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Portfolio Optimization using Catastrophe Bonds

Bachelor Thesis

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Executive Summary

(Re-)insurance companies developed catastrophe bonds in the 1990s as a means of protecting themselves from the financial losses and further consequences of a natural catastrophe, such as a hurricane or an earthquake. The aim was to transfer such major risks to the capital market. Due to the peculiarities of this investment opportunity, several studies suggest that catastrophe bonds have a low correlation with other asset classes. But there is no reference to the interrelation of catastrophe bonds or their impact on a private investor's portfolio. Therefore, this thesis examines the extent to which catastrophe bonds are suitable for the diversification of an optimized portfolio.

In order to measure the effect of catastrophe bonds, a basic portfolio is created to be optimized under certain conditions in accordance with Markowitz's theories. By adding catastrophe bond indices, the impact on the performance measures can be assessed for several scenarios. This involves the inclusion of different risk contexts to record the consequences for varying needs of private investors during the timeframe from 1 January 2009 to 31 December 2018. In addition, the correlation of several catastrophe bond funds over a number of time periods is examined.

The results of the empirical analysis indicate that it may be beneficial to include a catastrophe bond index in a portfolio. In addition to the low correlation with other assets, the risk-return combination of such an index is also almost efficient. Especially in a medium-risk context, the risk-adjusted performance and risk measures improve significantly. Therefore, an investment in this additional asset class can generate a diversification effect. However, there is also the possibility that the tail risk increases or the performance of the portfolio reacts more sensitively to changes in exogenous input variables, such as the rate of the risk-free investment.

Consequently, it cannot be confirmed that the inclusion of a catastrophe bond index or fund is worthwhile in every portfolio. Moreover, diversification may even deteriorate if several catastrophe bond funds are integrated into a portfolio. This is due to the strong positive relationship between this investment type. Therefore, an investor should carefully evaluate the circumstances before considering an investment in catastrophe bonds for diversification purposes.