

# Seasonal weather forecasts: Opportunities and challenges for the insurance industry

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An attempt is made to shed some light on the opportunities and challenges facing the insurance industry based on recent information forecasting the most likely state of the atmosphere during the next few months. To this end, a description is given of the key characteristics of weather-related insurance markets and some challenging questions within the context of seasonal weather forecasts are posed for those involved in risk.

## **Overview of weather risks**

Two main insurance/derivative markets are highly influenced by weather.

The first category includes storm-exposed property insurance markets and large loss potentials in the USA (100-year insured market loss totalling some USD 50 billion), Japan (roughly JPY 7,800 billion) and Europe (approx. CHF 25 billion). Risk transfer in these traditional reinsurance markets is triggered mainly by the loss burden due to intense hurricanes and extratropical winter storms affecting Europe. Those involved in risk are international reinsurers and, generally speaking, more locally oriented insurers. The business relations between these two counterparties are based on long-term relationships for the most part and there is mutual understanding that losses incurred by one party will be paid back over the years by the other. Due to these payback expectations, reinsurers are faced with notorious price cycles – prices increase significantly in the aftermath of large losses and continuously decrease during loss-free periods, thereby reaching levels which are far below the expected average annual losses. These characteristics of the traditional catastrophe insurance markets and the fact that the triggering property loss is influenced by a number of other factors strongly limit the influence of seasonal weather forecasts on the supply and demand patterns and pricing on these markets.

Secondly, there are the newly emerging weather derivative/weather insurance markets aimed at covering the weather-related revenue fluctuations and/or costs of various industry sectors. The most advanced of these markets covers weather-related volume fluctuations in energy commodities (i.e., natural gas, heating oil and electricity) of energy utilities operating in the USA and is estimated to currently provide coverage for about USD 1 billion. Risk transfer is triggered by the so-called Heating Degree Day (during the winter season) or the Cooling Degree Day (during the summer season) indices<sup>1</sup>. Thereby the HDD/CDD values of each day in the risk period are totaled, and payments depend upon whether or not a certain HDD/CDD threshold is reached at the end of the risk period. These indices record systematic deviations of seasonal temperature patterns from some climatological average which is precisely that addressed in seasonal weather forecasts. Furthermore, these transactions are made in a capital market environment which – in contrast to the traditional reinsurance environment – has no payback expectations. In other words, these risk transfer products must be priced so that they are always

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<sup>1</sup> Heating Degree Day [Cooling Degree Day] indices are totalled over the risk period (for example, the typical winter season risk period covers 152 HDD days from 1 November to 31 March) and defined as:  $HDD = \text{Max}(65^\circ\text{F} - (T_{\text{max}} + T_{\text{min}})/2; 0)$  [ $CDD = \text{Max}((T_{\text{max}} + T_{\text{min}})/2 - 65^\circ\text{F}; 0)$ ] where in  $T_{\text{max}}$  and  $T_{\text{min}}$  are in-turn the maximum and the minimum temperature per day.

TRÜB, J.: SEASONAL WEATHER FORECASTS: OPPORTUNITIES AND CHALLENGES FOR THE INSURANCE INDUSTRY commensurate with the risks taken. Both the trigger, based on purely meteorological information, and the need for risk-adequate prices explain why these markets are strongly influenced by the availability of seasonal weather forecast data.

### ***Challenges for those involved in risk***

The two most prominent questions facing those involved in risk are:

- How much risks transfer is needed/is accepted (the supply and demand pattern)?, and
- Is the pricing for this risk transfer commensurate with the risks?

Both these questions address the reliability of the seasonal weather forecasts. Taking the view of the risk taker, avoiding opportunistic risk transfer for insufficient prices is of prime importance. For example, a client with operations strongly influenced by ENSO phases is likely to make his risk transfer dependent on the ENSO cycle. For risk takers, it is then important to operate with different pricing regimes for the ENSO cold, warm and neutral phases to ensure risk adequate pricing. In addition, viewing each of these phases individually, there should be no systematic deviations in the long run between seasonal weather forecasts and the observations as recorded in the weather indices triggering some cash flows. However, some uncertainty in the seasonal weather forecasts is acceptable as it – similar to other risks such as credit risks - contributes to an overall uncertainty loading.