



Regent's University London

European Business School London

Final Dissertation for the fulfilment of the MSc Finance (with Specialisations) degree

Title:

Supply & Demand for CAT Bonds in the Current Global ILS Market

- SURVEY RESULTS SHARED WITH PARTICIPANTS -

By

Chris-Cornelius Segeritz

Abstract

CAT bonds and other ILS play an increasingly important role in providing risk financing for large-scale risk events. Both sponsors and investors have strong motivations to engage further in this market, because this asset class offers benefits for both parties. As a result, the market has witnessed continuous growth over the last 20 years and is expected to grow substantially over the next years. Because financial markets are basically driven by supply and demand dynamics, this study asks the following research question: **What factors influence supply and demand for CAT bonds in the current global ILS market?**

To reach this aim, the study reviews the existing ILS knowledge and applies a mixed methodological approach, incorporating both a quantitative and qualitative method. This approach combines a new comprehensive empirical survey among market participants of the broader international CAT bond market and three contemporary case studies.

The key results of the study can be summarized as follows: Diversification benefits, a stable and attractive risk-return profile, a low correlation with traditional asset classes, the appetite for specific trigger types and a low (or even negative) interest rate environment are key factors which drive the demand for CAT bonds. Further key factors which influence the supply and demand include demographic factors, ESG appeal, climate change and the need to close the protection gap. CAT bonds are a viable tool to complement traditional (re)insurance due to pricing and capacity constraints, for hedging against event risks. Also, the findings demonstrate that there is significant potential for a broadening of the market and that the CAT bond structure is suitable for a wider range of new types of risks/perils to be securitised in the future (e.g. cyber risk). During the dissertation process another unexpected factor arose which influences this exotic asset class: The global Coronavirus (Covid-19) pandemic crisis.

The study also highlights current and future impediments and challenges. The empirical results from the survey responses reveal, that a lack of modelling and information available for new types of risk, as well as high administration, transaction and structuring costs are the two most significant impediment factors which oppose further market expansion.

5. Analysis and Results

The following chapter is dedicated to the analysis and findings of this dissertation. It comprises of two major parts. The first part (Chapter 5.1) provides an empirical contribution and investigates in-depth the results from a comprehensive global survey with experts from the broader CAT bond market. The second part (Chapter 5.2, 5.3 and 5.4) covers the analysis of the three contemporary case studies and relates their findings to the initial research objectives. Specifically, these cases explore in-depth the World Bank's Pandemic CAT Bonds, PG&E's Wildfire CAT Bond and Cyber CAT Bonds.

This approach is chosen because it allows to examine how the relevant empirical results from the online survey match up with the findings from the case studies.

5.1 Empirical Section: Global Survey with Market Participants

Sample Characteristics

Overall, **39 individuals** participated and completed the online survey which corresponds to a **response rate of 11.7%**. From 406 potential recipients, there were 72 bounces in total. This is due to the fact that some contact details were no longer valid, out of date or inaccurate (e.g. market participants who were no longer with a firm). Additionally, some email systems refused to accept a connection from the University's email system, due to corporate policies constraints. Thus, the **response rate is derived from an overall population of 334 market participants**. On average, it took the participants 6 minutes to complete the online survey. The online study was conducted by using the survey software *Typeform*. An automatically generated summary report from this study can be accessed [here](#).

As mentioned above and earlier in Chapter 4.1, the sample size of the following survey is 39. Thus, it can be concluded that the **sample size is sufficiently large enough to be statistically representative** (≥ 30). Also, the survey had reached out to a **broad spectrum of market participants** – both from the **supply-side and demand-side** – in the international CAT bond market.

General Questions

As shown in Figure 10 below, respondents from the survey come from 10 countries. The majority of market participants is headquartered in **Bermuda (24%)**, followed by **the USA (22%)**, **Switzerland (16%)** and **the UK (16%)**. The sample is dominated by countries which host large parts of the global ILS investor and issuer base and can thus be considered to be a **well-balanced representation** of the overall CAT bond market. As discussed in Chapter 3.3, the distribution highlights once again the importance of the regulatory environment which influences the supply for this asset class. Jurisdictions like Bermuda provide a suitable legal structure for ILS vehicles, providing both comparably low issuance costs and high levels of expertise in the issuance of CAT bonds.

Figure 10: Geographic Scope of Respondents

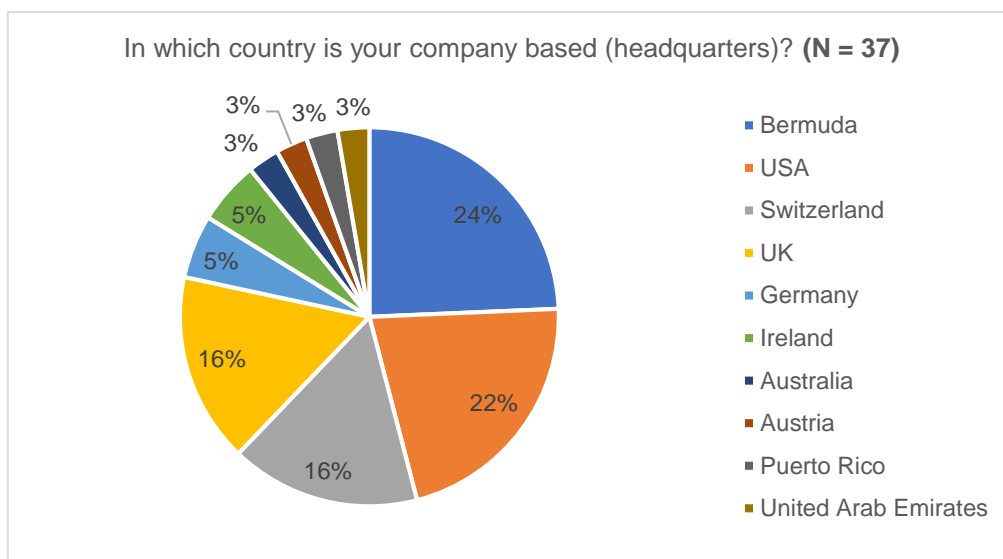
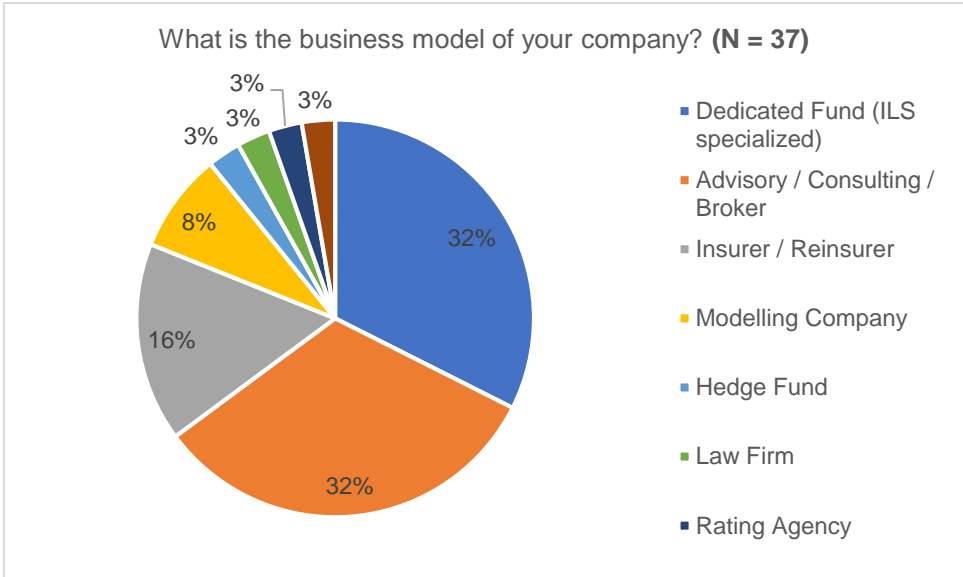


Figure 11 illustrates the composition of the respondents' base. Three market participants types stand out in this survey. These are **dedicated ILS funds (32%)**, **Advisory / Consulting / Brokers (32%)** and **Insurers / Reinsurers (16%)**. This is a **positive indication for the representativeness** of this study, as **the sample covers both the demand-side and supply-side** of the broader CAT bond market. The survey covered participants from Advisory, Consulting and Brokers as they are leading global (re)insurance specialists, providing their clients broking expertise, strategic advisory, consultancy services and/or industry-leading analytics in the field of ILS / CAT instruments. Brokers trade ILS in the global markets and provide the liquidity for investors, thus enabling them to optimise portfolio balance with regards to seasonality, among others. Therefore, this group reflects a key informant target group and was integrated in this study as well.

Figure 11: Business Model

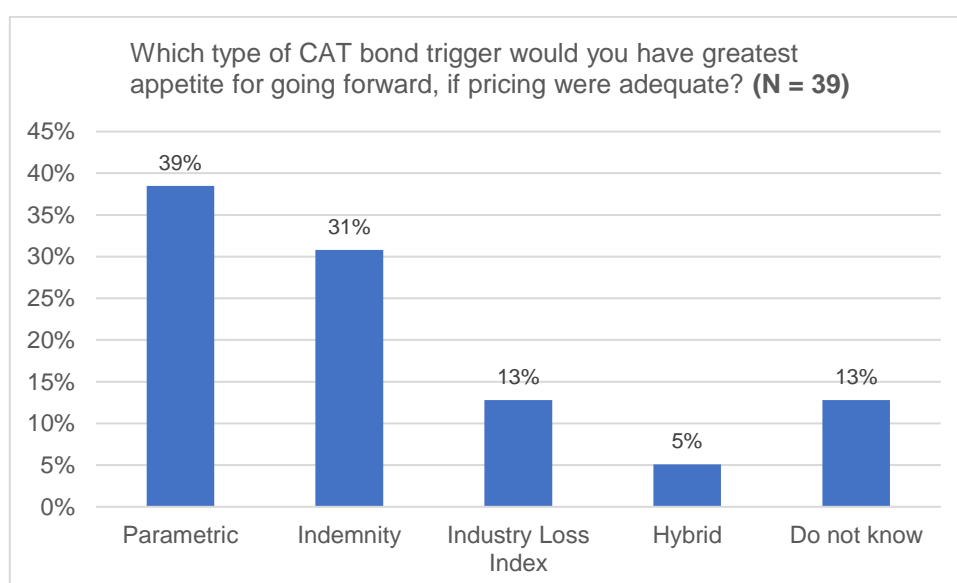


Other survey participants include hedge funds, rating agencies and law firms who are considered to have profound expertise and knowledge in the area of ILS and CAT bonds as well. As a result, the sample exhibits a **well-balanced mix of market participants** and this implies that the data should be representative.

Trigger Types

The fourth question addresses trigger types as a factor which drive both the supply and demand for CAT bonds. An important factor when issuing CAT bonds and investing in this asset class is the choice of an appropriate trigger type for the relevant market participants. Figure 12 below depicts that market participants have greatest appetite for the **Parametric trigger (39%) followed by the Indemnity trigger (31%)** types.

Figure 12: Trigger Types



Each single trigger type is associated with a different degree of transparency and basis risk (see Chapter 2). From an **investor's point of view** the **pure parametric mechanism represents the most attractive trigger** as it has the highest transparency for investors but the highest basis risk for sponsors. Investors are able to precisely follow the trigger parameters and sponsors can benefit from quick settlement after the event. Moreover, the potential of moral hazard is lower.

Indemnity triggers are considered as the **most favourable mechanism** from a **supply-side perspective** since they minimize the sponsor's basis risk. However, these mechanisms are less transparent to investors. Additionally, these transactions can take a significant amount of time to settle, when an event occurred. Furthermore, in terms of structuring and administration costs, indemnity triggers are considered as the most expensive and pure parametric triggers the least expensive.

As the demand-side and supply-side are well-balanced in this study, the results provide further evidence that both Parametric and Indemnity mechanisms are the most attractive triggers for further growth in the CAT bond market.

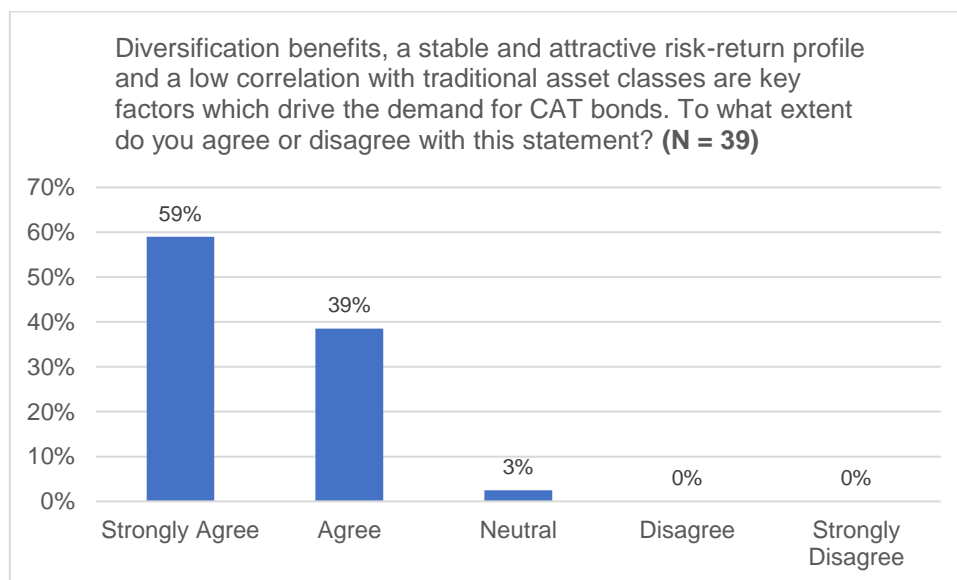
In the current global ILS market, the results also imply that there is still **less appetite for Industry Loss Index (13%) and Hybrid (5%) triggers.**

However, it must be highlighted that the **balance of issuance swings depending on if investors' demand or issuers' supply is the key market driver.** Thus, there is no consensus among market participants as to which the most appropriate trigger type is.

Portfolio Diversification, Risk-Return and Correlation Characteristics

The third question addresses the factors which influence the demand for CAT bonds. Figure 13 reveals that around **98% of the survey participants believe that diversification benefits, a stable and attractive risk-return profile and a low correlation with traditional asset classes** are key factors which drive the demand for CAT bonds. Almost 60% of the respondents strongly agreed and no participants disagreed with the statement as shown below. This provides strong supporting evidence to the related hypothesis made in Chapter 3.1 of the Literature Review.

Figure 13: Portfolio Diversification, Risk-Return and Correlation Characteristics



Their (historically) relatively high returns, which exhibit both a low volatility and a low correlation with traditional asset classes (such as equities) is the major reason why investors are attracted to CAT bonds. Consequently, it is possible to achieve considerable portfolio diversification effects, while benefiting from a generous risk premium. The returns of ILS are ‘event-linked’ rather than correlated with risks that are generally associated with the wider financial markets.

One market expert discussed this further and highlighted, that diversification effects can be considered on two different levels: a macro level and a micro level. On the one hand, the macro level refers to diversification effects *into ILS* (compared to the wider asset classes, as mentioned on the previous page). On the other hand, the micro level

refers to diversification *within ILS* (for instance, by geography or peril) (see also Appendix C).

However, the **global financial crisis 2007-08** has shown that **CAT bonds were not completely immune to changes in systematic risk** and exhibited a behaviour which was not consistent to those of zero-beta instruments. Nevertheless, in the aftermath of the crisis higher quality of the collateral accounts and improved structures which isolated investors further from market risks have been received positively by the market.

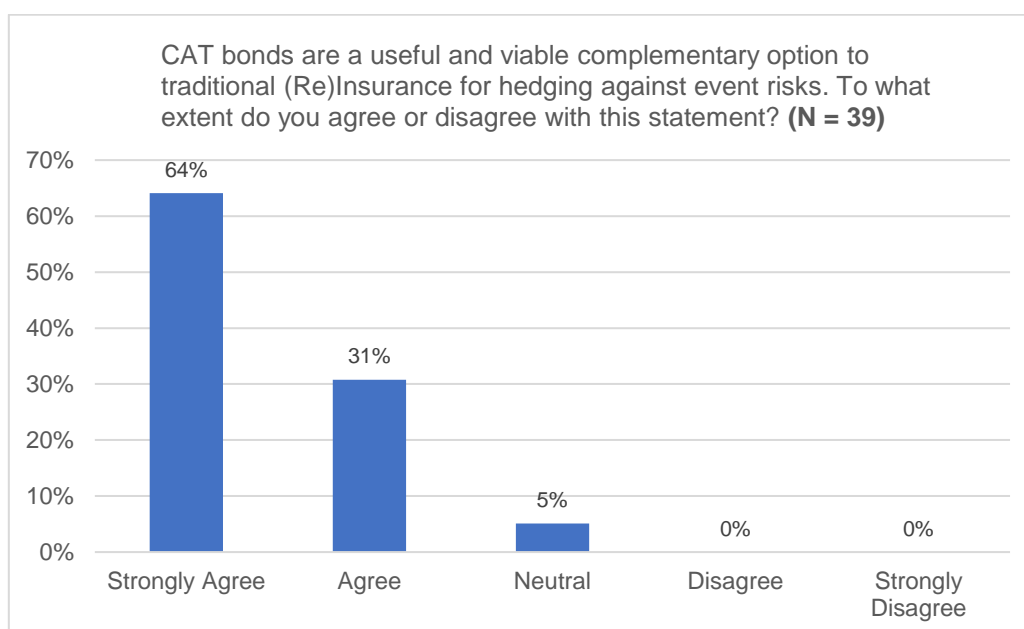
Nowadays, in times of financial **volatility** and uncertainty during the ongoing **Covid-19 pandemic crisis**, it seems that CAT bonds are demonstrating once again their **diversification potential**, offering a relatively safe haven during the current turmoil in the global financial markets.

Complementary Option to Traditional (Re)Insurance

The next question is relating to factors which influence the supply for CAT bonds and thus takes a sponsor's perspective.

Figure 14 below illustrates that **95% of the respondents agree that CAT bonds are a useful and viable complementary option of traditional (re)insurance** for hedging against event risks. Nearly two-thirds of the respondents strongly agreed, and no participant disagreed to the statement as shown below. Only 2 respondents had a neutral attitude to this statement.

Figure 14: Complementary Option to Traditional (Re)Insurance



The results provide further supporting evidence to the related hypothesis made in Chapter 3.2 of the Literature Review. There are five main factors which make CAT bonds an attractive and viable alternative to the traditional (re)insurance market.

First of all, severe and large-scale natural disasters have the possibility of causing losses which exceed the reasonable carrying **capacity** of the (re)insurance industry. However, the capital markets exhibit a much larger risk-bearing capacity than the reinsurance market.

The second factor is associated with **pricing**. CAT linked securities can act as a substitute layer in an existing reinsurance tower, when pricing is attractive relative to

traditional reinsurance. Generally, in the aftermath of extreme natural disasters, there is a lack in industry capital which puts pressure on (re)insurer to increase rates to rebuild surplus. Therefore, during such a 'hard' market period, CAT linked instruments tend to be less expensive than reinsurance for some risks.

Third, multi-year reinsurance contracts are not always available and expensive, whereas CAT instruments provide sponsors with an **affordable fixed-cost coverage over a multi-year period**.

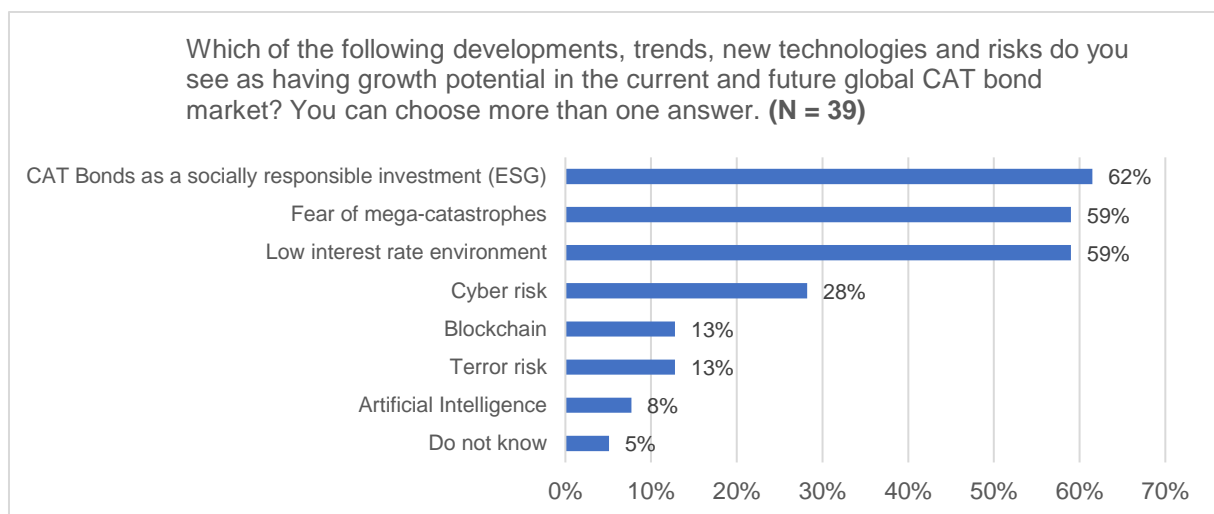
Fourthly, CAT linked securities allow for an **efficient systematic claims procedure**: Traditional reinsurance contracts may give rise to payment or coverage disputes. CAT bonds however are designed to mostly avoid these disputes by paying out rather promptly, thus minimizing the loss development period. Therefore, funding is available more quickly after a triggering event occurred (especially in non-indemnity transactions).

Lastly, CAT bonds allow for **minimizing credit risk** and a greater **credit quality**. Reinsurance buyers need to take counterparty risk into account and thus purchase often coverage from many different firms. CAT bonds allow to **reduce this counterparty risk** because the SPV is investing the collateral in highly-rated securities.

Recent Developments and Trends; New Technologies and Risks

The following question asked market participants about potential market opportunities in the current and future CAT bond market, including recent developments and trends, new technologies and risks. This type of question takes a holistic perspective and deals with factors which may drive both the demand and supply for CAT bonds. Based on the market experts' opinions, Figure 15 below shows that three factors stand out.

Figure 15: Recent Developments and Trends; New Technologies and Risks



These include CAT Bonds as a **socially responsible investment (ESG) (61.5%)**, followed by the **fear of mega-catastrophes** and the **low interest rate environment (both 59%)**.

As a result, market participants have confirmed these three sub-hypotheses presented in Chapter 3.5. First of all, they provide further evidence that investors are increasingly esteeming CAT bonds for their socially responsible impact to meet their ESG requirements. Additionally, the majority of respondents believes that the current interest rate situation involves further growth potential for the CAT bond market. Equity market volatility and an environment of persistent low or even negative interest rates make ILS an attractive alternative for investors. Furthermore, the majority of participants thinks that the fear of future mega-catastrophes will further boost the CAT bond expansion on the supply-side.

On the other hand, it seems that there is **less consensus among market experts** regarding the current and future growth potential of **cyber risk (28.2%), Blockchain and terror risk (both 12.8%) and Artificial Intelligence (7.7%)**.

Figure 15 reveals that ILS have the potential to **create new market opportunities** by providing capacity in several **other areas of risk transfer**. Those include the **securitization of terror risk or cyber risk**, which are examined in the context of two case study analyses in this dissertation (see Chapter 3.5 and 5.4). CAT bonds can not only provide the necessary capital in case of large loss events (e.g. caused by terrorism or cyber-attacks), but also offer investors additional investment opportunities. However, the percentages imply that the market in these areas is still in a comparably **immature condition**, requiring to overcome hurdles (such as modelling or pricing issues) before becoming mainstream. Also, there is the concern that securitizations of these two types of risks could involve some correlation with the markets if the underlying events are extremely large-scale.

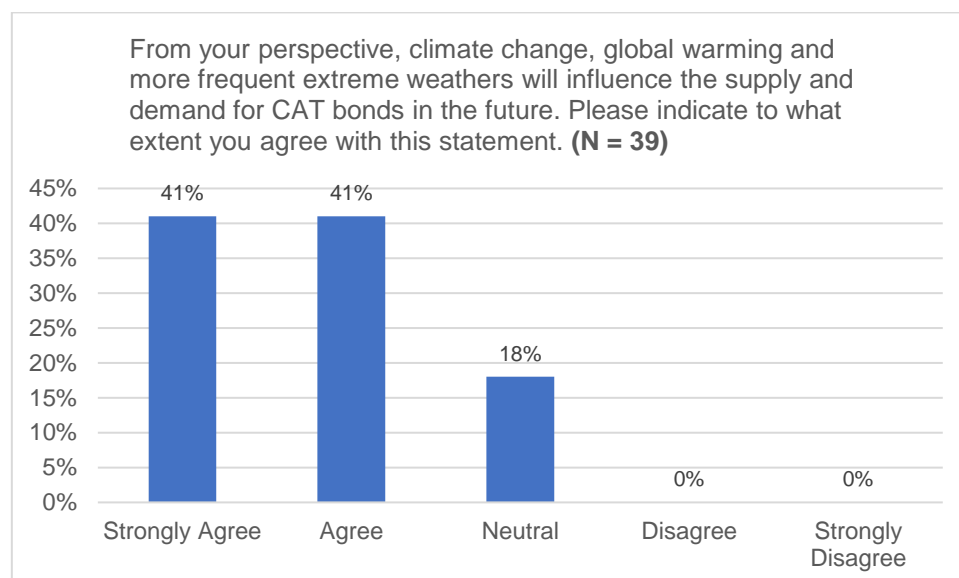
Interestingly, a **similar rationale applies for new technologies like Blockchain and AI** which have been represented comparably low. Especially for Blockchain technology the regulatory hurdles are considered as high to take. Thus, market experts reject the hypothesis stated in Chapter 3.5 that these new technologies could currently or in the near future play a meaningful role.

Climate Change and Global Warming

The seventh question deals with climate change and its effects which might influence the supply and demand for CAT bonds and thus takes a holistic view.

Figure 16 illustrates that **82% of the market experts agree that climate change, global warming and more frequent extreme weathers will have impact on the supply and demand** for CAT bonds in the future. More than 40% of the respondents strongly agreed, and no participant disagreed to the statement as shown below. Only 7 participants had a neutral opinion to this statement.

Figure 16: Climate Change and Global Warming



It can be concluded, that the respondents provided strong supporting evidence for this argument and thus confirmed the related hypothesis made in Chapter 3.4 of the Literature Review.

Various scientists have shown that extreme weather such as record-setting heat, extreme drought and rainfall will occur more frequently around the world. For instance, extreme events were marked by the influence of climate change in 2017 (hurricane season in the US) and 2018 when wildfires in California and heat waves in Europe occurred.

Another major effect will be the rising **risk of floods**. Warmer air holds more moisture, leading to wetter and more frequent severe storms. Especially **in the UK**, flooding is

considered as the **most prevalent climate hazard** and models predict that flood occurrences will continue to rise. Heavier rainfall caused by storms (e.g. Storm *Dennis* in February 2020) can be linked to climate change. In addition, rising sea levels worsen the situation and turn storms and floods into an increasingly sizeable threat for homeowners in flood-prone areas near rivers and coasts.

The increased hazards will pose **new challenges for the insurance and reinsurance industry** which face increasing risks, higher potential losses and capacity constraints. That's why CAT bonds are likely to play a **more meaningful role in the future**. (Re)Insurers will increasingly integrate CAT instruments in their overall risk management mechanisms as a **risk mitigating tool to complement financing efforts**. This will enable them to cover the growing liabilities, which in turn will increase the supply for CAT bonds.

The results also show that the majority of market participants believes that climate change will influence the demand-side in the future. However, it is **difficult to derive to what extent the appetite for this asset class will be influenced** (see Chapter 3.4). Therefore, making inferences here might be misleading. This could be one reason why 18% of the respondents revealed a neutral opinion.

Climate change is a gradual and long-term phenomenon, whereas CAT bonds are short-term instruments with a term of two to three years. Hence, climate change will impact the ILS market and its composition in the long term but will impact only marginally single CAT instruments or portfolios on the short run.

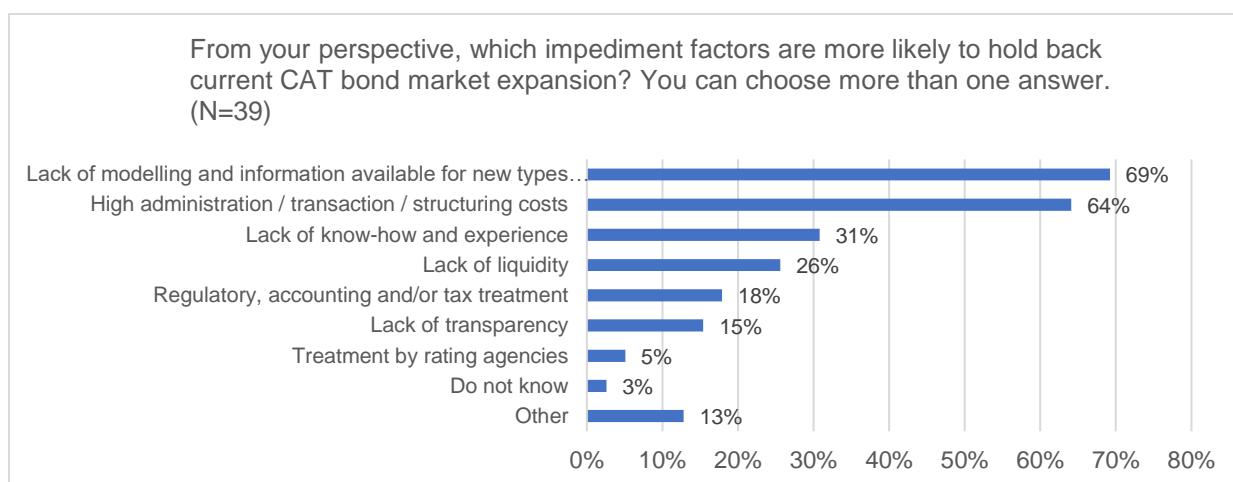
Furthermore, it is necessary that the impact of climate change on the ILS market over multi-year periods needs to be **evaluated in combination with secondary effects such as supply and demand dynamics**, pricing or shifts in insured exposures.

Nevertheless, the results imply that climate change and potential related CAT bond losses lead ILS investors to reassess the underlying risks (see also Chapter 5.3: Case Study 2: PG&E's wildfire CAT bond).

Impediment Factors

The next question asked market experts about factors opposing current CAT bond market expansion. This type of question also takes a holistic view and deals with impediment aspects which currently influence both the demand and supply for CAT bonds. Based on the market participants' input, Figure 17 below depicts that two factors stand out.

Figure 17: Impediment Factors



The **most significant impediments** to a current CAT bond market expansion include the **lack of modelling and information available for new types of risk/peril (69%)**, as well as **high administration/transaction/structuring costs (64%)**. The third largest concern of market experts is the **lack of know-how and experience (31%)**, followed by liquidity concerns (26%). Currently, respondents are **less concerned about regulatory, accounting and/or tax treatment (18%)** issues and a **lack of transparency (15%)**. For market participants, the treatment by rating agencies seems to be the least of their concerns for further market expansion (5%). Moreover, 5 market experts shared other potential impediments on this question which will be analysed and discussed further below.

From a demand-side perspective, investors (especially dedicated ILS funds) are predominantly concerned about the first three points. The supply-side (e.g. (re)insurers) is also concerned about these three arguments, thus complement each other's views.

Referring forward to Chapter 5.3 and 5.4, the analyses of the case studies will show, that a lack of sophisticated modelling and data available for new types for risk (such as cyber risk and wildfire risk) are severe impediments to further expansion. The results outlined above provide further supporting evidence for this relationship.

As already discussed in Chapter 3.2 of this study and confirmed by the survey participants, a **major challenge of CAT bonds are the high transaction costs** including legal fees and administration costs and high structuring costs including fees to lawyers, rating agencies, modelling agencies and distribution costs. Reducing transaction costs would be crucial in order to broaden the investor base, which in turn may increase the demand for this asset class.

One respondent emphasized the **lack of knowledge and expertise** in general as a significant impediment for further ILS market expansion. More education and training in regard to this niche asset class would make market participants feel more comfortable with this asset class and could in turn increase propensity to invest. Additionally, the participant stresses that large losses exposures to investors might represent an issue.

Although not a major concern, another **market expert highlighted the importance and value of liquidity**. CAT bonds belong to one of the few assets which can more easily be sold and generally has many buyers. Even in times of severe financial turmoil – like the Pandemic Covid-19 crisis – an investor can sell close to par and secure cash for allocation elsewhere. **Higher levels of liquidity** in the market would be beneficial to **attract** an even **broader audience of potential investors**.

Another important impediment which has not been mentioned in the questionnaire but highlighted by one market expert is the **lack of standardization**. Generally, CAT bonds involve standardized elements but are overall rather customized. Standardization would allow for reducing legal fees and lower transaction cost. Furthermore, higher levels of standardization increase transparency. The more standardized and transparent this asset class, the more investors are attracted by it. Also, the respondent stresses the lack of transaction documents available, which would increase transparency.

Another survey participant mentions the **availability of cheaper reinsurance** which makes CAT bonds comparably less attractive. This statement can be aligned with the second impediment factor (e.g. high structuring costs). This participant adds that

investors are currently reticent to invest due to climate change fears and thus underpins the hypothesis from Chapter 3.4.

Finally, two other impediment factors which were pointed out by two respondents included **lower levels of flexibility** compared to traditional reinsurance and issues with collecting valid losses. The latter can be associated to issues related to trigger types but also underpins the first impediment factor (e.g. lack of modelling / data available).

Other Factors & Further Comments

The last question represented an open-ended survey question. Participants were given the opportunity to share further ideas, opinions and additional comments related to the research question. This kind of question helped to underline previous findings and to gain further interesting insights on the topic. **Overall, 33 out of 39 respondents (around 85%) shared their additional views.** A comprehensive list of all quotations from the respondents is included in Appendix B. Additional ex post comments from market experts are provided in Appendix C.

In order to allow a more efficient reporting the answers have been grouped based on their themes and key messages. The respective results are displayed in Table 7 on the following page. The analysis exhibits a **well-balanced representation of comments from both demand-side and supply-side market participants** (see Appendix B and Table 5). Interestingly, **most statements** (9 in total, or 27.3% of all comments) **are centred around** the impact of **the global Covid-19 pandemic crisis** on the CAT bond market.

From a **demand-side view**, the ongoing Covid-19 crisis could further boost the demand for CAT bonds. In these times of significant uncertainty and high financial market volatility, CAT instruments are once again **proofing their diversification characteristics and low correlation with broader financial markets**. In other words, the increased correlation among other investments (like equities) will drive additional demand for this asset class in investors' portfolios. On the other hand, some experts are concerned that a possible global recession may cause investors to **remove their capital from the ILS market**, due to an increasing **demand for liquidity**. Additionally, another market expert points out that the small size of the market and liquidity constraints could be limiting factors for further market expansion. The latter could perhaps result from a growing gap between bid and ask price targets in the ongoing pandemic crisis.

Surprisingly, one participant expressed concerns about pricing and stability of available collateral in the current environment. Generally, the credit quality of the collateral such as US Treasuries or IBRD notes is very high and structures have been evolved since the collapse of Lehman Brothers (which acted as counterparty in some CAT transactions). However, the comment highlights the importance of quality and stability of the collateral structure in current times of significant turmoil in financial markets.

Table 7: Other Factors & Further Comments

Finally, from your perspective, do you currently or in the next 3 years see any other driving or impeding factors which might influence the demand and supply for CAT bonds? (N = 33)			
	Demand-side (Investors Perspectives)	Supply-Side (Sponsors Perspectives)	
Driving Factors	Coronavirus (Covid-19) Pandemic Crisis <i>“CAT bonds demonstrate the value of decorrelation and diversification”</i>	Pricing & Capacity Constraints of (Re)Insurers	
	Overall Performance and Risk-Return Profile	Closing Protection Gap	
	ESG-Positive Investments	World Bank’s IBRD Activities	
	Low Interest Rate Environment	New Types of Risk (e.g. cyber)	
	Greater Expertise and Experience in the Investment Community		Growing Reinsurance Market in General
			Climate Change & Risk Events (especially in developing countries)
			M&A Activities
Evolving Trigger Types (e.g. sensor-based parametric)			
Impeding Factors	Coronavirus (Covid-19) Pandemic Crisis <i>“Demand for liquidity among investors may remove capital from the market.”</i>	Coronavirus (Covid-19) Pandemic Crisis <i>“A global recession may lead to a reduced insurance business and therefore a reduced supply for CAT Bonds.”</i>	
	Climate Change & Risk Events	Attractiveness of other Reinsurance Products (e.g. collateralized reinsurance)	
	Market Size & Liquidity	Regulatory Treatment	
	Pricing and Stability of Collateral		

Besides these new interesting considerations - especially the Coronavirus factor which has not been hypothesised and was thus missing in the questionnaire design - respondents provided further supporting evidence to some of the factors which have been already presented and analysed earlier in this survey chapter and/or in the Literature Review. Once again, they **confirm the hypotheses related to the following factors** which influence the demand and supply for CAT bonds: know-how and experience, climate change and related extreme risk events, the current low

interest rate environment, CAT bonds as ESG-positive investments and an attractive and stable risk-return profile.

For instance, five comments revolve around the impending effects of climate change and risk events. The fear of climate change and global warming and significant large-scale events occurring could discourage many investors and reduce appetite for this asset class. Additionally, long loss development periods after an event are also seen as problematic by many of a respondent's clients.

However, one respondent emphasized that CAT bond investors have fared extremely well even through the past three years of CAT losses as most bonds have not been affected.

From a **supply-side view**, the Coronavirus crisis was also taken into account by market participants. If a global recession happens, this could lead to a reduced insurance business in general and therefore a reduced supply for CAT linked securities. Other new impeding factors include the overall **attractiveness of other reinsurance products** (such as collateralized reinsurance) and the **unfavourable regulatory treatment** (e.g. for parametric covers because they are viewed as banking type derivatives and thus regulated under Banking regulation).

Regarding new driving factors, one market expert notes that the growth of the ILS market will also be driven by a **growing reinsurance market** in general.

Another participant mentions **evolving trigger types**, such as data-driven sensor-based triggers which could expand coverage in the future (e.g. for flood events). These triggers are more cost-effective, whilst reducing lengthy claims processing times and enable for much more rapid pay-outs. Also, **parametric insurance products are emerging** in several markets - their success would certainly drive both supply and demand for parametric ILS covers, since parametric trigger mechanisms are considered as more attractive from an investor's perspective.

Furthermore, 5 comments are centred around pricing and capacity issues of (re)insurers. Capacity constraints of traditional (re)insurance and further increases in retrocessional pricing will increase supply and remain the two key drivers of issuance decision for sponsors. Three market experts agreed that the protection gap is another key factor. **Closing the protection gap** between insured and uninsured losses could

be an opportunity for further market growth in the traditional and alternative reinsurance space.

Moreover, one market expert **highlighted the impact of M&A activity** on the supply of CAT bonds. CAT instruments typically work best for large multi-national primary insurers. M&A leads to larger companies, where tail protection is more of a regulatory purchase rather than pure risk management/income protection. CAT bonds work very well for such remote risks; no credit risk, larger deals possible and a multi-year protection.

Finally, besides these further interesting insights - such as sensor-based triggers or M&A activity - which have not been hypothesised and thus not considered in the questionnaire design - respondents provided further supporting evidence to some of the factors which have already been presented and analysed earlier in this survey chapter and/or in the Literature Review. Once again, **market experts confirmed the hypotheses** related to the following factors which influence the demand and supply for CAT bonds: New types of risk (e.g. cyber), climate change & risk events, and regulatory treatment. Particularly, a further expansion of the World Bank's risk transfer efforts via the **IBRD CAR program** (e.g. pandemic CAT bonds) are seen as potential growth drivers by two ILS experts.

Appendix A: Survey

Consent Form

Dear Sir / Madam,

The researcher requests your consent for participation in a study about Catastrophe Bonds (CAT Bonds) as part of his MSc Finance dissertation. The research aims of the dissertation focus on examining the factors which influence the demand & supply for CAT bonds in the current global ILS market.

This consent form asks you to allow the researcher to use your comments to enhance understanding of the topic:

I understand that the researcher will not identify me by name in any reports using information obtained from this survey, and that my confidentiality as a participant in this study will remain secure and anonymous. I understand that only disguised extracts from my statements may be quoted in the researcher's dissertation.

Participation in this study is completely voluntary. If you decide not to participate there will not be any negative consequences. Please be aware that if you decide to participate, you may stop participating at any time and you may decide not to answer any specific question. Participants are not offered any benefits from their involvement.

The researcher will maintain the research records or data **confidential and anonymous**. Any personal and professional details will be destroyed.

By **selecting "I accept"** and submitting this form you are indicating that you have read the description of the study, are over the age of 18, are consenting to the terms and conditions described above and are agreeing to take part in the research.

If you would like to receive the results of this research or if have any questions please don't hesitate to contact the researcher via e-mail at Chris-Cornelius.Segeritz@regents.ac.uk.

Thank you in advance for your time and your participation!

Kind regards,

Chris Segeritz

If you wish to seek further clarification and information about this study, please contact the researcher:

Chris-C. Segeritz

MSc Finance with Specialisations (Fixed Income & Derivatives)
European Business School London
Regent's University | Inner Circle | Regent's Park | London | NW1 4NS
E: Chris-Cornelius.Segeritz@regents.ac.uk

You can also contact the academic supervisor:

John Diamondopoulos

Senior Lecturer in Finance
Faculty of Business and Management
European Business School London
Regent's University | Inner Circle | Regent's Park | London | NW1 4NS
E: diamondj@regents.ac.uk | T: 020 7487 7631

- A. I accept
- B. I don't accept

1. What is the business model of your company?
 - A. Investment Bank
 - B. Insurer / Reinsurer
 - C. Hedge Fund
 - D. Dedicated Fund (ILS specialized)
 - E. Pension Fund
 - F. Family Office
 - G. Advisory / Consulting / Broker
 - H. Regulator
 - I. Modelling Company
 - J. Other Investor
 - K. Other Sponsor / Issuer

2. In which country is your company based (headquarters)?
 - A. USA
 - B. Bermuda
 - C. Switzerland
 - D. UK
 - E. Ireland
 - F. Germany
 - G. France
 - H. Cayman Islands
 - I. Other

3. Diversification benefits, a stable and attractive risk-return profile and a low correlation with traditional asset classes are key factors which drive the demand for CAT bonds. To what extent do you agree or disagree with this statement?
 - A. Strongly Agree
 - B. Agree
 - C. Neutral
 - D. Disagree
 - E. Strongly Disagree

4. Which type of CAT bond trigger would you have greatest appetite for going forward, if pricing were adequate?
 - A. Indemnity
 - B. Industry Loss Index
 - C. Parametric
 - D. Hybrid
 - E. Do not know

5. CAT bonds are a useful and viable complementary option to traditional (Re)Insurance for hedging against event risks. To what extent do you agree or disagree with this statement?
- A. Strongly Agree
 - B. Agree
 - C. Neutral
 - D. Disagree
 - E. Strongly Disagree
6. Which of the following developments, trends, new technologies and risks do you see as having growth potential in the current and future global CAT bond market? You can choose more than one answer.
- A. Low interest rate environment
 - B. Blockchain
 - C. Artificial Intelligence
 - D. CAT Bonds as a socially responsible investment (ESG)
 - E. Fear of mega-catastrophes
 - F. Cyber Risk
 - G. Terror Risk
 - H. Do not know
7. From your perspective, climate change, global warming and more frequent extreme weathers will influence the supply and demand for CAT bonds in the future. Please indicate to what extent you agree with this statement.
- A. Strongly Agree
 - B. Agree
 - C. Neutral
 - D. Disagree
 - E. Strongly Disagree
8. From your perspective, which impediment factors are more likely to hold back current CAT bond market expansion? You can choose more than one answer.
- A. Regulatory, Accounting and/or Tax Treatment
 - B. Treatment by rating agencies
 - C. Lack of Liquidity
 - D. Lack of Transparency
 - E. High Administration/Transaction/Structuring Costs
 - F. Lack of know-how and experience
 - G. Lack of modelling and information available for new types of risk
 - H. Do not know
 - I. Other
9. Finally, from your perspective, do you currently or in the next 3 years see any other driving or impeding factors which might influence the demand and supply for CAT bonds?

(Please type your answer here ...)

Appendix B: Responses Open-End Survey Question

Finally, from your perspective, do you currently or in the next 3 years see any other driving or impeding factors which might influence the demand and supply for CAT bonds? (N = 33)

Demand-Side (Investors Perspectives)	Supply-Side (Sponsors Perspectives)
<p>Coronavirus (Covid-19) Pandemic Crisis</p> <ul style="list-style-type: none"> • <i>More demand for cat bonds on the investment size as a result of the coronavirus which demonstrates the value of decorrelation</i> • <i>Unique non correlation of cat bonds with other investments.</i> • <i>Proof of low correlation in covid-19 market crash</i> • <i>Current pandemic ignited depression</i> • <i>Increased correlation among other investments will drive additional demand for cat bonds as an investment</i> • <i>Virus outbreak could hit investor demand.</i> • <i>Liquidity crunch from possible global recession</i> • <i>Demand for liquidity among investors may remove capital from the market</i> 	<p>(Re)Insurance Market & its Products</p> <ul style="list-style-type: none"> • <i>Growth in ILS will also be driven by a growing reinsurance market in general</i> • <i>More efficient capital in ILS compared to traditional reinsurers</i> • <i>Overall attractiveness of other reinsurance products (including collateralized reinsurance)</i> <p>Pricing & Capacity of (Re)Insurance</p> <ul style="list-style-type: none"> • <i>Re-insurance capacity</i> • <i>Capacity and pricing</i> • <i>Supply will be governed by pricing and structuring</i> • <i>Further increases in retrocessional pricing will increase demand</i> • <i>Price of traditional reinsurance to remain the main driver of issuance decision for sponsors</i>
<p>Climate Change & Risk Events</p> <ul style="list-style-type: none"> • <i>Fear of climate change and global warming will reduce investor appetite from certain categories of allocator</i> • <i>Large events occurring</i> • <i>Significant risk events which trigger CAT bond pay-outs to reinsurers and not investors.</i> • <i>A further year of significant losses (after 2017 and 2018) could serve to discourage many investors and consultants (some of whom recommended very aggressive managers whose strategies clearly underperformed) and result in their abandoning the asset class.</i> • <i>Long loss development periods after an event are also seen as problematic by many of our clients</i> 	<p>Closing Protection Gap</p> <ul style="list-style-type: none"> • <i>Closing the protection gap, ease of access (standardisation of ILS products implemented by technological solutions, does not need to be blockchain), hybridisation of the reinsurance business model</i> • <i>Closing the gap between insured and uninsured losses could be an opportunity for further market growth in the traditional and alternative reinsurance space</i> • <i>Reducing the protection gap</i>
<p>Performance / risk-return profile</p> <ul style="list-style-type: none"> • <i>Cat Bond investors have fared extremely well even through the last 3 years of Cat Losses. Most bonds have not been affected.</i> • <i>Given the high complexity of the asset class, many investors and consultants may decide that the underperformance was more an asset class issue than one of having chosen the wrong manager. Unfortunately, many allocators chose aggressive strategies promising high (double digit) returns as they were hungry for yield.</i> 	<p>Regulatory factors</p> <ul style="list-style-type: none"> • <i>Impeding: Lack of trust in the legal systems, e.g. caused by current attempts to rewrite insurance coverage documents in order to get coverage for the Coronavirus caused economic losses, bad regulatory treatment for parametric covers because they are viewed as banking type derivatives and thus regulated under Banking regulation</i> • <i>Also, the approach of regulators to authorising Solvency II SPVs in the EU</i> • <i>Government intervention</i>

<p>Interest Rates</p> <ul style="list-style-type: none"> • <i>Low interest environment</i> • <i>Low interest rates will certainly increase capital availability.</i> 	<p>WB (IBRD) Activities</p> <ul style="list-style-type: none"> • <i>We see potential growth drivers in a further expansion of the World Bank's risk transfer efforts through the IBRD CAR program</i> • <i>The raising conviction to cover frontier markets assets (Asia), raising IBRD activities, replacement of US Treasury Money Market Funds as collateral into more sustainable bonds (IBRD)</i>
<p>ESG-Investing</p> <ul style="list-style-type: none"> • <i>Demand for socially responsible investments</i> 	<p>Coronavirus (Covid-19) Pandemic Crisis</p> <ul style="list-style-type: none"> • <i>If we see a global recession, this could lead to a reduced insurance business and therefore in a reduced supply for CAT Bonds</i>
<p>Expertise</p> <ul style="list-style-type: none"> • <i>Greater knowledge in the investment community</i> 	<p>New Types of Risk</p> <ul style="list-style-type: none"> • <i>Pandemic, cyber, and civil order business interruption</i>
<p>Market Size & Liquidity</p> <ul style="list-style-type: none"> • <i>Small size of the market and liquidity constraints could be limiting factors for further market expansion</i> 	<p>Evolving Trigger Types</p> <ul style="list-style-type: none"> • <i>Parametric insurance products are emerging in several markets - their success will certainly drive demand for parametric ILS covers.</i> • <i>Data driven sensor-based triggers</i>
<p>Collateral</p> <ul style="list-style-type: none"> • <i>The pricing and stability of available collateral in the current environment is a concern</i> 	<p>M&A Activities</p> <ul style="list-style-type: none"> • <i>M&A activity - cat bonds typically work best for large multi-national primary insurers. M&A leads to larger companies, where tail protection is more of a regulatory purchase rather than pure risk management/income protection. Cat bonds work very well for such remote risks; no credit risk, larger deals possible, multi-year protection...</i>
<p>Further Comments / Other Factors</p> <ul style="list-style-type: none"> • <i>Demand from investors will increase</i> • <i>ILS funds who have just grown to earn fees</i> • <i>Overall capacity of ILS funds (which has decreased in the last few months)</i> • <i>Parametric insurance products are emerging in several markets - their success will certainly drive demand for parametric ILS covers.</i> 	<p>Climate Change</p> <ul style="list-style-type: none"> • <i>Driving: Climate change, more concentration of values (developed countries), disaster finance by Governments</i>
	<p>Further Comments / Other Factors</p> <ul style="list-style-type: none"> • <i>We also need more casualty/liability risk, ILS capacity</i> • <i>Bond form itself only works for a small section of market (4x annual risk transfer is direct to ILS funds)</i>

Appendix C: Ex Post Survey Comments

- *We see potential growth drivers in a further expansion of the World Bank's risk transfer efforts through the IBRD CAR program. Growth in ILS will also be driven by a growing reinsurance market in general. Closing the gap between insured and uninsured losses could be an opportunity for further market growth in the traditional and alternative reinsurance space. The small size of the market and liquidity constraints could be limiting factors for further market expansion and long loss development periods after an event are also seen as problematic by many of our clients.*

(Switzerland; Investment Management; Head Portfolio Management)

- *On diversification, I always think of this at a macro level and a micro level. Macro = diversification INTO ILS (as compared to wider asset classes), Micro = diversification WITHIN ILS (e.g. by geography / peril etc). One additional question, therefore, may be "how important to you is diversification within ILS".*

We trade ILS in the global markets providing liquidity for Investors, so enabling them to optimise portfolio balance with regards to seasonality etc. Another question may therefore involve the value of liquidity.

(United Kingdom; Brokerage; Head ILS & Insurance)