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STRATOSPHERIC PROFITS

Forecasting technology and risk management take the worry out of changes in the weather

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From farmers to fashion houses, from advertisers to airlines, weather affects the bottom line of numerous industries worldwide. Indeed, more than a third of US economic growth is linked to weather conditions, according to figures from the Department of Commerce. A colder-than-expected winter, say, will directly impact how much fuel will be burnt to heat homes, how fast crops will grow and how much consumers will spend on goods.

Yet until recently few companies could or would take action to mitigate the risk of either extreme or rapidly changing weather on their business. This is changing though, thanks to a combination of advances in forecasting technology, a sharpened focus on cost control in the wake of the financial crisis, and the increasing sophistication of the weather-intelligence and risk-management sectors.

NASA's latest Earth-observing satellite - which blasted off into space last November - boasts five new instruments, designed to collect even more detailed information about Earth's atmosphere, land and oceans than was possible even a couple of years ago. The satellite promises to increase the accuracy and extend the length of time for advanced weather warnings, helping to save lives and property and better meet the needs of commercial interests.

Those working in agriculture are among the biggest beneficiaries. Foreknowledge is crucial, of course, when farmers are preparing to plant and protect their crops, and guard against insect infestations and disease outbreaks that are sensitive to temperature changes. The fishing industry is equally dependent on reliable forecasts.

Advanced warning mechanisms can save the transportation industry huge amounts of money, too. Weather-related incidents and delays cost the aviation business billions of dollars every year, therefore accurate, advanced forecasting can bring significant savings that, in theory, can then be passed on to consumers.

As technology advances, a growing number of innovative companies are developing complex statistical tools for analysing and quantifying weather risk. At the same time, the weather derivatives industry is rapidly evolving from its commoditised, energy-based roots in the US into a global provider of tailored protection for both developed and emerging markets.

Over the next few pages we examine how six very different industries are putting their faith in the new technology - finding new ways both to manage weather risk and use it to their advantage - and identify key growth areas for the weather industry's development.

Energy

Among the biggest users of weather intelligence, and easily the biggest users of weather protection, are the major energy providers on both sides of the Atlantic - indeed, the weather derivatives market was born out of the energy sector in the US, as exchanges developed products to enable companies to hedge against losses from warm days in winter or cool spells in summer.

Energy firms are still the biggest customers for the Chicago Mercantile Exchange's standardised products, but an increasing number of operators are opting for tailored products to meet the changing needs of the industry.

"People are becoming more aware of the need to manage risk but have less money to do so since the financial crisis, so it's up to us to come up with innovative structures that allow them to accomplish both," says Bill Windle, managing director of RenRe Energy Advisors and president of the Weather Risk Management Association.

Several of RenRe's clients, for example, have chosen to forego some of their profits under favourable weather conditions in return for cheaper downside protection. Similarly, Stephen Doherty at Speedwell, a global provider of weather data and intelligence, reports a recent increase in interest in structures that combine weather and commodity risk, either in the form of a hedge against oil or gas prices when demand is high or, for renewable operators, a product that locks in fuel costs in the event of a weather-related shortfall in output.

Indeed, the growth of the renewables sector is - in theory at least - throwing up opportunities for weather risk providers. Whereas energy firms have traditionally used

weather derivatives to hedge against shortfalls in demand and commodity derivatives to protect against supply-side price hikes, with the rise of wind, solar and hydro power they now face weather risk on both sides of the equation.

Hedging wind risk in particular, however, presents a whole new set of challenges. In order to write protection, weather derivatives providers need to see several years' worth of historical data - but most windfarms are in remote locations far from recording stations. Moreover, where there is data, it is for wind speeds at ground level rather than the 150m height of the turbines.

Fortunately, most wind-power firms install 'met masts' at potential farm sites to take readings for 18-24 months prior to taking build decisions. Weather risk firms such as New York-based Galileo can then combine this with data from other sources to create a pricing model. And this type of hedging is not only useful for existing windfarm owners - as Martin Malinow, CEO of Galileo explains, in a capital-constrained world it could provide a crucial ingredient in the funding mix for the wind industry.

"People are increasingly looking for alternative forms of capital that can sit in the project structure. A wind-hedging product fits the bill as it is effectively weather-contingent capital," he says. "The equity provider can go to the lender with a highly rated wind-insurance product which will guarantee a minimum production level to meet debt service or serve as a mezzanine layer between equity and debt. This allows the developer to say to the bank: 'With this insurance in place, I'd like to use less equity.'"

Windfarms are also proving a key market for weather intelligence, especially in countries such as Denmark and the UK, where wind is the dominant renewable sector. For example, UK government agency the Met Office (formerly the Meteorological Office) has developed computer modelling to identify potential farm sites and provides services to existing farms, alerting them to possible power outages and hazards - such as lightning - that would affect maintenance. It is also leveraging its long experience of providing marine forecasts for the offshore oil and gas sector to support the growing offshore wind market.

Both the Met Office and Galileo cite solar as an upcoming sector for weather intelligence and risk management - Galileo did its first solar irradiance transaction in Germany two years ago - while hydropower providers are already making extensive use of weather hedges, particularly in the developing world. "In a lot of emerging economies hydro is critical to their energy mix and they can ill afford to be without power," says Speedwell's Doherty.

Writing protection in emerging markets has traditionally been challenging due to the lack of reliable historical weather data, but that is changing, in part thanks to firms such as Speedwell that have spent the past decade searching out information from a host of countries and, in the absence of it, installing thousands of weather stations across the globe. The Met Office also works with national weather services to improve forecasting and data quality - and the result, says Doherty, is that the number of countries off-limits to weather hedging is now restricted to a few outliers such as North Korea.

Agriculture

Few sectors are as weather-dependent as agriculture, so it comes as no surprise that a growing number of farmers - particularly in emerging economies - are discovering the advantages of weather protection. In India, for example, where the timing and magnitude of the monsoon are key drivers of the economy, big agricultural states such as Karnataka, Maharashtra and Uttar Pradesh already provide weather insurance to small farmers and offset it at state level with risk providers in the US and Europe.

In the developed world, where weather derivatives have been in the mix for more than a decade, the key trend today is towards more advanced use of weather intelligence in crop planning. Weather consultants such as Planalytics are using sophisticated monitoring and modelling techniques to help agricultural firms in sectors from large agrocrops to grass and soft fruits to improve yield, seed selection and crop development.

Tim Morris, European managing director of specialist consultancy Planalytics, flags agriculture as one of the major growth markets for weather intelligence in the coming years. "Life sciences is going to grow extremely quickly," he says, "because as the supply side of the food industry needs to become more and more competitive, making decisions on when to plant in order to achieve the best price is going to become increasingly important."

Retail/consumer

Weather is arguably the biggest factor driving the behaviour of consumers. As Morris at Planalytics says: "The first thing you do when you throw back the curtains in the morning is decide what you're going to wear, and that is largely down to the weather. It will influence where you go to eat your lunch, what you choose to eat, and what you do in your leisure time."

Yet retail firms have been surprisingly slow to incorporate this into their corporate strategy - weather has been largely seen as uncontrollable, something to be blamed when times are hard and ignored when sales are soaring. The financial crisis, however, has focused minds on the bottom line, and weather consultants report a recent upsurge in interest from the sector.

"Organisations are finding it increasingly difficult to compete and any extra intelligence they can get that helps them manage their stock levels etc is going to help," says Cathy Durston of the Met Office.

The rise of a more analytical approach to weather intelligence has also helped. For retail companies, knowing what the weather is going to do is much less important than quantifying the effect of those conditions on sales - a task that has been overlooked in the past in part because of its statistical complexity but one that can produce invaluable and sometimes counterintuitive results.

Sales of soft drinks, for example, are clearly influenced by temperature but the relationship between the two is far from linear. Below a certain key trigger temperature - which varies according to location and time of year - sales remain static. Once that threshold has been exceeded, however, every extra degree gives a significant uplift until a peak temperature is reached beyond which demand starts to fall off.

Understanding these relationships is becoming ever more important as consumer behaviour changes, says Morris. "At the moment there are a lot of companies that are recognising that things are changing, that consumers are buying much closer to the point of need than they may have done before."

And it is not just about sales. US restaurant chain Cheesecake Factory recently asked online forecaster and consultancy Weather Underground to analyse the effects of weather across its network with a view to managing staffing levels. "If you have one waiter standing idle in one location because of adverse weather it's not a big deal - but if you have hundreds of locations, that means hundreds of waiters standing idle over a year, and avoiding that means a pretty big cost saving," says the consultancy's marketing director, Toby Skinner.

Retail firms are also waking up to the advantages of weather hedging, particularly since firms such as CelsiusPro have started to target the SME sector with a wide range of products. Since launching in 2008, the Zurich-based derivatives provider has had notable success with leisure parks buying protection against bad weather in the crucial summer months, and has even sold rainfall hedges to restaurants with large outdoor spaces.

Morris is confident that retail will remain a key growth market for weather intelligence, particularly in the food sector. "Some of the very best food retailers are using this information already but a lot are not using it well at all," he says. "I think food retail will take this extremely quickly because it's very immediate - in fact weather intelligence is probably the main additional parameter that's being embedded into most short-range replenishment models right now."

Marketing

Marketers have long been aware of the link between weather and advertising - promoting porridge in a heatwave, for example, is clearly unlikely to get results - but have struggled to make effective use of the knowledge due to long lead-in times for ad campaigns and the limited accuracy of forecasts. With the advent of the internet and advances in short-term forecasting, however, that has all changed - and marketing departments are discovering ever more innovative uses for weather intelligence and weather derivatives.

Leading online forecaster Weather Underground, for example, allows firms to target its 13.2 million monthly unique users in the US with real-time ads tailored to local weather conditions. Thus, rainfall in any area can trigger the release of ads for umbrellas, anoraks or tropical holidays, while a rise in temperature past a trigger point will activate

ice cream ads. Companies with a broad product range can deploy multiple ads as conditions change-car-makers, for example, can promote convertibles on sunny days and four-wheel drives when it starts to rain.

Similarly, consultancy Planalytics uses cutting-edge weather modelling to give clients advance warning of conditions conducive to marketing. This can be used opportunistically - knowing that TV forecasters are likely to start talking about snow in the next couple of weeks, for example, is invaluable to winter-coat manufacturers - or to get the timing right for seasonal campaigns. Lawnmower sellers, for example, get most benefit from promotions at the start of spring, but unfortunately for them, that can be a very moveable feast.

"We've had retailers who have run a campaign on the same weekend for two years running," says Planalytics' Morris. "The first year they get a massive uplift, the second year there's snow on the ground. After that they tend to come to us and ask if it can be avoided, and usually it can."

The development of smaller-scale and highly customisable weather derivatives is also catching marketers' attention. Among the clients of Zurich-based online weather protection provider CelsiusPro is Swiss barbecue-maker Koenig, which used rainfall derivatives to overcome customers' reluctance to buy barbecues in a rainy spring by offering a refund in the event of a wet summer - with the bonus that any payout from the derivative would be in cash while barbecue owners would receive vouchers that would encourage further spending.

CelsiusPro has also sold weather protection to organisers of some open-air festivals and reports strong interest from ski-lift operators in the Alps hoping to persuade skiers to buy seasonal lift passes by offering a money-back guarantee in the event of yet another snow-free winter.

Another key growth area for weather-based marketing is likely to be social media, according to Weather Underground's Skinner. "Weather is the number-one conversation topic around the world," he says. "If you're talking to a complete stranger, the first thing you talk about is what the weather's like." In the UK, broadcaster HBO promoted its medieval fantasy series *Game of Thrones* using an app created by Weather Underground that combined real-world forecasts for London with those for the fictional kingdom depicted in the TV show.

Similarly, weather can prove an ideal medium for continuing contact with customers. A travel company that sells a flight to Turkey, say, can maintain vital post-sales communication by emailing or texting passengers with weather forecasts for Istanbul in the days prior to travel.

Transport

As tens of thousands of travellers stranded across Europe and the US over the past two winters can testify, transport is a highly weather-dependent business. It is in

consequence also a lucrative sector for organisations such as the Met Office, which reports a big increase in demand for its portfolio of transport-related products - from aircraft de-icing alerts and ultra-sensitive forecasting for airports to warnings of leaves on the line for rail companies - following last year's chaos.

Andy Giles, UK managing director at weather-forecasting business MeteoGroup, cites the use of "augmented reality" for weather services as another important trend in the transport sector. "Real-time devices, such as smartphones, are able to interact directly with, for example, cars and roadway monitoring equipment to create ongoing, updated weather alerts to help drivers make key decisions," he says.

Due to the diffuse nature of transport risk, weather hedging in the sector is primarily limited to protection against adverse conditions in specified locations - a frozen port, for example, or icy runways - but big transport companies are providing a growing market for advance intelligence about climate change effects. According to the Met Office, a number of firms have commissioned studies on subjects such as the potential effects of sea-level rises on key ports around the world.

Construction

Paradoxically, construction is both one of the simplest and one of the most complex sectors for weather intelligence and risk providers. Accurately assessing the financial impact of, for example, snowfall on a particular construction project can be highly challenging, while in countries such as Ireland and the Netherlands (where unionised workers down tools at specific temperatures or precipitation levels), it can easily be both quantified and hedged - something online weather-protection firm CelsiusPro has been quick to catch onto, signing up the Dutch and Irish construction associations.

But however challenging the sector, Martin Malinow at Galileo argues that it is likely to provide one of the biggest markets for weather products in the coming years, given the vast need for infrastructure build-out across the developing world in particular.

"The emerging middle classes in these countries are going to want stuff they've never had before, including clean water, reliable electricity and good roads, and a lot of aspects of getting those things up and running is logistically weather-related," he says.

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