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Foreword

The 11th Annual Meeting of the Sponsoring Group Reinsurance (Förderkreis Rückversicherung) on the topic of reinsurance was held 13 July 2018, in Niederkassel near Cologne. Some 85 invited representatives of the (re)insurance companies supporting the Sponsoring Group took part in the meeting, together with guests. Offered for the fourth time as part of the Annual Meeting, the Researchers' Corner gave eight members of academic staff at the Cologne Research Centre for Reinsurance an opportunity to deliver a presentation on their respective individual research projects.

Professor Materne also conducted interviews with Dr. Falk Niehörster (Climate Risk Innovations) and Dr. Magnus Kobel (YAS.life). Dr. Niehörster reported on his research and consulting activities in regard to maritime climate change and Dr. Kobel on the business model of his InsurTec, YAS.life, and his general experience in the establishment and development of start-ups.

In three sessions – each with 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 research theory with practice.



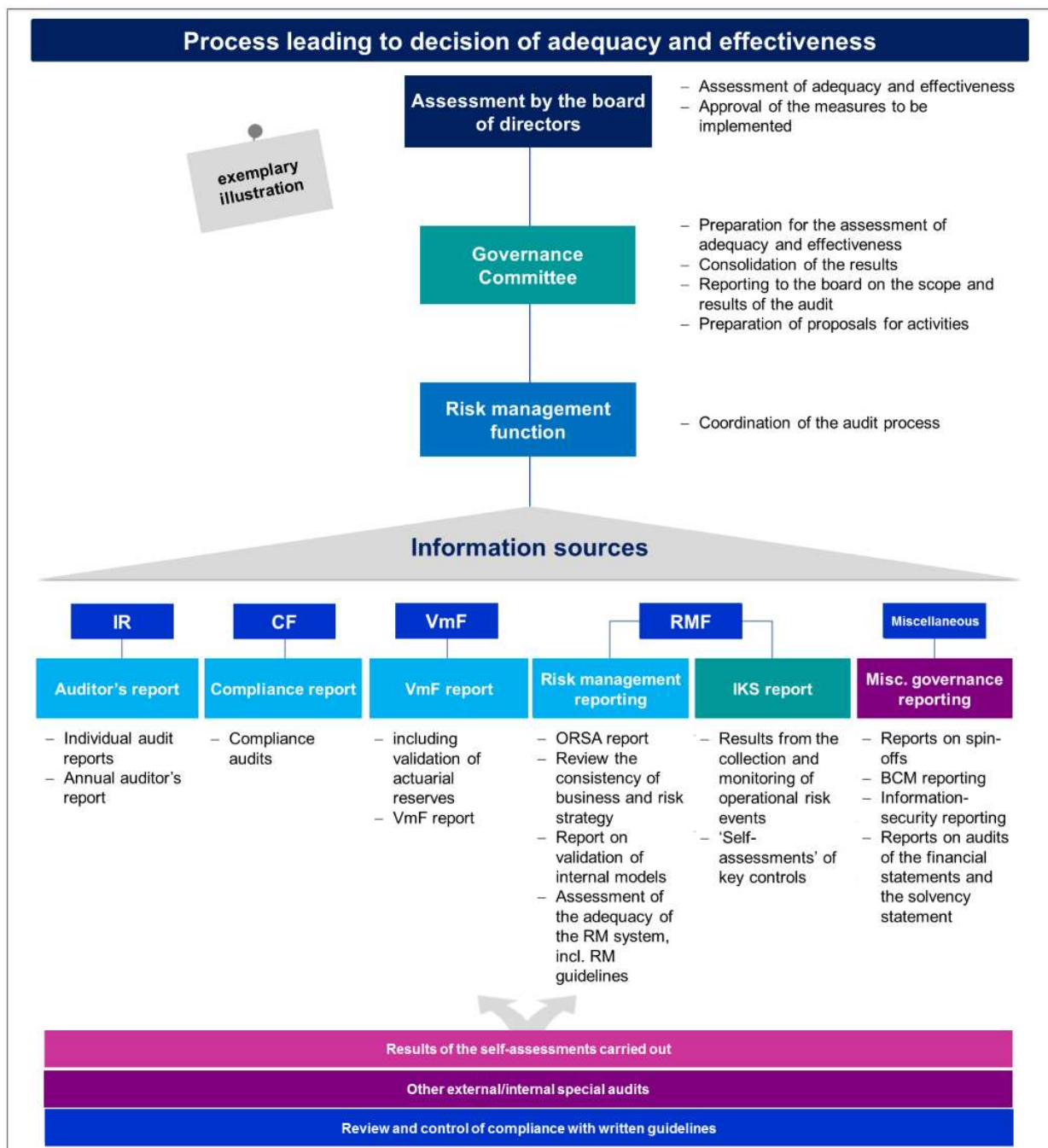
We would like to thank the funding bodies who make this event possible to begin with and provide our scholars an opportunity to conduct their research.

Cologne, August 2018

Prof. Stefan Materne

11th Annual Meeting of the Sponsoring Group Reinsurance
Researchers' Corner, 13th July 2018

Internal Review of the Governance System in Practice
Manuel Dietmann, M.Sc.



11th Annual Meeting of the Sponsoring Group Reinsurance Researchers' Corner, 13th July 2018

Internal Review of the Governance System in Practice

Manuel Dietmann, M.Sc.

Now that the large wave of certification of internal risk models has been passed through and users of the standard model have also set their parameters for stable calculations, the focus of the supervisory authority is increasingly moving to the design of organisational and operational structure, and hence the implementation of the requirements for an effective governance system under Solvency II principles. Pillar 2 of the pillar system of Solvency II reflects the requirements for the governance system of insurance companies.

An indication of this is also Circular 2/2017 (VA) of the German Federal Financial Supervisory Authority (BaFin): Minimum requirements on the system of governance of insurance undertakings (in short: MaGo). Use of the term 'business organisation' is synonymous with that of 'governance system.' MaGo systematically replaces MaRisk VA, which was repealed on 31 December 2015, and assumes comparable characteristics as a matter of law. MaGo specifies the rules for the governance system under the German Insurance Supervision Act (VAG) and Commission Delegated Regulation (EU) 2015/35 (DVO) and interprets these as binding upon BaFin. This ensures consistent application to all insurance companies and groups.

A key element of the requirements is the internal audit of the governance system. Accordingly, the board of directors regularly assesses the governance system, with the assessment cycle to be determined in accordance with the risk profile. Regular assessment must be ensured by means of an audit plan or similar instruments. Before the audit can be carried out, the insurance company should define the elements of the governance system individually for the company. While the underlying regulatory provisions provide an indication of the elements that should at least be considered, they must not be understood as binding rules for the final scope of the governance system. The considerations listed in the VAG are noteworthy in this context and include elements such as Fit and Proper, Risk Management and the Internal Control System (ICS).

The above figure provides an example of the possible design of the process for internal audit of the governance system. The lower section shows the possible sources of information that can be used to assess the governance system. The upper section, on the other hand, outlines the process from initialisation through to final decision by the board of directors.

For the most part, the sources of information that can be enlisted to assess the governance system are already available in the company. This makes it possible to rely particularly on existing knowledge, thereby avoiding disproportionately high additional expense. Among other things, the following reports of the four key functions can be included:

- **Internal audit:** Individual audit reports and the annual audit report
- **Compliance function:** Compliance report
- **Actuarial function (VmF):** VmF report
- **Risk management function:** ORSA report

Because some of these reports of results already contain statements on the adequacy and effectiveness of certain systems and processes, they are suitable as a basis for assessing these areas within the framework of an assessment of the governance system. Further insights are also available through reports by other governance managers, such as the outsourcing (reports on spin-offs) or disaster management (business continuity management reporting) functions.

This information can be supplemented with other processes established in the company and with the results produced: Firstly, through review and monitoring of the written guidelines. The written guidelines, such as the Risk Management Guideline, the Underwriting Guideline or the Reinsurance Guideline, must be reviewed at least once a year. In doing so, the insurance company must apply internal controls to see to it that the written guidelines are complied with. Internal (e.g. by the compliance function) or external special audits (e.g. by BaFin or an auditor) can also be performed. Stakeholders can also have governance officers evaluate their own area of responsibility by means of self-assessments. In practice, these self-assessments are usually based on a company's own specifications as documented in the written guidelines.

All of the information referred to, which is predominantly already in the hands of the insurance companies, can be factored into the internal audit of the governance system and incorporated into the assessment.

At the procedural level, the internal audit of the governance system should provide a role that centrally coordinates the review process. In practice, it can be observed that this role is often performed by the risk management function or the compliance function. Following initialisation of the review process, this coordinating function transports the findings obtained on the basis of the above-mentioned information sources to a committee or body that prepares the assessment of the governance system for the board of directors. In practice, this committee is usually referred to as the 'governance committee;' it is composed of the four key functions and, where appropriate, other governance officers. The governance committee scrutinises the results and develops proposals for assessing the individual elements of the

governance system. The results are consolidated and prepared for the management board in accordance with management requirements. If there are individual elements with deficiencies, weaknesses or deficits, the governance committee should develop appropriate measures and submit them to the board as a proposal.

The board of directors is responsible for the final assessment of the adequacy and effectiveness of the governance system. The findings of the internal audit are presented to the board at a board meeting. On this basis, the board of directors approves the assessment of the governance system and the measures to be implemented to remedy any deficiencies, weaknesses or deficits with regard to the individual elements. Execution of the measures approved should be monitored by the governance committee. The board of directors obtains regular reports on developments with regard to the implementation of measures.

Finally, the result of the internal audit of the governance system is published in the Solvency and Financial Condition Report (SFCR). Taking into account the individual elements of the governance system, there should be a specific statement of whether and why adequacy was affirmed.

Discussion

In practice, a lack of implementation of individual elements of the governance system increasingly leads to findings by the supervisory authorities in the course of internal or external audits. In this case, the state of implementation, as well as any backlog demand, must be addressed. As an example, reference should be made to the outsourcing of important functions and insurance activities. Many insurance companies have not yet taken the increased requirements for spin-offs under Solvency II fully into account during the spin-off process. In some cases, important process steps – such as the integration of the risk management function into risk analysis, implementation of due diligence as well as monitoring of the spin-off based on suitable key performance indicators (KPIs) – have not yet been effectively implemented within the company. Nevertheless, existing outsourcing arrangements already contractually set prior to the introduction of Solvency II are not necessarily subject to re-tendering, as long as there is a subsequent adjustment made to the new governance requirements.

For further information, please contact Manuel Dietmann (manuel.dietmann@th-koeln.de).

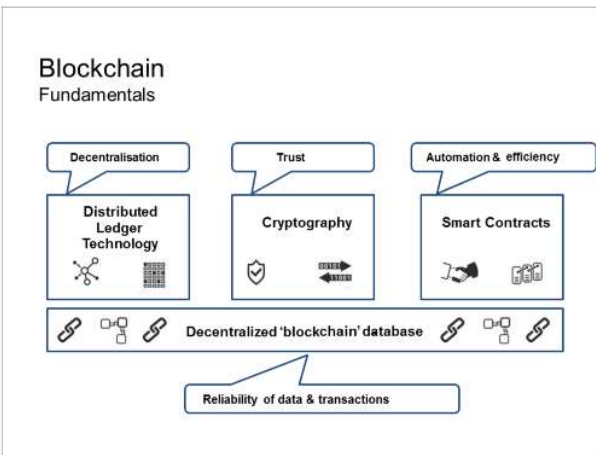
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Researchers' Corner, 13th July 2018

DLT – Change in Business Relationships between Primary Insurers and Reinsurance Companies

Jörg Dirks, M.Sc. / FCII

- **Distributed Ledger Technology (DLT)** is the term for a special form of electronic data processing and the data storage in which it results
- Distributed Ledger denotes a **decentralised database**
- Shared write and read permissions for all participants in a network

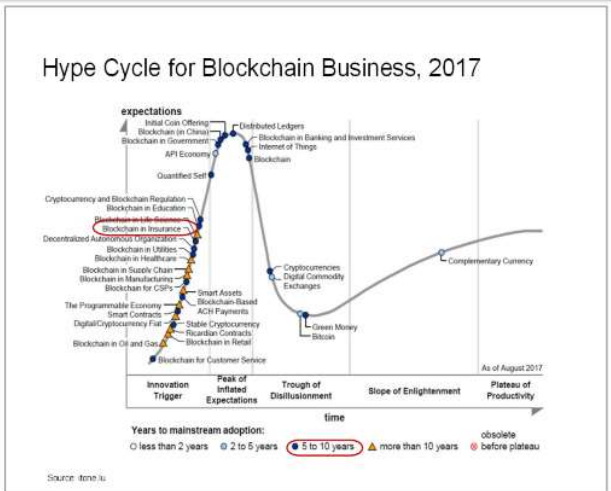
- Participants can **flexibly** and **independently** add new data records
- Through updating processes, all participants have the **latest version** of the database – transparency is guaranteed



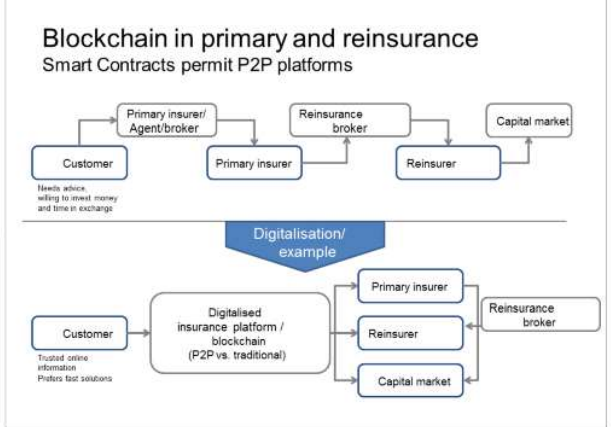
- **Blockchains** are forgery-proof, distributed data structures (decentralised registers)
- Cryptographic technologies are used to map transactions in a **logged, verified and decentralised manner**
- This is based on **seamless and fixed** data recording

- **Smart Contracts** are based on blockchain technology
- Within the framework of DLT, these are **legally binding contracts** (e.g. insurance contracts)

- Easy access to business connections
- Reduces **time and cost** by reducing intermediaries



- Future definition of a standard for blockchain in the insurance sector
- Mapping of cross-company process steps of the value chains



- Blockchain enables **parametric insurance**
- Blockchain enables **peer-to-peer business models**
- Decentralisation concept can be disruptive
- **Smart contracts** offer enormous automation potential
- Most industry implementations are still in the proof-of-concept/early-adopter phase

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DLT – Change in Business Relationships between Primary Insurers and Reinsurance Companies

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What follows is a description of the basics of Distributed Ledger Technology (DLT), including the other components of blockchain technology, as a technical framework. The possible shift in the business relationship between primary insurers and reinsurance companies is also presented, based on a conceivable future use of a blockchain-based transaction platform.

Distributed Ledger Technology is a special form of electronic data processing and resulting data storage. A distributed ledger describes a decentralised database that permits shared write and read permissions to participants in a network. As this network is characterised by the elimination of a central entity, participants can add new data records flexibly and independently. A subsequent update process ensures that all participants have the current database status.

A special feature of DLT is the blockchain as a technical framework. Blockchains are forgery-proof, distributed data structures in which transactions are logged, traceable, unchangeable and free from a central entity. This is based on seamless and fixed data recording.

The blockchain is based on distributed ledger technology, cryptography and the resulting smart contracts, the basis of which constitutes blockchain technology. 'Smart contracts' comprise legally binding contracts, including insurance contracts, within the scope of Distributed Ledger Technology. The components of the blockchain are bundled as a decentralized database in a 'chain of blocks', therefore the name of blockchain.

Smart contracts allow easier access to new or existing business relationships in the blockchain area. With fewer intermediaries, this can then lead to reductions in the time and cost expenditures involved. Particularly in the current soft-market phase in the reinsurance sector, reinsurance companies are keen to reduce or optimise costs in ways that will provide a competitive advantage.

The Hype Cycle for Blockchain Business by Gartner Inc., from 2017, shows the current course of this the new technology in the insurance industry. The assumption for the further course of technological hype currently suggests that blockchain technology has arrived in the insurance sector and has already reached a peak level

of hype. The initiatives currently known in particular, such as B3i or RITA, suggest that the primary insurance and reinsurance industries have recognised the significance of this technology and seek initial tests and implementations for possible use of a transformation platform.

Aided by the definition of a standard for blockchain in the insurance sector, in future it will be possible to map a variety of process steps of the value chains across companies. The internationally oriented reinsurance companies in particular depend on a worldwide standard definition for reinsurance transactions via blockchain platforms or strive to help shape globally uniform standards.

In light of the above functions, there could be versatile uses for DLT in the future. In case of significant risks insured by multiple insurance companies, blockchain technology can be used to establish automatic data exchange between the companies involved. The variety of stakeholders involved in the reinsurance value chain makes the benefits of blockchain technology more significant here than in the banking industry, for example. All parties involved could be informed in real time in the event of any policy changes or claims. Primary insurers and reinsurance companies would have the same, uniform information at their disposal; this way, a risk assessment, for example, could be mapped more efficiently and free from filters.

Innovative concepts such as automation processes in the conclusion of contracts, and the cost-benefit aspects in which these concepts result, make it conceivable that reinsurance companies could strengthen direct business relationships with primary insurers in certain sectors network more effectively with one another.

How overarching use of DLT will affect the primary and reinsurance sectors remains to be seen. Based on what we know today, the primary and reinsurance sector will have to confront the challenges and the opportunities of new technologies. The effort to create a global transfer platform is designed to help market participants assign, manage and trade risks more easily. Modern Distributed Ledger Technologies provide a certain guarantee that downstream transactions can be transferred securely, confidentially and efficiently within a blockchain network. With its basis in trust, the insurance industry in particular can benefit from this innovation.

At this point in time, one can only speculate as to how quickly and broadly this transformation will lead to a change in market structures. Current evidence, however, suggests that there are some market inefficiencies that could be corrected.

Discussion

- 1.) Working within blockchain technology, can a policyholder with a primary insurer have his or her name deleted, and how is a blockchain-based transfer platform compliant in this regard with the European Union's requirements concerning data protection?

Response by J. Dirks:

Where the issue of data protection is concerned, legal and technical standards are certainly still needed at the national and supranational levels to ensure the conformity of Distributed Ledger Technology with the requirements of data protection.

- 2.) Question from the audience to the audience as to which of the companies in attendance already have a blockchain-based transfer platform in productive use or already have initial experience with it. None of the attendees confirms productive use. This leads the questioner to conclude that Distributed Ledger Technology and the blockchain as a technical framework may thus be at the beginning of the hype cycle for blockchain business in the primary insurance and reinsurance sector.

Response by J. Dirks:

This consideration and interpretation of the hype cycle for blockchain business is a function of the individual companies and cannot be generalised on the basis of a survey of audience members. The trend in the Hype Cycle does suggest that peak hype has likely already been scaled as the first examples of disillusionment are now emerging in the market. The kinds of uniform market standards described still need to be established. Several primary insurance and reinsurance companies have already gained initial experience with blockchains.

- 3.) Question from the audience concerning the presenter's opinion of the B3i initiative along with experience with and the substance of the initiative.

Response by J. Dirks:

The lecturer points out that he does not wish to state a personal opinion on market initiatives. The determination to innovate in the reinsurance industry is important, in his view, and he emphasises that early discussion and consideration of this topic can be particularly beneficial to reinsurance companies in the future. The expertise that this requires must be developed early on, however.

- 4.) How will the calm of the primary insurance company change within the context of peer-to-peer business models? In future, will the primary insurer be merely a vendor of technical infrastructure and a trustee of the actuarial expertise reflected in smart contracts?

Response by J. Dirks:

The approach of peer-to-peer business models is based on networks in which participants are directly linked with one another and have the same rights. This means that communication will take place not via a central server, for example, but directly from one participant's computer to the computer of the next network participant.

Since the participants in a peer-to-peer business model have the same information and rights at the same time, it is quite conceivable that primary insurers will assume the role of a vendor under this business approach. Expertise, however, especially in more complicated sectors, will be essential in the future. Therefore, it must be assumed that primary insurance companies will continue to play an important role in the value chain in the future, such that the technical advantages of smart contracts will benefit all participants.

For further information, please contact Jörg Dirks (joerg.dirks@th-koeln.de).

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Risk Transfer in Emerging and Developing Countries

Wolfgang Koch, B.A.

Risk exposure due to natural disasters in 2017

	High Income	Low Income
Loss events: 734	37.8%	6.9%
Deaths: 9,946	10%	15.1%
Loss: USD 337 bn	85.3%	0.6%
Insur. losses: USD 137 bn	96.1%	0%

Sovereign cat pools

In relation to Harvey, Irma and Maria

Scheme	CCRIF	ARC	PCRAFI
Insured risks	Earthquake, tropical cyclone, precipitation	Drought, tropical cyclone, flood	Earthquake, tropical cyclone
Modelling	AIR Worldwide	AIR Worldwide	AIR Worldwide
Premium income 2016	USD 27.7 m	USD 25 m	USD 2.5 m
Cover amount 2016/2017	USD 697 m	USD 100 m	USD 45 m
Reinsured cover (2016/2017)	25% of the cover amount	41% of the cover amount	90% (quota should decrease following implementation)

Country	Pay-outs for hurricane 'Irma'
Antigua & Barbuda	USD 6,794,875
Anguilla	USD 6,529,100
St. Kitts & Nevis	USD 2,294,603
Turks & Caicos Islands	USD 13,631,865
Haiti	USD 162,000
Bahamas	USD 234,000
Total	USD 29,646,443

Standard network for concluding insurance contract

- ✓ Risk diversification across several countries with different risk profiles
- ✓ Risk pooling reduces the premium for climate insurance
 - Operating costs (e.g. program mme development)
 - Capital costs (diversified portfolio)
 - Information costs (improved, standardised information)
- ✓ Resilience through parametric index triggers
- ✓ Larger transactions possible through standard products of interest to the reinsurance market

Pandemic Emergency Financing Facility (PEF)

Filoviruses (e.g. Ebola)

Max. cover: USD 200 m	Number of dead in IDA countries		
	From 250	From 750	From 2,500
Regional spread	30% (USD 60 m)	60% (USD 120 m)	100% (USD 200 m)
Global spread	35% (USD 70 m)	70% (USD 140 m)	100% (USD 200 m)

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②

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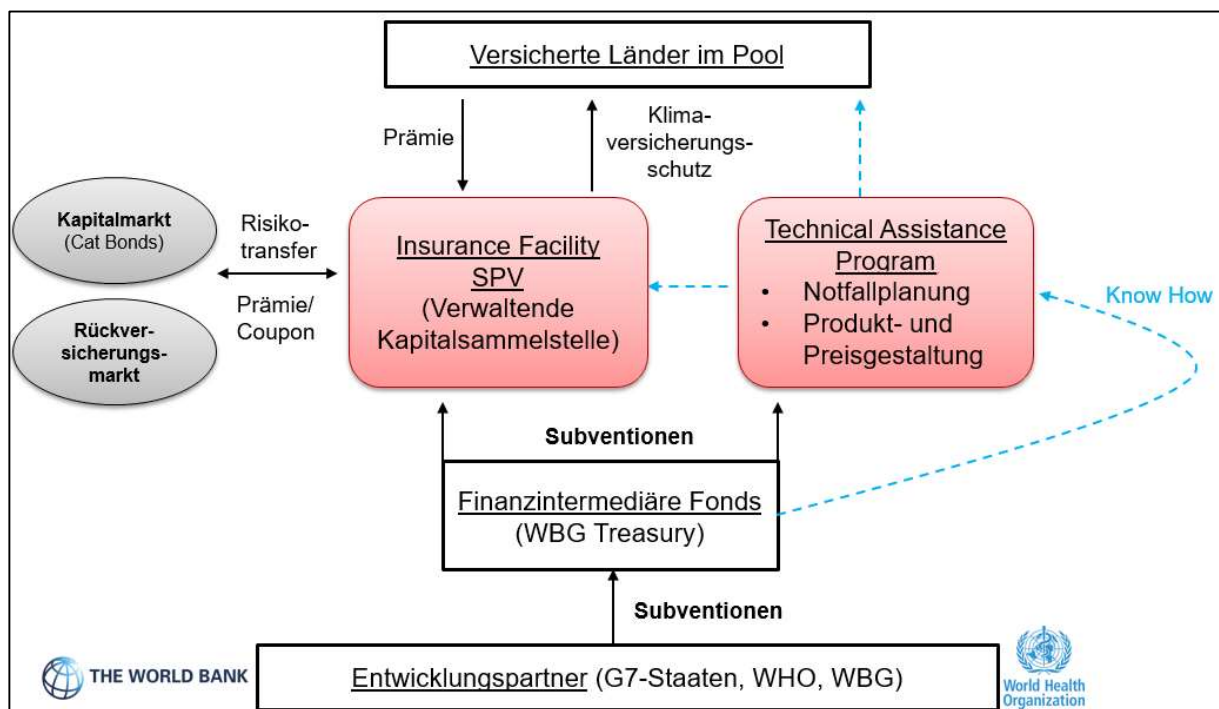
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Risk Transfer in Emerging and Developing Countries

Wolfgang Koch, B.A.

With regard to 'risk transfer in emerging and developing countries', the question arises as to whether climate insurance through sovereign cat pools offers adequate financial protection against natural disasters in emerging and developing countries. There are currently three sovereign cat pools worldwide that are concerned with hedging against natural disasters: 'CCRIF' in the Caribbean, 'ARC' in Africa and 'PCRAFI' in the Pacific. The following diagram presents the structure of risk pooling:



Grants are initially paid by the development partners (e.g. G7 states, World Health Organisation or World Bank). Generally speaking, with the exception of donations, states have at least the theoretical possibility, in fiscal terms, of taking in more taxes, undertaking capital allocations or borrowing on the capital market. Financing through tax increase or capital allocation from long-term investment goals to short-term humanitarian measures is not possible for the state of a developing country, however since experience has shown that there are no fiscal resources available for a major economic loss. Moreover, these fiscal measures incur opportunity costs for these developing countries that pose a setback to their long-term development. The only conceivable financing option, then, apart from aid and donations, is an increase in sovereign debt. An increase in sovereign debt may lead to a downgrade in the ratings

of the developing countries concerned. According to the S&P, Moody's or Fitch rating agencies, however, the creditworthiness ratings of many developing countries is so poor that no rating is issued at all. Sovereign insolvency thus often leads to debt relief. The motivation of these financiers is thus the product of the fact that, otherwise, the loss due to natural disaster will have to be paid downstream by development partners anyway. Consequently, the development partners are interested in long-term ex-ante measures that permit improved financing through a more effective portfolio while providing developing countries with long-term opportunities to support themselves at least in part through climate insurance.

The grants are paid into the World Bank's financial intermediary funds (FIFs) managed by the World Bank Group Treasury, which serves as the finance ministry for the World Bank. A share of the grants, and the high level of expertise of WBG Treasury in the field of asset liability management (know-how), are passed along to the Technical Assistance Program. This institution performs disaster planning in the form of ex-ante measures; it also designs products and premiums for climate insurance. Risk information is passed along by the Technical Assistance Program to the countries insured in the pool. Climate insurance is eventually issued to these countries through the Insurance Facility SPV in exchange for an insurance premium that covers a portion of the risk. The Insurance Facility SPV serves as a managing financial intermediary the aim of which is to optimise the portfolio and thus achieve reduced climate insurance premiums. The excess portion of risk is transferred to the capital market (cat bonds) and the reinsurance market (quota share reinsurance). The key figures for the years 2016/2017 are shown in the following table:

Schema	CCRIF	ARC	PCRAFI
Versicherte Risiken	Erdbeben, Tropischer Wirbelsturm, Niederschlag	Dürre, Tropischer Wirbelsturm, Flut	Erdbeben, Tropischer Wirbelsturm
Modellierung	AIR Worldwide	AIR Worldwide	AIR Worldwide
Prämieneinnahmen 2016	27,7 Mio. USD	25 Mio. USD	2,3 Mio. USD
Deckungssumme 2016/2017	697 Mio USD	100 Mio. USD	45 Mio. USD
Rückversicherte Deckung (2016/2017)	25% der Deckungssumme	41% der Deckungssumme	90% (Quote soll nach Umsetzung sinken)

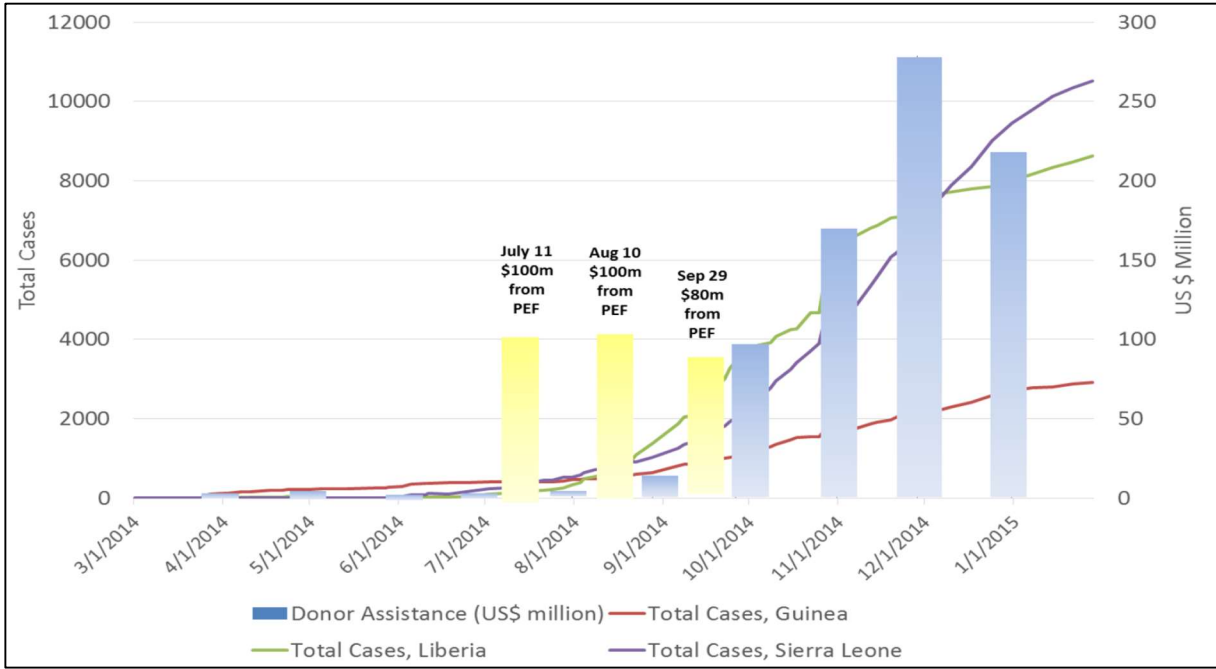
In what follows, the extent of loss due to natural disasters in emerging and developing countries must be presented in comparison to developed countries. The extent of the damages incurred, and the large insurance gap of more than USD 2 bn versus industrialised countries in 2017, make it clear that financial hedging by means of climate insurance can constitute a suitable ex-ante approach.

Sovereign cat pools provide risk diversification across countries with partially different risk profiles. Furthermore, parametric index triggers are in place to ensure quick financing in the event of a claim. This limits the moral hazard while increasing transparency at the same time. On the other hand, the basic risk due to this form of trigger is relatively high, but not as high as it would be in the case of a purely parametric trigger. Furthermore, risk pooling reduces the premium for climate insurance cover. Standardised programmes reduce operating costs across all countries; a diversified portfolio reduces capital costs, and information costs are reduced thanks to improved and standardised information.

After weighing up the advantages and drawbacks involved, it can be stated that sovereign cat pools can cushion economic shocks, thus creating resilience in emerging and developing countries. With regard to hurricane 'Irma', however, the basic risk became obvious as a practical matter, due to a low pay-out for the Bahamas and Haiti by the sovereign cat pool CCRIF. 'Total payments by CCRIF, in an amount of just under USD 30 bn, covered countries' premiums of USD 27.7 bn within the pool, as can be seen in the table below:

Land	Auszahlungen von CCRIF für Hurrikan "Irma"
Antigua & Barbuda	6.794.875 USD
Anguilla	6.529.100 USD
St. Kitts & Nevis	2.294.603 USD
Turks & Caicosinseln	13.631.865 USD
Haiti	162.000 USD
Bahamas	234.000 USD
Insgesamt	29.646.443 USD

The question also arises as to whether, with the support of insurance, the economic growth of developing countries can be protected if an epidemic or pandemic were to break out. In this context, reference may be had, for instance, to the economic impact of the Ebola epidemic in 2014. As this consideration makes clear, developing countries are particularly susceptible to epidemics due to low insurance penetration and low per-capita gross national income. In this case, late intervention by the World Health Organization led to a drop in gross domestic product due to a decline in the factors of human capital and labour, and to an increase in sovereign debt. The limited tools of fiscal policy in the hands of developing countries will be improved with the support of the newly established 'Pandemic Emergency Financing Facility' (PEF). The rapid pay-out mechanism, which is coupled to parametric triggers, can create resilience in developing countries and cushion exogenous shock. Risk modelling reveals the necessary ex-ante measures. Taking the Ebola epidemic of 2014 as an example, there would have been premium input of USD 55-65 m, compared to a rapid pay-out output in the amount of USD 280 m:



In the case of the Ebola outbreak in Congo in May 2018, PEF provided rapid assistance with a USD 12 m pay-out. The entire Ebola action plan of USD 56.8 m was thus supported by PEF.

Discussion

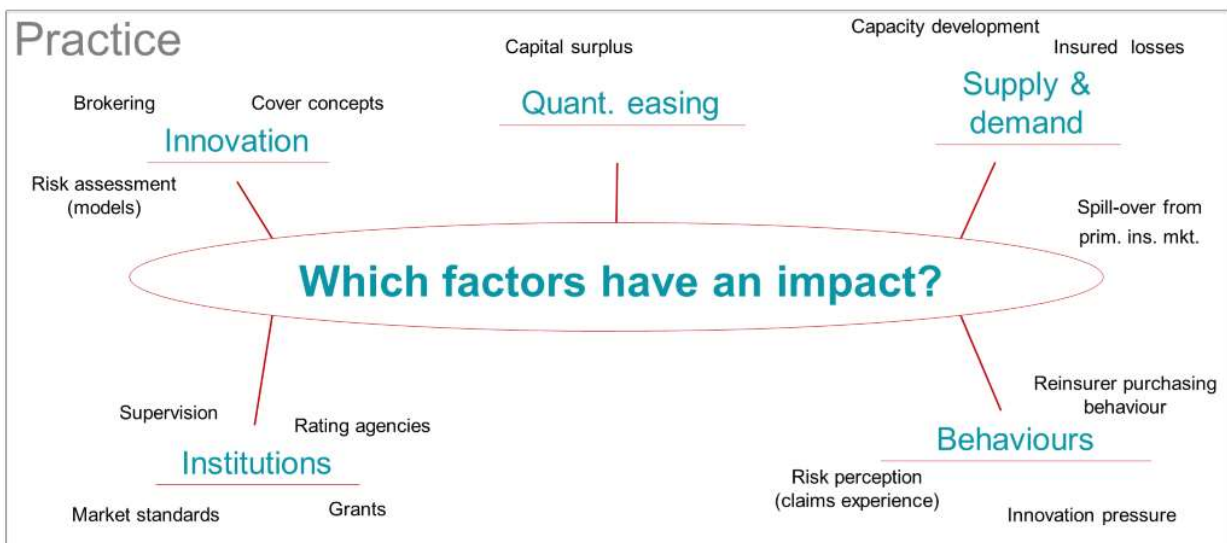
- Who exactly are the recipients of premium and compensation payments? Is corruption ruled out by virtue of the fact that payments of premiums and compensation are made through the World Bank and the World Health Organization as interfaces?
- Are the triggers of the World Bank and World Health Organization too 'soft'?
- Does it make sense to develop and deepen this topic further? (Keywords: Green Climate Fund, InsuResilience)

For further information, please contact Wolfgang Koch (wolfgang.koch@th-koeln.de).

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The Price of Risk Transfer

Robert Joniec, M.Sc. / FCII



Theory

[Akerlof \(1970\), Azevedo \(2017\)](#)

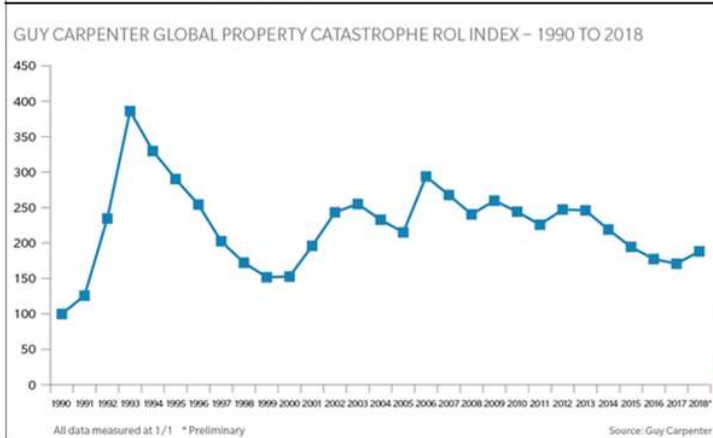
Supply & demand
Preferences
Antiselection
Equilibrium

[Borch \(1962\)](#)

Utility
Diversification
Pareto

[Froot & O'Connell \(2008\)](#)

Shortcomings of the financial market
Asymm. info.
Market power



	0	(-1)	(-2)	(-3)
Ins. vol.	-0.07	-0.05	0.97	-0.09
Reins. vol.	0.68	0.67	0.79	0.11
Total vol.	0.06	0.41	0.96	-0.18

Correlation between securitisation activity and insured losses in the same year (0) and one (-1), two (-2) and three (-3) years prior.

➔ **Reasons? Are there constants? Are there limits?**

11th Annual Meeting of the Sponsoring Group Reinsurance Researchers' Corner, 13th July 2018

The Price of Risk Transfer

Robert Joniec, M.Sc. / FCII

Reinsurance is something special. It transfers actuarial risk between parties. Pricing also constitutes a part of these transactions. As in any market, an aggregated price level is formed that changes over time. This price is not expected to remain constant, as it will be affected in non-trivial ways by a variety of different factors. When examining potential factors, one could assign them to the following five categories: *Innovations* are understood to mean both new coverage and brokerage concepts as well as new methods for risk assessment (e.g. 'vendor models'). It cannot be denied that *institutions* have a direct influence on the market, at least insofar as they create the framework in which the market takes place and through which a price is reflected. At the same time, market stakeholders' *risk perception* is a component, as it determines purchasing behaviour to a significant extent. Both are translated into factors of *supply and demand*. In this category, however, demand is to be understood primarily as a measure of purchased/requested/consumed capacity, while supply is viewed as a measure of available capacity and its inflow. Finally, *quantitative easing* must be singled out; here it would be very interesting to know the extent to which it has had an impact on the price for risk transfer, and the form in which capital has contributed to the reinsurance market.

The related questions have already been considered from an academic point of view. Akerlof made one of the first contributions when, in 1970, he described the primary insurance market as a market created by the purchase of insurance cover by policyholders based on their preferences and expectations. This market is, heavily characterised by information asymmetries, however, as a result of which the role of institutions could consist in exerting influence and hence (theoretically) permitting the market to function. Much more interesting in view of the topic at hand, however, was the work by Borch, who described the specificity of the reinsurance market in 1962. In this work, risk is considered in isolation and assessed independently of the financial market – with insurance risk viewed as generally independent of financial-market risks. There are a variety of approaches to this question. Borch opted for utility-maximising primary insurance and reinsurance companies, with reinsurers also acting as diversification brokers. The overall market can thus be understood as a large, well-diversified carrier of risk that also requires a certain aggregated price for risk transfer. Somewhat later, the work of Froot & O'Connell advanced consideration of this topic even further. These scholars found that shortcomings in the financial market played a very important role in pricing. These shortcomings are also

generated through information asymmetries and are further amplified by market power.

Some of the factors also considered in Froot & O'Connell quickly emerge when considering actual price trends. Thus, the price developments in the early 1990s, in 2005, 2011 and possibly in 2017/18 all have a feature in common. In these years, high insured losses led to a price increase in the following year. At the same time, however, it is striking that the price increase has changed year-over-year. Also interesting – now in regard to alternative risk transfer – is the relationship between securitisation activity (number and volume) and the aforementioned insured losses the same year, a year prior, and two years prior. We see, for example, that securitisation activity increased sharply two years hence, i.e. in 2007, after the high-loss year 2005. A conceivable explanation for this is the shift in risk perception following a fresh loss experience. Consequently, in-house processes are initiated which aim at additional alternative cover. After one and a half to two years, we see how this materialises in the issuance of a cat bond. The correlation we observe here is surprisingly high – although it should be noted that because the amount of data is still quite modest, statements should be interpreted with a bit more care.

A special situation emerges for the years 2017 and 2018. High insured losses were recorded at the end of 2017. Although 2017 was already a very active year in the ILS area, 2018 was already on track to break records very early on. While it can be assumed that a certain level of standardisation made it possible to carry out securitisation more expeditiously, but can this reduction to a few weeks or months suffice to explain the high issuance volumes in early 2018?

Returning to the overall market, it is necessary to ascertain the extent and speed with which a multiple 'Katrina loss' would affect pricing. Again, the question arises as to which factor affects price, and to what extent – and whether a limit exists for such effects. It is similarly important to clarify whether there are constants that do not change over time and can be expected to exist in the future, and how these factors behave relative to one another. The market for alternative risk transfer now has a volume of almost USD 100 bn; will it soon have reached its limit, or will it be able to continue to grow? What does the role of traditional reinsurance look like in this context?

Discussion

The announcement of the lecture made mention of supply and demand shocks; what are these shocks, and can they be found in the database? – 'Shocks' refers to the sudden consumption of a certain amount of risk capacity (high-loss events) or the

sudden inflow of a certain amount of capacity (inflow via alternative risk transfer). The quality and granularity of the data and the period we can consider, coupled with the rarity of swings, pose a major challenge in the search for shocks and their effects. Because we are trying not just to present correlations but also note causalities, it is particularly important to pursue this research question.

On the one hand, we have the change in price, but what about the trend in underlying risks due to climate change, technical innovations such as the cyber risk? This is not constant in nature, either. It is for this precise reason that methods for risk assessment (vendor models) could play a major role. The price of risk transfer is viewed as the 'spread' that is paid beyond the expected loss. If a model is not trusted to reflect hypothetical reality at least as closely as possible, this fact will be reflected in the spread. This is how people 50 years ago worked with premium loading that represent a multiple of today's mark-up. From an investor's point of view, the spread decreases as the quality of the models increases.

The subsequent spontaneous vote among 16 listeners revealed that 15 of them were of the opinion that quantitative easing would have a greater impact on price than an update in vendor model that leads to a 10% adjustment in expectation of loss.

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The Threat of Drones 2.0

Significant Changes in the Drone Regulation and Its (Possible) Impacts

Kai-Olaf Knocks, M.A., FCII



Regulation Governing the Operation of Unmanned Aircraft:

- Labelling requirement > 0.25kg
- Proof of knowledge > 2kg
- Permit requirement > 5kg
- No changes relative to liability and compulsory insurance cover

Relevance of the regulation in practical terms:

- For the vast majority of drones, only the labelling requirement applies
- Particularly for privately used drones, there is neither a requirement for proof of knowledge nor an operator's permit

Typical insurance cover amounts:

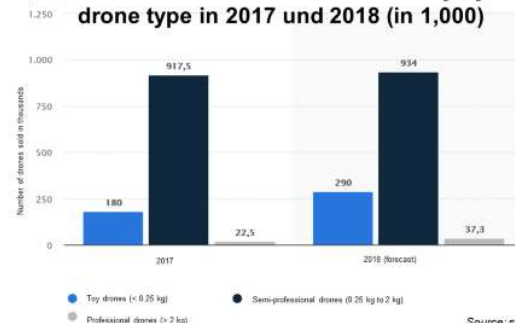
- Private use:
 - Included in private liability insurance – often in premium packages
 - Usually without sub-limit
- Commercial use:
 - Usually separate policies
 - Cover amounts up to EUR 10 m

Potential for loss:

- Sightings of drones per DFS:
2015: 14 2016: 64 2017: 88
- Cyber
- Terror

Source: German Federal Ministry of Transport and Digital Infrastructure (BMVI)

Number of drones sold in Germany by drone type in 2017 und 2018 (in 1,000)



Source: statistika.com

Claims experience to date:

- Despite a sharp increase in the number of drones, the damage frequency is very low
- There are no reports of major loss

Conclusion

- The Drone Regulation goes in the right direction – but whether provisions will suffice remains open to question.
- While claims experience has been slight to date, a potential for loss definitely exists.

11th Annual Meeting of the Sponsoring Group Reinsurance Researchers' Corner, 13th July 2018

The Drone Regulation and Its (Possible) Impacts

Kai-Olaf Knocks, M.A. / FCII

Legal changes in the Drone Regulation

What has changed as a result of this regulation? The diagram provided by the German Federal Ministry of Transport¹ shows the essential provisions of the regulation. On the right hand side, we see various no-fly zones, such as airport control zones or industrial plants; these no-fly zones were essentially already in effect before the regulation was introduced, however. Another point is the line drawn between model aircraft and drones in privately use – up until now, the same regulations have applied here as applied for model aircraft. Now, for example, model pilots operating in model airfields are permitted to fly above an altitude of 100 m. This altitude is generally prohibited in the case of drones, regardless of their weight. However, the major change in which the drone regulation results is the introduction of three weight limits. A labelling requirement has been in effect since last year for drones with a take-off weight of 250 g or more. These drones must be marked with a label indicating the name and address of the owner. This labelling obligation is not to be confused with a registration obligation such as that requested by some institutions such as the German Insurance Association (GDV), which would have made it possible, for instance, to determine how many drones are in circulation in Germany. The second weight limit applies for take-off weights of 2 kg or more. From this weight, proof of knowledge is required – essentially a type of driving licence for the aircraft. From a take-off weight of 5 kg, the third weight limit applies – here, a permit is required of the kind that already applied in the case of drones in private use. The permission requirement has hitherto been in effect for commercially used drones, regardless of their weight; consequently, this can be viewed as relief for drones in non-private use. The regulation has not made any changes where liability and compulsory insurance cover are concerned. Encumbrance liability and strict liability still both apply. Drones also continue to be considered aircraft and thus subject to compulsory insurance cover.

¹ See https://www.bmvi.de/SharedDocs/DE/Publikationen/LF/flyer-die-neue-drohnen-verordnung.pdf?__blob=publicationFile, accessed on 23 July 2018.

Relevance of the regulation in practical terms

By far the largest share of the drones in use today have a take-off weight of less than 2 kg. Hence, only the labelling obligation is relevant here. It can be assumed that because heavier drones are mainly professional, commercially used devices, the vast majority of drones in private use do not require proof of knowledge or permitting. The world's most widespread drone, for instance, the 'Phantom', by market leader DJI (estimated market share 70%-80%), is currently in its 4th generation, with a total weight of 1.4 kg and thus clearly short of the 2-kg limit. At least from a regulatory point of view, the risk of privately used drones must therefore be assessed as higher.

Cover concepts

The cover typically offered on the market does not reflect this higher risk in the private area, however. For the private use of drones, more and more providers are covered by private liability insurance – usually within the 'premium packages' for take-off weights of up to 5 kg. This weight limit has since dropped for some products. This could be due to the fact that comparison portals are only concerned to determine whether drones are insured or not, and any possible weight limits have no effect on the product comparison.

In the private sector, where drones are usually covered without a sublimit, the available capacity ranges up to 50 million euros. In the commercial sector, there are mainly separate policies with cover amounts of between 1 million euros – which is approximately equivalent to the legal limit for strict liability – up to a cover amount of 10 million euros, with premiums ranging between 150 and 400 euros depending on the scope of cover.

Loss trend

How can these high capacities explain very low premiums, particularly in the private sector? This is mainly due to the still very low frequency of loss. Because major losses are still unknown, at least in the German market, higher premiums and separate policies seemingly cannot take root in the market, particularly in the private sector. The new labelling requirement might conceivably lead to an increase in reports of loss, since the pilot or owner can be identified more easily in the event of a loss; to date, at least, no such trend is discernible.

And yet the potential for loss remains and is constantly growing as a result of the constant increase in the number of drones. According to German air traffic control authorities, the number of drone sightings from aircraft has increased, from 14 in 2015 to 64 in 2016 and 88 in 2017. Although it remains open to question whether a drone could cause an aircraft to crash, experts often do not want to completely rule this out. Added to this are hazards such as cyber – many drones are nowadays controlled via Wi-Fi connection – but also terror, although there can be no cover here due to the exclusion of intent.

Conclusion

The Drone Regulation goes in the right direction – but whether provisions of this form will suffice remains open to question. A registration obligation would have been beneficial in many ways – among other things, in order to provide a better assessment of the risk for our industry. As a practical matter, moreover, the proof of knowledge that is required only for drones weighing 2 kg or more is not relevant for the vast majority of drones. A limit lower than this would be desirable here as a preventive measure, because the potential for damage definitely exists.

Discussion

- Why has there not been a transition to compulsory registration?
- Which entities review compliance with the Drone Regulation? Is this only done in the event of a loss?

For further information, please contact Kai-Olaf Knocks (kai-olaf.knocks@th-koeln.de).

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Reinsurance Aspects of (Networked) Automated Driving

Fabian Pütz (M.Sc. / cand. PhD)

Increasing demand for cat cover

I. Motor vehicle insurance

- ❖ Average loss due to NatCat events
- ❖ Cover of personal injury to the human 'driver'
- ❖ Correlation of accident events (serial loss) possible
- ❖ Man-made cat risk possible through cyber attacks

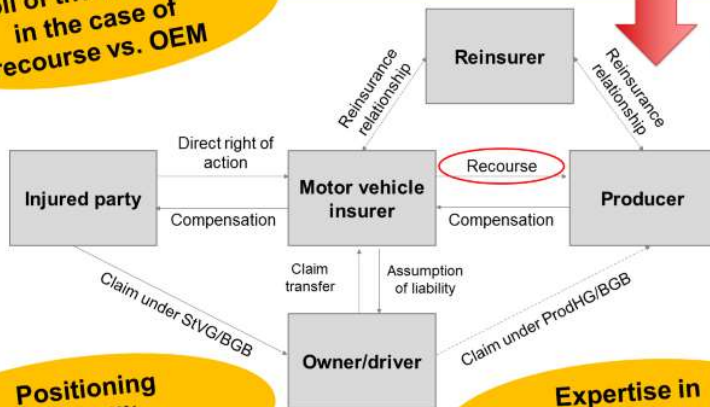
II. Product liability

- ❖ Recourse of motor vehicle insurers possible pursuant to German Product Liability Act and German Civil Code
- Recourse tends to only be efficient and viable for the motor vehicle insurer in the event of major loss

III. Product recall

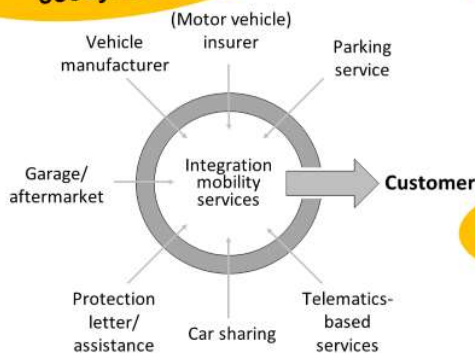
- ❖ Increased frequency of recalls expected
 - Complexity of vehicle infrastructure
 - Stricter implementation by supervisory authorities
 - Increasing innovation pressure in the automobile market
- ❖ Increasing magnitude of loss from recalls

Roll of the reinsurer in the case of recourse vs. OEM



- ❖ Vehicle primary insurer **not obligated, motivated or able** to carry through with recourse of basic loss (attritional losses); interest of reinsurers opposed in some cases
- Pool of technical and legal expertise by reinsurers more efficient
- Reinsurer with overview of market has information advantage for 'evidence' vs. OEM

Positioning in mobility ecosystems



- ❖ Holistic, strategic cooperation with OEMs as suppliers of product and capacity
- ❖ Helping the motor vehicle primary insurer transform the business model

Expertise in alternative pricing methods

- ❖ increasing automation requires other forms of pricing of risks in the field of motor vehicles
- Shift from driver-centric pricing towards risk assessment of the technical system

Reinsurer capacity for (cumulative) risks



Automotive cyber



Product liability



Product recall

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Reinsurance Aspects of (Networked) Automated Driving

Fabian Pütz, M.Sc. / cand. PhD

What follows is a presentation of the reinsurance-specific aspects of increasing networking and automation of motor vehicles, on the basis of risk-related and legal considerations. When considering the effects of increasing networking and automation at the level of risk exposure, a distinction can be drawn between the motor vehicle, product liability and product recall lines of insurance.

Beginning with the effects of risk in terms of motor vehicle insurance, a distinction can be drawn between the impacts on risks that already exist and have relevance, on the one hand, and the emerging risks that only arise as a result of increasing technologisation of vehicles on the other. It should be pointed out that the following remarks on aspects specific to the reinsurance sector must be considered in relation to the overall trend throughout the entire market for the primary insurance of motor vehicles.

In the area of existing and relevant hazards, the increasing penetration of automated vehicles equipped with sensor hardware has an influence, for instance, on average loss amounts for NatCat damage to a vehicle. Even if the built-in sensor technology may not be directly damaged in the event of a storm or hail event, added recalibration expense after repair leads to a potential increase in average claims amounts. Compared with this, there are also secondary effects if, for example, increasing automation leads to shifts in mobility behaviour, particularly in urban areas. Increasing use of shared mobility offers, for instance – which can potentially be bolstered by increasing automation – would result in fewer vehicles within the sphere of impact affected by natural events, in turn potentially lightening the loss burden due to NatCat events.

The relative share of personal injury in the loss portfolio in motor vehicle insurance could increase as well. This assumption is based on the legal view that the human 'driver' using a (highly) automated driving function will gradually take on the role of a passive passenger. Nowadays, personal injury to the human driver is regularly excluded from the strict owner liability, this change in legal status would result in a situation in which personal injury to the person in the 'driver's seat' would be subject to compensation as if for a personal injury to other passengers.

In addition to the effects on existing risks, there are also new risks in the field of motor vehicle insurance, and their characteristics differ significantly from the risks seen to

date in the field of motor vehicle liability. Cumulative and serial loss events in the field of motor liability are only of very limited relevance nowadays, for example in the case of black ice events. However, the fact that the future driving decisions of an automated vehicle will no longer be made by a human driver but instead by the implemented software can lead to an accumulation of accident events (serial loss) as a result of an error within this software. This is the case at least when the vehicles respond in deterministically identical ways to sensor inputs and execute an inadequate driving manoeuvre in certain driving scenarios, leading to an accident.

The issue of cyber attacks, for commercial or terrorist reasons, against networked automated vehicles has already been discussed at many levels of the insurance market and will be relevant in future in the field of motor vehicle insurance. If it should become possible here to hack not just one vehicle but actually several at the same time, and even to control them remotely, this results in a potential for major and cumulative loss events with high claims amounts. This risk merits particular consideration in a context in which the risk of a cyber-induced accident event cannot be excluded in order to limit accumulation risk in the scope of cover for a primary insurance policy concluded under strict owner liability. In 2015, for example, an experimental hacker attack on a Jeep Chrysler showed that the technical infrastructure in the automobile is certainly subject to increased vulnerability to cyber attacks.

The fact that this experimental hacker attack resulted in the recall of approximately 1.4 million vehicles also shows that increasing vehicle automation and networking affects the risk of product recalls in the automotive sector. The assumption here is that the frequency of recalls will increase in future, as the automation of driving functions increases the complexity of vehicle infrastructure in terms of both software and hardware. This potentially results in a corresponding increase in the number of sources of error within the vehicle. Because vehicles increasingly do not only intervene in an assistive manner but even carry out safety-relevant driving tasks independently, it also has to be assumed that if a safety risk is identified, the supervisory authorities will require even stricter execution of recalls. Finally, the residual risk of recall also increases as the increasing complexity of the vehicles and the testing and validation effort that this involves in the automobile market is faced with increasing innovation pressure. This results, among other things, from the entry of alternative market players from the technology sector (e.g. Google or Apple) and manifests itself in a further shortening of development cycles. Finally, in addition to the described impact on the frequency of recalls in the automobile market, upon an analysis of the American recall database of the NHTSA, it is also striking that the average scope of recall events has also increased in recent years as a result, for example, of the increasing use of platform design. As individual recall events in the industry have also shown, these events may potentially involve extreme economic and insurance-relevant loss amounts, thus requiring sufficient reinsurance capacity.

In the area of product liability, based on the applicable liability and insurance system in Germany, it can be assumed that this risk will be a relevant topic for reinsurers in particular. Following adaptation of the German Road Traffic Act in 2017, it must be stated as a matter of principle that the legislature is largely adhering to the legal framework currently in force to the greatest extent possible. In this case, in the triangular relationship between the injured third party, motor vehicle insurer and vehicle owner, it is still the case that the owner is subject to strict liability even when using automated driving functions, and that the injured third party can lodge a claim directly against the motor vehicle insurer. In its explanatory memorandum to the amended German Road Traffic Act (StVG), the legislature goes on to point out that the motor vehicle insurer can or should charge liability costs on to the respective producer by way of recourse, in accordance with the German Product Liability Act or the German Civil Code (BGB). Upon closer inspection of this two-stage process, however, it should be noted that the motor vehicle insurer is under no obligation to actually pursue recourse proceedings against the producer. Thus, the self-interests of the motor vehicle insurer must decisively factor into any analysis of whether the pursuit of recourse proceedings will have a high relevance as a practical matter. It should be noted, however, that the motor vehicle insurer has no self-interest in pursuing recourse proceedings on a broad front, as this would gradually erode its own business model and induce a shift in premium volumes towards product liability insurance. Here, the motor vehicle insurer tends to have an active interest in pursuing recourse proceedings only in the event of major loss, as the ratio of its own claims expenses to the expense associated with recourse is more favourable. Assuming that major loss events in motor vehicle insurance are sometimes only of secondary importance, pursuing recourse proceedings for major loss would not lead to a significant retreat in market premium volume, all other things being held equal.

In addition to the interest of the motor vehicle insurer, however, it is open to question whether it possesses the technical and legal expertise required to successfully pursue recourse proceedings. Here in particular, it can be considered more efficient to maintain the appropriate expertise for the overall market at the higher level of the reinsurer. In addition, the reinsurer can potentially narrow any information asymmetries that may exist between individual car insurers and car makers on the strength of its higher-level position and on the strength its market overview. Alongside this possible service function by the reinsurer in a recourse context, it also has to be assumed that recourse is also economically relevant to a reinsurer if the major losses of the motor vehicle insurer for which recourse is sought are covered by (non-)proportional reinsurance programmes. On the other hand, alongside the reinsurer's role as a service provider of technical and legal expertise for the pursuit of recourse on the part of car makers, there is also a need for risk-management services and adequate (re-)insurance cover for the corresponding cases of product liability.

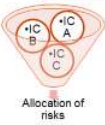
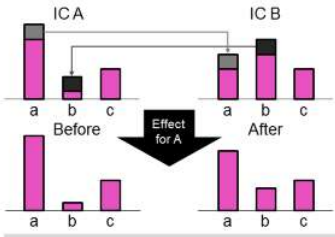
In conclusion, then, it can be stated that, from a reinsurance perspective, the potentially increasing relevance of major, serial and cumulative loss, there will be an increase in the need for corresponding capacities, particularly in the areas of automotive cyber, product liability and product recall. It has also been shown that changes in the risk landscape associated with the automobile also present opportunities for reinsurers to position themselves as service providers and suppliers of expertise.

For further information, please contact Fabian Pütz (fabian.puetz@th-koeln.de).

11th Annual Meeting of the Sponsoring Group Reinsurance
Researchers' Corner, 13th July 2018

Pooling of Local Natural Disasters

Fabian Lassen, M.Sc. / FCII

Insurance pool	Actuarial swap
 <p><i>'The participating insurers throw their businesses together into a common pool and divide them up again among pool members on a quota basis.'</i></p> <p>Fehlmann, Heinz (1948)</p> <p>A commission can be used to adjust random deviations in the expected values. The commission amount is determined on the basis of the claims experience contributed. Pool members with a good claims ratio will receive a commission for future business brought in. The scheme can be financed through ongoing premiums, reduced guarantee funds or surpluses.</p> <p>With the aid of a balancing factor, the quality of a portfolio is to be determined in advance. This is intended to specify a risk-adequate pool premium per member based on a country-specific risk profile. Risk assessment is based on a methodology that is understood as general, e.g. hazard zones.</p>	<p>In the case of an actuarial swap, actuarial cash flows with a comparable probability of occurrence and amount are exchanged.</p>  <p>The success of such a swap is mainly a function of the activating events and triggers selected.</p> <p>A multi-dimensional diversification effect across the region and the risk class can be achieved and the efficiency of the risk portfolio enhanced.</p> <p>The challenge is to identify hazards that exhibit the same probability of occurrence and a comparable level of expected loss. The actual loss must correlate with the selected trigger.</p>
Conclusion	
<p>Insurance pool</p> <ul style="list-style-type: none"> • Complex administration • Cash flow from contract conclusion • Higher transaction costs through claims management • Risk-appropriate valuation of portfolios to reduce subsidisation of pool members • Risk-based bonus for lower-risk portfolios 	<p>Actuarial swap</p> <ul style="list-style-type: none"> • Less complex administration • Cash flow only for a defined event • Analysis of correlations between different hazards and regions is required to locate suitable hazard combinations • Data quality is important • No subsidisation of the partner • Basic risk
<ul style="list-style-type: none"> ➤ How do the parties involved react to one-sided increases in volatility? ➤ What steps can be taken to achieve a balance? 	

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Pooling of Local Natural Disasters

Fabian Lassen, M.Sc. / FCII

A joint project with Achmea and Gothaer, worked to identify ways in which several insurers could work together to better plan their own actuarial results. The basic concept was for several insurers to contribute portfolios with different risks from different regions in order to achieve greater diversification of risk. The collaboration was to leave existing reinsurance structures unaffected; the aim, instead, was to reduce volatility in net earnings.

An investigation was performed of the insurance pool and the actuarial swap as already-proven methods for risk diversification. Both possibilities are presented and compared below.

The insurance pool has a long and successful history and forms an integral part of traditional insurance. Reference is had to the definition of the insurance pool put forward by Mr. Heinz Fehlmann in 1948. In the pure form of an insurance pool, participating insurers (pool members) divide up the premiums and claims brought into the pool proportionally amongst themselves. Today's insurance pools exhibit a large variety of characteristics and designs. Examples in Germany include the Pharmapool (German Pharmaceutical Reinsurance Association) or the Atomic Pool (German Nuclear Reactor Insurance Association).

Various adjustments to the classic insurance pool were weighed in the effort to achieve the objectives set out above for improving earnings planning by establishing a common insurance pool. Particular attention was paid to premiums, as these are fundamentally easier to adjust than claims are. Two of the different adaptation variants are outlined below. One variant provides for payment of a commission for good claims experience. Claims experience is assessed retroactively, with pool members demonstrating good claims ratios receiving a commission for the subsequent period. This is intended not only to offset/prevent cross-subsidisation of other pool members but also to create an incentive to continue to bring business into the insurance pool. In the other variant presented, the quality of the portfolio introduced is assessed in advance, in order to set a risk-based pool premium per pool member right from the outset. In practice, both of these variants can be used in combination.

From the point of view of alternative risk transfer, an actuarial swap can also achieve the objectives of the joint project. An actuarial swap can achieve a multi-dimensional

diversification effect across the region and the risk class through a swap of actuarial cash flows. In contrast to traditional insurance, however, claims are paid out on the basis of what are known as 'triggers.' In this case, parameters that have been defined in advance – such as the amount of precipitation or wind speed in a particular area – must be reached or exceeded before a payment that has been firmly agreed beforehand is made. The challenge consists in identifying portfolios that have similar distributions of loss frequency and loss amount, and also in selecting a suitable trigger that correlates with the actual loss. Success is thus essentially a function of the trigger selected.

When comparing an insurance pool and an actuarial swap, the following differences can be noted: Depending on its design, an insurance pool can be implemented with less expense than an actuarial swap. However, in order to prevent cross-subsidisation of fellow pool members, it is important to establish a mechanism that will lead to a balance in payments by pool members in the long term. Given the nature of the insurance pool, higher administrative costs are to be expected, as cash flows will begin to move the moment a contract is concluded. The actuarial swap, on the other hand, is characterised by easier management from the moment a contract is concluded. This is due, among other things, to the fact that payments flow only if the specified trigger is activated. The challenge for an actuarial swap is to find a suitable trigger. Significant added expense must be expected during the preparatory phase compared to what would be incurred for an insurance pool. Not to be overlooked is the basic risk that a party will go uncompensated for a loss that has occurred but fails to activate the trigger.

Both measures can lead to the agreed objective. In order to establish one of the two measures, the next step is to conduct a detailed analysis of the relevant portfolios. This is intended, for one, to locate suitable portfolios that lead to greater risk diversification under a collaborative scheme. For another, modelling would be required to test both measures, and to locate a suitable trigger.

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The Rising Middle Class in China and Its Implications for (Re)Insurance Industry

Lihong Wang, M.Sc./ FCII

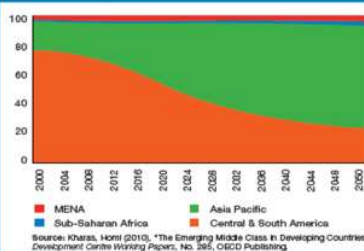
Introduction

In stark contrast to the ongoing decline of the perceived middle class in the developed western world, China now has the largest middle class population of any nation. Nearly **400 million** people are now considered middle class.

In the consequence of rising income and assets, insurance is becoming more relevant and of importance.

However, it is essential to understand who they are, where they are and how they spend their money. It is vital for (re)insurers to assess the implications and learn to tap into this new market.

Global middle class consumption, 2000-50
(Percentage of global total)



The rising Middle Class populations are now expanding to North and the West, in Tier two to four cities.



Source: McKinsey Quarterly, June 2013 on mapping China's middle class
<https://www.mckinsey.com/industries/retail/our-insights/mapping-chinas-middle-class>
Remarks: McKinsey grouped Chinese cities based on their economic development and political importance. Typically, Tier 1 cities have more than 15 million people, Tier 2 cities have 3 to 15 million people, Tier 3 and 4 cities have 150,000 to 3 million and fewer than 150,000 people respectively.

The Size of Middle Class, 2009 – 2030 (millions of people and global share) – Source: World Bank

	2009		2020		2030	
North America	338	18%	333	10%	322	7%
Europe	664	36%	703	22%	680	14%
Central and South America	181	10%	251	8%	313	6%
Asia Pacific	525	28%	1,740	54%	3,228	66%
Sub-Saharan Africa	32	2%	57	2%	107	2%
Middle East and North Africa	105	6%	165	5%	234	5%
World	1,845	100%	3,249	100%	4,884	100%

Chinese Middle Class

- Having been previously concentrated in the eastern coastal cities such as Beijing, Shanghai, and Guangzhou, they are now expanding to the western and northern parts of the country.
- Many of these citizens are starting to plan for their welfare and manage their finances, and are becoming a more mature and attractive market to retailers.
- They purchase things (high value, high tech items) such as private property, personal automobiles and take vacations overseas. They spend considerable amount of money on eating out, buying fine clothing and joining private clubs and gyms.
- They are a highly educated, highly productive and skilled labour force. Many hold a degree, speak at least one foreign language, are familiar with the Internet and truly the driving force behind China's internationalism.
- Similar to other Asian countries, such as South Korea and Japan, China will maintain a high saving ratio but keep spending more. Health insurance and Insurances with investment elements are especially in high demand.

In general, not only life but also non-life insurance sectors will be affected by this transformation. However, insurance companies have to cope with product innovation and customer relationship management. While the rising middle class demands new products and services, the underwriting results and claim patterns are yet to be revealed.

Implications for the (re)insurance Industry

- China remains as an attractive insurance market but a challenging new environment to operate.
- The internet usage is growing. China already has a large number of netizens (over 600 millions). Customer relationship management throughout the whole product life cycle has to be managed by online tools.
- Market practice changes rapidly. Are the indexation and exposure appropriate for reinsurance pricing?
- How will cost elements impact in terms of claims adjusting and triangle developments contributed by services being readily available and accessible?

11th Annual Meeting of the Sponsoring Group Reinsurance Researchers' Corner, 13th July 2018

The Rising Middle Class in China and Its Implications for (Re)Insurance Industry

Lihong Wang, M.Sc. / FCII

This article focusses on the 2018 research project on the rising Chinese middle class and its implications on insurance and the reinsurance industry. Following a brief introduction, the research findings will be presented including the answers to the questions who the Chinese middle class is, where it is and how they spend their money. After that, the implications on insurance will be examined.

You might have noticed that Chinese tourists are queuing to pay at the airports, and they have bought the entire stock of baby formula milk powder in German grocery stores. Recently a report estimated the current Chinese middle-class population is about 440 million (using the definition from the World Bank of 'disposable income of USD 10 to 50 dollars per day', the income that someone has available to spend or save after taxes have been taken out and they have paid for food and other basic needs). China has become the largest middle-class nation in the world, and the middle-class population will grow a further 700 million by 2030.

We come now to the first graph, which presents the significant increase of wealth in the Asia Pacific region, in contrast to the relative decline of the middle class in rest of the world, especially in Europe and North America. We can see from the graph, a projection published by the OECD in 2009, that the size of the European middle-class population does not change much from 2009 to 2030 (slight increase from 664 m to 703 m by 2020 and decrease to 680 m by 2030). However, the global share of Europe's middle class decreases from 36% to 22% and to only 14% within two decades.

During the same period of time, in Asia Pacific, mainly China and India, the global middle class share is rising quickly from 28% to 54% by 2020 and again almost reaches nearly two-thirds of the world by 2030 (a nearly fivefold increase in middle-class population).

The definition of 'middle class' does not go without debate; however, almost all institutions agree on income level and a certain lifestyle. The Chinese government has classified individuals with an income from USD 9,000 to 74,000 as members of the middle class. McKinsey narrows this down to USD 9,000 to 34,000 and further predicts that the upper middle class (USD 16,000 to 34,000) will be mainstream. Chinese Media Channel Wu presented a slightly different version in 2017: income

between USD 15,000 and 74,000 along with additional characteristics, including travelling overseas, playing sports, paying extra for housing and private medical care, and, interestingly, owning air purifiers.

Why is the rising Chinese middle class important?

To give you an idea of what members of the middle class do with their new money, we can see from the second graph that China will continue to be one of the most important markets in terms of global consumption because of the emerging middle class. Around 23% of global middle-class consumption will originate from China.

A large number of people in China have more money and are willing to spend it. This is going to impact the economy, society, and the environment. Of course, when we look at insurance, the implications will be immense. That is why insurance and reinsurance cannot ignore this group of attractive future insurance buyers.

The first question is, 'Where are they?' Moreover, who are they?

There are over 100 cities with more than 1 million residents. Previously, the middle class were situated in eastern coastal metropolises such as Beijing, Shanghai and Guangzhou. Now, they are expanding to the northern and western parts of the country due to lower housing/living costs and new opportunities in Tier-2 and -3 cities. Nearly half of those who left the above-mentioned major metropolises did so in their late 20s. For instance, the selected cities in the map (Graph 3), particularly Tier-2 cities, which usually have 3 million to 15 million people, are attracting more and more talents with better job opportunities and a higher quality of life.

According to Channel Wu, members of the Chinese middle class usually hold a degree, live in big cities and have disposable income. The survey revealed that many of the emerging middle-class people were born in the 1980s, graduated from college, speak at least one foreign language and live a Westernized lifestyle. I quote: 'they are smart, confident, and optimistic. They emphasize quality of life – and are increasingly able to pay for it.' They are familiar with the internet and social media and spend a lot of time shopping online. There are over 600 m 'Netizens' in China, and the number is still growing.

So how do they spend their money, and can they be attractive customers?

According to surveys, the most money they spend was on personal development, travel and living expenses, followed by child rearing, dining, fitness, commuting, socializing, clothes and entertainment. They like new experiences (e.g. overseas travel), but they also like to purchase high-value, high-tech items, for example private property, personal cars and smart gear. Insurance is becoming more and more relevant, as they would need insurance to protect their assets and lifestyle.

Just to clarify, they do not spend all their new money. The gross savings rate in China is still relatively high, at 45% as measured in 2017. In fact, China's savings rate is one of the highest in the world. As a group, they are also a young, educated, productive and skilled labour force. In addition, they have started to plan for their welfare and manage their finances. They are particularly interested in health insurance, and insurance products with investment elements.

There are many business opportunities. Both life and non-life sectors will be positively affected by this transaction.

In general, China will remain an attractive market, but a difficult environment in which to operate. Insurance companies are dealing with a big group of potential customers who are in need of financial protection yet need to create innovative products that suit the needs of these people and provide customer services to their liking. The traditional distribution channels will still work, but speedy, transparent and online channels will win in the long run. Many insurance companies will have to upgrade their IT infrastructure and employ and train people for customer relationship management.

Still, challenges remain, as the underwriting results and claims patterns have yet to unfold, for both insurers and reinsurers.

There are a lot of funds and capital waiting to be invested, and the price pressure remains high. Internet usage can be an advantage or disadvantage: insurers and reinsurers will have to deal with IT issues (artificial intelligence, blockchain and cyber-attacks), as these could fundamentally change the business model in China. In 2013 to 2014, Zhong An, the first online insurance company jointly launched by Alibaba, Tencent, and Ping An, reportedly sold 600 million policies to 150 million clients. Since then, more and more insurances have been sold online.

Although business tends to be relatively short-tailed where liability insurance is concerned, another challenge for reinsurers is to make certain that exposure and indexation are appropriate. Government policy and laws/regulations can also change rapidly.

Of course, reinsurers will be particularly interested in their accumulation control. They cannot ignore the immense wealth concentration in certain cities and areas, and the consequent exposure accumulation for insurance/reinsurance.

Last but not least, cost elements, on the other hand, have increased significantly and might rise further where repair, tests, and other contractual obligations/extra expenses from coverage extensions are concerned. The experts, such as loss adjustors, surveyors, brokers, lawyers and other experts, are getting more and more involved in claims and seem to have driven claim costs up.

To sum it up, even though many insurers and reinsurers are talking about closing or bridging the protection gap, such an action could also be helpful when considering the Chinese or even a general rising middle class.

Discussion

- What is the brokers' role in China, and what are their market shares?

The top brokers Aon, Willis, Guy Carp are present. But there is also an increasing number of local brokers active in the market. Their market share can vary from region to region. There are no separate statistics, but I believe the brokers are mostly located in Tier 1 cities (such as Beijing, Shanghai, Guangzhou) and spreading into Tier 2 cities, where they enjoy more acceptance and business opportunities.

- What do you expect the regulations' impact to be on the further rise of the middle class?

The middle class serves as a stabilizer for a society, and China welcomes the idea of more domestic consumption and prosperity for all. On the other hand, the government is also trying to strike a balance between more personal freedom and a harmonious, one-party society.

- Is digitalisation the key to getting these clients?

It seems inevitable that more and more people rely on the internet and demand services that are speedy, transparent and communicative. Of course, the traditional way of distribution will still work, and complex risks will still require brokers' services, but in my view, the online channel will be mainstream, especially for standard products such as car insurance or travel insurance.

- What about Alibaba's approach in digital insurance? What about the role of WeChat?

Alibaba is investing in digital insurance, and the company I mentioned earlier (Zhong An) was jointly founded by Alibaba (initially 30%, decreased to 20% after Zhong An went public). Lately, Alibaba has also made efforts to apply blockchain technology in the insurance and reinsurance industry.

WeChat (Chinese version of WhatsApp) has hundreds of millions of users. It is increasingly becoming a platform for online transactions with a payment solution. Insurance companies have started to allow individuals to make claims and submit photos and documents via WeChat since 2016.

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