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Bachelor Thesis

**Welfare Effects of Cat Bonds:
from Hurricane Andrew to Fukushima**

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Executive Summary

The idea for this paper was born shortly after the Tohoku earthquake in Japan in 2011. Observation of the large amount of losses caused by the disaster raised a question about the insurance and reinsurance solutions used in case of low-frequency high-impact events. From the financial point of view, the most interesting subject seemed to be the idea of catastrophe bonds. The analysis of transferring catastrophe risk to capital markets via cat bonds allows understanding the actual development of worldwide reinsurance. Furthermore, the gained knowledge can help to improve today used (re-) insurance approaches.

This paper has two main questions in view. Firstly, we investigate which features of reinsurance products allowed them to be accepted and achieve success. In order to find the answer, the paper presents an overview of reinsurance products dedicated to natural disasters before and after the introduction of catastrophe bonds in 1996. Secondly, this bachelor thesis should help answer the question: whether or not participation in cat bonds' transactions allows sponsors and investors to derive profits.

The purpose of researching the two aforementioned questions lies in the overall evaluation of catastrophe bonds transactions. We want to know, whether or not the new securities meet the expectations of market participants and if not, what is responsible for it.

The paper begins with a brief introduction to the subject that presents the main sources, which the thesis is based on. Afterwards, the first chapter is dedicated to (re-) insurance market before the creation of cat bonds. This part examines on one hand the amount of natural catastrophes between 1970 and 2010 and on the other hand the value of insured losses caused by disasters in this same period. Additionally, it explains the idea of traditional reinsurance.

The second part submits the insurance-linked securities, which were introduced as consequence of Hurricane Andrew occurrence in 1992. The central point of this chapter is a detailed description of catastrophe bonds. Not only does the paper introduce the idea of securities, but also explains different approaches to their structuring i.e. types

of triggered event. We also include sections which analyze the trend in terms of the amount of issued cat bonds, their rating and pricing.

The third chapter examines the impact of introduction of cat bonds on the welfare level of sponsors and investors. Firstly, we focus on sponsors' wellbeing. We try to discover what motivates entities exposed to catastrophe risk to issue a cat security. Apart from literature research, we relied on linear regression t-test in order to analyze the impact of cat bonds' issuance announcement on sponsors' stock price. Furthermore, the paper investigates disclosed triggered bonds. We wanted to know whether or not in case of a disaster occurrence, cat bonds had passed their "real life test" and fulfilled financial promises made to sponsors. Finally, we looked at the cat risk management from the government's point of view. The cat bonds issuance by a state is illustrated by the transaction sponsored by Mexico. Afterwards, the paper analyses what benefits an investment in cat bonds can bring, in comparison with investment in other classes of assets. The comparison is divided into two fundamental parts. In the beginning, we examine returns from cat bonds indices versus returns from fixed-income indices. Then, we conduct similar analysis, but with regard to equity indices.

The last chapter is a summary of the paper, giving overall evaluation of the benefits of catastrophe bonds on wellbeing of different market participants. Amongst the results we find, that the undisturbed cat bonds' presence on the market proves that these securities have been accepted by market participants. Furthermore, we do not find any significant relationship between the announcement day and sponsors' stock prices. Because of differences between "Act of God" bonds and reinsurance, entities exposed to cat risk use the bonds as complements in their risk policies. Mexico is one of the best examples, when a country decided to complete their reinsurance policy with cat bond issuance. Also in case of disaster occurrence, the securities "did their job". We are not aware of any case, when there was a kind of cat bonds "bankruptcy" on occurrence of natural catastrophe. However, cat bonds with indemnity trigger require much more time to disburse the principal value to sponsors. From a perspective of investors, the cat bonds let to diversify their portfolio. During the years 2002-2012, the catastrophe bond indices brought higher return than analyzed fixed income and equity indices. However, the cat

bonds are still perceived as a quite new financial solution what is connected with higher level of uncertainty. This uncertainty must be included in proposed by markets returns.

The paper draws an overall conclusion that catastrophe bonds contributed to the improvement of market participants' wellbeing. The bonds allow sponsors to transfer part of catastrophe risk to capital markets. Due to this connection, the insurers are not exposed to counterparty risk to such extend as in case of reinsurance. Especially, cat bonds eliminate the counterparty's bankruptcy risk in case of disaster occurrence. Similarly, investors gain profits due to diversifying role of cat bonds and their good performance. At the same time the investors cannot forget that in finance there are no such things as "free lunches" and higher return results from a lot of uncertainty.

Whereas the majority of papers about catastrophe bonds describe the cat securities with regard to reinsurance, this paper examines cat bonds rather from the market participants' perspective. The assessment of usefulness of securities via the analysis of the sponsors' and investors' welfare levels is a new approach in studies on "Act of God" bonds