Plenum
Insurance Linked Capital

Catastrophe Bonds

Cyber CAT Bonds with high premiums on the rise.
High Correlation between cyber bonds could slow down growth.

- The demand for cyber risk coverage is growing rapidly and Swiss Re estimates the global premium volume of the cyber market at USD 23bn in 2025[1].
- It was therefore only a matter of time before the first Cyber CAT Bonds were issued. The first four 144A Cyber CAT Bonds were issued in Q4 2023. Although they differ in terms of structure and detailed risk exposure, they cover all cyber risks in the "far tail" and offer little diversification potential between them.
- The pricing of all Cyber CAT Bonds corresponds to that of other peak perils such as hurricane risk in Florida. The spreads also compensate for a some model risk associated with each new risk lacking historical data.
- We consider the first Cyber CAT Bonds to be an attractive and high yielding risk with interesting prospects and have added some to our CAT Bond portfolios. Given the low diversification potential within the risk class, we treat all Cyber CAT Bonds as identical risks and have limited the overall allocation to 2% of NAV in the Plenum CAT Bond Dynamic Fund and the Plenum Insurance Capital Fund.
- It remains to be seen whether there will be a further differentiation of cyber risks in terms of regions, event types or sectors. Without this, we see limited growth potential for cyber risks in the capital market-based reinsurance business.

Development of the market

In an environment in which intangible assets now represent a large proportion of global corporate assets and digitalisation is shaping our everyday and economic lives, cyber risk protection is becoming increasingly important. In addition to the complexity of cyber risks and threats, the risk transfer of this risk segment is also part of the development of insurance solutions for this rapidly growing segment in the future.

While cyber risk coverage has been a topic in the traditional reinsurance market for a number of years, it was occasionally discussed in the CAT Bond market, but this new risk had never been successfully placed in the form of a CAT Bond until the end of 2022. This changed last year, and the Cyber CAT Bond private placements by Beazley in the first three quarters, which targeted a small group of investors, were an important precursor to this. Beazley was thus able to transfer a total of USD 81.5 million in cyber risks to the capital market via three transactions. This ice breaker was followed suit in the fourth quarter by broadly offered Cyber CAT Bonds of AXIS, Beazley, Swiss Re and Chubb. Interestingly, AXIS opened the round of new issues here and not Beazley, despite its experience with the existing private placements.

[1] Swiss Re Institute: https://www.swissre.com/risk-knowledge/advancing-societal-benefits-digitalisation/about-cyber-insurance-market.html

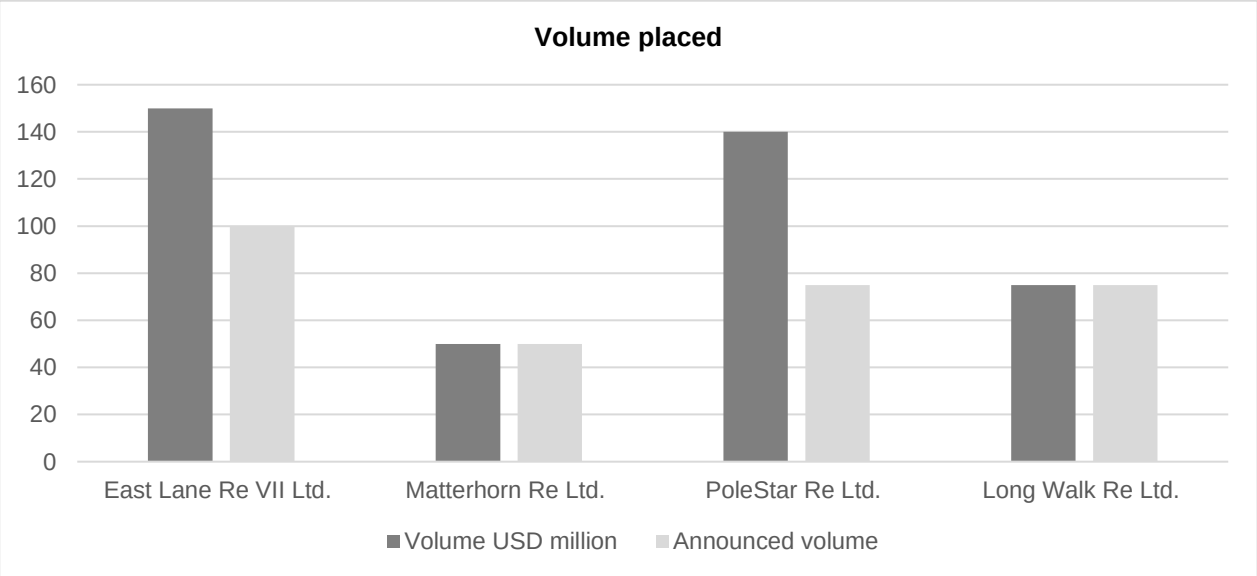
144A Cyber CAT Bonds

Name	Cedent	Volume USD million	Spread	Expected loss
East Lane Re VII Ltd (Series 2024-1)	Chubb	150	9.25%	1.39%
Matterhorn Re Ltd (Series 2023-1)	Swiss Re	50	12.00%	1.72%
PoleStar Re Ltd (Series 2024-1)	Beazley	140	13.00%	1.26%
Long Walk Re Ltd (Series 2024-1)	AXIS Capital	75	9.75%	1.97%

Source: artemis.bm

Placement success

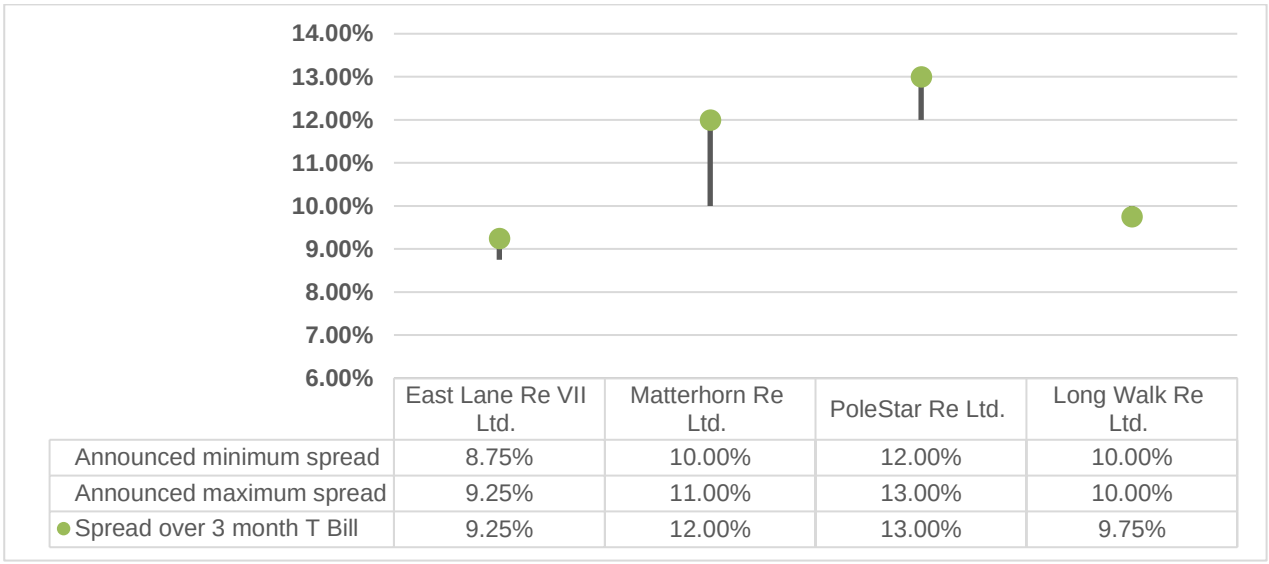
All four cyber CAT Bonds met strong investor interest and were well received by the market. Hence, transaction sizes grew strongly. The chart below shows that all bonds reached at least their original placement volume or grew significantly, leading to a total volume of over USD 400m in cyber risks, which is a success considering that this is a new, complex and dynamically changing risk.



Source: artemis.bm

The high risk premiums of the new CAT Bonds were certainly the basis for the success of these new issues. With the exception of the AXIS transaction, the bonds were placed with risk premiums at the upper end or even above the initially targeted range. Relative to other, more established risks in the CAT Bond market, the bonds carried higher risk premiums, reflecting the higher uncertainty in risk modelling and the market's reduced familiarity with this risk. Part of this "novelty premium" is likely to decrease with further cyber CAT Bond transactions and over time.

Spread over 3 month T Bill

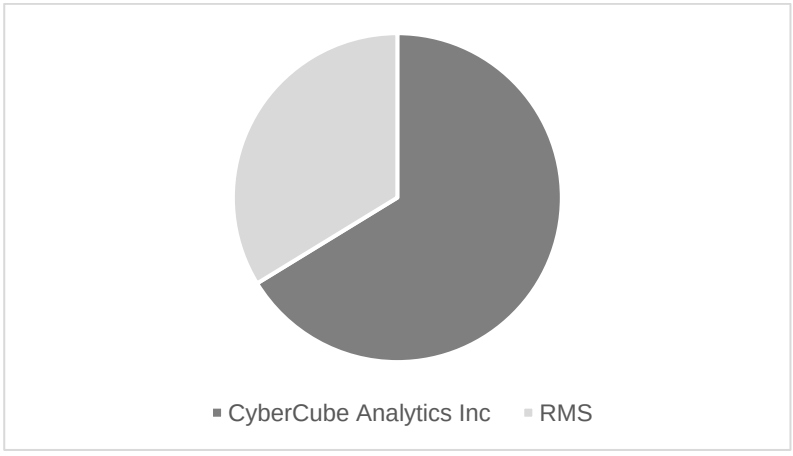


	East Lane Re VII Ltd.	Matterhorn Re Ltd.	PoleStar Re Ltd.	Long Walk Re Ltd.
Announced minimum spread	8.75%	10.00%	12.00%	10.00%
Announced maximum spread	9.25%	11.00%	13.00%	10.00%
Spread over 3 month T Bill	9.25%	12.00%	13.00%	9.75%

Source: Plenum Investments.

The premium level at placement also shows a very differentiated view of the transferred cyber risks by the market. Interestingly, the first bond placed by AXIS is the only bond with a slight decrease in the risk premium during the offering period to investors and also has the second-lowest risk premium in this peer group, despite the highest modelled risk. One possible explanation is that AXIS has provided other risk modellers with detailed data. This high level of transparency makes it easier for investors to compare their own risk modelling with the risk modelling attached to the transaction and increases confidence in the transaction. The PoleStar Re transaction sponsored by Beazley shows the exact opposite picture. The bond offers the highest risk premium in absolute terms, even though the modelled expected loss is the lowest among its peers. However, this transaction is also the only one in which the risk modelling was not carried out by CyberCube Analytics but by RMS, which limits the comparability of the risk numbers.

Market shares of cyber modelling companies



Source: Plenum Investments.

Structure and covered risks

The structure and exposure of these Cyber CAT Bonds differs in some respects despite their similarities. What the four transactions have in common is a covered risk period of two years which is shorter than the

usual three years in the natural catastrophe CAT Bond market. The trigger mechanisms are also very similar. Three of the four transactions are based on the financial loss due to an insured cyber event for the insurer, so-called indemnity triggers, while only the Swiss Re transaction uses a trigger mechanism based on an industry loss index published by PERILS. Both of these solutions are routinely used in other CAT Bond transactions and are the most common payout mechanisms in the CAT Bond market. Swiss Re's Matterhorn transaction is also unique as it is the only transaction limited to the US, while the other bonds cover cyber risks globally. However, the risk of the other bonds stems also chiefly from the US, the largest cyber insurance market.

Insured industries

Cyber insurance is in demand in all industry sectors and consequently the underlying business covers a wide range of sectors and companies of all sizes. Nevertheless, we note that the extreme risk transferred by cyber CAT bonds is dominated by a small number of industries. The following table illustrates that the risk comes mostly from four industries:

Financials	21.94%
Retail	15.61%
Information Technology	13.95%
Manufacturing	8.97%
Total	**60.47%**

Source: Plenum Investments.

Risk and event definition

The objective of the sponsors' perspective is similar for all four transactions. In each of the transactions, the aim is to cover individual major loss events with massive financial implications. Consequently, the underlying risk cover for all transactions was designed as "per event" cover and the loss events were defined as “Widespread Cyber Event” or “Systemic Cyber Event”. This is in line with the preference of many ILS investors to be exposed only to "headline events". Coverage of cyber events of various causes on an aggregate basis is unlikely to be accepted by the market at present.

The most far-reaching differences to conventional natural catastrophe CAT Bonds are in the event definition. The majority of CAT Bonds use risk definitions that are clearly described both spatially and temporally and must be confirmed by independent third parties, such as meteorological authorities. However, the nature of cyber risks requires a much broader definition. Only transactions based on an industry loss index have an event definition carried out by an independent third party. Indemnity cyber CAT bonds, require the cedent to define whether a cyber event has occurred. Consequently, events such as "Widespread Cyber Event" or "Systemic Cyber Event" must be defined more precisely in the documentation of the respective CAT bond. The aim of the event definition is to limit the cover to the extent that it can be traced back to a single cause and to exclude losses due to different causes.

The definition of a cyber event therefore includes, among other things, clauses that:

- Describe the loss event further. Examples: Denial of Service Attack, Data Breach, Social Engineering Fraud, System Failure, Hacking etc.
- Define that the threat actor must take action from outside the organisation
- Ensure that several insureds were affected by the same originating cause
- Limit the common cause as the same vulnerability, the same delivery mechanism for the malicious code or the same point of failure

- Excludes the combination of losses from different threat actors
- Exclude untargeted attacks such as phishing

In addition, indemnity transactions are subject to restrictions that limit or exclude certain risks at the level of the insurance policies. This typically includes exclusions of cover such as

- Personal injury
- Damage to public infrastructure (e.g. power or network failure)
- Liability claims for infringement of intellectual property
- Physical hazards or environmental pollution
- War and state-sponsored cyberattacks

Over the years, the insurance industry has gained experience with the effectiveness of such exclusions and has adapted the design of its insurance terms to ensure that these exclusions are enforceable.

Use of cyber risks in a portfolio context

Cyber CAT Bonds are highly interesting additions to CAT Bond portfolios for several reasons. They make a significant contribution to diversification, as these bonds are largely uncorrelated with natural catastrophes that are typically covered by traditional CAT Bonds. At the same time, they carry a very high risk premium. Improved portfolio diversification therefore does not result in lower returns. However, the use of cyber CAT Bonds to improve diversification is subject to certain restrictions, which can be attributed to reasons both within and outside the cyber risk segment.

First, the bonds currently available are exposed to very similar scenarios, despite their different structures. A prolonged outage of cloud services, for example, could lead to the default of all cyber CAT Bonds. The correlation in the event of an incident is therefore close to 1 and leads to a further cluster risk in the portfolio in the event of over-allocation.

Correlation matrix

	East Lane Re VII	Long Walk Re	Matterhorn Re	PoleStar Re
East Lane Re VII	1.00	n/a*	n/a*	n/a*
Long Walk Re	n/a*	1.00	0.95	0.79
Matterhorn Re	n/a*	0.95	1.00	0.83
PoleStar Re	n/a*	0.79	0.83	1.00

Source: Plenum, Risk modelling with RMS Miu, *Correlation not modellable in Miu, can also be assumed to be highly correlated

Second, such major cyber events will have a global impact on a wide range of industries and will trigger corresponding reactions in financial markets. This increases the correlation of CAT Bond investments with other investments in a broad asset allocation and thus reduces the diversification benefits of this asset class. However, as long as these aspects are sufficiently taken into account in the portfolio construction of a CAT

Bond portfolio, the addition of cyber risks is an attractive supplement and generates substantial additional benefits both in terms of improved diversification and in terms of the achievable risk premiums.

Cyber risk - quo vadis?

The emergence of the cyber CAT Bond market is comparable to the traditional CAT Bond market that developed after Hurricane Andrew in 1992 showed that reinsurance capacity could become scarce, particularly in Florida. The risk-bearing capacity of reinsurers is limited and the diversification potential within cyber risk - especially for extreme events - is low. As all four Cyber CAT Bonds cover loss scenarios in the "far tail", their correlation is high. Therefore, at Plenum Investments we have limited our total cyber allocation to 2% of the total portfolio and generally treat all cyber transactions as if they were the same transaction. This could slow down growth going forward.

The current size of the CAT bond market is around USD 45bn - if other investment managers adopt a similar approach to cyber risk as we do, the potential for cyber CAT Bonds appears to be limited to 2-4% of the total CAT Bond market, which would equate to a total Cyber CAT Bond volume of around 1-2bn. As USD 415m of Cyber CAT Bonds have been issued so far, there is still some growth potential. However, substantially more growth potential can be realized with diversification within cyber risk - similar to Florida, where granular exposures in different geographic areas within the state with significantly different risk profiles have become available over time.

But how could Cyber CAT Bonds cover the risk in a more differentiated way? We currently see the following differentiation possibilities:

- Event type: Example „cloud outage“
- Geography: Example „USA“
- Industry: Example „financial industry“

As with any emerging market, it is difficult to foresee how this market will develop. From a portfolio management perspective, cyber CAT Bonds that cover risks as granularly as possible are certainly desirable, potentially creating diversification potential in the future. Greater fragmentation of the underlying insurance business into different market segments, independent of risk exposure, would also free up more capacity in other areas of the reinsurance market.

Conclusion

Cyber CAT Bonds are an attractive and diversifying development within the CAT Bond market. In order to develop into a substantially larger market segment, the transferred risks within this segment must become more granular in their structure and have greater differentiating features. Otherwise, they will soon no longer offer any value added in a CAT Bond portfolio context and the market will saturate. This will also mean that cyber CAT Bonds will most likely cover a broader risk spectrum in future and not just extreme/far tail risks as well as enable the broader use of such bonds in portfolios with different risk and return positioning. We consider this a logical development that we look forward to.