The weather derivatives market continues to gain end-user, hedge fund and investor interest. *Roderick Bruce* examines the forecast and finds a silver lining on the current Wall Street cloud

Every cloud...

★ After a barren year in 2006/7, the weather derivatives market has come storming back. Notional value of over-the-counter (OTC) and exchange-based weather trades on the Chicago Mercantile Exchange (CME) rose 76% between April 2007 and March 2008 to reach $32 billion, while contracts traded rose by 35% to 985,000 over the same period, according to a survey by Pricewaterhouse-Coopers (PwC).

The market had reached a high of $45 billion in 2005/2006, and its decline the subsequent year led many to question its longevity. "Since its inception, the weather markets have faced challenges, but they continue to be resilient," says Felix Carabello, director of alternative investments at CME Group.

Carabello says the 2006/2007 drop in trading volume came from a period of staff reorganisation within market participants. He noted that traders' risk appetite was reduced as they settled into their new roles. "Because a number of traders were changing jobs, we saw a decrease in volumes," he says. "The moves were caused by market evolution and organic growth. It was like a kid losing its milk teeth before it matures."

End-user hedging business – particularly within the energy sector – remains the pillar that the weather market is built on. "In addition to the headline numbers in the PwC survey, which have grown quite a lot over the years, perhaps an even better barometer of the market's health is that end-user hedging transactions have been growing at a steady pace since the inception of the market," says Martin Malinow, CEO of Galileo Weather Risk Management and president of the Weather Risk Management Association (WRMA).

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The weather markets look ripe for further growth. End-users are coming from a variety of new sectors, with increasingly advanced structured deals making risk transfer more effective, and innovative origination companies such as Storm Exchange and Weather-Bill are offering improved access to derivatives for small businesses. Most significantly, as the winds of change sweep away investment banks and insurance companies on Wall Street, hedge funds and reinsurers are turning to the market in increasing numbers, as are investors seeking uncorrelated assets to diversify portfolios.

Energetic growth

Market participants say that around 90–95% of global weather derivatives volumes come from the US, with Europe supplying the bulk of the remainder, with some trades occurring elsewhere, particularly Japan, Australia and India.

The US energy sector, which pioneered the weather derivatives market in 1998 with a deal between Koch Industries and Enron, remains the biggest end-user, according to brokers. A CME Group / Storm Exchange survey carried out in April, which polled 205 risk and finance mangers across the US, found that 74% of respondents in the energy sector had attempted to quantify the impact of weather on their business, and 35% had actually employed

weather hedges to manage that risk. That compares to 29% of retailers – none of whom had employed derivatives.

"Energy companies are still the number one participant," says Bill Windle, who began trading weather derivatives at Enron in 1999 and is now managing director at RenRe Investment Managers, a weather risk management company. "More and more unregulated energy providers are seeking our services because they do not benefit from regulatory mechanisms that limit their exposures – they're in a truly free market, so volumetric and price exposure is significant."

More energy companies – producers, marketers and consumers – are getting involved in the market as product offerings advance. Significant new volumes are coming from cross-commodity deals that allow hedgers to offset both volumetric risk with traditional derivatives and price risk with more complex structures.

For example, a deregulated natural gas provider depends on cold weather to drive sales. While the company can estimate sales based on temperature predictions (using heating or cooling degree day – HDD /CDD – indexes) and create a supply portfolio accordingly, if the winter is colder than expected then the company will be forced to enter the market to buy more gas when prices are at their highest.

To hedge this risk, the company can buy a natural gas-linked weather derivative. "If the temperatures are over a certain strike we'll sell the company natural gas at a fixed or indexed price, allowing them some comfort that they won't have to purchase in a high price environment," says Windle.

Should the winter be warmer than expected, a put position then allows the company to sell any excess inventory at the end of the season at a predetermined or indexed price, allowing the company to better match their volumetric and price exposures in one combined product.

The weather derivatives market has come storming back after a barren year in 2006/7

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"There's quite a bit of appetite for these products," says Windle.

That appetite is not limited to the US. Whereas energy companies in Europe traditionally hedge volumetric risk from warm winters, many gas distribution companies in the UK now hedge price risk from colder than expected winters. "If it's much colder than normal, short-term natural gas prices in the UK tend to spike more than they do on the European continent," says Jens Boening, managing director Europe & Asia at WeatherBill, which provides customised products to end-users from utilities to small businesses.

Boening points out that end-user demand in Europe is not met efficiently in the traded market, as standardised products (such as those based on HDDs at London Heathrow) leave significant basis risk.

Cross-commodity products are therefore attracting new end-users to the market, and increased volumes from established

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counterparties. "Weather is becoming a cross-commodity market, and around 20% of our business now comes from these deals, up from about 10% a year ago," says Nicholas Ernst, head of the weather derivatives group at broker Evolution Markets. "The growth in the market is not just coming from new end-users, but also increased risk transfer from the natural gas, power and heating oil markets."

"WeatherBill will definitely give the end-user market a boost"

Jens Boening, WeatherBill

Harvesting new business

Advances in deal structuring, combined with soaring grain prices, have drawn significant interest in weather risk hedging from the agriculture sector. "There is weather risk in the entire agricultural value chain, only a portion of which is covered by Federal crop insurance," says the WRMA's Malinow. "At these unprecedented price levels, there is more absolute value to lose than ever before."

Weather risk manager and information provider Storm Exchange has seen its business grow dramatically, thanks in no small part to the agricultural sector. The company has tripled its staff in the past 12 months, hiring experts in agronomy and agricultural meteorology to meet growing demand. Storm Exchange has developed crop-specific indexes, based on how weather impacts yield and crop growth, and offers structured derivative products around them.

"The convergence of energy risk and agricultural risk is now more prevalent than ever, given the effect of yield and price volatility on many of the largest ethanol producers," says David Riker, president and CEO of Storm Exchange. "The deals we're doing now are multi-year contracts worth hundreds of millions of dollars, whereas only a year ago we were dealing with more middle-market clients."

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Felix Carabello, CME Group

Brian O'Hearne, managing director, financial products at Swiss Re, says that agriculture is clearly the fastest growing end-user sector, as awareness of weather's impact on crop yield – and how to hedge this risk – improves across North and South America. "We've seen interest from Australia, South Africa – anywhere with an agricultural economy has a need for weather derivatives," he says.

One such economy is India's, where 55% of the population (around 621 million people) depend on agriculture for their livelihood. The sector contributes 18% of India's GDP, equivalent to $748 billion. Weather risk is concentrated in precipitation: 75% of the country's annual rainfall of 110 centimetres occurs during the summer monsoon season between June and September. In addition, 26% of India's power generation comes from hydropower.

"Higher or lower than normal rainfall can create a huge problem for the economy, particularly large sections of the rural population," says Kolli Rao, chief manager of the Agricultural Insurance Company of India (AICI). "Weather derivatives and insurance could therefore be a huge market here."

Janani Akhilandeswari, a consultant at The Centre for Insurance and Risk Management (CIRM), estimates that India's OTC weather derivatives market is worth around $1 billion. At the moment, exchange-traded weather derivatives are not permitted under Indian law as they are "intangible assets", but a bill being considered by the government is likely to allow trading in commodity options, weather derivatives and index futures within the next 12 months. Index-based weather insurance products currently meet the demands of the agriculture sector.

"We are currently working with the National Commodity and Derivatives Exchange [NCDEX] in designing and pricing exchange-traded weather derivative products to be traded once the regulatory barriers are lifted," says CIRM consultant Rupalee Ruchismita. "We see huge potential in this market." The Multi Commodity Exchange of India (MCX) is also said to be considering launching weather derivatives, according to AICI's Rao.

Kendall Johnson, managing director and global head of weather derivatives at broker

TFS Energy, says his team will broker Indian exchange-traded weather contracts when they are launched. "We've had global enquiries regarding the contract – such a launch would seem likely based on the success that the World Bank has had in starting to use derivatives to ease the effects of famine and droughts in Africa," he says.

Swiss Re has recently added two staff to its Mumbai office to take advantage of future opportunities in India. In the short term, O'Hearne expects further growth to come from agriculture in the US. "As the CME Group has bought [agricultural exchange] CBOT, we may see more weather and grains being traded together," he says. "Late planting of crops has driven concern over freeze risk, so there may be increased trading of CME monthly weather contracts against corn or soybeans exposed to that risk."

Open to investors

While new end-user hedging business may be adding to volumes in the weather market, significant interest also comes from North American commodity hedge funds offsetting weather risk to their positions in the natural gas and power markets.

"We've had hedge funds talking to us for years, but until recently they haven't participated because they haven't been able to trade enough volume to make it worth their while," says one weather broker who wished to remain anonymous.

As liquidity has grown, weather-focussed funds have started to emerge, too. One such hedge fund is the Cumulus group of funds, which have total assets under management of around $100 million. A "substantial part" of this is allocated to front-month CME-cleared weather derivatives according to Peter Brewer, Cumulus' chief investment officer. He says that commodity hedge funds – particularly those trading natural gas – now account for more than half of interdealer weather derivatives trades. However, he doubts there will be an increase in funds purely trading weather derivatives. "Only the best can survive in that framework and many have tried and failed previously," says Brewer.

Hedge funds wanting to trade large volumes in the market now have the ability to deal with a counterparty of unprecedented size and risk appetite: the UBS Global Warming Index. Launched in April 2007, the index offers institutional and private investors exposure to rolling front-month weather futures contracts on the CME, for cities in the US, Europe and Japan. It has attracted $145 million in investment so far.

Weather derivatives contracts are generally for one month out to six months. "Using the index we take a different approach: we can structure long-dated trades, offering a long investment timeframe to our clents," says Ilija Murisic, executive director, hybrid derivatives trading at UBS, who created the index.

The index lends itself to the creation of structured solutions, blending weather with other asset classes like equities, commodities and carbon, says Murisic. "We have structured trades blended with equities indices such as the Standard & Poor's Clean Energy Index, or the S&P Global Water Index or other commodities like crude oil."

Murisic says the index is probably the largest presence in the market, estimating that, not including options, it holds 40% of weather futures positions. Indeed the index's first major transaction in the market, an auction held by TFS Energy, boosted open interest on the CME by 13%, and had a notional value of $64 million. The auction solicited offers on May-September CDD-swaps for 11 US cities.

TFS Energy's Johnson says the fact that the market was able to accommodate such a large risk transfer without price slippage is testament to the maturity and depth it now has. The auction format helps to build liquidity where it was previously lacking. "The auction might come from one country and place the risk in two different countries or time zones," says Johnson. "It's becoming a truly global market and the auction format helps us to cover that."

CME Group's Carabello says the UBS Global Warming Index is "really smart", and has changed the complexion of the market. "Now, a completely different kind of risk appetite exists in the market," he says. "It has validated what the market does, and now companies are looking at climatic phenomena and securitising it to become a yield-producing asset for their clients."

The index's initial summer hedges were carried out through TFS, and according to sources familiar with the situation, UBS carried out the index's first winter hedge with a direct, bilateral deal in late August. Hedge

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funds were reportedly keen to trade as the index was a counterparty of unprecedented size in the market.

Some participants aren't so enthusiastic though. "When UBS enters the market it creates a ripple effect," says one weather market participant. "It's a problem for the market when someone puts out an auction, instead of taking a more calculated approach to execution. When someone comes in and shows their entire hand it pretty much paralyses the market for a lengthy period of time."

Another participant observes that, as the index is weighted for locational liquidity rather than seasonal liquidity, the exposures are greater in October to April, instead of being weighted towards the more liquid mid-season. "Conceptually it's great, but I question the longevity of it, given the way it's being executed," he says.

However, the majority of feedback from the market on the UBS index is positive. "There's now plenty of liquidity in the market to absorb structures like this," says Swiss Re's O'Hearne. "Investors are looking for diversification, and weather derivatives offer very good non-correlated returns."

Murisic told *Energy Risk* that he is now developing an investor index based on potential Indian precipitation contracts, to be listed on the NCDEX. "The Indian monsoon derivatives market could be one of the world's largest in terms of volume," he says. He is also hoping to develop an index for the burgeoning hurricane derivatives market (see 'Hurricane derivatives' box).

Investors may be poised to play a major role in the weather market's expansion, but there is a consensus among participants that growing end-user business is the key to assuring long-term market integrity. "From the beginning people thought our markets would be revolutionary, but they have been evolutionary," says RenRe's Windle. "There is no next big thing that will come in and double market volumes, but I'm confident that there will be continued double digit year on year growth in the trading of weather-related products."

Bright forecast

One platform seeking to harness the global potential of weather risk management is WeatherBill, by offering a service that allows businesses to customise, price and buy weather coverage online. Since being founded in 2006 it has protected a diverse range of clients, from travel companies to car washes and hair salons. The company itself does not actively trade the market, but rather develops a portfolio of offsetting – negatively correlated or uncorrelated – weather derivative contracts.

WeatherBill offers online access to around 20 different contract types combining temperature, precipitation, snow and frost across seven countries including the US, UK and Germany. "We are the first to offer this level of customisability in terms of the indices available and weather stations being offered – we will definitely give the end-user market a boost," says WeatherBill's Boening, formerly of Merrill Lynch and vice-president of the WRMA. "Our mission is to democratise the weather market."

WeatherBill is currently seeking registration with the UK's Financial Services Authority, which will allow it to offer its products to every UK business. The level of granularity offered is very different to the standardised CME contracts that have so far been the market driver. "Companies like WeatherBill and Storm Exchange provide an invaluable service, a different kind of risk transfer tool

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"The good news is that there is new appreciation that falling asset prices don't change the temperature in London"

Martin Malinow, Galileo Weather Risk Management & WRMA

from us," says CME Group's Carabello. "It's more customised, less commoditised."

Market veterans Brian O'Hearne and Bill Windle view WeatherBill's emergence as the next step for the market. Windle feels the increased liquidity will benefit all market players. "The tide will rise, and as it rises it will lift all boats," says Windle. "I wish WeatherBill success, because it will be beneficial to all of us."

O'Hearne meanwhile points to Swiss Re's agreement to provide risk capacity to CelsiusPro, a Europe-focused platform similar to WeatherBill, as a signal that online origination could be the way forward.

With end-user and investor interest on the rise, the forecast looks bright for continued growth in weather derivatives trading, despite the testing times currently being experienced in the global markets. Indeed, the very nature of the weather market means it may benefit as institutions seek diversification.

Malinow is cautiously optimistic. "We haven't seen much impact on weather markets so far, but it would be naive to think there won't be some fallout given the general credit contraction and deleveraging we have been facing," he says. "The good news is that there is new appreciation that falling asset prices don't change the temperature in London." ER

Hurricane derivatives

Index-based hurricane futures and options, launched on the CME in March 2007, stand at the crossroads between the insurance / reinsurance industry and the capital markets. The products were formulated in a joint-venture between specialist reinsurance company Carvill, the index provider, and CME Group as a result of the devastating 2005 hurricane season, which caused an estimated $79 billion worth of damage. Such was the hit on the insurance market that some claims from Hurricane Katrina remain unsettled.

"The problem that the reinsurance companies faced was a concentration risk – companies had been warehousing risk so it was concentrated too much in one space," says CME Group's Felix Carabello. "Some reinsurance companies believe that warehousing of risk was an unsustainable business model and they realize that they have to shed their risk through different types of counterparties accessible through CME Clearing."

Insurance companies previously insured their risk through a reinsurance contract called an Insurance Loss Warranty (ILW), brokered by companies such as Aon or Guy Carpenter. Now products such as catastrophe bonds, which pay out to investors based on large weather events, or ILW-based insurance futures (traded on London-based Insurance Futures Exchange, IFEX) are allowing hedge funds, investors and energy companies to hedge hurricane risk, at the same time diversifying the insurance market.

The CME contracts have increased accessibility to the market, as they do not feature an indemnity piece; no receipt for loss needs to be shown to guarantee a payout (unlike ILWs). "With these futures you can parametrically calculate the risk and infer statistical losses, and it settles immediately," says Ilija Murisc of UBS. "For a utility company that's very useful."

The underlying index measures hurricane size and maximum wind speed. Contracts trade at $100 for each 0.1 points on the index. A relatively small hurricane with a 60-mile radius and 74 mph winds would score 2.5 on the index. Hurricane Katrina would have scored 19. "The Carvill index is a more precise proxy for storm damage and intensity than the Saffir-Simpson scale [which rates hurricanes in categories 1 to 5]" says Martin Malinow of Galileo Weather Risk Management. "It's a purely parametric index, so it's effectively a weather derivative and seems to be a product that's here to stay."

Nicholas Ernst of Evolution Markets, which recently set up a desk to broker cat bonds, ILW derivatives and the CME's hurricane futures, says that hedge funds prefer to trade the CME/Carvill futures as the index format is ideal for algorithmic trading. "The problem is that it doesn't fully cover all insurances risks – it leaves significant basis risk," he says. "Right now it's maybe too big a leap from the way business is traditionally done, but the market is two or three years away from really exploding."

After little interest in 2007, an active 2008 storm season has seen 32,600 hurricane contracts traded on the CME up to August this year; notional value has yet to be calculated, according to the CME.

Swiss Re's Brian O'Hearne says that more point-specific and location-specific products have helped to encourage insurance companies to trade on exchanges. "Insurance derivatives are poised for significant growth," he says.

One participant who wished to remain anonymous says that many insurance hedge funds are up 10-15% for the year, because they are uncorrelated to floundering financial markets. "With AIG having gone belly up there will be more reinsurance opportunities," he says. "The fact these assets have done well when everything else has performed poorly means there will be significant capital inflows."

And of course, institutional and retail investors are on the lookout for uncorrelated assets. "There are opportunities to create an index in the catastrophe markets, just as UBS has done in the weather markets," says Kendall Johnson of TFS Energy.