

PRACTICE NOTE:

CATASTROPHE BONDS 101: THE WHAT, THE WHY AND THE HOW

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I. Overview

Over the past few years, climate-related events have dominated world news. 2023 alone witnessed several devastating earthquakes, typhoons, tornados, floods, droughts and other such events throughout the world. Earlier this year, Cyclone Belal caused widespread flooding in Mauritius.¹ And this is just the beginning. The threat of extreme weather events, which lead to natural disasters, will continue to escalate over time as the earth warms.² As Oxfam International explained, “[s]implify put, changes in the global climate exacerbate climate hazards and amplify the risk of extreme weather disasters.³

These types of events will have a disproportionate impact on developing countries and emerging markets. For example, “small, low-income countries can lose over 200 percent of their GDP from a single disaster, as happened in 2017 to Caribbean islands such as the Dominican Republic, following Hurricane Maria.”⁴ However, developed countries are also severely impacted by climate events. In 2023 in the United States, damages from natural disasters, including wildfires, drought,

floods, tornados, tropical cyclones and severe weather/hail events, totalled \$92.9 billion.⁵

Disaster response occurs at the individual, household, business, national and often international levels. Undoubtedly, as noted in “Disaster Insurance Reimagined: Protection in a Time of Increasing Risk,” insurance can play a huge role in disaster relief and the ability of actors within those levels to respond quickly and effectively.⁶

Relatedly, it should come as no surprise that the costs of uninsured losses can be extraordinary. According to one report, in 2022, global natural disasters resulted in economic losses of \$313 billion.⁷ Swiss Re Institute’s natural catastrophe resilience index indicated that approximately 75% of global risk was unprotected in that same year,⁸ meaning that over \$230 billion of losses were uninsured.

Notwithstanding its importance and utility, many victims of natural disasters (individuals, households, businesses and countries) lack insurance. Beyond this, even where insurance and reinsurance⁹ are utilised, these tools may lack the capacity to fully cover the anticipated losses from future disasters.¹⁰

¹<https://www.aljazeera.com/program/newsfeed/2024/1/16/flash-floods-in-mauritius>

²<https://www.aljazeera.com/gallery/2023/12/27/natural-disasters-that-plagued-the-world-in-2023>

³<https://www.oxfam.org/en/5-natural-disasters-beg-climate-action>

⁴Jarzabkowski, Paula, Chalkias, Konstantinos, Cacciatori, Eugenia and Bednarek, Rebecca, “Disaster Insurance Reimagined: Protection in a Time of Increasing Risk”, Oxford University Press, 2023

⁵<https://www.climate.gov/news-features/blogs/beyond-data/2023-historic-year-us-billion-dollar-weather-and-climate-disasters#:~:text=In%202023%2C%20the%20United%20States,2023%20disasters%20totalled%20%2492.9%20billion.>

⁶Jarzabkowski, Chalkias, Cacciatori, and Bednarek, “Disaster Insurance Reimagined: Protection in a Time of increasing Risk” (no. 4)

⁷<https://www.aon.com/getmedia/f34ec133-3175-406c-e0b-25cea768c5cf/20230125-weather-climate-catastrophe-insight.pdf>

⁸<https://www.bloomberg.com/news/articles/2023-10-24/-catastrophe-bond-market-headed-for-major-surge-in-issuance>

⁹[Insurance companies buy “reinsurance” to cover risks that go beyond what they are able to cover \(called “tail risks”\).](https://www.aon.com/getmedia/f34ec133-3175-406c-e0b-25cea768c5cf/20230125-weather-climate-catastrophe-insight.pdf)

¹⁰<https://www.milliman.com/en/insight/meeting-the-g7-commitment-to-disaster-financing-with-catastrophe-bonds>

The combination of the anticipated increase in climate-related natural disaster events, insufficient insurance coverage to mitigate associated losses, and the incapacity of the conventional (re)insurance sector to address these liabilities underscores the need to explore new solutions.

Catastrophe bonds, or CAT bonds, offer one option, transferring catastrophe-related risk from the CAT bond issuer (often called the “cedent” or the “sponsor”) to the capital markets. These bonds are fixed income instruments that provide a payout to the sponsor (of all or part of the principal) when a predefined event, for example a hurricane, tornado or an earthquake, occurs. If no triggering event arises, the principal is returned to investors, who, in effect, had been betting on the non-occurrence of the predefined catastrophic event.¹¹ However, where a triggering event does occur, the principal goes to the sponsor. Based on the risk of these instruments, yields tend to be high.

II. Brief History of CAT Bonds

CAT bonds have a history dating back to the mid-1990s and Hurricane Andrew which caused over \$25 billion in damages and resulted in the failure of numerous insurance carriers.¹² Sponsored by St. Paul Re, the George Town Re Ltd. 1996 CAT bond is considered to be the first true CAT bond.¹³ It covered worldwide risks (also known as “perils”), including related to marine, aviation and fire.¹⁴ In 2006, Mexico’s Fund for Natural Disasters (FONDEN) issued the first sovereign CAT bond. The bond was in an amount of \$160 million and was designed to pay out in the event of severe earthquakes. Payouts under that bond varied according to the magnitude and location of earthquakes.¹⁵

In 2009, the World Bank launched the MultiCat Program to support governments to issue CAT bonds. Mexico issued its second CAT bond under the MultiCat Program (and was the first country to do so). The MultiCat

Program was designed to help developing countries access affordable insurance through the capital markets.¹⁶ The program allows countries to insure against multiple perils (including earthquakes, floods and hurricanes), regions, and countries.¹⁷

Today, CAT bonds are issued by governments¹⁸, international financial institutions¹⁹, insurers, reinsurers and corporate entities,²⁰ each of which will have a different objective. For example, governments and IFIs may issue CAT bonds in order to enable access to immediate funds for disaster recovery and relief. An insurance company, however, may issue a CAT bond in order to reduce its exposure in respect of its underwritten policies.²¹ Companies also issue CAT bonds. Tech giant Google has issued CAT bonds to protect its corporate operations in the event of a catastrophic earthquake.²² Investors in CAT bonds tend to be asset managers, (re)insurers, and institutional investors.

III. Structure

In the typical CAT bond structure, the sponsor will create a special purpose vehicle (SPV)²³ to issue the bond. This structure minimizes counterparty risk and allows the sponsor and the SPV to have different credit ratings.²⁴ Once the bond is issued, the principal (or investment capital) is typically placed in a secured collateral account which is invested in highly rated securities (e.g., U.S. Treasuries). See Figure 1 below. Investors are then paid a coupon composed of the interest the SPV makes from the collateral account and the premiums paid by the sponsor.²⁵ If the covered event occurs during the life of the bond, the collateral account is liquidated, and payout made to the sponsor. If the covered event does not occur before the end of the bond term, the investors will be repaid the principal.²⁶

¹¹<https://www.imf.org/en/Publications/staff-climate-notes/Issues/2022/06/29/Sovereign-Climate-Debt-Instruments-An-Overview-of-the-Green-and-Catastrophe-Bond-Markets-518272#:~:text=Staff%20Climate%20Notes,-Sovereign%20Climate%20Debt&text=Catastrophe%20and%20green%20bonds%20in,well%20documented%20in%20the%20literature>

¹²<https://agentsync.io/blog/insurance-101/understanding-cat-bonds>

¹³<https://www.artemis.bm/news/george-town-re-silver-jubilee-135bn-of-catastrophe-bonds-tracked/>

¹⁴ <https://www.artemis.bm/deal-directory/george-town-re-ld/>

¹⁵<https://www.disasterprotection.org/blogs/the-state-of-pre-arranged-financing-for-disasters-2023#:~:text=Pre%20arranged%20financing%20is%20growing,9%20obillion%20in%202021>

¹⁶<https://www.worldbank.org/en/news/press-release/2009/10/19/world-bank-launches-multicat-program>

¹⁷https://www.gfdrr.org/sites/default/files/publication/FONDEN_per_M4.pdf

¹⁸Examples include Chile (2023), Jamaica (2021), Mexico (2020), and the Philippines (2019)

¹⁹For example, the World Bank’s 2017 pandemic bond.

²⁰<https://www.milliman.com/en/insight/meeting-the-g7-commitment-to-disaster-financing-with-catastrophe-bonds#4>

²¹https://fraser.stlouisfed.org/files/docs/historical/frbchi/fedletter/frbchi_fedletter_2018_405.pdf

²²<https://www.investmentnews.com/finance/news/this-bond-market-is-providing-double-digit-returns-244332>

²³The SPV will be “bankruptcy remote” which removes financial risk from the sponsor.

²⁴<https://www.imf.org/en/Publications/staff-climate-notes/Issues/2022/06/29/Sovereign-Climate-Debt-Instruments-An-Overview-of-the-Green-and-Catastrophe-Bond-Markets-518272#:~:text=Staff%20Climate%20Notes,-Sovereign%20Climate%20Debt&text=Catastrophe%20and%20green%20bonds%20in,well%20documented%20in%20the%20literature>

²⁵<https://www.artemis.bm/library/what-is-a-catastrophe-bond/>

²⁶ Ibid.

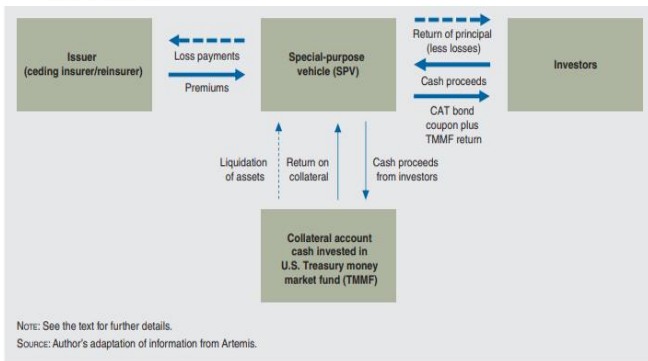


Figure 1: CAT Bond Structure²⁷

Most government-sponsored CAT bonds are now facilitated by the World Bank through its “capital-at-risk” notes program,²⁸ which obviates the need for an SPV as the Bank acts as the issuer/insurer. In this structure, the World Bank acts as intermediary between the government sponsor and investors. The issued bonds then sit on the World Bank’s balance sheet.²⁹ The World Bank also issues CAT bonds for the benefit of risk pools such as the Caribbean Catastrophe Risk Insurance Facility (CCRIF).³⁰

Figure 2 below relates to Jamaica’s CAT bond. In this CAT bond, Jamaica (and its immediate environs) was divided into sections with each section tied to a specific payout trigger based on the central barometric pressure of a storm. This allowed “the bond’s risk target to be tailored to Jamaica’s different geographical features, population densities, and local infrastructures.”³¹

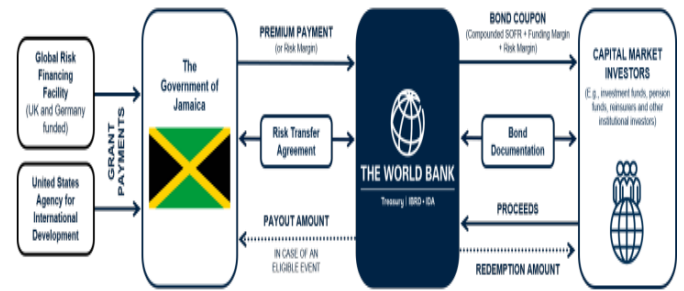


Figure 2: “Case Study: World Bank Catastrophe Bond provides Jamaica with Financial Protection against Tropical Cyclones”³²

The World Bank intends to increase its CAT bond issuances from its current \$1 billion to \$5 billion over the next five years and to expand its catastrophe cover beyond hurricanes, pandemics and earthquakes.³³

Catastrophe risk modelling is another important aspect of the CAT bond structuring process. Risk modelling is typically conducted by a third-party risk modeller who seeks to determine the likelihood that there will be a payout under the bond as well as the average expected payout amount (called the “expected loss” risk metric).³⁴ The expected loss also feeds into the premium determination. Details about the expected loss is outlined in the CAT bond offering documentation. Of note, this third-party modeller will also likely later calculate the actual losses after a triggering event.³⁵

IV. CAT Bond Trigger Types

There are four CAT bond trigger types: indemnity based, modelled-based, industry loss and parametric.

An indemnity-based CAT bond ties payments to the actual losses incurred by the sponsor, providing reimbursements for losses resulting from a covered natural catastrophe.³⁶ An indemnity-based CAT bond would, for example, allow a (re)insurer to collect when its catastrophe-related losses exceed a specific amount

²⁷https://fraser.stlouisfed.org/files/docs/historical/frbchi/fedletter/frbchi_fedletter_2018_405.pdf

²⁸Under the program, “the World Bank issues notes where some or all of the investors’ principal may be at risk, such as catastrophe bonds (cat bonds) and pandemic bonds.”

<https://treasury.worldbank.org/en/about/unit/treasury/ibrd/ibrd-capital-at-risk-notes#:~:text=Capital%20at%20Risk%20Notes%20are,security%20rating%20than%20the%20Facility.>

²⁹<https://www.milliman.com/en/insight/meeting-the-g7-commitment-to-disaster-financing-with-catastrophe-bonds#4>

³⁰<https://www.worldbank.org/en/news/press-release/2014/06/30/world-bank-issues-its-first-ever-catastrophe-bond-linked-to-natural-hazard-risks-in-sixteen-caribbean-countries>; CCRIF is a risk-pooling facility with the objective of limiting the impact of catastrophic earthquakes and hurricanes in member countries through the quick provision of financial liquidity when a policy is triggered.

³¹<https://www.milliman.com/en/insight/meeting-the-g7-commitment-to-disaster-financing-with-catastrophe-bonds#7>

³²<https://thedocs.worldbank.org/en/doc/43a111757d3b1ffcabde80ee7e60535-0340012021/original/Case-Study-Jamaica-Cat-Bond.pdf>

³³<https://www.bloomberg.com/news/articles/2023-10-24/-catastrophe-bond-market-headed-for-major-surge-in-issuance>

³⁴<https://www.disasterprotection.org/blogs/the-state-of-pre-arranged-financing-for-disasters-2023#:~:text=Pre%2Darranged%20financing%20is%20growing,9%20billion%20in%202021>

³⁵<https://www.imf.org/en/Publications/staff-climate-notes/Issues/2022/06/29/Sovereign-Climate-Debt-Instruments-An-Overview-of-the-Green-and-Catastrophe-Bond-Markets-518272#:~:text=Staff%20Climate%20Notes,-Sovereign%20Climate%20Debt&text=Catastrophe%20and%20green%20bonds%20in,well%20documented%20in%20the%20literature>

³⁶https://fraser.stlouisfed.org/files/docs/historical/frbchi/fedletter/frbchi_fedletter_2018_405.pdf

(this is referred to as the CAT bond's "attachment point").³⁷ The "exhaustion point" is the point where the principal has been fully disbursed and the investors are no longer liable.³⁸ While this structure provides protection to the sponsor, it also has the disadvantage of a potentially delayed payout as the actual amount of damages must be assessed first.³⁹ Of note, most sovereign CAT bonds are parametric (explained below) not indemnity based. Modelled triggers are similar to indemnity triggers, but are based on estimated or projected claims developed using computer and/or third-party models after the triggering event.

Industry loss CAT bond payouts are based on the aggregate losses to the (re)insurance industry as a whole and thus require an independent estimate of these covered losses.⁴⁰ A (re)insurance company may issue this type of CAT bond to obtain a payout where the industry suffers a loss.

Other CAT bonds use a parametric structure, where the payout is based on an objective trigger related to the risk such as the magnitude of an earthquake, wind speed, rainfall or barometric pressure. While, as compared to indemnity-based CAT bonds, the parametric-based CAT bond may not match the actual loss, payouts under this structure should be faster as the parametric indicator can be measured quickly. This structure is often used by a government or IFI sponsor to allow quick access to funding following the parametric trigger event.

CAT bonds may be structured to cover one event or a series of events over a specified time period.⁴¹

V. Pros and Cons of CAT Bonds for Sponsors and Investors

For all sponsors regardless of type, CAT bonds have the clear benefit of transferring risk to the capital markets, mitigating exposure to potential losses stemming from natural disasters, and diversifying sources of risk protection. They may also serve a positive signalling purpose by illustrating that the sponsor is proactively seeking appropriate risk management strategies. Because they are fully funded transactions, CAT bonds

have no impact on the sponsor's debt. In addition, where the SPV structure is used, potential financial risk to the sponsor is insulated.

For governments, when structured using parametric triggers, CAT bonds offer quick access to financing that can be used for disaster relief efforts. CAT bonds also offer (re)insurers an alternative to reinsurance/retrocession⁴², helping to diversify their capital resources. In addition, because CAT bonds compete with traditional reinsurance, they "exert downward pressure"⁴³ on reinsurance/retrocession market prices.

There are several benefits of CAT bonds from an investor perspective as well. First and foremost, these offer a high risk – high return proposition. Indeed, there has been a rising interest in CAT bonds due to their elevated returns, in particular, as compared to other debt markets.⁴⁴ One October 2023 Bloomberg article highlighted that CAT bonds were "up about 17%, while investors in US Treasuries have lost money."⁴⁵ It is also the case that risk spreads have increased over time.⁴⁶ In addition, because the occurrence or non-occurrence of a natural disaster is not directly tied to economic activity (although clearly, a disaster can impact economic activity), returns are typically uncorrelated with traditional financial assets such as stocks and bonds (i.e., equity market changes, credit and interest rate risks).⁴⁷ This allows investors to diversify risk profiles, playing into hedging strategies for which there is significant demand. Finally, and importantly, CAT bonds may help investors to meet their ESG objectives through helping sponsors address the impacts of climate change.

CAT bonds are not without challenges from a sponsor perspective, however. First, in order to attract investors, sponsors must pay higher yields to compensate for the risk of the catastrophic event. In addition, as they are complex in nature (requiring specific structuring, multiple parties and inputs, modelling, and specialist legal advice), they can be costly to set up. Further, because there is also a risk that the trigger events defined in the CAT bond do not align perfectly with the issuer's

³⁷ Ibid.

³⁸https://caia.org/sites/default/files/AIAR_Q4_2015-02_Edresses_CatBonds_o.pdf

³⁹<https://www.imf.org/en/Publications/staff-climate-notes/Issues/2022/06/29/Sovereign-Climate-Debt-Instruments-An-Overview-of-the-Green-and-Catastrophe-Bond-Markets-518272#:~:text=Staff%20Climate%20Notes,-Sovereign%20Climate%20Debt&text=Catastrophe%20and%20green%20bonds%20in,well%20documented%20in%20the%20literature>

⁴⁰https://fraser.stlouisfed.org/files/docs/historical/frbchi/fedletter/frbchi_fedletter_2018_405.pdf

⁴¹ <https://www.artemis.bm/library/what-is-a-catastrophe-bond/>

⁴² When a reinsurance company buys reinsurance, it is called "retrocession".

⁴³https://fraser.stlouisfed.org/files/docs/historical/frbchi/fedletter/frbchi_fedletter_2018_405.pdf

⁴⁴<https://www.bloomberg.com/news/articles/2023-10-24/-catastrophe-bond-market-headed-for-major-surge-in-issuance>

⁴⁵ Ibid.

⁴⁶<https://www.imf.org/en/Publications/staff-climate-notes/Issues/2022/06/29/Sovereign-Climate-Debt-Instruments-An-Overview-of-the-Green-and-Catastrophe-Bond-Markets-518272#:~:text=Staff%20Climate%20Notes,-Sovereign%20Climate%20Debt&text=Catastrophe%20and%20green%20bonds%20in,well%20documented%20in%20the%20literature>

⁴⁷https://caia.org/sites/default/files/AIAR_Q4_2015-02_Edresses_CatBonds_o.pdf

losses from a catastrophe, the issuer may not receive the level of hoped for financial protection. Nonetheless, many sponsors continue to make the determination that the costs of being unprotected far outweigh the costs of protection.

Like for the sponsor, there are investor risks related to CAT bonds. The primary investor risk is obviously that the catastrophic event occurs which requires them to pay out. Importantly, however, the interest rates associated with CAT bonds have been high compared to the expected loss,⁴⁸ meaning that from an investor point of view, the return may be well worth the risk.

VI. Conclusion

Notwithstanding the risks associated with CAT bonds on both the sponsor and investor sides, they offer a compelling tool for risk transfer and investment diversification. It is likely for that reason that the market is expected to continue to grow. In fact, the World Economic Forum has estimated that the CAT bond market will soar to \$50 billion by the end of 2025.⁴⁹ This growth trajectory reflects the increasing recognition of both the benefits that CAT bonds can provide to sponsors in managing and mitigating catastrophic risks and the potential financial upside of these instruments to investors.

⁴⁸<https://finimize.com/content/the-cats-out-of-the-bag-with-16-returns-these-bonds-are-among-the-years-best>

⁴⁹<https://www.investmentnews.com/fixed-income/news/this-bond-market-is-providing-double-digit-returns-244332>

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