In the fourth edition of **B** we discuss hurricane forecasting and its relevance to reinsurance. We also review the post-WTC performance of the rating agencies, discuss the reinsurance industry's continuing 'big squeeze' and look at capital provision at Lloyd's.

Hurricanes rank above earthquakes and floods as the USA's most costly natural disaster. The annual damage bill in the continental US from hurricane and tropical storm landfalls during the period 1926 – 2001 is estimated to be US$5.3bn (at 2002 dollar equivalent). However, substantial variability occurs, with 1999 and 1997, for example, costing US$8.4bn and just US$0.16bn respectively.

Insurers and reinsurers have long recognised that skilful long-range forecasts of seasonal US and Caribbean hurricane strike numbers could be used to optimise their prior-season purchase of reinsurance or retrocession, thereby reducing risk and volatility. However, three facts have taken the edge off the use of seasonal hurricane forecasts in (re)insurance business decisions to date. Firstly, Hurricane Andrew – the most expensive insured loss on record, at US$20.5bn, occurred in a relatively inactive hurricane year. Secondly, there is a general lack of confidence concerning the accuracy of seasonal hurricane forecasts. Thirdly, the short record of insurance industry hurricane loss data (from 1990) makes a reliable assessment of forecast value difficult.

The purpose of this commentary is to show the growing insurance interest in such forecasts, the increasingly robust skills now available, and the new products and developments which, for the first time, are offering good potential for applying seasonal (and other) hurricane forecasts in business decision making. The focus is on Atlantic and US landfalling hurricanes but the discussion applies also to other global tropical cyclone regions of interest to (re)insurers.

TROPICALSTORMRISK

The TSR consortium comprises experts on insurance, risk management and seasonal climate forecasting. The TSR industry expertise is drawn from the Benfield Group, Royal & SunAlliance and from Crawford & Company. The TSR scientific grouping brings together climate physicists, meteorologists and statisticians at University College London and the Met Office. TSR forecasts, skill assessments and products are available from www.tropicalstormrisk.com.

PREDICTION SKILLS

The true proof of a forecast is its long-term track record, but how can you judge the accuracy and usefulness of the TSR seasonal forecast models which have been operational only since 1998? One good result does not mean that the method is foolproof any more than one bad result means that it is useless. The skill of a forecasting model can be assessed by hindcasting, i.e. by computing what the model would have predicted in prior years had it been available at that time. A rigorous hindcast for say the 1990 hurricane season is built solely using data up to and including 1989; a hindcast for 1991 is built only using data through 1990. The TSR web site provides rigorous hindcast skill values, as a function of lead month, averaged for 1987 to 2001, for various storm and landfall strike categories in the Atlantic, Caribbean, NW Pacific and Australian-region basins. For Atlantic hurricanes, seasonal forecasts have useful skill from early April. This skill increases steadily as the main hurricane season start of 1 August approaches.

How did the TSR forecasts perform in 2002? Christopher Landsea, co-author of the Gray and NOAA seasonal Atlantic hurricane outlooks, acknowledges that ''the TSR forecasts were certainly the first to correctly anticipate a below normal Atlantic hurricane season in 2002''. The TSR forecasts predicted the below average activity from early May (which competing forecasts did not anticipate until early August). This success combines with accurate TSR seasonal predictions for the 2002 NW Pacific typhoon season (20 – 30% above average overall activity) and for the 2001/02 Australian cyclone season (40% below average storm activity).

NEW FORECAST PRODUCTS FOR RISK AWARENESS

Innovative TSR forecast products released within the past year to increase risk awareness include:

● **Forecasts of the National Ocean and Atmospheric Administration Accumulated Cyclone Energy (ACE) Index Over Sea and Land.** TSR forecasts values of the ACE Index – a measure of total wind energy – for seasonal Atlantic basin overall activity, Atlantic basin regional activity and US landfall activity. We define the US ACE index as the sum of the squares of 1-hr maximum sustained wind speeds for all systems while they are at least tropical storm strength and over the US mainland. Since this index reflects a combination of intensity and duration it should be a better measure of likely damage than the number of tropical storm or hurricane landfalls alone.
● **Monthly Updated Forecasts.** These are issued for seasonal Atlantic basin, US landfalling and Caribbean Lesser Antilles landfalling activity (and for the ACE values) from early December to early August. For NW Pacific typhoon and Australian-region cyclone activity the monthly updates run from March to August and from June to December respectively. Since climate conditions can change rapidly (eg an abrupt change happened in the North Atlantic between April and May 2002), this product provides (re)insurers with the latest up to date forecast information.
● **TSR Storm Tracker.** This product – designed for clarity of information, ease of use and relevant content for (re)insurers – is available on-line at www.tropicalstormrisk.com. It provides real-time forecasts out to 5 days lead for all active tropical cyclone systems worldwide. These forecasts are updated every 6 – 12 hours and provide the best available information on storm strength, track and track uncertainty, all with various levels of zoom. A unique feature to be included soon is current and forecast 2-dimensional windfields (in knots) for all systems of at least hurricane force. The TSR Storm Tracker provides insurers with the latest information for assessing the risk from active tropical storms worldwide.

BUSINESS APPLICATION

Recent TSR research shows that the seasonal US ACE Index is more predictable than the seasonal number of US hurricane strikes. For early August forecasts, the correlation skill for predicting the US ACE Index in true independent hindcast mode for the 30-year period 1973 – 2002 is 0.48. Thus 23% of the interannual variability in this index is predictable before the start of the main hurricane season.

TSR, in collaboration with the Helvetia Patria Group, is developing a method to simulate 10,000 years of US hurricane landfalls, losses and ACE index forecasts to examine the business relevance of the forecasted ACE skills for reinsurance/retrocession buy and sell strategies. Unlike traditional reinsurance with a 1 January renewal date, Industry Loss Warranty (ILW) contracts, triggered by market rather than individual company losses, are traded throughout the year and thus are suitable products for these studies. Three different ILW buying strategies are examined:

● Always Buy – the traditional strategy to buy cover regardless of hurricane forecasts.
● Forecast – uses the TSR ACE Index forecast information to decide whether to buy.
● Climatology – uses averages of recent years hurricane experience to decide whether to buy.

Results show that the 'Forecast' strategy clearly outperforms the other buying strategies by about 10% in terms of protection purchase efficiency (the ratio of price paid for protection to the resulting reduction in risk based capital). Furthermore, the 'Forecast' strategy also shows lower net retained risk and volatility.

Full details of the analysis are available on request – please see the contact details below. These early results give good grounds for expecting that, over a period of years, an additional profit margin may be obtained through an efficient buying of reinsurance or retrocession based on the TSR seasonal US hurricane ACE Index forecasts in early August. Similarly reinsurers can increase their profit margins by implementing a similar sell strategy of coverage based on ACE forecasts.

SUMMARY AND FUTURE PROSPECTS

Seasonal hurricane predictions are a new and unexplored resource for the (re)insurance industry. Confidence in their accuracy and value has to increase before insurance and reinsurance executives will employ them routinely in business decisions.

Using dynamic financial analysis models, such as Benfield's ReMetrica II, it is simple to see how a forecast changes the marginal cost/benefit of buying (or selling) a particular reinsurance contract.

The new forecast products and developments outlined offer, for the first time, good grounds for believing that seasonal hurricane forecasts can offer real value. This is not just in terms of increased risk awareness, but also in improved reinsurance efficiency assessment and long-term return on capital.

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HURRICANE FORECASTING
THE MOVE TOWARDS
BUSINESS RELEVANCE

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