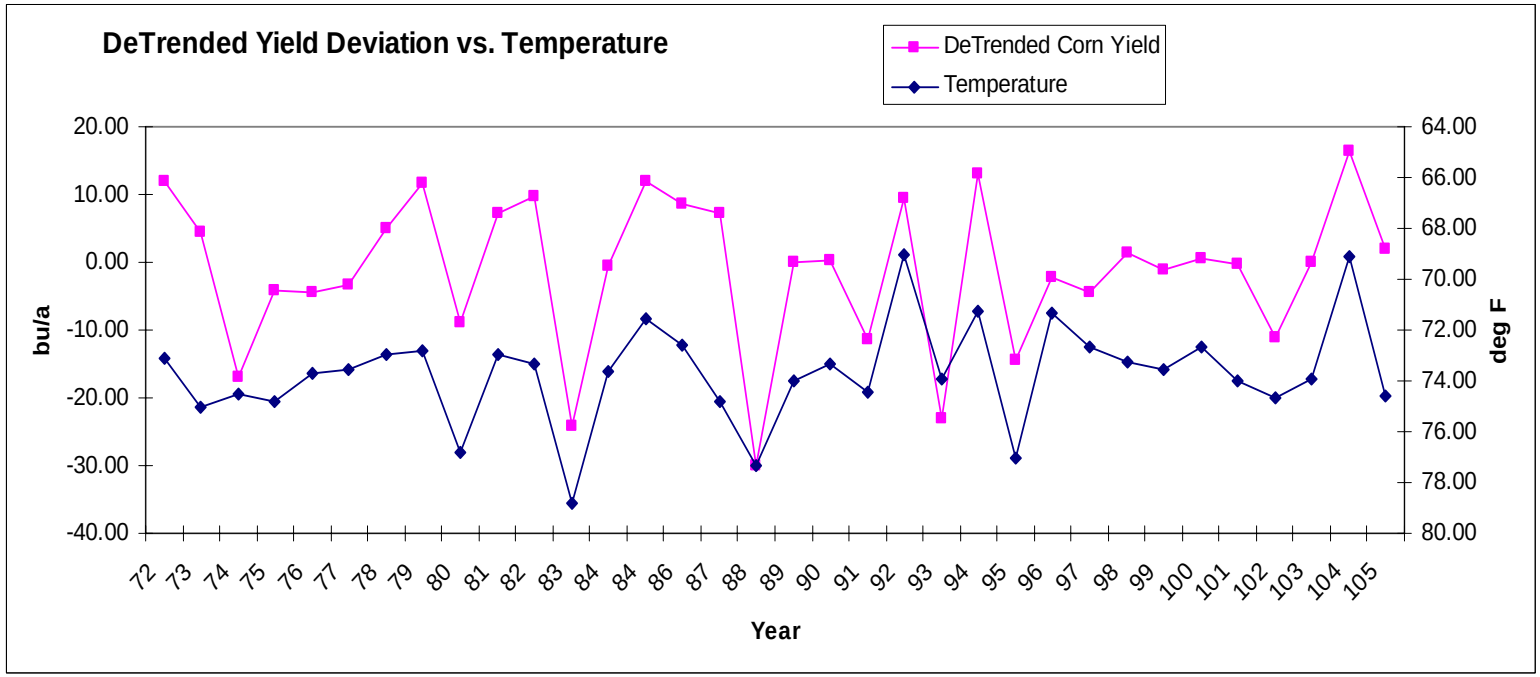
- Strategies
  - Hedges. A hedged strategy could be long the weather (buy a winter call) and short nat gas, expecting to lose on the weather contract if it is warm but reaping a potentially higher value in nat gas.
  - Fundamental strategies. On the belief there is plenty of nat gas in storage yet high prices and a belief from a climate signal or otherwise, that it will be a warm winter, one could sell the weather market and also sell natural gas.
  - Similar opportunities exist in heating oil, power, agricultural markets…

Situation in the agricultural sector

- Farmers and the agricultural industry face financial risk from yield variability due to weather – mainly drought.
- Many farmers depend upon pre-financing against their future revenue streams for seed, fertilizer, and other agro chemical products.
- Food processing companies need to purchase commodities on spot markets in case of a bad harvest.
- Agro chemical companies are exposed to weather-related fluctuations in the demand for their products & services; additionally they are exposed to the farmers credit risk.
- Weather is a good predictor of crop yields and prices

Temperature and Yield Relationship (source National Weather Service and National Agricultural Statistical Service)



Emissions

- Weather, commodity, emissions and weather related insurance are becoming increasingly interdependent
  - Europe has tremendous hydro-electric capacity, dry weather or cold weather that locks capacity increases need for thermal power generation and greater emissions
- Emissions markets experiencing significant growth
- Strong correlations with weather and energy prices

Weather and Emissions outlook

- NAP I expect no significant cross commodity trades between weather & emissions with compliance buyers in Europe mostly long
- NAP II, assume tighter allocations to increase activity as weather may significantly affect a compliance buyers long/short positions; example power utility that needs to substitute hydro power with more carbon intensive thermal production during drought
- US and Canada, expect Federal or state carbon regulations (example California) resulting in an increase of emission trading; as the short term demand of emission instruments is weather dependent that will result in additional weather trading

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Weather and Commodity wrap up

The volatility of weather and commodity prices is increasing and their interdependence creates new trading and risk management opportunities. Unpredictable weather no longer means unmanageable risks.

- Weather, like natural gas or corn, is a commodity and can be managed via an increasingly robust market
- Interdependence and increased liquidity of weather market creates new trading opportunities in both weather and commodity markets
- Structures only limited by creativity (i.e. mitigate warm winter exposure through sale of calls … monetize inherent long position)
- A portfolio, or layering, approach (long-term, mid-term, spot) to risk management may provide advantages, actively practiced by some utilities

Insurance Linked Securities

- Insurance-linked securities (“ILS”) offer an attractive risk return profile as a diversifying component within a broader fixed income portfolio
- By bridging the insurance and capital markets, ILS are creating a range of attractive investment opportunities previously unavailable to those outside the insurance industry
- Since 1996, over $30 billion in worldwide insurance and reinsurance capacity has been created through the issuance of ILS, with much of the issuance linked to both natural catastrophe perils as well as life risks, 2006 greatest issuance year
- A broad universe of investors have committed capital and resources to the sector
- Swiss Re’s ILS team is the leader in the market

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