Insurability of Pandemic Risks

In brief

The large economic losses caused by COVID-19 and the natural science consensus about the growing frequency of emerging infectious diseases suggest that the risk of global pandemics will remain after COVID-19 crises is over. The emphasis turns toward the insurance industry and its potential to play an active role in building economic resilience to future pandemic events. We study to which degree the insurance industry can contribute to building the economic resilience to future pandemics by analyzing the scope for the private insurance market for pandemic risks. Based on the three-moments CAPM of Kraus and Litzenberger (1976), we build a theoretical framework that explains how supply and demand of catastrophe insurance depend on the correlated tail risks that capture the distinctive characteristics of the pandemic losses and stock market downturns during the pandemic. Furthermore, we implement this framework empirically in pricing a hypothetical pandemic contract that provides coverage against unemployment in case of a pandemic event, on the premises that pandemics are catastrophic events. Our results suggest that the private pandemic insurance market has limited scope as a stand-alone and that the ability to transfer risks to the financial market and the role of the government should be considered to prepare society for the next pandemic.

Policy implications

One

The correlated nature of pandemic loss claims implies fat-tail loss distribution and thus a limited scope for stand-alone private market for pandemic insurance.

Two

The expected shortfall of the pandemic loss distribution is higher than the typical shortfall for other natural catastrophes. Thus, insurers would require a higher markup to provide coverage.

Three

We develop a framework to evaluate the size of risk transfer to the financial market and the government that are necessary to achieve the reasonable market coverage.

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In detail

COVID-19 crises triggered a discussion in the insurance industry regarding insurability of pandemic risks. In this paper, we take a systematic approach to assess the scope of private insurance market for pandemic risks.

Building on a premise that pandemics are classified as catastrophic risks by the insurance industry, we start by providing a framework that explains theoretically how the catastrophe insurance supply and demand depend on the skewed and fat-tailed loss distributions and the co-movement between insurance stocks performance and the financial market.

Our theoretical framework builds on the three-moments CAPM of Kraus and Litzenberger (1976) on the supply and a consistent utility function that considers the first three moments on the demand side. Our results suggest on the one hand that insurers have to charge a higher price if losses are negatively correlated with the return of the market portfolio, if losses occur at the same time and have a significant impact on the value of the market portfolio, and if they lower the otherwise positive skewness of the capital market returns. On the other hand, our model convey that policyholders are willing to pay a higher price for the pandemic insurance if a pandemic risk also affects wealth and income components that are not directly hit by the pandemic disease. The individual willingness to pay depends in particular on the individual risk aversion.

In order to quantify the degree in which the demand and supply side match, to give as a grasp of the size of the market for pandemic insurance, we build on previous studies of aggregate supply and demand for insurance of natural

The large economic losses caused by the

catastrophic risks. We then calibrate empirically the private insurance market equilibrium to pandemic risk data.

Estimating supply of insurance against natural catastrophes

The supply function depends on the price elasticity of supply, which in turn we model as dependent on the characteristics of the loss distribution and the systematic exposure to the financial market performance.

Our measure of price is a mark-up, charged above the paid losses and other expenses. Using the regulatory filings of property-casualty insurers in the US, we calculate the mark-ups for a business lines of homeowners and farmowners insurers which are exposed to natural catastrophes' losses. We rely on the loss distributions for perils and geographic classifications estimated by Froot and O'Connell (2008), and use the state-level data of each insurer in the region in a given year, to obtain insurer-level expected shortfall. The correlation of the insurer's stock portfolio with the market portfolio is estimated employing a two-factor CAPM specification following the methodology in Hartley et al. (2016).

We find the coefficient on the expected shortfall to be positive and significant, confirming that insurers charge higher prices for insuring exposures with higher expected shortfall, i.e., higher tail risk; controlling for firm and year fixed effects.

Designing a hypothetical pandemic insurance contract and calibrating its markup

We consider a hypothetical contract designed to alleviate the impact on unemployment in the case of a pandemic event. The contract pays a lump-sum unemployment benefit for 12 months contingent on the occurrence of a pandemic. Our target buyers are service-providers and small businesses that are largely affected by the reduction of in-person business activity in case of pandemics.

To calibrate the loss distribution of the contract, we employ the high-frequency economic data collected during the COVID-19 pandemic by Opportunity Insights Team and discussed by Chetty et al. (2020).

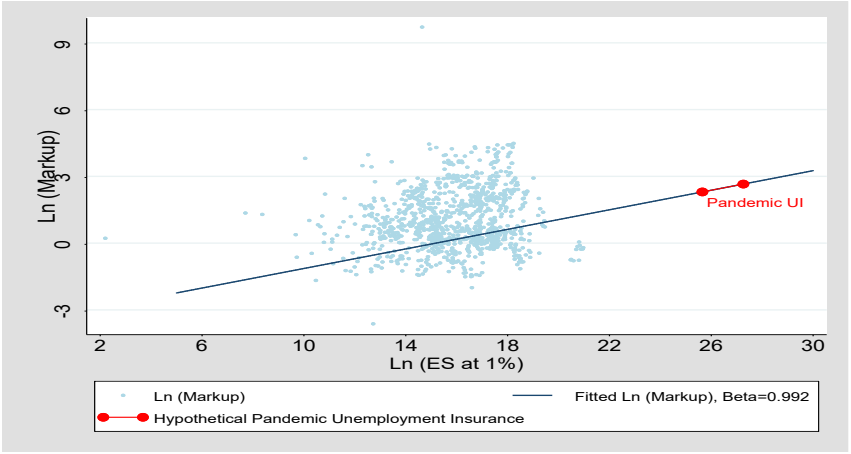

Figure 1: Markup as a function of Expected shortfall, log -log regression

We find that there is a strong statistically and economically significant relationship between the infection rates and the economic activity and employment and thereby use infection rates to predict unemployment claims, from which we derive the severity of the loss distribution of a pandemic. The frequency of 1-in-100 years is taken as baseline, based on epidemiological studies. Combining the frequency and severity distributions at the county level in the US, we estimate the expected shortfall of our hypothetical contract.

As these estimations are on a US-wide pandemic event level whereas the markup regression we calculated is based on firm level data, we consider a range of possible market shares that prevail in the farm owners and homeowners line of business as a proxy for the market share that an individual insurer could have on the pandemic insurance contract.

Figure 1 depicts the range of expected shortfall and the corresponding markup for monthly pay-out amounts of $2000 for an insurer covering between 3% and 15% of this hypothetical market. The large expected shortfall of this type of insurance, leads to a high required mark-up which is in the top 12% compared to homeowners and farmowners loss distribution.

Potential extensions / applications of the model

Our results suggest that there is limited scope for the private market for pandemic loss coverage and mechanisms of risk transfer to the financial market and the role of the government should be considered. The model can be used to evaluate the size of support needed to achieve a reasonable market coverage.

This I.VW Policy Brief summarizes "Insurability of Pandemic Risks'" by Helmut Gründl (Goethe University Frankfurt), Danjela Guxha (University of St. Gallen), Anastasia Kartasheva (University of St. Gallen and Hato Schmeiser (University of St. Gallen), working paper.

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