

STATSTICAL ANALYSIS OF THE SPREADS OF CATASTROPHE BONDS AT THE TIME OF ISSUE

By

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ABSTRACT

In this paper the catastrophe bond prices, as determined by the market, are analysed. The limited published work in this area has been carried out mainly by cat bond investors and is based either on intuition, or on simple linear regression on one factor or on comparisons of the prices of cat bonds with similar features. In this paper a Generalised Additive Model is fitted to the market data. The statistical significance of different factors which may affect the cat bond prices is examined and the effect of these factors on the prices is measured. A statistical framework and analysis could provide insight into the cat bond pricing and could have applications among other things in the construction of a cat bond portfolio, cat bond price indices and in understanding changes of the price of risk over time.

KEYWORDS

Catastrophe Bonds; Bond Pricing; Regression; Generalised Additive Models

1. INTRODUCTION

The recent increase in catastrophe (cat) bond issues has also created an interest in understanding how these instruments are priced. The purpose of this paper is to examine the factors that affect cat bond prices and measure the effect of these factors on the bond prices using statistical models.

This paper does not try to estimate what the price of a cat bond should be. This is a different subject and the answer to it depends, among other things, on the requirements, the restrictions and generally the risk appetite of the investors. Several theoretical aspects of cat bond pricing are covered in Cox, S. & Pedersen, H. (1997), in Schmock, U. (1999) and in Tilley, J.A. (1997). In this paper the bond prices are considered to be a given input determined by the market. Also this paper does not examine the fluctuations of the prices of the traded cat bonds. It analyses the prices at the time of the issue of the bond.

Some of the results in this article are known to practitioners. For example the fact that bonds which cover US natural perils have required a higher return than similar bonds which cover, for example, Mediterranean earthquake is common knowledge. However, a statistical analysis confirms this belief, estimates the difference in the reward that these two different perils require, and also enables us to separate the effect on the price of the covered perils from the effect of other features of the cat bond.