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**Publikationen der Kölner Forschungsstelle Rückversicherung  
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# **Proceedings of the Researchers' Corner for the 13<sup>th</sup> Annual Meeting of the Sponsoring Group Reinsurance 2020**

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und Rechtswissenschaften

**Technology**  
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## **Foreword**

The 13<sup>th</sup> Annual Meeting of the Sponsoring Group Reinsurance was held 26 June 2020. Due to COVID-19, the event was held online this year. Some 80 representatives of the (re)insurance companies involved in the Sponsoring Group took part in the meeting, along with guests. Offered for the sixth time as part of the Annual Meeting, the Researchers' Corner gave the seven academic researchers at the Cologne Research Centre for Reinsurance an opportunity to deliver a presentation on the research project each in which each is involved in 2020.

In three sessions – each featuring 2-3 parallel lectures with posters – the most important results of the scientific studies by the Cologne Research Centre for Reinsurance were presented and discussed. The heterogeneity of the topics presented by academic staff reflects the dovetailing of Cologne Research Centre with reinsurance practice.

### **Session 1**

- a) Manuel Dietmann (M.Sc.): Preventive recovery planning for insurance companies
- b) Robert Joniec (M.Sc., FCII, cand. PhD): Capital is fungible, the market is growing more efficient – But how valid are research results?
- c) Jörg Dirks (M.Sc., FCII): Cyber risks in reinsurance – Insurable on a parametric basis through AI?

### **Session 2**

- a) Wolfgang Koch (M.Sc., FCII): Trend in sovereign cat pools in emerging and developing economies
- b) Fabian Lassen (M.Sc., FCII): Environmental social governance – A look at reinsurers

### **Session 3**

- a) Fabian Pütz (M.Sc., PhD): Reinsurance aspects of product recalls in the automobile sector
- b) Lihong Wang (M.Sc., FCII): China's Belt and Road Initiative (BRI) – Its impact on the global (re)insurance industry



### **Poster session**

- a) Fabian Lassen (M.Sc., FCII): Private-public partnership – The solution for the insurability of pandemics?
- b) Christian Serries (B.Sc.): Silent Cyber as a challenge for the (re-) insurance industry
- c) Frank Cremer (B.Sc. / FCII): Digital ecosystems – Relevance for reinsurance?
- d) Harald Kurtze (B.Sc.): Sharing economy – Impacts for reinsurance?



With the publication series, 'Proceedings of the Researchers' Corner', the Cologne Research Centre for Reinsurance meets the desire for publication of the research results of our scholars together with the accompanying posters and discussions. The titles are reproduced in keeping with the above agenda of the Researchers' Corner for the 13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung [Sponsoring Group Reinsurance].

We would like to express our deep gratitude to the sponsors with whose support the activities of the Cologne Research Centre for Reinsurance, and the Annual Meeting of the Sponsoring Group Reinsurance in particular, are possible.

Cologne, December 2020

Prof. Stefan Materne

## **Chair for Reinsurance, Cologne Research Centre for Reinsurance at the Cologne University of Applied Sciences and Sponsoring Group Reinsurance**

The Professorship for Reinsurance was established in 1988; Prof. Stefan Materne received the first appointment to the professorship. The position was redesignated the Chair for Reinsurance by rectorate decision in 2008. The basis for this was the defined field of instruction and research comprised by reinsurance together with related topics such as alternative risk transfer, captives, insurance-linked securities, etc. In particular, the integration of the Chair of Reinsurance within the Institute of Insurance Studies at the Cologne University of Applied Sciences permits a focus on instruction and research in the field of reinsurance. The focus on the specialisation in reinsurance, in turn, promotes the international reputation of the chair and of the affiliated Cologne Research Centre for Reinsurance.

The Cologne Research Centre for Reinsurance currently employs seven academic researchers, two academic project managers, three research assistants and a student assistant and ensures the bidirectional transfer of knowledge between theory and practice. This takes place, firstly, through continuous, bilateral project cooperation as well as an exchange of views with the respective experts in the field, and secondly, through publications by the Cologne Research Centre for Reinsurance and the two major scientific events held each year (Cologne Reinsurance Symposium, Annual Meeting of the Förderkreis Rückversicherung [Sponsoring Group Reinsurance]).

Since 2004, the Cologne Research Centre for Reinsurance has hosted the Cologne Reinsurance Symposium free of charge, an annual event with more than 500 attendees. This event, with its top-flight presenters and international implementation with the aid of simultaneous interpreting, shapes the international reputation of our reinsurance-oriented activities.

The Cologne Research Centre for Reinsurance is fully financed by third-party funds provided from the Sponsoring Group Reinsurance, in which there are currently 94 companies involved. These are risk carriers (with an approx. 85% market share worldwide) as well as cedents and reinsurance-oriented service providers. Whether in the academic world or in the reinsurance market, there is no other institution similar to the Sponsoring Group Reinsurance.

## Sponsoring Group Reinsurance



Current as at Dec. 2020

The Annual Meeting of the Sponsoring Group Reinsurance is held once a year, offering another major scientific event for the Cologne Research Centre for Reinsurance. Participants include representatives (re)insurance-company members of the of Sponsoring Group Reinsurance along with invited guests. *Researchers' Corner*, a lecture event in which the currently seven researchers of the Cologne Research Centre for Reinsurance present the results of their research, represents another important opportunity for interaction with practitioners.

The solid practical relevance of our research activities is manifested in their full financing by the Sponsoring Group Reinsurance – which is funded by the (re-)insurance industry – and in excellent attendance at the Cologne Reinsurance Symposium and the Annual Meeting of the Sponsoring Group Reinsurance.

We want to thank the Sponsoring Group Reinsurance, the University leadership and administration, iwv Köln [the Institute of Insurance Cologne] and the employees of the Cologne Research Centre for Reinsurance for all their support for research projects and events.

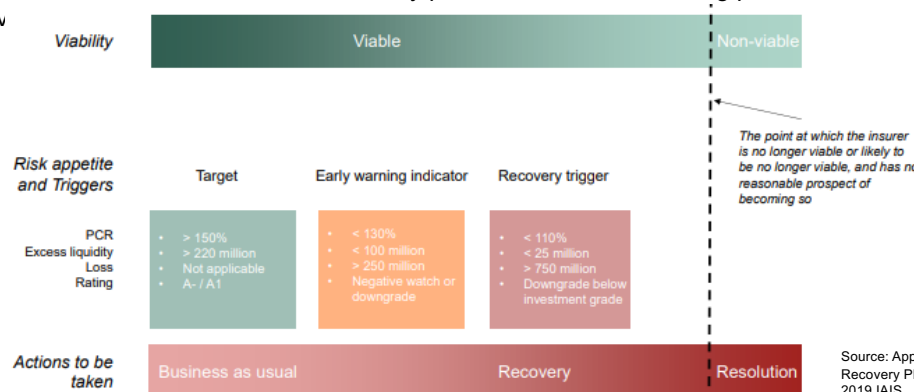
13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung [Sponsoring Group  
Reinsurance] Researchers' Corner, 26 June 2020

## Preventive recovery planning for insurance companies

Manuel Dietmann, M.Sc.

### Background to preventive recovery planning for insurance companies

- To bolster crisis resistance, various national supervisory authorities are increasingly calling for implementation of preventive recovery plans
- In the absence of a specific hazard situation, the German Federal Financial Supervisory Authority (BaFin) may at any time request submission of a preventive recovery plan in application of Section 26 (1) of the German Insurance Supervision Act (VAG)
- This must be differentiated from: A recovery plan or short-term financing plan under Section 134 or 135 V



### The core elements of a preventive recovery plan in accordance with the IAIS Application Paper on Recovery Planning

<b>Group analysis</b>	Analysis of the group structure including relevant companies and description of the decision-making structures; analysis of internal and external dependencies
<b>Governance</b>	Presentation of governance in normal business operations as well as during the recovery phase. Description of monitoring and escalation processes incl. roles and responsibilities
<b>Recovery indicators</b>	The recovery indicators define escalation thresholds that trigger the onset of the recovery phase
<b>Action options</b>	Presentation of a very wide array of options for action that can be carried out in a crisis situation
<b>Stress scenarios</b>	Hypothetical scenarios will describe risk to the company and demonstrate which effective options for action can be used to restore financial stability



**13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung  
[Sponsoring Group Reinsurance]  
Researchers' Corner, 26 June 2020**

**Preventive recovery planning for  
insurance companies**

**Manuel Dietmann, M.Sc.**

Manuel Dietmann has been a part-time member of academic staff at the Cologne Research Centre for Reinsurance at the Cologne University of Applied Sciences since 2012. After successfully completing his Master's degree in Insurance, he has been working full-time at KPMG since 2014. His work there involves advising insurance companies, concentrating on risk management, governance systems and reporting.



The topic of preventive recovery planning on the part of insurance companies has recently begun to receive greater attention by the German Federal Financial Supervisory Authority (BaFin). What at first glance would appear to be a compulsory exercise for regulators is actually more than that when viewed in greater detail. The preventive recovery plan is an interesting topic with a high level of management attention. This recovery plan must describe how appropriate options can be furnished in the event of a hypothetical crisis.

For some time now, the topic of recovery planning has been one of the tools available to banks in their efforts to bolster their resistance to crisis. After the financial crisis, banks were obliged to draw up a preventive recovery plan. With the passage of time, the European Insurance and Occupational Pensions Authority (EIOPA) also commented on this issue and also views a preventive recovery plan as a necessity for insurance companies. In principle, and even in the absence of any specific risk, under Section 26 (1) of the German Insurance Supervision Act (VAG) BaFin can request insurance companies to submit a preventive recovery plan. This preventive recovery plan must be distinguished from a realistic recovery plan in accordance with Section 134 VAG, and from a realistic and short-term recovery plan pursuant to Section 135 VAG. The recovery plan or financing plan under Section 134 or 135 VAG applies in the event of non-fulfilment of the Solvency Capital Requirement (SCR) or Minimum Capital Requirement (MCR). The preventive recovery plan may also be required of strongly capitalised insurance companies with sufficient cover. The core

purpose of the preventive recovery plan is to strengthen companies' resilience to crisis situations. This is why insurance firms' recovery plans must demonstrate that they can restore financial stability on their own power in the event of a hypothetical crisis such as a financial market crisis or a pandemic. Accordingly, steps (known as 'options for action') must be defined that demonstrate the kind of robustness that will take companies from the red to the green zone.

The main elements are taken from the Application Paper on Recovery Planning of the International Association of Insurance Supervisors (IAIS). In the group analysis, companies present the details of their group structure, business model and internal and external networking. Within the governance framework, the firms present their approach to recovery governance together with detailed and structured escalation processes. Roles and responsibilities that will apply in the event of recovery must be defined. A clear statement must be made as to who reports to whom, and as to the composition of the recovery body that assesses the situation and makes decisions in the event of recovery. An ad-hoc notification must be made to BaFin. The section on recovery indicators lays out the thresholds that trigger the recovery. It is not sufficient to specify the Solvency II coverage ratio as the exclusive recovery indicator. Other dimensions, such as income (HGB indicator) or liquidity, must be factored in as well. But even an operational loss event could serve as an indicator. The heart and most extensive element of the recovery plan is the section on options for action. A variety of options for action must be described down to a high level of detail. Options for action can take different forms such as capital measures, earnings measures, product-specific measures, personnel measures or regulatory measures. An impact analysis must be carried out for each individual option for action. The analysis describes the impact of these options for action at different levels. These levels include not only the recovery indicators as defined but also, for instance, the reputation or the business model. An implementation analysis must also be performed that comprises feasibility and obstacles of an option for action as well as the time span that implementation involves. Implementation planning sheds light on the individual operational process steps of the action option that is to be implemented. The section on stress scenarios tests involves a check of the options for action. Hypothetical stress scenarios are simulated, and there is a check of whether the action options are effective in the event of recovery. The scenario is viewed with and without consideration of action options.

The advantage of a preventive recovery plan is that the options for action are ready to deploy in the event of a crisis situation. Then the board can be aware of the effectiveness, feasibility and operational implementation planning of the options for action. This is thus a tool for use in boosting resistance to crisis. Having a complete plan at the ready as a way of knowing the kinds of responses available in a crisis – and not having to wait to generate these analyses until once the crisis has already occurred – poses considerable added value for the company.

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## Discussion

- Are the options for action dictated by the supervisory authority?

That is not the case. The options for action always have to be determined with the individual company in mind. A large array of company-specific factors, such as the business model, the risk profile and internal and external networking, are essential to this determination. Individual options for action may have a pronounced effect on certain companies, while the same options for action might not have any effect on other companies.

- Are the stress scenarios dictated by the supervisory authorities?

The supervisory authority does not specify any stress scenarios in this connection; these scenarios must be defined with the individual company in mind. There can be resort to the company's own risk and solvency assessment (ORSA), for example. For purposes of the recovery plan, however, the scenarios described in the ORSA must be recalibrated for the severity to be extreme enough to trigger a recovery. Three scenarios are typically requested. All in all, each defined recovery indicator should be triggered at least once.

Please contact Manuel Dietmann ([manuel.dietmann@th-koeln.de](mailto:manuel.dietmann@th-koeln.de)) with any questions or comments.



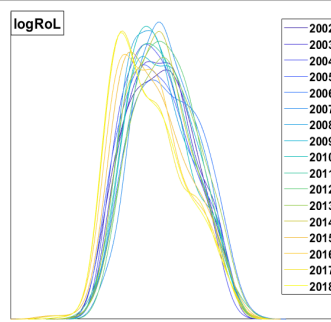
13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung [Sponsoring Group Reinsurance] Researchers' Corner, 26 June 2020

# Capital is fungible, the market is becoming more efficient – But how valid are research results?

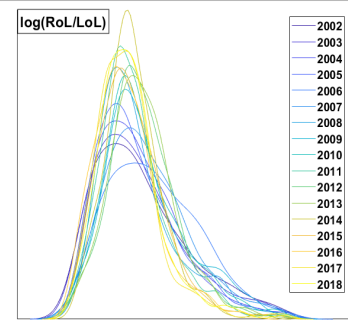
Robert Joniec, M.Sc./ B.Sc./ FCII

## Data & analysis

- North American disaster claims excesses
- 3258 contracts between 2005 and 2018
- *Actuarial* variables considered:
  - Modelled damage, standard deviation, attachment, limit, probability of entry and exit, insured risks, total annual limit requested (per company),
- *Economic* variables considered:
  - Taxes, risk-free interest, capital costs, insured losses, overcapacity
- Mixed linear model
- Company- and market-interest-rate-specific



Distribution of the log(Rate on Line).



Distribution of logMultiples (=Rate on Line / Loss on Line), per contract year.

## Possible model specifications

### Market phases

2005 – 2013  
vs.  
2014 – 2018

2

2

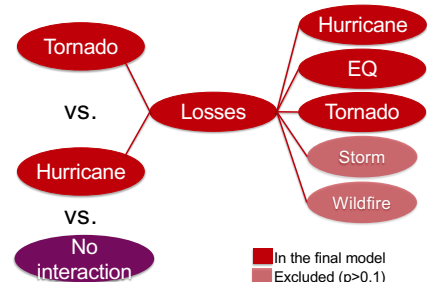
2+1

$2 \times 2 \times (2+1) = 12$  result 'channels' with different statements...

'Price'  
Rate on line  
vs.  
Multiple

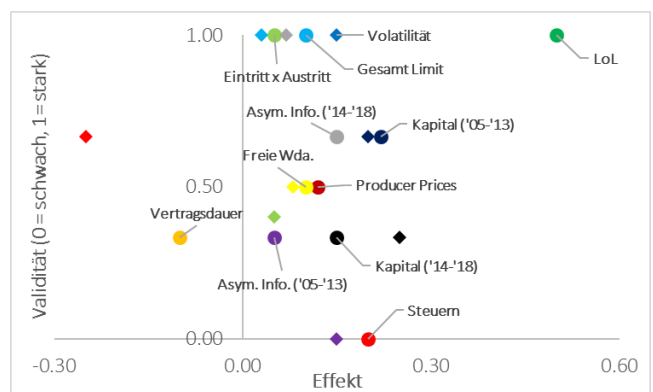
### Three-way interaction:

Loss drivers x Insur. losses x Insur. hazard



## Implications

- Graph helps assess the validity and consistency of the results
- Circles = RoL model, Square = Multiple model
- Good: Symbols of the same colour, located close together and high on the validity scale
- Bad: Low validity, symbols of the same colour scattered or not shown as a pair
- **In addition:** Until 2013, offer (esp. shocks) decisive, regardless of the hazard insured against -> Fungible capital, barriers to entry
- **In addition:** From 2014, insured hazard in comparison to others -> Information asymmetry / transparency
- Interpretation must incorporate sensitivity based on model and data



**13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung  
[Sponsoring Group Reinsurance]  
Researchers' Corner, 26 June 2020**

**Capital is fungible, the market is growing more efficient –  
But how valid are research results?**

**Robert Joniec, M.Sc. / FCII / cand. PhD**



Robert Joniec has been a part-time member of academic staff at the Cologne Research Centre for Reinsurance since 2017. In addition, he is a PhD student at the University of Limerick and is investigating the influence of alternative risk transfer on the market for reinsurance. His main occupation is as a member of the Strategic Advisory EMEA Team at Guy Carpenter & Company GmbH.

This year's research topic is a continuation of the topics from the past two years. Like these, it, too, can be subsumed under the following question: 'What drives the price/cycle in reinsurance?' The analysis is based on 3,258 North American disaster claims excesses for natural disasters brokered by Guy Carpenter between 2005 and 2018. The information considered therein reflects actuarial assumptions such as:

- Risks insured in the policy,
- Reinsurance premium,
- Modelled damage and its standard deviation,
- Probabilities of entry and exit in the layer,
- Deductible and limits,
- Term of the policy,
- Number and price of replenishments

and economic framework conditions, such as:

- Level of the federal funds rate,
- The effective tax burden for US (re)insurers,
- Cost (producer price index) for US (re)insurers,
- Insured losses due to natural disasters.

The data are evaluated within a mixed linear model; this is a regression that permits assumptions specific to the company and the market interest rates involved.

Compared to last year's preliminary results, this year's results are the outcome of a considerably improved statistical analysis. Further development brought the conspicuous sensitivity of results and the associated complexity of the question to light. Three expansions were made in the course of this. First, the observation period is divided into an early market phase (2005-2013) and a late market phase (2014-2018). Second, another definition of price is added alongside the classic rate on line view – multiple. A multiple is the ratio of the premium to the expected loss. Third, a three-way interaction is formulated on the basis of which the selected hypotheses from the capital constraint theory are tested. Information on the hazard with the greatest loss in the previous year is associated with the hazard covered under the policy and the amount of all insured losses brought about by natural disasters. This is considered for hurricanes and tornadoes as drivers of loss. Finally, models without a three-way interaction are still used to determine how the results change through use of the interaction. The three changes (market phase, definition of price, three-way interaction) result in a total of twelve model specifications that lead to very different and at times contradictory results. The implications for the initial question are that the choice of method and the results that depend on it are associated with uncertainties that should be considered in an interpretation. An assessment of the validity and consistency of all of results helps with this task. Figure 1 summarises the results. Results from the rate on line models are shown as circles, and the results from multiple models as squares. 'Good' results can be found where symbols of the same colour are grouped close together and high on the validity scale. Examples of this are the aggregate limit in demand by companies (total limit). Results associated with high uncertainty are characterised by a large distance between symbols of the same colour (or the absence of a second symbol) and a low validity value. Examples of this are the effect of taxes or the term of the policy.

Trends between the early and late market can also be seen. The effect of capital (i.e. high loss) is stronger in the early market than it is in the late market. There is an increase in the validity, and hence the significance, of the variables that can be associated with asymmetric information. By the same token (not shown in the figure), Hurricane Katrina led to a significant change in actuarial assumptions for hurricane policies, and thus in the prices as well. A price increase on a risk-adjusted basis is not statistically significant, however. The demand for policies that cover tornadoes is reduced, and thus so is the price. Prices for policies that cover losses due to earthquakes have risen. Hurricane Katrina thus generated all three possible effects on reinsurance prices within the scope of existing market-cycle theories. In contrast to this, Hurricanes Harvey, Maria and Irma did not induce any of the three effects in the late market.

In sum, it can be said that, in the case of reinsurance prices, the uncertainty involved in working with regression models and the interpretation of sensitive results is material and should also be communicated as such. Nevertheless, meaningful and

clear results can be derived with the aid of targeted processes (three-way interaction).

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## Discussion

- Additional information about the model

The difficulty in modelling as used here owes in large measure to the low frequency of data. Contracts are renewed at certain dates each year. Meanwhile, multiple factors that could have an impact on pricing are changing, and this makes it difficult to separate out the effects on price. One remedy to this situation is a long observation period and a high number of different observations (contracts). This is enabled, among other things, by the three-way interaction used and by linkage of non-independent variables. For example, the insured hazard of hurricane correlates with the amount of the insured loss; as a result, there is also a greater probability that hurricanes are primary drivers of loss. Hence, it would be wrong not to combine the three variables with one another. The choice of using a mixed linear model is based on the fact that the data constitute an unbalanced panel. Here, we assume that there are company-specific differences in pricing that influence the level of risk-free interest on companies' capital costs, and hence their decision-making around reinsurance as well. The former significantly improves the model. And yet the role of risk-free interest with regard to the policies considered is not clear. But the model chosen is not geared to a related issue, either. Instead, what is involved is the control of boundary conditions.

- Application for predicting future prices

Prices can be predicted only up to a point, and any predictions made should be interpreted very cautiously. The division into market phases and the resulting different results underscore this fact. Although the model incorporates lots of factors, their roles could change, e.g. in a market in the wake of COVID-19. An example of such a change can be found in our survey of prices after the Harvey, Irma and Maria hurricane events. The model from the early market phase structurally overestimated the prices after the hurricanes. Limitations such as these are unavoidable. On the other hand, the trends we identified in the role of capital and asymmetric information are also the something that does not change overnight – except in the case of serious events. What is interesting to consider is the difference in modelling and the associated differences in asymmetric information between the hazards. It can be concluded from this that hurricanes already enjoy more confidence in the

early market phase than earthquake models do. This is not observable in the later market, however.

- Comment on earthquake models (Gero Michel, AIG Re)

Earthquake models were among the first applications in the modelling of natural disasters, much sooner than hurricanes. Modelling of tails is hampered, however, by the fact that major incidents are rare. This has an impact on the reliability for high return periods when compared to other hazards.

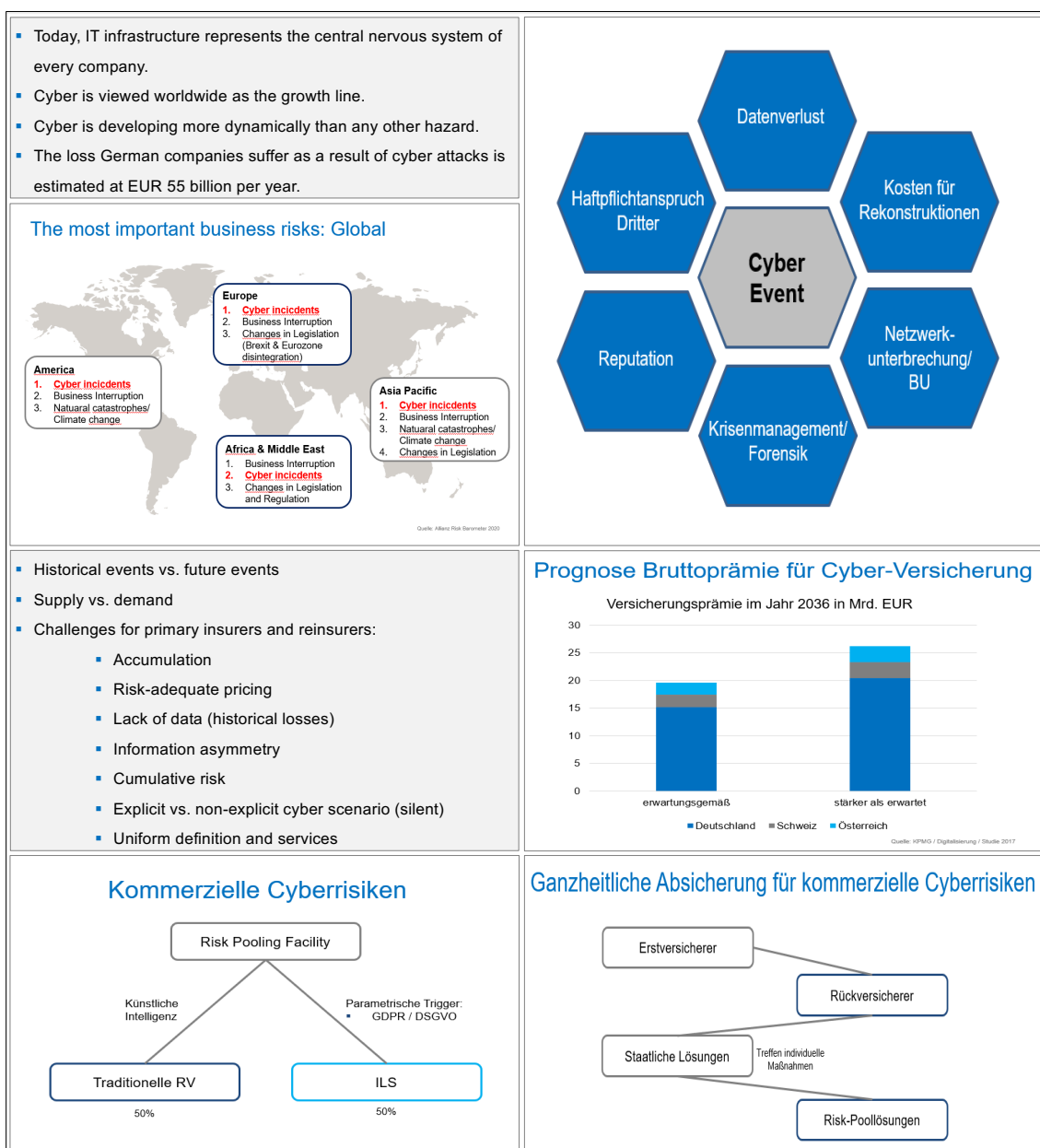
Please contact Robert Joniec ([robert.joniec@th-koeln.de](mailto:robert.joniec@th-koeln.de)) with any questions or comments.



13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung [Sponsoring Group Reinsurance] Researchers' Corner, 26 June 2020

# Cyber risks in reinsurance – Insurable on a parametric basis and through AI?

Jörg Dirks, M.Sc. / FCII



**13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung  
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**Cyber risks in reinsurance – Insurable on a parametric basis and through artificial intelligence?**

**Jörg Dirks, M.Sc. / FCII**



Jörg Dirks (M. Sc.) is a researcher at the Cologne Research Centre for Reinsurance at the Cologne University of Applied Sciences, where he works under Prof. Stefan Materne and investigates the topic Cyber risks in reinsurance – Insurable on a parametric basis and through artificial intelligence (AI). The focus is particularly on the resulting opportunities and challenges in hedging cyber risks for *small* and medium-sized *enterprises* ('SMEs' for short) and so-called 'critical infrastructures' (KRITIS).

Jörg Dirks is employed full-time at Hannover Re as an underwriter for aerospace reinsurance and supervises the Asian region there.

Today, IT infrastructure represents the central nervous system of every company. Many of the activities of our daily lives are handled via the Internet.

There is a lack of an adequately sustainable awareness of the cyber risks to which companies are exposed due to advanced digital networking. This is partly due to the fact that the danger of so-called 'cyber attacks' is only partially palpable to many, with attacks going unnoticed in some cases. As a result of major incidents, such as WannaCry and Petya in 2017, or Emotet in 2019, awareness of these risks should be keen, and yet vulnerability remains high due to the often insufficient protections against cyber crime.

In view of the increasing digitalisation, the market for cyber risks is developing dynamically, both in Europe and internationally. According to a study by Bitkom, Germany's digital association, the cyber damage inflicted on German companies each year is estimated to be around EUR 55 billion – and the trend is rising. According to the official information of the German Federal Criminal Police Office on losses due to cyber attacks on German companies, the figure is significantly lower and stands at around EUR 51 million. This large discrepancy is due to the fact that only a fraction



of cyber attacks are waged in a way that generates public attention, since the companies affected want to avoid negative reputational effects.

The impacts of cyber attacks and the losses related to them not only harm the particular firm but can also harm the economy on the whole. In a study by the Allianz Risk Barometer in 2020, cyber risk has emerged as the world's number one enterprise risk, followed by business interruptions and natural disasters. The 'cyber' threat is regarded as a growth area in the primary and reinsurance sectors worldwide and has been developing more dynamically than any other hazard for the past five years. With the help of services (such as prevention and claims processing), reinsurance companies can benefit from a growth market. Given the expected trend in the market for cyber insurance, a study by KPMG estimates a gross insurance premium for cyber insurance of up to EUR 20 billion through the year 2036 in the DACH regions alone (Germany, Switzerland & Austria).

The complexity of the cyber threat and the evolving nature of the risk involved present a host of challenges for the design of insurance products, for underwriting, for risk management and for cumulative control – for both primary and reinsurance companies. Correct assessment of cyber risk is therefore indispensable, and the right approach must always be developed further. Special attention needs to be given to the variety of forms a cyber event can take. Thus, primary and reinsurance companies can incur not only the costs of data loss, but also the costs of reconstructing IT infrastructure, the costs of network and business interruptions, costs of crisis management, costs of reputational risk, and the costs of third-party liability claims.

The complexity of a risk, its assessment and, above all, the lack of data and understanding become decisive factors when considering the enormous cumulative potential of cyber policies. Because connectivity and cyber technology are ubiquitous, a widespread single event can lead to a large number of cyber contracts. Silent cyber scenarios in particular need to be factored into risk-based pricing.

Reinsurers support primary insurance companies and their end customers with risk management while taking on a number of economically important tasks. Yet cyber risks pose some challenges for reinsurers, as follows:

- Accumulation
- Risk-adequate pricing
- Lack of data
- Information asymmetry
- Cumulative risk
- Explicit vs. non-explicit cyber scenario (silent cyber)
- Uniform definition and services

As a result of the increasing interconnectivity of the economy as well as monocultures of hardware and software, a cyber incident can hit many companies simultaneously and wreak considerable macroeconomic damage, particularly in critical infrastructures. Infrastructures are considered critical if the consequences of an outage cannot be remedied through claim payments in monetary form alone. In cases such as these, the transfer of risk with the aid of cyber reinsurance reaches its limits.

In cyber insurance, the past does not provide a reliable indication of the likelihood of a claim; risks must be simulated with the aid of complex model calculations. Artificial intelligence (AI) could be beneficial for the assessment of cyber risks in the effort to make patterns and probabilities in the field of risk transfer easier and more efficient to analyse. Parametric reinsurance solutions supplemental to classic insurance could provide an alternative approach. Parametric cyber coverage with a defined trigger (e.g. aided by the GDPR as trigger) can be offered as a release of payments of claims.

To help keep small and medium-sized enterprises sufficiently insurable, and for larger industry solutions as well, a risk-pooling facility could be created in which the traditional reinsurance market shares the claim burden with the insurance-linked securities market. Aided by artificial intelligence and using parametric triggers (e.g. through the GDPR), the claims situation could become more efficient and targeted.

Parametric cyber coverage could prevent transparency issues in claims settlement and reduce costly audits of reinsurers. A possible AI strategy could be used to simplify assessments of cyber risks and render make these assessments more efficient. Parametric cyber solutions can also be interesting for alternative capital; after all, vehicles with trigger solutions such as this are widespread in the NatCat area as well.

Holistic hedging is suitable for large industry risks and for critical infrastructures as well. This could take the form of close cooperation with primary and reinsurers and in cooperation with state-based solutions. The idea is for primary and reinsurance firms to join forces with state-based solutions to create 'cyber risk pooling' and provide full protection against cyber attacks. The form of protection could be based on the current Extremus Versicherungs-AG, as a special insurer. Particularly if reinsurers worldwide are no longer in a position to cover loss events of this order of magnitude within the framework of conventional forms of contract, and insurability reaches its limits, holistic protection is useful.

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## Discussion

- Which scenarios are considered? Certain sector? International or regional protection? Or historic losses only? What is the estimated annual loss experienced by German companies? From certain cyber attacks?

This research work took all lines worldwide into consideration. All sectors were analysed, along with the impact on the capital market. Future damage scenarios were also considered and assessed with new forms of hedging.

As various studies have shown, the estimated loss that German companies suffer each year consists mainly of malware and ransomware.

- Is cyber of interest to the ILS market at all, particularly taking into account a possible correlation between cyber incidents and the capital market? Is the cyber threat comparable to NatCat hazards or pandemics, particularly where economic impact is concerned?

A pandemic correlates with the capital market, particularly with economic development across multiple sectors. Historically, cyber attacks have exhibited a correlation to the capital market. Following a cyber attack, stock prices for the company and sector affected have briefly dropped but then went on to a sustained recovery. Nonetheless, a cyber attack that becomes known carries a high reputational risk with it. Whether this can be fully restored is unknown. And yet there is a need to revise awareness of cyber attacks in an effort to narrow the gap between known reports of loss and unknown reports. In turn, greater transparency creates a better understanding and simplifies the forms of protection accordingly. A uniform definition of cyber incidents and claim payments is an essential part of creating the kind of clear understanding that will make this hazard interesting and understandable for investors as well. The analysis shows that a certain niche exists for cyber disasters in the market for ILS.

- What loss assumptions did you analyse for your research? Were only historic losses assessed here? Were the rapidly developing IT sector and IT technology factored into the models as well?

The dynamic trends in IT were taken into account. It is not sufficient to consider exclusively historic losses. To achieve full protection, primary and reinsurers

must take future loss trends into account as well. In addition, as known historical loss data are not sufficient for risk-appropriate pricing, model calculations for future loss effects must be included.

Please contact Jörg Dirks ([joerg.dirks@th-koeln.de](mailto:joerg.dirks@th-koeln.de)) with any questions or comments.

13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung  
[Sponsoring Group Reinsurance] Researchers' Corner, 26 June 2020

## Trend in sovereign cat pools in emerging and developing economies

Wolfgang Koch, M.Sc. / FCII

Sovereign cat pools		Instruments of fiscal policy in emerging and developing economies	

**13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung  
[Sponsoring Group Reinsurance]  
Researchers' Corner, 26 June 2020**

**Trend in sovereign cat pools in emerging and developing economies**

**Wolfgang Koch, M.Sc. / FCII**

Wolfgang Koch (M.Sc. / FCII) is Executive Assistant to the Chief Executive Officer at Deutsche Rückversicherung AG / VÖV Rückversicherung KöR, on the one hand, and a member of academic staff at the Cologne Research Centre for Reinsurance on the other.



In recent years, three sovereign catastrophe risk pools have developed worldwide, offering climate insurance against natural disasters in emerging and developing economies:

- Caribbean Catastrophe Risk Insurance Facility (CCRIF) in the Caribbean
- African Risk Capacity (ARC) in Africa
- Pacific Catastrophe Risk Insurance Company (PCRIC) in the Pacific region

These pools have emerged against the backdrop of limited fiscal room for manoeuvre in emerging and developing economies. Increases in tax revenues or capital allocations are scarcely possible in these economies. Moreover, debt on the capital market often ends in debt relief, and this can jeopardise refinancing. Ultimately, the only measure remaining is to provide donations and aid that can be made available by the G7 countries, the World Bank or the World Health Organization, among others.

It must be in donors' interest to invest these funds as effectively and meaningfully as possible. Thus, the decision was made to undertake a public transfer of risk to the insurance industry, as this approach presents the following advantages:

- Resilience due to fast payout mechanisms in the event of a natural disaster, as climate insurance is backed by a parametric index trigger. The parametric index trigger has an increased baseline risk, meaning that the actual loss amount deviates from the contractually regulated claim payment. Still, the baseline risk is lower than it would be under a purely parametric trigger. In addition to quick payout, the trigger also offers further advantages in the form of low moral risk and high transparency.

- Emergence of a unified network for the conclusion of insurance cover
- Creation of risk diversification across several countries, some with different risk profiles
- Risk pooling reduces the premium for climate insurance
  - Reduced operating costs due to standardized programme developments
  - Reduced costs of raising capital
  - Reduced information costs due to improved and standardised information
- Diversification of risk across multiple countries with different risk profiles, together with the creation of standard products, means that larger transactions are possible, and this may be of interest to the reinsurance market

As a next step, the trend of the three pools from 2017-2019 was presented in greater detail. All pools offer climate insurance against earthquakes, tropical cyclones and excessive precipitation. ARC also insures against drought and flooding.

CCRIF in the Caribbean (at once the largest and, in recent years, the most-used pool) registered a great number of additions. Accordingly, gross premium income increased by one-third and stood at USD 36.3 million. The coverage amount also rose to USD 755 million. The trend in reinsurance cover is also encouraging. All of the pools are covered by excess-loss reinsurance. In the Caribbean pool, the excess loss was slightly increased to USD 170 xs 25 million (USD 132.6 xs 25 million in 2017) in respect of earthquakes and tropical cyclones. It is also encouraging that a new cover of 12 xs 3 could be built up for Central America for excessive precipitation.

The trend for ARC and PCRIC has been quite different: Many countries have left the African pool in recent years, and this has had a correspondingly negative impact on the coverage amount (USD 34.3 million) and the excess loss with only USD 30 xs 3 million (USD 60 xs 7 million in 2017). This development occurs against the backdrop of frequent occurrence of baseline risk, with the pool thus falling short of its expectations. These unmet expectations have led many countries to exit the pool. Unfortunately, PCRIC has also experienced some departures. In addition, the design of this pool is not clear to outsiders, and information is difficult to gather. In the case of the other pools, it was possible to collect figures through annual reports, but this was not possible for this pool.

Theses and recommendations for the years ahead were derived from on these findings:

- Enhanced dialogue advisable with governments to create transparency, particularly with regard to PCRIC

- Improve the response to unmet expectations. With regard to ARC, baseline risk often applied, and countries were notified that the insurance solution would suffice as the sole response to natural disasters in future. In fact, climate insurance can only constitute a small, and above all a rapidly payable, component for ex post financing as a result of natural disasters.
- To attract new members, the product range should be expanded in cooperation with the countries. In the case of ARC, a drought insurance was erroneously modelled with a plant that was ultimately not planted at all. Misunderstandings such as these are naturally preventable and serve to increase baseline risk.
- Deriving from this, model accuracy needs to be improved to reduce baseline risk, particularly by investing in portable data.
- It is also advisable to model the risk of parametric micro-insurance schemes; to date, only CCRIF has successfully practised this. This avoids displacement by the private sector; and, from a certain order of magnitude, steps such as these can become interesting for the reinsurance market again.

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## Discussion

- To what extent does the size of the pools play a role here? Is it worth it for reinsurers to invest in the pools if they are still quite small?

Only 'CCRIF', the Caribbean pool, can report a positive trend in recent years. At the same time, this pool is the oldest and has often proven its value in the past (e.g. payouts during 'HIM' in 2018). The positive development of CRRIF was already discussed during the presentation.

Many (re)insurers are already investing in the pools (including Allianz, Munich Re, Swiss Re, SCOR, Renaissance Re, XL Catlin, etc.) Particularly in the case of ARC and PCRIC, which are very small to begin with and have retrenched in recent years, a recommendation is difficult to make. These pools are also having difficulty recruiting new, qualified employees. The primary lack here, aside from positive performance, is a shortage of transparency. The next few years will prove crucial to the effort to demonstrate long-term sustainability.

- Can corruption be excluded in this context?

At this point, it is difficult to assess the extent to which corruption plays a role. I am not aware of any publication on this topic, but this question is often raised.



The properties of the parametric index trigger, among other things, will help remedy corruption. As the benefits obligation is exclusively a function of a physically measurable criterion of a natural event, the moral risk due to this form of trigger must be assessed as very low.

- From an insurance point of view, what role do countries, pools and donors play?

Countries = policyholders

Pools = insurers

Donors = subsidies/know-how, e.g. through the G7 countries or the WHO, are transferred to the pools. This results in a transfer of public risk to the insurance industry (public-private partnership)

Please contact Wolfgang Koch ([wolfgang.koch@th-koeln.de](mailto:wolfgang.koch@th-koeln.de)) with any questions or comments.



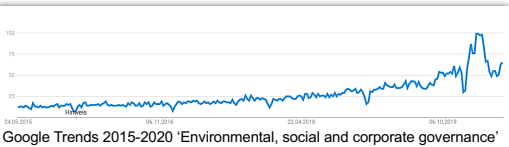
**13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung**  
**[Sponsoring Group Reinsurance] Researchers' Corner, 26 June 2020**

## **Environmental Social Governance – A look at the reinsurers**


**Fabian Lassen, M.Sc. / FCII**

**Introduction and definition**

ESG, originally a topic in the investment sector, now also applies to underwriting.




Google Trends 2015-2020 'Environmental, social and corporate governance'




**Environment**

- Water
- Climate
- Resources
- Species diversity



**Social**

- Human rights
- Health and safety
- Demographic change




**Governance**

- Corruption
- Supervisory structure
- Compliance
- Risk management

Source: Own presentation based on Schindler: Nachhaltige Kapitalanlagen – Chancen nachhaltig nutzen, 2018, p. 20

**Influence in underwriting by reinsurers**

Important aspect in underwriting

- Coal-fired power plants 
- Nuclear energy

**Options for reinsurers**


- Optional underwriting: Influence possible
- Treaty underwriting
  - Exclusions in reinsurance policies?
  - Screening of cedents?
  - Exclusion of entire markets?

- Health insurance
- Longevity
- Sanctions screening
- ESG reports

**Consequence for cedents**

- Rating reinsurers in terms of ESG
- Results can be incorporated into sustainability report

**Conclusion**



Through investments and reinsurance, reinsurers promote renewable energies

- The influence of reinsurers may be overstated.
- Is ESG-compliant action relevant to the underwriting business of the future?

# **13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung [Sponsoring Group Reinsurance] Researchers' Corner, 26 June 2020**

## **Environmental social governance – A look at the reinsurers**

**Fabian Lassen, M.Sc. / FCII**

Fabian Lassen has been a member of academic staff at the Cologne Research Centre for Reinsurance at the Cologne University of Applied Sciences since 2015. As an underwriter in non-life reinsurance at R+V Versicherung, he is also responsible for the markets of Denmark and Switzerland.



The term 'ESG' has established itself as a synonym for sustainable management. The term is divided into the three areas of Environment, Social and Governance – or 'ESG' for short. The ideas behind ESG come from the investment world and can also be applied to (re)insurers' underwriting. Up until now, there has been a significant increase in the public's interest in sustainable management. One indication of this can be seen in the 'Google Trends' from 2015 to 2000, which show an increase in searches of the term 'ESG'.

The underwriting of risks is also called into question within the context of ESG-compliant behaviour. The main focus here is on conventional power plants, and coal-fired power plants in particular. The criticism is that power plants such as these share in the responsibility for climate change. Based on the environmental aspect of the ESG criteria, these power plants should not be insured.

If reinsurers want to act in accordance with the ESG criteria, there are different options for action where the environment is concerned. These include the selection of risks, screening of cedents or, where possible, even the exclusion of entire markets. When choosing risks, reinsurers can decide on each individual risk under optional reinsurance, thus excluding individual industries – coal-fired power plants among them.

In the case of compulsory reinsurance, however, a blanket exclusion is rather difficult to implement in practice. One reason for this can be seen in the fact that some countries are particularly reliant upon conventional power plants. It is logical to assume that, particularly in the case of smaller economies, the sectors of the economy are so networked that local insurers based there either insure coal-fired

power plants directly, or else they insure other suppliers of these power plants. If a reinsurer were to exclude power plants like these across-the-board, doing business with the primary insurers located there would be significantly more difficult. Would it thus be necessary to exclude such a market in order to act in complete compliance with the ESG? From today's point of view, such a step seems very drastic and not expedient, either. One task the insurance sector fulfils for economies is to serve as a bearer of risk. Therefore, during the phase of transitioning to more sustainable business practices, sectors that are viewed critically should continue to receive insurance coverage.

More and more primary insurers are generating ESG reports depicting the various aspects of their business activities. Not only are customers calling for greater consideration of ESG criteria, but regulatory authorities are also devoting greater attention to these issues. In return for options for action on the part of reinsurers, cedents may assess reinsurers' ESG measures and take their findings into account in ESG reports and in their purchases of reinsurance.

ESG has gained in importance in recent years. It was also addressed, e.g., in a Greenpeace campaign at the Reinsurance Conference held in Baden-Baden in 2019. It can be noted that reinsurers are promoting renewable energies, in part through investments and reinsurance. In the medium term, ESG-compliant conduct by reinsurers might become relevant to purchases of reinsurance in some markets that place particular emphasis on sustainability.

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## Discussion

- To what extent do ESG criteria enter into ratings?

ESG criteria are taken into account not only in traditional corporate ratings but also in specific ESG ratings.

If a company's corporate rating is lowered as a result of ESG factors, this must be reported to the European Securities and Markets Authority (ESMA).

Ratings agencies such as AM Best and S&P comment on ESG factors in their ratings reports and offer specific ESG ratings in addition to traditional ratings.

- Can companies benefit from ESG-compliant activities?

Companies can certainly reference their activities within the framework of ESG criteria as one means of promoting their own company. ESG reports and ESG

ratings can be used as marketing tools. This could help attract new target groups.

The issue is becoming increasingly important, particularly in the investment sector. This is evident in the issue of disaster bonds. There, more and more investors are demanding an ESG label or the like. To date, it turns out that it is difficult to apply these criteria to disaster bonds. The capital raised for the disaster bond is initially invested in secure and liquid securities. The ESG criteria can be applied here. In the event of a claim, however, the structure does not always ensure the identity of the payout recipient. In most cases, the claim payment from the disaster bond does not follow the original risk.

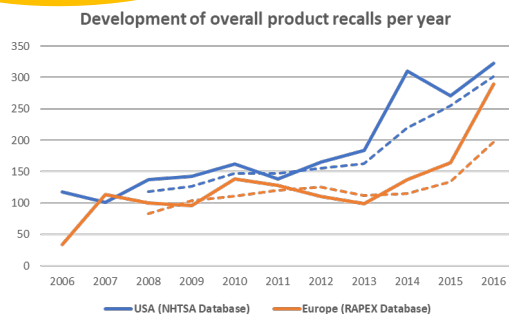
Please contact Fabian Lassen ([fabian\\_janbert.lassen@th-koeln.de](mailto:fabian_janbert.lassen@th-koeln.de)) with any questions or comments.

13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung  
[Sponsoring Group Reinsurance] Researchers' Corner, 26 June 2020

## Reinsurance aspects of product recalls in the automobile sector

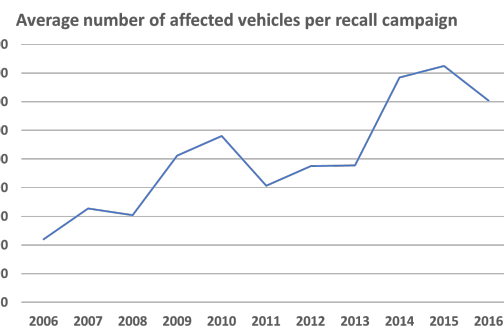
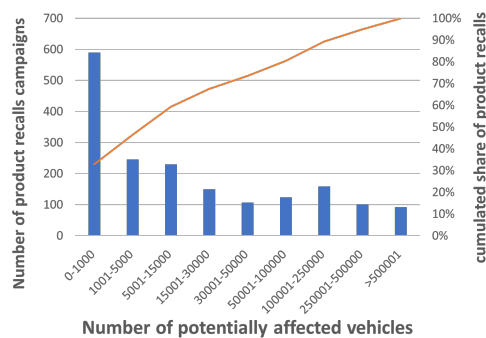
Fabian Pütz, PhD / M.Sc.

Increasing number  
of recall campaigns



- ❖ **Increased frequency** of recalls expected
  - Complexity of vehicle infrastructure
  - Stricter implementation by supervisory authorities
  - Increasing innovation pressure in the automobile market
- ❖ **Extent of loss** involved in recalls increasing

Reinsurer capacity  
for 'tail risks'

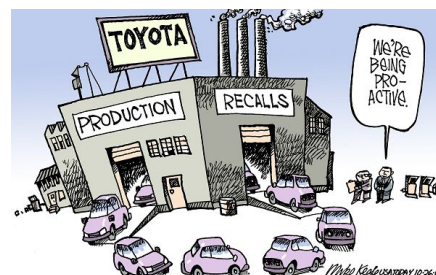


Opportunities and  
challenges for  
reinsurers

- 🔒 **Financial and time tail risk**
- 🔑 Sufficient risk capacity

- 🔒 **Lack of reliable loss statistics**
- 🔑 Sufficient technical expertise in the automobile and supplier sector

- 🏆 **'Product recall' as strategic asset for the development of new business models & partnerships in the 'mobility' field**



## **13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung [Sponsoring Group Reinsurance] Researchers' Corner, 26 June 2020**

### **Reinsurance aspects of product recalls in the automobile sector**

**Fabian Pütz, M.Sc. / PhD**



Fabian Pütz (PhD/M. Sc.) has been a member of academic staff at the Cologne Research Centre for Reinsurance since 2014. His doctorate, completed in 2020 at the Cologne University of Applied Sciences/University of Limerick, involved an analysis of the effects of networked, automated vehicles on the insurance industry. In the field he works for Echo Re within the DEVK Group.

The brief lecture addresses reinsurance-relevant aspects of product recalls in the automobile sector, with special consideration given to

- the historical development of the frequency and extent of loss in the case of product recalls,
- the potential impacts of increasing vehicle networking and automation and
- the opportunities for strategic positioning by reinsurers in or through this line.

To analyse historical trends in recall activity, the publicly available recall databases in the US market (National Highway Traffic Safety Administration (NHTSA) Database) and in Europe (Rapid Exchange of Information System (RAPEX) Database) were consulted.

When evaluating the historical recall activity based on recall campaigns per year in the period between 2006 and 2016, it can be seen that the figures have (more than) doubled in both markets. For example, product recall campaigns in Europe increased from 110 to 290, and in the USA they went from 165 to 323. This increase in product recalls is due in part to individual extraordinary recall events, such as the 'exhaust-emissions affair' or other major events such as the recall of airbags by Takata. Given the significant general increase, however, these extraordinary events cannot be regarded as the sole drivers of the increasing frequency of product recalls in the automobile sector. This is why it must be assumed that the increasing number of



recalls is the result of some fundamental, underlying trend. One of these basic drivers can be seen in the increasing complexity of the vehicle infrastructure. This complexity is brought about, among other things, through greater penetration by vehicles fitted with passive and active driver-assistance systems and by entertainment functions and the associated on-board electronics. Consequently, in the period under consideration through 2016, an analysis of historical recall activity exhibits a slightly rising share of product recalls as a result of software, control units and sensors. Against the backdrop of a further increase in the networking and automation of automobiles in future, *ceteris paribus*, one can expect the complexity of vehicle software and hardware infrastructure – and hence the susceptibility to error – to increase even further.

This could then be reflected in a further increase in recall figures, particularly as a result of secondary factors such as stricter implementation of product recalls by the competent regulatory authorities. The increased public interest in product recalls triggered by individual events in the automotive sector can certainly lead to more proactive, stricter execution of product recalls by the supervisory authorities. The increase in vehicle automation, which goes hand-in-hand with a takeover of safety-relevant driving functions, offers another reason for requiring recalls in the most proactive and strict manner.

In addition to the described increase in the frequency of claims, the trend in the average extent of loss was examined based on data for the US market. Since NHTSA statistics do not provide direct monetary values for the costs of the respective recall campaigns, the (average) number of vehicles affected serves as an indicator of the intensity of loss. This approach is rooted in the assumption that the cost of a product recall increases – *ceteris paribus* – in proportion to the number of vehicles involved. Despite the volatile trend between individual years in this key figure during the period under consideration, between 2006 and 2016, the rise in the curve, from an average of approximately 43,000 affected vehicles (2006) to 140,000 (2016), suggests an increase in the extent of loss. One approach to explaining this pattern can be found in the fact that the reduction in direct production costs as a result of a platform- and module-based production method is accompanied by an increase in the number of vehicles affected in the event of product recall. From a (re)insurer's point of view, a particularly important part of an indicative assessment of the inherent risk involved is the distribution of the number of recall campaigns per risk band for the vehicles concerned. As this distribution reveals, although a large share of recall campaigns involve comparatively few vehicles, there is also a material risk that recalls will impact several hundred thousand vehicles. In this connection, it warrants particular emphasis that the statistics comprise only the vehicles affected in the US market and do not take a worldwide accumulation of recalls into account.

In addition to this 'tail risk' where the extent of loss is concerned, product recall events involve a temporal 'tail risk' due to the time gap between vehicle production and the

detection of product defects or the initiation of recall campaigns. During the period under consideration, in the US market the average time lag between the start of vehicle production and notification of a product recall was 2.77 years. There is an additional extension of the temporal tail risk due to the fact that final implementation of a recall campaign can last several weeks or even months. Determination of the final costs of a recall, particularly in terms of the resulting 'legal costs', is necessarily delayed if these costs must first be determined through legal proceedings.

Due to the inherent tail risks inherent in product recalls, adequate risk-bearing of these events requires sufficient capacity on the part of the bearers of risk – and due to the peak risks, on the part of the reinsurance market in particular. The international orientation of the automotive market also calls for an international presence or capability for assisting the respective customers in their relevant markets.

One challenge that faces (re)insurers in their underwriting of product-recall risks in the automotive sector is the lack of reliable claims statistics that could be used to price the inherent risk involved. Although publicly available statistics permit analysis at a higher level, they are not suitable for granular pricing of expected (monetary) losses due to individual components/product groups. As a result, an adequate assessment of risk when performing underwriting in this line calls for in-depth technical expertise along with knowledge of the automotive and supplier industries.

As conversations with (re)insurers involved in this line made clear, the profitability of this line can also be characterised as low as a result of the low trend in losses in the past. No deeper details were known to the lecturer. In this respect, it should also be noted that statements about profitability in light of a temporal 'tail risk' can be made only after a certain settlement period.

Although the lack of reliable claims statistics and the lack of profitability pose two key challenges to underwriting product-recall risk in the automotive sector, strategic added value can result from involvement in this line as part of the transformation of the field of 'mobility'. Here, reinsurers with robust experience in the 'product liability/product recall' area could position themselves not only as suppliers of insurance products for primary customers of a mobility provider, but also as a holistic supplier of risk-management expertise for the operational risks of these very events. The beginnings of this holistic, strategic cooperation are already observable in the market, where they are leading to a closing of ranks in the overall relationship between (re)insurers and mobility providers/OEMs. This, in turn, can improve not only the grasp of risk on the part of the (re)insurer but risk management by the mobility provider/OEM as well.

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## Discussion

- Did the analysis consider which link in the OEM/supplier production chain is financially affected by a product recall?

The speaker states that the NHTSA (USA) and RAPEX (Europe) statistics evaluated do not permit any direct conclusions to be drawn about the supplier operations affected. It should also be noted that the arrangements for sharing or bearing the financial loss of a product recall are often contractually agreed between OEMs and the respective suppliers and along the supply chain (Tier 1 → Tier 2 → Tier 3). As this information is confidential, it was not possible to analyse in greater detail the specific design of these provisions for the sharing and assumption of liability. Based on his discussions with individual insurers, however, the speaker had the impression that because of their market situation, OEMs or major suppliers to automobile manufacturers tend to pass financial risks along to the downstream links in the supply chain.

The discussion participant raising the question essentially has no objection to this view; he adds that the insurance company for which he works does not insure OEMs and that the recall statistics based on RAPEX/NHTSA claims statistics do not permit direct conclusions about the claims statistics of small and medium-sized automotive suppliers.

- In response to the speaker's comment that there is not enough data to permit an assessment of the profitability of the 'vehicle product recall' line, and that this, in turn, makes it difficult to assess the strategic relevance, a discussion participant points out that the tail character of this line that has been mentioned makes it even more difficult to assess profitability, particularly for more recent underwriting years.
- Is there a difference in the tail character (with regard to the amount of time incurred or extent of loss) when individual time bands within the period analysed are compared?

The speaker states that an explicit analysis over time has been carried out only with regard to the average number of vehicles affected per recall campaign. Here, it was already pointed out in the presentation that this key figure has trended upwards during the period under consideration but is subject to strong fluctuations in individual years.

Where the time tail involved is concerned (the temporal distance between production and initiation of the recall campaign), there was no analysis

performed out during the period under consideration; it is nonetheless discernible that this would represent a potentially interesting broadening of the analytical spectrum. On an ad hoc basis, however, one can only assume that an increase in software-induced product recalls, for example, could lead to a shortening if a shorter time tail is assumed, especially if errors can be corrected over-the-air via software updates.

Please contact Fabian Pütz ([fabian.puetz@th-koeln.de](mailto:fabian.puetz@th-koeln.de)) with any questions or comments.

13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung  
[Sponsoring Group Reinsurance] Researchers' Corner, 26 June 2020

## China's Belt and Road Initiative (BRI) – Its impact on the global (re)insurance industry

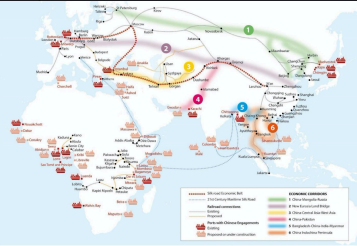
Lihong Wang, M.Sc. / FCII

### Introduction

In late 2013, China announced the One Belt One Road Initiative, also known as Belt and Road Initiative (BRI), which was hailed as the "Project of the Century".

It is an ambitious strategic plan (2015-2030) for expansion and integrating Asia, Africa and Europe, through land-based trade and infrastructure projects (Belt), in addition to ocean-based infrastructure (Road).

If it succeeds, it will involve nearly 70 countries and 4.5 bn people and impact more than 40% of the world's GDP. It is poised to strengthen trade and investment flows and promote intercontinental cooperation.



Source: OECD research from multiple sources, including: HKTDC, MERICS, Belt and Road Center, Foreign Policy, The Diplomat, Silk Routes, State Council Information Office of the People's Republic of China, WWF Hong Kong (China).

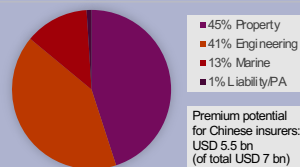
The strategic objective of the BRI is to secure a favourable international environment to facilitate China's economic development.

### The benefits of BRI to China

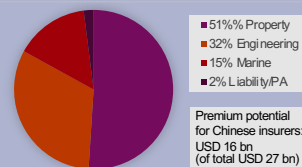
Opening and re-opening of trade routes, creation of business opportunities, stimulation of overseas demand	Promotion of political alliance, global resilience, tourism, cultural exchange and peace	Increase of employment opportunities for the Chinese workforce	China-centric globalization with China playing an ever-larger role
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### Potential Insurance Premiums

From already planned BRI projects as of July 2016



From other BRI projects up to 2030



Source: Swiss Re Economic Research & Consulting, "China's Belt & Road Initiative, and the impact on commercial insurance (October 2016)".  
Note: Construction-related marine insurance includes project cargo and cover for delayed start-up. Liability/Personal Accident (PA) includes single-project professional indemnity, product liability and employer liability/PA.

The Swiss Re BRI 2016 Report estimated USD 7 billion in potential premiums for the planned projects as of July 2016 for China's planned projects valued at USD 1.2 trillion (of which USD 5.5 bn for Chinese insurers) and a further USD 27 bn in potential premiums until 2030 for property, engineering, marine, liability and credit insurance.

Source: Swiss Re Economic Research & Consulting

### BRI infrastructure projects

The projects under BRI are the centrepiece of the strategy; as of May 2019, there have been over 2600 projects with a combined value of USD 3.7 tn. They are mainly related to infrastructure development in the transport, energy, mining, IT and communications sectors but also cover industrial parks, Special Economic Zones (SEZ), tourism and urban development.

They include for example:

1. Jakarta-Bandung High-Speed Rail – Indonesia
2. Abuja – Kaduna Railway – Nigeria
3. Colombo Port City – Sri Lanka
4. Piraeus Port – Greece
5. Temburong Bridge – Brunei
6. Padma Bridge – Bangladesh
7. Punta Sierra Wind Farm – Chile
8. Yamal LNG Project – Russia
9. China-Belarus Industrial Park – Belarus
10. International Free Trade Zone – Djibouti

### The impact of BRI on global (re)insurance markets

In general, the impact of the BRI on the global (re)insurance industry can be felt in three ways.

**Firstly**, China intends to use commercial insurance to manage risks and bring in expertise for the BRI projects and operations, predominantly in less-developed countries and with diverse political, financial, regulatory and operational risks. The complexity can be a big challenge for underwriters, claims and other professionals.

**Secondly**, BRI can enhance trade and security in these regions. Through closer geopolitical and economic ties with Asian, African and European countries, BRI will improve general trade conditions, especially in those critical areas subject to war, terrorism and piracy.

**Thirdly**, BRI can promote innovation and collaboration, upgrade infrastructure connectivity and act as a major influencer in negotiating with (re)insurers for these projects and in these regions going forward. There have been pioneering tools, such as big data, AI and drones developed for commercial insurance purposes, which will profoundly change insurance operations in some countries.

**13<sup>th</sup> Annual Meeting of the Sponsoring Group Reinsurance  
(Förderkreis Rückversicherung)  
on June 26<sup>th</sup>, 2020**

**China's Belt and Road Initiative (BRI) –  
Its impact on the global (re)insurance industry**

**Lihong Wang, M.Sc. / FCII**



My name is Lihong Wang; I have been working as a part-time researcher at the Cologne Research Centre of Reinsurance for nine years. As for my full-time job, I have been working as a consultant at International Risk Solutions Ltd, Lloyd's broker based in London since January 2020. Before this, I worked at R+V Re, as an underwriter and then a claims manager for over seven years.

This year's research project focuses on China's Belt and Road Initiative (BRI). This project is also called One Belt One Road Initiative and was announced by China in late 2013. It is a strategic plan from 2015 to 2030 to connect Asia, Africa and Europe. More than 130 countries and over 30 international organisations already signed up for the Memorandum of Understanding. The BRI has two segments, the land-based trade and infrastructure projects (i.e. Belt) and ocean-based infrastructures (i.e. 21st Century maritime silk road). Roughly, there were six trade corridors in the Belt, starting from China, through Mongolia and Russia, east Europe and finally reach central Europe from the north; or through central Asia to reach Turkey and Iran in the middle; and in the south, through South Asia, Southeast Asia and reach Singapore. The maritime silk road starts from east China and goes through the Indian Ocean, connecting Asia, the South Pacific, the Middle East. The ships reach Africa before the Suez Canal and finally Europe.

If the BRI succeeds, it will involve nearly 70 countries with more than 4.5 billion people and impact over 40% of the world's GDP. The objective of the BRI is to secure a favourable international environment to facilitate China's economic growth, gain increased political and industrial influences in the world. The benefits of BRI to China include the business opportunities by increased overseas demand, the political alliances and peaceful trade environment, Chinese citizens employment opportunities within China and in overseas, and China-central globalisation with China playing an ever-larger role.

The centrepiece of the BRI lies in the infrastructure projects. As of May 2019, there are over 2600 projects with a combined value of USD 3.7 trillion USD. These projects are mainly related to transport, energy, mining, IT and communication sectors, such as railway, highway, power plants, satellites and internet constructions. They also cover industrial and urban development, such as industrial parks, special economic zones, tourism and urban development.

Some of the great examples are

- the high-speed railway from Jakarta to Bandung in Indonesia (up to 350km/h),
- Abuja to Kaduna Railway in Nigeria (first Nigeria's international standard gauge railway, already transporting millions of people),
- Colombo port city in Sri Lanka (is estimated provide up to 83.000 jobs to the locals until 2030),
- Piraeus Port in Greece (the fastest-growing container terminal in the world and the gateway to Europe),
- Tambourine Bridge in Brunei (a cross-sea bridge),
- Padma Bridge in Bangladesh (a multipurpose road-rail bridge),
- Punta Sierra Wind Farm in Chile (Pacific Hydro's first wind farm in Chile),
- Yamal LNG Project in Russia (one of the largest and most complex LNG projects in the world),
- China Belarus Industrial Park in Belarus (the largest industrial park created outside of China),
- and the international Free Trade Zone in Djibouti (which will connect Africa by road and Asia, Africa and Europe by sea).

These projects present significant opportunities for the respective countries and the Chinese economy.

In terms of insurance, it also presents a great opportunity, according to Swiss Re Economic Research and Consulting report in 2016. BRI will generate an estimated USD 7 billion potential premiums from the already planned projects valued at USD 1.2 trillion as of July 2016. There can be a further 27 billion USD premiums from potential projects up to 2030. Most of the premiums, USD 5.5 billion and 16 billion respectively, will go to Chinese insurers. In terms of line of business, property and engineering combined can generate over 80% of the total potential premiums. Still,

Marine, Liability, Personal Accidental and Credit & Bonds line of business will also benefit from them. These risks might pass on to reinsurers through treaty or facultative reinsurance. Thus, global reinsurers will also see the growth opportunity.

The impact of BRI to the global insurance and reinsurance markets can be felt in three ways. Firstly, China intends to use commercial insurance to manage the risks and bring in expertise for the BRI projects and operations, which can be a challenge for global insurers and reinsurers. The reasons are that these countries are mostly less developed and less transparent, also with various political, financial, regulatory and operations risks. It brings difficulties in underwriting, claims handling and dispute resolution. Secondly, BRI can enhance trade and security in the leading trade corridors. Through closer geopolitical and economic ties with Asian, African, and European countries, BRI will improve the general infrastructure and framework for trading, especially in those critical areas for marine and aviation due to war, terrorism and piracy.

Last but not least, BRI can promote innovation, collaboration and upgrade the infrastructure connectivity. BRI can set terms for the projects going forward and can profoundly change the way that insurance and reinsurance operate in these countries. Various governments have signed up to the BRI memorandum of understanding which can ease the barriers for international trades. BRI bring Chinese capital and Chinese technology into those projects and further enable China to act as a significant influencer for these projects in negotiating with (re)insurers on the terms and prices. There are already smart tools such as drones, AI, big data in use for these projects.

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## Discussion

- China is building Africa on a large scale.

Probably the most notable development in Africa is attributed to China's involvement and investment. Cities such as Mombasa in Nigeria have rapid growth in the necessary infrastructures. Of course, there is some resistance and even resentment for China to trade the support for raw materials in Africa, such as timber, minerals. In Europe, there is some fear of China using technology to steal intellectual property. But overall, from China's perspective, the Chinese leaders intend to share the development and prosperity with the partnering countries.

- Is BRI a kind of modern colonisation? Why should the insurance premiums mostly go to China?



There is much complexity in the process, in terms of political, operational, financial and regulatory aspects, but also cultural differences of doing business with China. Different from the European history of expanding to other countries in the past, China aims for win-win deals and long-term benefits. However, the initial bidding process and tenders mostly take place in China and use the Chinese language. Sometimes only some particular companies are allowed to participate. Therefore, it is estimated that although many other countries will benefit, the Chinese economy will gain the most.

- Does Europe have a strategy to deal with the BRI?

Some countries such as Italy, Greece and Cyprus have been busy working with Chinese to co-develop some BRI projects. Few countries (such as Poland, the Czech Republic, and Hungary) have benefited from Chinese investment. However, BRI has also caused some tensions and doubts in some European countries. While the Western world is distracted or even weakened by social unrest and COVID-19, China is advancing with its BRI projects in Southeast Asia already and will continue to develop the BRI projects. Unfortunately, Europe has relatively little knowledge and strategy to cope with the rise of China and the expansion of Chinese influence in the global stage. In 2019, Europe proposed a new unified "European way to connectivity"; however, so far, there has been very little substance in that project.

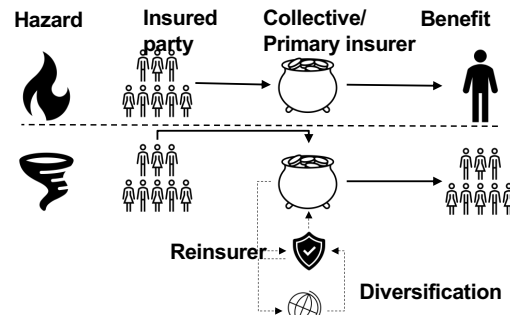
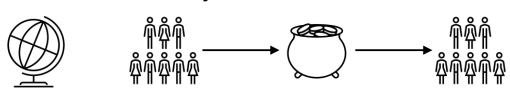
Would you like to comment or ask any questions? Please feel free to contact Lihong Wang (Lihong.wang@th-koeln.de).



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## Private-Public Partnership – The solution for the insurability of pandemics?

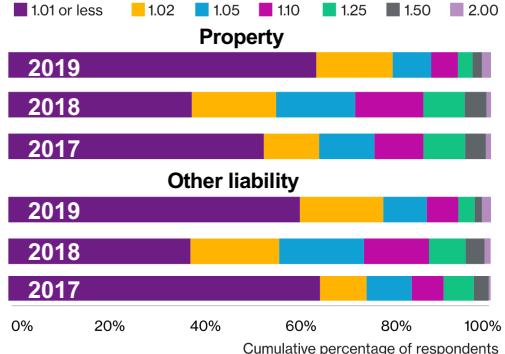
Fabian Lassen, M.Sc. / FCII

Introduction	
<p>Portfolio diversification (regions and line) and reinsurance can make local disasters insurable.</p> 	<p>Losses on a global scale, and with few possibilities for diversification, point up the limit of insurability.</p>  <p>Many regions, industries and insurers (losses, premiums and investments) are affected by COVID-19 at the same time.</p> <p>When incidents as severe as this occur, sometimes there are calls to pass the losses along to insurers or the state.</p>
Private-Public Partnership in practice (selection)	
<p><b>Classic forms</b></p> <ul style="list-style-type: none"> <li>Nuclear pool (e.g. German Nuclear Reactor Insurance Association)</li> <li>Pharma pool (e.g. German Pharmaceutical Reinsurance Association)</li> <li>Solutions against natural hazards (e.g. Flood Re)</li> </ul> <p><b>PPP and alternative risk transfer</b></p> <ul style="list-style-type: none"> <li>PEF (Pandemic Emergency Financing Facility)</li> <li>CCRIF (Caribbean Catastrophe Risk Insurance Facility)</li> </ul>	<p><b>3-step approach</b></p> <ol style="list-style-type: none"> <li><b>Private insurers</b> <ul style="list-style-type: none"> <li>Assumption of insurable hazards and risks</li> <li>Inclusion of pandemics (these are passed on to ii)</li> </ul> </li> <li><b>PPP</b> <ul style="list-style-type: none"> <li>Pool solution</li> <li>partially reinsured or securitised</li> </ul> </li> <li><b>State</b> <ul style="list-style-type: none"> <li>Guarantees and liquidity</li> <li>Fiscal policy</li> </ul> </li> </ol> <p>Source: I.VW-HSG and Wharton Risk Center</p>
Conclusion	
<ul style="list-style-type: none"> <li>Pandemics exist at the limit of insurability</li> <li>The objective of state intervention is to permit an insurance market for extreme events (intervention only if the market cannot perform)</li> <li>What will the next disaster be, and can the capital market even provide support at all here?</li> </ul>	

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## Silent Cyber as a challenge for the (re-) insurance industry

Christian Serries, B.Sc.

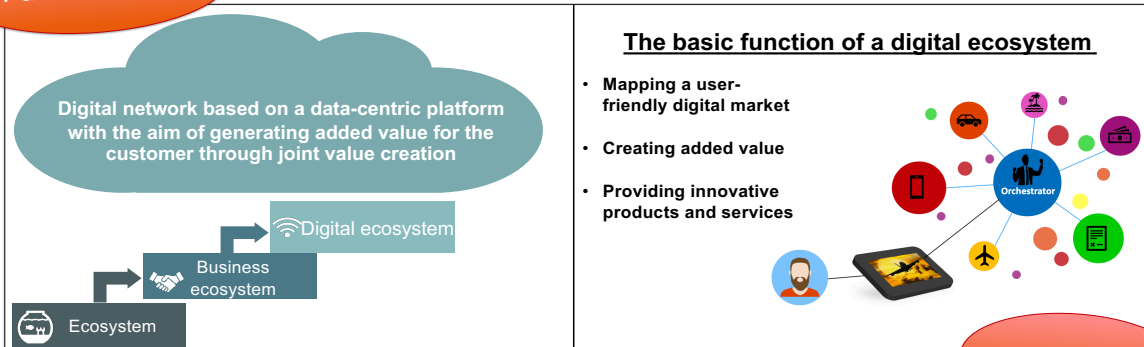
<p><b><u>Cyber – a multi-faceted risk:</u></b></p> <ul style="list-style-type: none"> <li>• Cyber risks pose a direct or indirect threat of property damage, personal injury and (real) financial loss, among other things</li> <li>• Cyber risk – potential for economic damage: Consisting either of damage due to a realised cyber hazard or independently thereof</li> </ul>	<p><b><u>Allianz Risk Barometer 2020:</u></b></p> <ol style="list-style-type: none"> <li>1) Cyber incidents</li> <li>2) Business interruption</li> <li>6) Fire</li> <li>8) Reputation</li> <li>9) New technologies</li> </ol> <p>} Cyber incidents can be a cause of damage</p>
<p><b><u>Silent Cyber / Non-Affirmative Cyber:</u></b></p> <ul style="list-style-type: none"> <li>• Implicit or unintended co-insurance of cyber in a 'traditional' insurance policy or portfolio</li> <li>• Exposures to cyber risks in these lines → Silent Cyber Risk</li> </ul> <p><b><u>Silent Cyber Risk Outlook:</u></b></p> <p>The perceived risk is decreasing in all lines and insured sectors – possible reasons:</p> <ul style="list-style-type: none"> <li>• No extensive cyber damage in the year prior to the survey owing to malware (such as e.g. 2017 with NotPetya)</li> <li>• Insurers' progress in Silent Cyber RM</li> </ul>	<p><b><u>Cyber risk factor perceived cyber risk exposure</u></b></p>  <p>Legend: 1.01 or less (purple), 1.02 (yellow), 1.05 (blue), 1.10 (pink), 1.25 (green), 1.50 (grey), 2.00 (light purple)</p> <p>Property</p> <p>Other liability</p> <p>2019, 2018, 2017</p> <p>0% 20% 40% 60% 80% 100% Cumulative percentage of respondents</p> <p>Willis Re (2019): Silent Cyber Risk Outlook</p> <p><b>Cyber risk factor:</b> For example, 1.01 denotes one additional cyber-related claim for every 100 non-cyber-related claims, and 1.5 represents one additional cyber-related claim for every two non-cyber-related claims.</p>
<p><b><u>Challenges:</u></b></p> <ul style="list-style-type: none"> <li>• Increasing dependence on technology</li> <li>• Greater networking of society and the economy (keyword: Internet of Things)</li> <li>• Risk accumulation: Cyber incidents are global, cross-sectoral events and can lead to losses in all lines</li> <li>• Cedent accumulation at the reinsurance level</li> <li>• Cyber risk analysis not yet fully developed</li> <li>• As a 'man-made peril', cyber is very dynamic</li> <li>• Effectiveness of wording (especially exclusion clauses) still needs to be proven in court</li> </ul>	<p><b><u>Solution approaches:</u></b></p> <ul style="list-style-type: none"> <li>• (Further) develop cyber risk analysis/modelling competency: Cyber cumulation and interdependencies between lines</li> <li>• Data collection in underwriting and claims management creates the basis for further insights</li> <li>• Revision of wording; thus (for the time being) limiting liability with the aid of exclusions, clauses and limits</li> <li>• Can one learn from the coronavirus pandemic – implication of insights (e.g. from business interruption) in cyber models?</li> </ul>

13<sup>th</sup> Annual Meeting of the Förderkreis Rückversicherung  
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## Digital ecosystems – Relevance for reinsurance?

Frank Cremer, B.Sc. / FCII

### Fundamentals



### International



#### Possible scenario in 2025:

- 12 digital ecosystems
- 30% of global revenue
- Approx. USD 60 trillion

Source: McKinsey & Company, 'The rise of ecosystems and platforms'



#### Digital insurer in the digital ecosystem:

- Established in 2013
- 400 million customers (as at 2017)
- 90% of revenue generated by partners of the ecosystem

Source: Naujoks, Hendrik inter al., 'How Insurers Can Reinvent Customer Relationships'

### Relevance

#### The opportunities for reinsurers are diverse



##### Technology and data

- Risk management and AI
- Reduction of information asymmetries

##### Advice and service

- Innovation
- Competitive edge

##### Competition

- 'Walled garden' strategy
- Platform market
- Fronting

#### The risks of a digital ecosystem must not be underestimated



##### Selection of ecosystem and partners

- Improper use of company data
- Investment risk
- Brand loss

##### Cyber risk and data

- Cumulative risk vis-à-vis cyber
- Counterparty risk

##### Competition

- Limitation to risk transfer



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Current as at: December 2020

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