Institute and Faculty of Actuaries

COVID-19 Report

COVID-19 and Future Pandemic Scenario Modelling for Property and Casualty (P&C) Insurers and Reinsurers

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Abstract

In this report, we explore the various lines exposures to COVID-19 and we look at the potential P&C market changes caused by it. We also attempt to define processes for P&C pandemic scenario modelling and exposure management.

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1. P&C Market Stress and Scenario Testing

Property and Casualty (P&C) insurers and reinsurers usually run stress and scenario tests to quantify the impact of natural and man-made catastrophe events on their portfolios. These requirements are driven by regulators in sophisticated markets and by rating agencies in less developed markets, with most of the focus historically being placed on hurricanes, earthquakes and terrorism events.

Solvency II regulation in Europe drove companies to look at their systemic risks and clash scenarios beyond natural catastrophes and terrorism. Insurers began to look at their potential aggregation scenarios across lines they write for several types of events; for example, an aviation crash scenario, an oil spill into the ocean or a workers compensation industry-wide claim such as exposure to harmful substances. Most recently regulators added cyber risk exposure to stress testing requirements.

Up until the emergence of COVID-19, P&C markets had not emphasized modelling pandemic risk scenarios for their businesses. This could have been because they never anticipated such a global pause of economic activity as was caused by COVID-19 governmental lockdowns. An additional reason could have been that non-life companies generally wrote relatively limited volumes of pandemic-specific coverages. Lloyd's of London recently claimed that the premiums for such risks were too high to have attracted material volumes of insurance business from companies. For the pandemic exposures that were written, the risk would have previously been perceived by non-life underwriters as localized; causing disruption to travel to some locations or causing some events cancellations, as was the case for the few previous outbreaks like SARS in Asia in 2002.

There is strong evidence pointing to increased frequency of new virus outbreaks that could result in more global pandemics like COVID-19. In the last 20 years, we have seen several new viruses such as SARS, MERS, Ebola and Zika to just name a few. All these viruses have crossed species to humans. Financial Times online says: "Scientists blame the increase in the spill-over of pathogens from animals on two trends: rapid globalization and humanity's cavalier interaction with nature. This means disease outbreaks and pandemics are likely to emerge regularly unless the trends can be checked or reversed." This will now mean all P&C companies would have to consider the impact of governmental lockdowns and global disease spread on their portfolios for COVID-19 and future pandemics.

Companies currently have to look beyond quantifying their loss exposure to COVID-19. In the resulting global economic contraction there would likely be a decreased need for insurance. For example, this may be true for insurance lines directly linked to global trade such as Marine Cargo or Trade Credit. Consequently, business volumes could be impacted, expenses and overall profitability of insurers might also suffer. Regulators around the world are monitoring the impact of COVID-19 on insurers. Actions such as updating capital calculations, calculating liquidity

strains, and performing stress and scenario tests on the balance sheets of companies have been seen. Regulatory reliefs with regards to filing of statutory returns have been granted to insurers in some countries like UK, Kenya and Mauritius to take into consideration the impact of COVID-19 curfew order on the financial sector.

Conversely, companies might have seen some reduction on claims such as a reduction in theft or accidents due to the national lockdown. The benefits of lockdown have been seen in the Motor line of business due to fewer vehicles in the road which results in a lower likelihood of road accidents. The UK conduct regulator (FCA) is monitoring whether insured businesses and individuals are being treated fairly by insurers, including in reference to premiums paid versus the reduced risk exposures due to COVID-19. In Mauritius, an insurer is providing a refund on the premium on motor policies to take into consideration that the country was in lockdown for two and a half months. The insurer is also offering discounts to policyholders on their next renewal.

2. COVID-19 P&C Exposures and How to think about them

There are two types of risk exposures that P&C companies have accumulated in respect of COVID-19: on contracts where pandemics are explicitly mentioned in the re/insurance contract, often referred to as affirmative exposures, and ones where contracts are 'silent' on pandemic risk exposures. Silent exposures occur in contracts when the wording does not explicitly exclude that particular risk from being covered, rather the contract is silent on it as a potential cause for a claim. This often happens when an event could not have been anticipated by underwriters, like COVID-19.

P&C markets have suffered Specialty Lines claims through Event Cancellations re/insurance. These contracts would have likely included explicit mention of diseases/pandemics as perils. Other lines heavily impacted by COVID-19 are Trade Credit, Surety and Political Risk. This was due to the unprecedented disruption in trade and supply chains experienced across the world. Such contracts often do not exclude pandemics. Travel insurance and Aviation insurance lines would have also been hit due to flight and holiday cancellations. Some Trave policies explicitly cover pandemics and some explicitly exclude them. It is also expected that Mortgage Protection lines would be hit indirectly by COVID-19 in subsequent stages due to the resulting decline in economic growth and rising unemployment. Here, the loss cause would be the recession rather than the pandemic.

Affirmative pandemic exposures for non-life re/insurers have been limited to date. Typically due to the potential for very large claims. For example, Travel insurers sometimes exclude pandemics to avoid large repatriation claim costs. The larger exposures are those that are 'silent'. Those can affect multiple lines simultaneously. The silent COVID-19 exposure in the market has come mainly through Business Interruption limits of coverage, Contingent Business Interruption and Loss of Profits limits. Such limits were usually offered on Property

and Casualty contracts. These were often ‘silent’ on pandemic risk. A few reinsurers have tended to exclude pandemics from their non-life reinsurance treaties. They offered Pandemic coverages explicitly or separately if required. On the other hand, most other P&C markets tended to underwrite contracts that were silent on pandemic risk. This was demonstrated in the recent court ruling against a few UK P&C insurers for contesting Business Interruption claims made by small business holders as a result of COVID-19. Insurers claimed that these Business Interruption limits were intended to cover losses caused by physical damage to insured properties and not pandemics. Those contracts were silent on pandemic risk and did not explicitly exclude it.

Whether the exposures were silent or affirmative, there are arguments around whether COVID-19 losses are caused by the pandemic itself, by the subsequent governmental interventions or by the economic consequences of the virus or the interventions. There has been much debate around whether contract wording for Property Business Interruption is exposed to COVID-19 through denial of access to property, economic impact of a pandemic or compulsory governmental closures. Other wording discussions have been around coverages that talk about named diseases, known diseases, variants of specific known diseases or any infectious disease as a cause for a claims. Time periods of exposure have also come into debate in respect of contract wording, contracts in future will need to be clear about what constitutes the date of notification and how long would coverage last given a similar event in future. Such considerations will surely shape the future of pandemic related re/insurance coverages

3. Market Outlook Post COVID-19

There is currently a market demand for COVID-19 coverages as well as future pandemics coverages. Lloyd’s of London is considering creating an ‘after the event’ coverage vehicle for COVID-19 and future pandemics (Recover Re). Most other markets are reluctant to offer exposure on an on-going event where no finality on loss quantum or governmental response exists. Markets remain very apprehensive about offering future pandemics coverages. Markets cannot offer coverages where they cannot make profits.

There is an ongoing debate in the non-life re/insurance space including Insurance-Linked Securities (ILS) markets whether a Pandemic as a proximate cause of an event will be excluded from policies and treaties in the future. In the Energy market at Lloyd’s of London underwriters wanted to avoid losses arising from computer viruses infecting oil drilling machinery. Such computer viruses are capable of causing fires and physical damage losses and contracts were previously silent on this risk. Hence they created a specific Cyber exclusion clause. Similar pandemic exclusion clauses may become the norm in future. This could result in the creation of a pandemic-specific market to absorb those excluded risks. The viability of any new pandemic market would depend primarily on the availability of reinsurance.

The other option is that pandemic risk exposures are not excluded and contracts remain silent. However this time reinsurers would create clash reinsurance coverages for their cedants. These contracts would cover an insurer across several lines of business when they suffer a systemic loss like COVID-19. Clash coverages are often found in the Casualty reinsurance space. For example, a particular event like a class action ruling against an employer may cause claims across a number of lines of business and a number of policies: Employers Liability, Directors and officers and Professional Indemnity. A clash reinsurance treaty might cover all claims above a certain deductible amount and up to a certain aggregate limit. The same approach could be adopted for pandemic events.

Many market participants have advised that they perceive a pandemic risk to be too expensive to insure. Others have indicated that they could protect a cedant against such a risk but at a remote level where the probability of occurrence is low. This may be translated into re/insurance contracts triggering at a certain remote threshold such as a large number of people dying from the virus or that governmental lockdowns are imposed. Often these products would be non- indemnity index based products, with limited or no indemnity features. Such products would often trigger given a certain index such as number of deaths from the virus recorded by an official source. The preference for non-indemnity products stems from the difficulty in predicting the size of a loss incurred by the insured due to a pandemic.

The alternative situation is that insurers find themselves unable to reinsure against this risk and hence exclude it, leaving those seeking insurance coverage unprotected against pandemics. This is still a possibility. An apt solution here may be to create governmental pools that protect insurers at lower probability thresholds and encourage a commercial reinsurance market to be created through sound risk and exposure management by governments. Examples of such an approach can be found at Flood Re, covering floods in the UK or through the Terrorism Risk Insurance Act (TRIA) in the US.

In response to COVID-19, the UK government has agreed to aid Trade Credit insurance writers with a £10bn reinsurance facility to ensure businesses still have access to advance credit to continue trading. The availability of advance liquidity in the financial markets is dependent on the availability of Trade Credit insurance to cover the risk of non-payment. In times like these, market liquidity and Trade Credit insurance become scarce and expensive given the increased risk of trading. This scheme would increase insurance capacity available for UK companies trading internationally in goods. It could help avoid companies going out of business and partially offset the impact of the economic recession by restoring market confidence lost to COVID-19. Many other countries already have such governmental schemes in places such as Canada, Germany and the Netherlands.

The situation is yet unclear, and most markets would prefer to see the conclusion of COVID-19 to decide on future exposures that they are willing to take on. Some global reinsurers and ILS funds have started to offer pandemic-related risk transfer products but typically this covers remote, localised risks including the risk of governmental interventions. Some have combined the direct pandemic exposure with government intervention triggers to make the risk transfer

more remote in occurrence.

4. Estimating P&C Pandemic Exposures

For the current COVID-19 situation, and in the case where P&C re/insurers continue to take on Pandemic risk silently in their contracts, considerable effort must be made to estimate the potential systemic exposure and aggregations under such re/insurance contracts. Moreover, regulators and rating agencies will require scenario modelling, not just for liabilities but for the asset side of the balance sheet.

On the asset side, economic factors will be stressed such as shares prices, bond default, inflation and interest rates. The asset side impact will be modelled in considerable detail by life insurance companies. P&C players could learn from life companies' approaches to handling asset risk during a pandemic albeit their liabilities and assets have much shorter durations. Life companies' approach would be especially helpful in jurisdictions such as Europe, where they are required to extensively report under Solvency II on various stresses with regards to changes in asset values. For example, $x\%$ fall in fair value in property/(un)listed shares and so on. Many P&C players could use such approaches to report, track and monitor asset risk associated with COVID-19 and future pandemics.

When looking at the liability side, it is important to understand what limits and sub-limits are being covered for non-life re/insurance lines. Many Property contracts historically were priced and analysed on the Property Physical Damage element with insufficient focus being placed on the Business Interruption element of the exposure. This was due to the perception that Physical Damage claims were more likely and typically more severe. Underwriters should analyse whether they could accrue exposures through a large pandemic very early in the underwriting process. This includes a close examination of the contractual language and brainstorming on potential scenarios in multi-disciplinary teams of insurance experts. Actuaries also need to examine the exposure more closely with underwriters at the pricing stage. All of this would require going beyond looking at historical data but being imaginative about future emerging risks and examining global trends.

Before any scenario modelling can be done, all limits of coverage concerning Business Interruptions or other limits that could be impacted by a pandemic or post-pandemic governmental action should be flagged, summed and understood. This process would have started at the risk entry stage where internal data systems should be adapted to flag specific exposures to limits and sub-limits of coverage. Flagging risks would allow underwriters to monitor continually how much pandemic exposure they are taking on regionally, by line of business and on a global company levels.

Many markets and regulators may simplify the scenario modelling process by working with deterministic Realistic Disaster Scenario (RDS) as in the case of some rating agencies and Lloyd's of London RDS reporting. This can be a prescribed methodology by regulators where direct stochastic modelling may be too challenging for a particular risk. The Lloyd's of London

has provided methodology guidance to quantify RDS scenarios for most major lines of business including Aviation, Cyber and Marine lines. Insurers themselves can also brainstorm around a small number of pandemic RDSs that vary by size and impact. These RDS scenarios often describe a remote and expensive event, including assumption about its knock-on impacts to allow a deterministic assessment of loss by markets across their exposed re/insurance lines. For example, an RDS could be described as: A global Pandemic causing 1m deaths or more, 3 months of lockdowns, causing 50% of commercial planes to be grounded, 30% contraction in global trade, 20% reduction in land traffic and so on.

Thereafter, limits of coverage must be linked to the RDSs. Typically, a damage factor methodology is applied to quantify the loss to the insurer from the RDS. This means that each 'flagged' limit, depending on what it is covering is multiplied by a percentage (damage factor), representing likelihood of loss of that limit due to the RDS. This percentage would take into account the assumed damage in the RDS scenario, the covered industry, location of risk, overall portfolio exposure and other attributes of the covered risk.

One alternative approach would be model the impact of pandemics stochastically. This means modelling a large range of pandemic scenarios and relating them to exposed limits of coverage. This may mean that a range of diseases would have to be considered and the risk of their occurrence and magnitude should be incorporated. One way to achieve this is for P&C markets to work with disease spread vendor modelling companies to link their exposures to the probabilistic modelling of disease spread. This approach has been followed extensively to date by markets for natural perils like hurricanes and earthquakes. Where probabilistic occurrence models are combined with economic loss estimation models, both are later used to quantify insured loss.

The thinking behind natural catastrophe models can be adapted to this context. For example, the probability of occurrence of a hurricane is based on historical incidence rates and studies of weather patterns and climate trends. Epidemiologists follow similar methods when modelling the risk of disease occurrence and spread. Hurricane models measure economic loss using attributes of the exposed physical assets in the path of the hurricane, like type of or purpose of building. The hurricane path could be replaced by the virus's geographical foot-print, both accumulating losses over time. With this approach, the attributes of the hurricane-exposed assets can be replaced with the risk characteristics of the country in the 'path' of the virus. Examples of risk characteristics are: The country's population density, its health infrastructure, its preparedness to deal with pandemics, its population demographics and co-morbidities, its population's mobility and travel patterns, its political and socio-economic conditions.

Uncertainty around governmental action such as lockdowns makes the modelling process more challenging, as governmental actions are key determinants of the spread and impact of the virus. These public health and policy interventions can now be incorporated into probabilistic models given the experience of COVID-19. Extensive data exists for each individual or set of interventions. This can serve as a modelling bedrock for analysing future

policy options in the face of new pandemic risks because they allow us to analyse policy choices and the history of their impact.

One method for economic loss estimation could be percentage loss of GDP (Gross Domestic Product) based on these risk factors above. How these factors are incorporated and measured will benefit hugely from COVID-19 data as it continues to emerge.

Quantifying the insured loss for hurricane and pandemic requires the applications of the limits of coverage to the probabilistic modelling of economic loss. The chosen methodology may also be a damage factor based methodology. It must capture the knock-on economic impacts on various industries and insurance specific covered risks. The methodology will be dependent on line of business, type of insurance coverage, regions covered, industries covered and many other factors.

The last option examined here is for in-house non-life risk teams to take control of the pandemic scenario modelling process, whether at the start of an actual pandemic or during for risk management purposes. Bearing in mind the range of diseases that may impact their portfolios, the way forward for the risk teams may be to classify disease outbreaks by range of factors such as basic reproductive number, transmission rate, recovery rate and fatality rates, to just name a few. Added to this are other factors that are perhaps harder to understand at the beginning of a new outbreak, such as clustering of spread where a few 'super-spreaders' are responsible for a disproportionately large number of new infections. There is evidence to suggest that this has been the case with a highly infectious airborne pathogen like COVID-19 compared to say Ebola.

The combination of these parameters then has to be related to probable governmental action. Aside from looking at COVID-19 governmental responses, the risk teams could relate potential action to the particular disease risk parameters. For example, a high basic reproductive number coupled with low recovery rate and high fatality rate might count as a scenario that triggers a global reaction. In contrast, an epidemic with a lower basic reproductive number even if highly fatal will likely result in limited response.

These classifications can help both with RDS modelling as well as scenario modelling at the start of a new outbreak. However, the examples given are oversimplified and there are other factors that have to be considered. One of the factors that made COVID-19 hard to manage was that the majority of people experience mild symptoms or even no symptoms at all, often the symptoms were not easily distinguishable from flu. On the other hand, a significant portion of the population experienced a very severe form of the illness which makes COVID-19 quite disruptive. The combination of these characteristics makes it hard to identify and isolate the infected individuals while the consequence of catching the disease can be deadly or life changing and hence cannot be ignored.

While the health insurance sector may have more experience in relating disease outbreaks directly to loss costs, the link between an outbreak and its effects on a P&C insurer's top and bottom lines are more tenuous. This is because most general insurance lines suffer losses due to the secondary economic effects of the outbreak rather than directly due to infection levels or

deaths. These effects can include changes in claims experience as well as changes in top line experience caused by decreased economic activity (and hence reduced need for insurance), changes in interest rates, inflation rate and exchange rates.

For P&C markets, gathering COVID-19 data and overlaying the spread with likely governmental policies whilst accounting for the different regional environments will be the first step toward being prepared for future pandemics.

5. Acknowledgements

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