Chapter 4.

DO CAT BOND YIELDS PREDICT FUTURE CATASTROPHIC EVENTS?

Rare events can generate substantial losses for insurance companies, particularly when such events are systemic. Natural disasters represent economy-wide phenomena that typically result in significant insurance outflows and, consequently, elevate the liabilities of reinsurance companies tasked with hedging rare-event risks for primary insurers. The construction of tradable portfolios replicating the behavior of factors underlying rare events, such as natural catastrophes, is fundamental to effectively hedging catastrophic risks and securitizing associated losses. These portfolios provide a basis for synthesizing various securities featuring catastrophe-linked payoffs (e.g., D'Arcy & France, 1992; Cummins et al., 2002; Harrington & Niehaus, 2003; Nowak et al., 2012). Among these instruments, the catastrophe ("CAT") bond is the most prominent, functioning as a derivative wherein the underlying "asset" comprises a composite of variables that reflect property losses indemnified by insurance companies.

A CAT bond is structured similarly to a corporate bond, wherein investors provide principal in exchange for periodic coupon payments and the return of principal at maturity, contingent upon the non-occurrence of a predefined catastrophic event. A CAT bond functions as a risk transfer instrument, offering protection against indemnity payments associated with a specified peril, as defined by a contractual "trigger." The trigger is explicitly stipulated within the bond covenants and may be based on the exceedance of a predetermined loss threshold, an index value, or specific geophysical or meteorological parameters. CAT bonds typically have maturities ranging from one to five years. A default event is declared if the triggering conditions are satisfied during the bond term. The default event permits the issuer to access the collateralized principal to finance losses arising from the covered event.

The capital raised through CAT bond issuance is generally invested in low-risk assets, such as money market funds or highly rated short-term instruments, serving as a dedicated collateral pool to secure potential claims. Following the 2008 Global Financial Crisis, particularly in the aftermath of the Lehman Brothers' bankruptcy, industry practices evolved significantly. Before the crisis, issuers frequently entered into total return swap agreements with financial institutions to manage investment returns on the collateral pool. However, the systemic failure of counterparties during the crisis prompted a widespread shift toward fully collateralized structures utilizing independently managed investment vehicles, thereby mitigating counterparty credit risk inherent in earlier CAT bond arrangements. This environment made CAT bonds increasingly attractive to investors seeking alternative sources of return, prompting a surge in issuance and pushing total outstanding volumes to nearly USD 10 billion before the crisis (Polacek, 2018).

Following the crisis, the CAT bond market experienced a temporary contraction, primarily due to counterparty exposures involving failed investment banks participating in collateral arrangements for several significant transactions. By the end of 2009, this challenge was addressed by adopting more robust and transparent collateral structures, restoring investor confidence and revitalizing market growth. Over the subsequent decade, the CAT bond market expanded substantially, with outstanding issuance more than doubling. This growth has been partly driven by persistently low global interest rates and a scarcity of high-yield opportunities in conventional fixed income markets. Furthermore, CAT bonds' low correlation with traditional asset classes has enhanced their appeal as portfolio diversification and risk-hedging tools. Recent advances in pricing methodologies and catastrophe risk modeling have also supported their development as a recognized investment class (Bauer et al., 2010; Bauer et al., 2013; Božović, 2021a; Božović, 2021b; Beer & Braun, 2022).

Today, the CAT bond market represents a complex and mature ecosystem involving various participants across the issuance and investment spectrum. On the supply side, large global reinsurers—such as AIG, Munich Re, Swiss Re, and USAA—remain the dominant issuers. However, government agencies, pension funds, and other institutional entities contribute to market supply (Edesess, 2015). On the demand side, institutional investors comprise the core investor base, particularly pension and hedge funds. In addition to these traditional actors, the market is supported by structuring and modeling agents, credit rating agencies, and specialized index providers who facilitate the design, assessment, and monitoring of CAT bond performance.

This chapter studies the informational content of CAT bond yields. In particular, it addresses whether these yields predict future catastrophic events. We approach this question by analyzing the dynamic association between CAT bond yields and the realized catastrophic losses they were supposed to hedge. The results indicate that market yields are moderately predictive of future catastrophic losses. Despite the specialized and complex nature of predictive information related to catastrophic events, the evidence supports the view that CAT bond markets efficiently accumulate diffuse information regarding future catastrophic losses.

The research topic falls into a growing literature on the market for catastrophe risk. Froot (2001), for example, offers a broad perspective on the subject. CAT bonds on average have excess spreads over comparably rated corporate bonds, forming the so-called *excess premium puzzle* (Lee & Yu, 2002; Cummins, Lalonde, & Phillips, 2004). Our research question is similar to that of Zhao & Yu (2020), who used panel data to study the predictive ability of individual CAT bond yields on future catastrophe losses in the United States. However, unlike them, our analysis focuses on a single value-weighted CAT bond yield series and overall losses, with a different methodological approach and set of control variables. It also does not focus on comparison to prediction markets.

The remainder of this chapter is organized as follows: Section 1 describes the data used in the empirical analysis. Section 2 presents the methodology. Section 3 shows and discusses the empirical results. Section 4 concludes.

1. DATA

Our analysis focuses on the U.S. data, given that they are the only comprehensive data related to CAT bond markets and catastrophe losses. To this end, we use several sources. Our primary variable of interest captures economic losses from weather and climate disasters affecting the U.S. between 1980 and 2024. The data on weather and climate disasters are available from the National Centers for Environmental Information, which are part of the National Oceanic and Atmospheric Administration (NOAA). They are updated quarterly and contain disaster descriptions, types (drought, flooding, freeze, severe storms, tropical cyclones, wildfires, and winter storms), begin and end dates, losses (raw and CPI-adjusted) in millions of dollars, and deaths.

As we are trying to measure the association between catastrophe losses and CAT bond yields, we use the weekly value-weighted CAT bond market yield data from Artemis. CAT bond yields represent the sum of the insurance risk spread derived from the premium paid for the coverage, and the yield of the collateral assets covering a specific CAT bond transaction (here assumed to be 3-month U.S. Treasury Bills). Apart from the insurance risk spread and the collateral yield, the Artemis data also contains expected losses, proportional to the probability of the unit monetary loss. To obtain the market weight of each CAT bond, its nominal value is divided by the total market volume. The data contains 743 observations between October 8, 2010 (week 41 of 2010) and December 27, 2024 (week 52 of 2024). We match these observations with the economic loss data from the NOAA database by associating each catastrophe event with the week of its beginning date. We follow previous studies and combine the U.S. catastrophe variables and CAT bond yields with additional control variables capturing the impact of capital market and insurance market developments. We use the U.S. market return over the risk-free rate, available from Kenneth French's Data Library; Moody's seasoned Baa corporate bond yield relative to the constant-maturity yield on 10-year U.S. Treasury Notes, available from the FRED Database of the St. Louis Fed; the FR Global Reinsurance Price Return Index, available from LSEG Eikon. These data are sampled weekly and matched on dates with the catastrophe losses and CAT bond yields.

Table 1 shows the summary statistics of all the variables used in our analysis. Panel A reports the catastrophe variables. Duration counts the days between a disaster's official beginning and the end. It spans between a single day and 366 days, with an average slightly below a month. Unadjusted loss is the total economic cost of a loss for each recorded disaster. The average loss is around 6 billion U.S. dollars, but the distribution is skewed, with a maximum of 125 billion. CPI-adjusted loss is the economic cost of a loss adjusted for inflation using the consumer price index, resulting in slightly higher values than the unadjusted loss. The number of deaths ranges between zero, which happened in 101 recorded cases when only economic losses were materialized, and 2981 related to Hurricane Maria in September 2017. Out of 239 recorded disaster cases in our sample, there are 13 droughts, 24 floodings, one freeze, 145 severe storms, 33 tropical cyclones, 12 wildfires and 11 winter storms.

Panel B reports the CAT bond variables. All values are in percent per annum. Collateral yield is 1.28 percent on average, ranging from –0.01 to 5.51 percent depending on the U.S. monetary policy cycles. Insurance risk spread is more stable and less skewed, with an average of 5.83 percent and a standard deviation of 1.79 percent. Expected loss fluctuates in a relatively narrow interval between 1.05 and 2.47 percent, and 1.92 percent on average. The CAT bond market yield is the sum of the collateral yield and the insurance risk premium. It has a fairly centered distribution with a mean of 7.12 percent and a standard deviation of 3.01 percent. An alternative way to decompose it is to represent it as a sum of expected loss and the overall risk premium. Therefore, the average risk premium is around 5.2 percent per annum.

Panel C summarizes the capital and insurance market variables. The market excess return is 26 basis points per week on average. As expected, it is very volatile, evidenced by a considerable standard deviation of 230 basis points. The risk-free rate (here proxied by the 1-month U.S. Treasury yield) is two basis points on average. The Baa corporate bond spread is 2.39 percent per year, which is substantially lower than the insurance risk spread, indicating that typical CAT bonds are perceived to be riskier than the lowest investment-grade category of corporate bonds, consistent with the excess premium puzzle.

Table 1. Summary statistics of catastrophe, CAT bond, and capital and insurance market variables. The table shows the observations (Obs), mean, standard deviation (Std. Dev.), minimum, and maximum for catastrophe, CAT bond, and capital and insurance market variables. The data consists of weekly observations between October 8, 2010, and December 27, 2024.

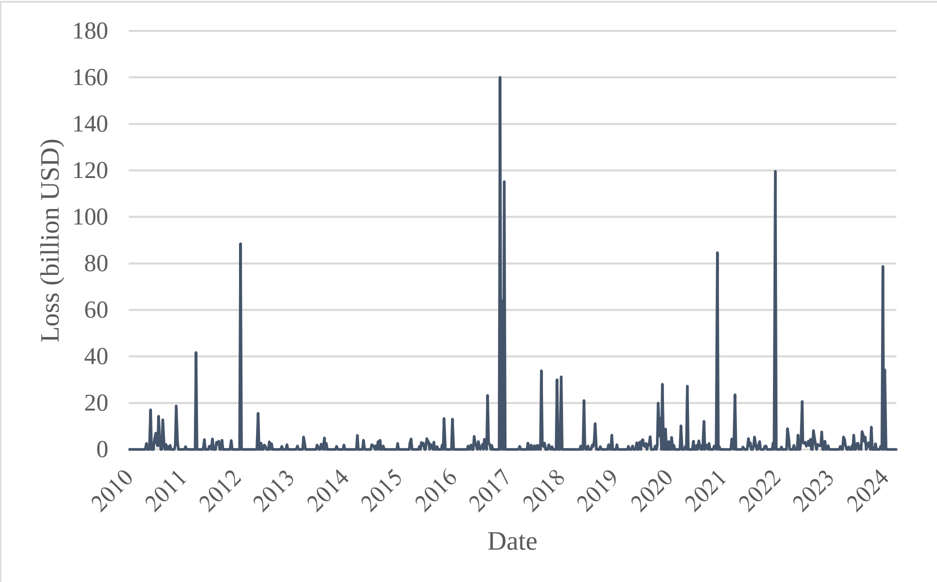
	Obs	Mean	Std. Dev.	Min	Max
Panel A: Catastrophe variables					
Duration (days)	239	29.43	79.21	1	366
Unadjusted loss (USD billion)	239	5.98	15.18	0.85	125.00
CPI-adjusted loss (USD billion)	239	7.20	18.23	1.06	160.00
Deaths	239	32.20	196.92	0	2981
Panel B: CAT bond variables					
Collateral yield	743	1.28	1.79	–0.01	5.51
Insurance risk spread	743	5.83	1.56	3.30	11.31
Expected loss	743	1.92	0.37	1.05	2.47
Market yield	743	7.12	3.01	3.67	15.91
Panel C: Capital and insurance market variables					
Market excess return	743	0.26	2.30	–14.56	12.34
Risk-free rate	743	0.02	0.04	0.00	0.12
Baa corporate bond spread	743	2.39	0.53	1.39	4.13
Reinsurance index return	743	0.21	2.95	–24.79	21.23

Sources: NOAA, Artemis, Kenneth French's Data Library, FRED, LSEG Eikon

Figure 1 illustrates the frequency and extent of catastrophe losses. It shows how CPI-adjusted economic losses associated with weather and climate disasters in the U.S. were distributed in time. The NOAA records losses when they occur, so we mapped them into weekly time buckets based on the initial date of a disaster. The losses were recorded only if they exceeded one billion dollars. Since disasters represent rare events, most weeks in the sample (524 out of 743) have no losses.

The economically most impactful events, with adjusted losses exceeding 50 billion U.S. dollars, are all associated with tropical cyclones. These are hurricanes Sandy (October 2012), Harvey (August 2017), Irma (September 2017), Maria (September 2017), Ida (August 2021), Ian (September 2022), and Helene (September 2024). The respective losses correspond to the most prominent peaks in Figure 1.

Figure 1. Frequency and extent of catastrophe losses. The graph illustrates CPI-adjusted economic losses associated with weather and climate disasters in the U.S., in billions of U.S. dollars. The data cover the period between October 8, 2010, and December 27, 2024, and are mapped into weekly time buckets.



Source: Author's calculations based on NOAA weather and climate disasters in the U.S.

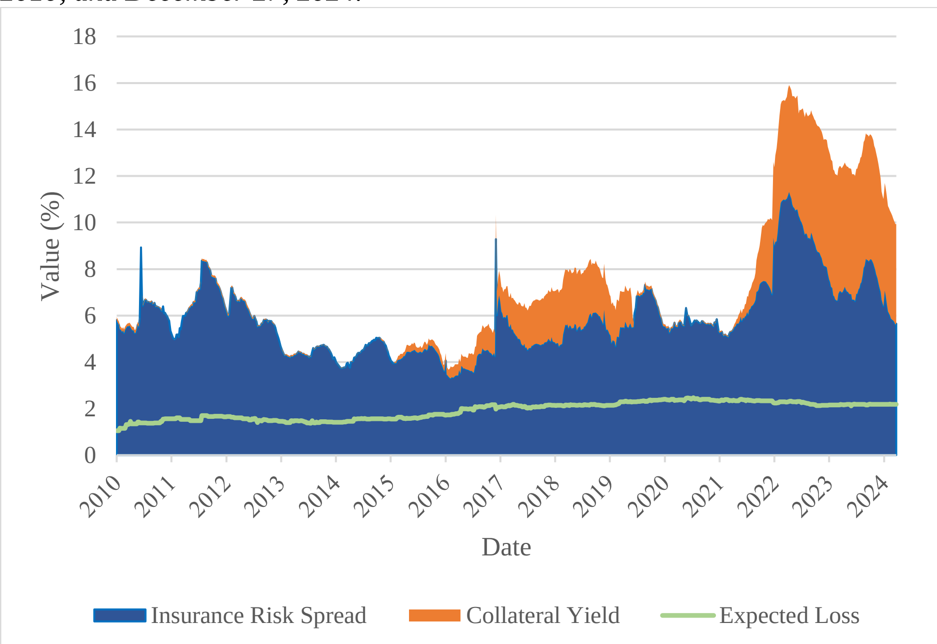
Table 2. Catastrophe variables by disaster type. The table shows the average values of catastrophe duration (in days), unadjusted and CPI-adjusted loss (in billions of USD) and the number of deaths, broken down by disaster type. The sample period is between October 8, 2010, and December 27, 2024.

Disaster type	Duration (days)	Unadjusted loss (USD billion)	CPI-adjusted loss (USD billion)	Deaths
Drought	302.46	9.46	11.96	81.85
Flooding	20.21	2.76	3.46	10.79
Freeze	3.00	1.00	1.30	0.00
Severe storm	3.01	2.17	2.59	8.32
Tropical cyclone	3.67	23.74	28.32	129.09
Wildfire	167.17	7.73	9.46	31.83
Winter storm	4.55	4.32	5.14	47.73

Sources: NOAA

In general, tropical cyclones are the most devastating natural disasters in terms of deaths and economic losses. We can see this from Table 2, which shows the average values of catastrophe duration, unadjusted and CPI-adjusted losses and the number of deaths by disaster type. On the other hand, they tend to last relatively short (less than four days on average). Disasters with a comparable duration, such as freezes and storms, have losses which are an order of magnitude smaller than those of tropical cyclones. However, winter storms have a very high average death toll. Floods last around three weeks on average and cause around ten deaths with moderately high economic losses. Wildfires and droughts are long-lasting, stretching for months on average. Their cumulative effect causes double-digit death tolls on average, with costs reaching tens of billions of dollars.

Figure 2. CAT bond data. The figure illustrates insurance risk spread, collateral yield and expected loss (all in percent) for the U.S. CAT bonds, calculated on a value-weighted basis. The insurance risk spread and the collateral yield are stacked areas, combining into the total market yield. The expected loss is displayed as a line. The data consists of weekly observations between October 8, 2010, and December 27, 2024.



Source: Artemis

Figure 2 displays the CAT bond data, showing insurance risk spread, collateral yield and expected loss. The insurance risk spread and the collateral yield are displayed as stacked areas, combining into the total market yield. The increases in insurance spread follow the catastrophic events leading to the most significant losses. This association is intuitive and aligns with Gürtler, Hibbeln, and

Winkelvos (2016), who find that disasters significantly impact CAT bond spreads. Section 3 will explore whether current CAT bond spreads also contain some predictive power for future catastrophe losses.

2. METHODOLOGY

To analyze the predictive power of CAT bond yields on catastrophe losses, we run the following regression:

$$\begin{aligned}\text{CATloss}_{t+h} = \beta_0 + \beta_1 \text{CATspread}_t + \beta_2 \text{MktRf}_t + \beta_3 \text{BaaSpread}_t \\ + \beta_4 \text{ReinsIndex}_t + \beta_5 \text{CATloss}_t + \beta_6 \text{Week}_t + \varepsilon_{t+h}.\end{aligned} \tag{1}$$

Here, CATloss_t is the total CPI-adjusted catastrophe loss during week t, and h is the forecast horizon, where we include horizons between one and eight weeks, 13 weeks, 26 weeks, 39 weeks ans 52 weeks. Our primary explanatory variable is CATspread_t, representing the insurance risk spread of CAT bonds in week t.

We follow previous studies and include the weekly excess return on the market portfolio, MktRf_t, and the Baa corporate bond spread, BaaSpread_t, to control for the impact of financial markets. We also include the reinsurance index return, ReinsIndex_t, to control for the global trends in the reinsurance market. The rationale is similar to the one given by Zhao & Yu (2020): capital-market variables capture the influence of financial markets on the predictive ability of CAT bond yields for actual catastrophe losses in future periods, while fluctuations in the reinsurance index highly correlate with future catastrophe losses. We also include catastrophe loss in week t as an additional regressor in Equation (1) to control for the influence of ongoing events on the predictive ability of CAT bond spreads. The idea is to rule out the scenario that any predictive ability of CAT bond spreads originates from their relationship with current catastrophe event variables rather than actual future losses.

Finally, we control for seasonal effects of weather and climate disasters by including the variable Week_t, which enumerates the calendar week in a given year. This variable should pick up any potential regularities in weather patterns that may occur in specific periods of the year. As an illustration, the average value of this variable, conditionally on any catastrophe loss in our sample, is around 23 (beginning of June). The losses above 50 billion USD occur on average in week 38 (mid-September).

We do not observe catastrophe losses continuously. However, we observe them only during disasters, so most CATloss observations will be zero.[86] Thus, our dependent variable is left-censored, so we estimate the regression coefficients in Equation (1) using the Tobit model. We assume that the error term ε_{t+h} satisfies the usual assumptions.

3. RESULTS

Tables 3–5 show the results obtained from Tobit regression, given by Equation (1). They report regression coefficients, standard errors, significance levels, the number of observations used in each regression given the forecast horizon, and the likelihood ratio test statistic for joint significance of explanatory variables.[87] We track the ability of CAT bond spreads to predict future catastrophe losses across different forecast horizons h. Table 3 shows the results for h = 1, 2, 3 and 4. Table 4 shows the results for h = 5, 6, 7 and 8. Table 5 shows the results for h = 13, 26, 39 and 52, approximately corresponding to three, six, nine and twelve months.

The results indicate that CAT bond spreads weakly predict future catastrophe losses at relatively lower forecast horizons. The CATspread_t coefficients are statistically significant at the 5% level for h = 1 and 2, and at the 10% level for h = 3, 5 and 6. The point estimates of significant coefficients are all positive, having values that range between 1.22 and 1.62. These values imply that, for instance, a percentage point increase in CAT bond spreads today is associated with a 1.62 billion dollar increase in catastrophe losses two weeks from now.

As expected, the ability of CAT bond spreads to predict future losses deteriorates with forecast horizon. The CATspread_t coefficients become insignificant at all reasonable levels beyond six weeks ahead. The joint significance of all regressors is preserved at a 5% level up to 39 weeks ahead, but falls at horizons of the order of one year.

[86] There are 524 out of 743 observations where the value of CATloss is zero, around 70% of the sample.

[87] The test statistic is distributed as chi-squared with six degrees of freedom.

*Table 3. Regression results for the predictive ability of CAT bond spreads. This table shows coefficients from Tobit regression, given by Equation (1), obtained with weekly observations between October 8, 2010, and December 27, 2024. The dependent variable is catastrophe loss in week $t+h$ ($CATloss_{t+h}$), where h is the forecasting horizon, i.e., the number of weeks ahead of the current date t. Here, we use the forecasting horizons of 1, 2, 3 and 4 weeks. The independent variables are the CAT bond insurance risk spread ($CATspread_t$), the excess return on the market portfolio ($MktRf_t$), the spread of Baa corporate bonds over 10-year U.S. Treasury Notes ($BaaSpread_t$), the return on the FR Global Reinsurance Price Return Index ($ReinsIndex_t$), catastrophe loss in week t ($CATloss_t$) and the calendar week in a given year ($Week_t$). We report the regression coefficients, the number of observations N and the likelihood ratio (LR) test statistic for joint significance of explanatory variables. Numbers in parentheses are the standard errors. The asterisks indicate the usual significance levels: *** for significance at 1%; ** for significance at 5%; * for significance at 10%.*

CATloss_{t+h}	Forecast horizon h (weeks):			
	1	2	3	4
constant	–11.30	–14.77**	–9.76	–7.25
	(7.45)	(7.26)	(7.49)	(7.29)
CATspread_t	1.42**	1.62**	1.35*	0.99
	(0.69)	(0.67)	(0.69)	(0.67)
MktRf_t	0.24	0.12	0.63	–0.94
	(0.63)	(0.61)	(0.62)	(0.60)
BaaSpread_t	–3.52*	–2.46	–3.32	–2.89
	(2.12)	(2.07)	(2.13)	(2.09)
ReinsIndex_t	–0.67	–0.30	–0.69	0.63
	(0.50)	(0.45)	(0.48)	(0.45)
CATloss_t	–0.21	0.32***	–0.23	0.29***
	(0.16)	(0.08)	(0.17)	(0.09)
Week_t	–0.16**	–0.20***	–0.23***	–0.31***
	(0.08)	(0.08)	(0.08)	(0.08)
N	742	741	740	739
LR	17.33***	32.35***	21.32***	34.50***

Source: Author's calculations based on NOAA, Artemis, Kenneth French's Data Library, FRED and LSEG Eikon data.

*Table 4. Regression results for the predictive ability of CAT bond spreads. This table shows coefficients from Tobit regression, given by Equation (1), obtained with weekly observations between October 8, 2010, and December 27, 2024. The dependent variable is catastrophe loss in week $t + h$ ($CATloss_{t+h}$), where h is the forecasting horizon, i.e., the number of weeks ahead of the current date t. Here, we use the forecasting horizons of 5, 6, 7 and 8 weeks. The independent variables are the CAT bond insurance risk spread ($CATspread_t$), the excess return on the market portfolio ($MktRf_t$), the spread of Baa corporate bonds over 10-year U.S. Treasury Notes ($BaaSpread_t$), the return on the FR Global Reinsurance Price Return Index ($ReinsIndex_t$), catastrophe loss in week t ($CATloss_t$) and the calendar week in a given year ($Week_t$). We report the regression coefficients, the number of observations N and the likelihood ratio (LR) test statistic for joint significance of explanatory variables. Numbers in parentheses are the standard errors. The asterisks indicate the usual significance levels: *** for significance at 1%; ** for significance at 5%; * for significance at 10%.*

CATloss_{t+h}	Forecast horizon h (weeks):			
	5	6	7	8
constant	–6.28	–6.34	–3.11	–2.12
	(7.45)	(7.47)	(7.47)	(7.49)
CATspread_t	1.32*	1.22*	1.09	0.91
	(0.69)	(0.69)	(0.69)	(0.69)
MktRf_t	0.19	0.01	–0.15	1.14*
	(0.63)	(0.63)	(0.63)	(0.64)
BaaSpread_t	–3.56*	–3.46	–3.77*	–3.73*
	(2.15)	(2.16)	(2.17)	(2.17)
ReinsIndex_t	–0.45	–0.27	0.08	–0.14
	(0.46)	(0.48)	(0.48)	(0.47)
CATloss_t	–0.34	–0.09	–0.32	–0.17
	(0.23)	(0.12)	(0.22)	(0.16)
Week_t	–0.33***	–0.33***	–0.38***	–0.41***
	(0.08)	(0.08)	(0.08)	(0.08)
N	738	737	736	735
LR	32.36***	28.31***	37.40***	42.46***

Source: Author's calculations based on NOAA, Artemis, Kenneth French's Data Library, FRED and LSEG Eikon data.

*Table 5. Regression results for the predictive ability of CAT bond spreads. This table shows coefficients from Tobit regression, given by Equation (1), obtained with weekly observations between October 8, 2010, and December 27, 2024. The dependent variable is catastrophe loss in week $t+h$ ($CATloss_{t+h}$), where h is the forecasting horizon, i.e., the number of weeks ahead of the current date t. Here, we use the forecasting horizons of 13, 26, 39 and 52 weeks. The independent variables are the CAT bond insurance risk spread ($CATspread_t$), the excess return on the market portfolio ($MktRf_t$), the spread of Baa corporate bonds over 10-year U.S. Treasury Notes ($BaaSpread_t$), the return on the FR Global Reinsurance Price Return Index ($ReinsIndex_t$), catastrophe loss in week t ($CATloss_t$) and the calendar week in a given year ($Week_t$). We report the regression coefficients, the number of observations N and the likelihood ratio (LR) test statistic for joint significance of explanatory variables. Numbers in parentheses are the standard errors. The asterisks indicate the usual significance levels: *** for significance at 1%; ** for significance at 5%; * for significance at 10%.*

CATloss_{t+h}	Forecast horizon h (weeks):			
	13	26	39	52
constant	–5.55	–12.98	–23.41***	–4.56
	(7.43)	(7.90)	(8.18)	(8.26)
CATspread_t	0.87	0.13	0.77	0.58
	(0.68)	(0.70)	(0.73)	(0.75)
MktRf_t	–0.34	–0.14	0.34	–0.34
	(0.62)	(0.64)	(0.64)	(0.67)
BaaSpread_t	–2.84	–4.45*	–3.50	–3.91
	(2.18)	(2.27)	(2.36)	(2.50)
ReinsIndex_t	0.29	0.22	–0.27	0.23
	(0.49)	(0.53)	(0.51)	(0.51)
CATloss_t	0.00	0.03	0.02	–0.08
	(0.11)	(0.10)	(0.10)	(0.14)
Week_t	–0.33***	0.25***	0.40***	–0.22***
	(0.07)	(0.08)	(0.08)	(0.08)
N	730	717	704	691
LR	27.36***	15.86**	30.02***	11.19*

Source: Author's calculations based on NOAA, Artemis, Kenneth French's Data Library, FRED and LSEG Eikon data.

The spread of Baa corporate bonds over 10-year U.S. Treasury Notes is occasionally significant at the 10% level, with a negative coefficient. An increase of one percentage point in corporate bond spread is associated with a decrease of future catastrophe losses by approximately 3.5–4.5 billion dollars. A potential interpretation of this relationship is that disaster losses are mitigated better when the perception of overall corporate risk is higher. However, the effect is not robust enough to infer some meaningful practical or policy implications.

Including contemporaneous catastrophe losses as an additional control improved the regression, as the coefficient is significant for some horizons. In these cases, it takes positive values, showing that losses exhibit mild persistency over closer periods (two to four weeks).

The only robust predictor among the explanatory variables considered in this analysis is the seasonal variable. The week-of-the-year counter remains highly significant at all forecast horizons, implying that seasonal effects have the most persistent predictive ability for losses induced by weather and climate disasters. This finding confirms our intuition about the dominant relevance of geophysical phenomena to weather and climate disasters.

* * *

This chapter analyzed whether CAT bond yields can predict future catastrophe losses arising from weather and climate disasters. The evidence from the U.S. weekly data between October 8, 2010, and December 27, 2024, suggests that the CAT bond insurance risk spread has a moderate predictive ability up to six weeks ahead. Therefore, the information that the CAT bond market aggregates contains some degree of predictability of the triggering events. CAT bond prices thus factor in the likelihood of natural disasters. The predictability does not come from anticipation of seasonal effects related to weather phenomena, which are controlled for in our regressions.

Our results indicate multiple avenues for future research on this topic, which may have various practical and policy implications. From a practical standpoint, the ability of CAT bond markets to aggregate and reflect short-term catastrophe risk has value for insurers, reinsurers and investors. Market signals derived from CAT bond spreads may serve as supplementary indicators in underwriting, pricing and portfolio management decisions. Moreover, given the short-term predictive horizon, relevant stakeholders, including public agencies and risk managers, could integrate these signals into operational disaster preparedness strategies.
From a policy perspective, our findings support recognizing insurance-linked securities markets as valuable contributors to the broader risk monitoring

infrastructure. Regulators and policymakers may promote transparency and liquidity in CAT bond markets to enhance informational efficiency. Furthermore, incorporating market-based indicators into supervisory frameworks could strengthen early warning systems for climate-related financial risks. As climate disasters become increasingly frequent and severe, leveraging financial market data for timely insights may aid financial stability and public resilience efforts.

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