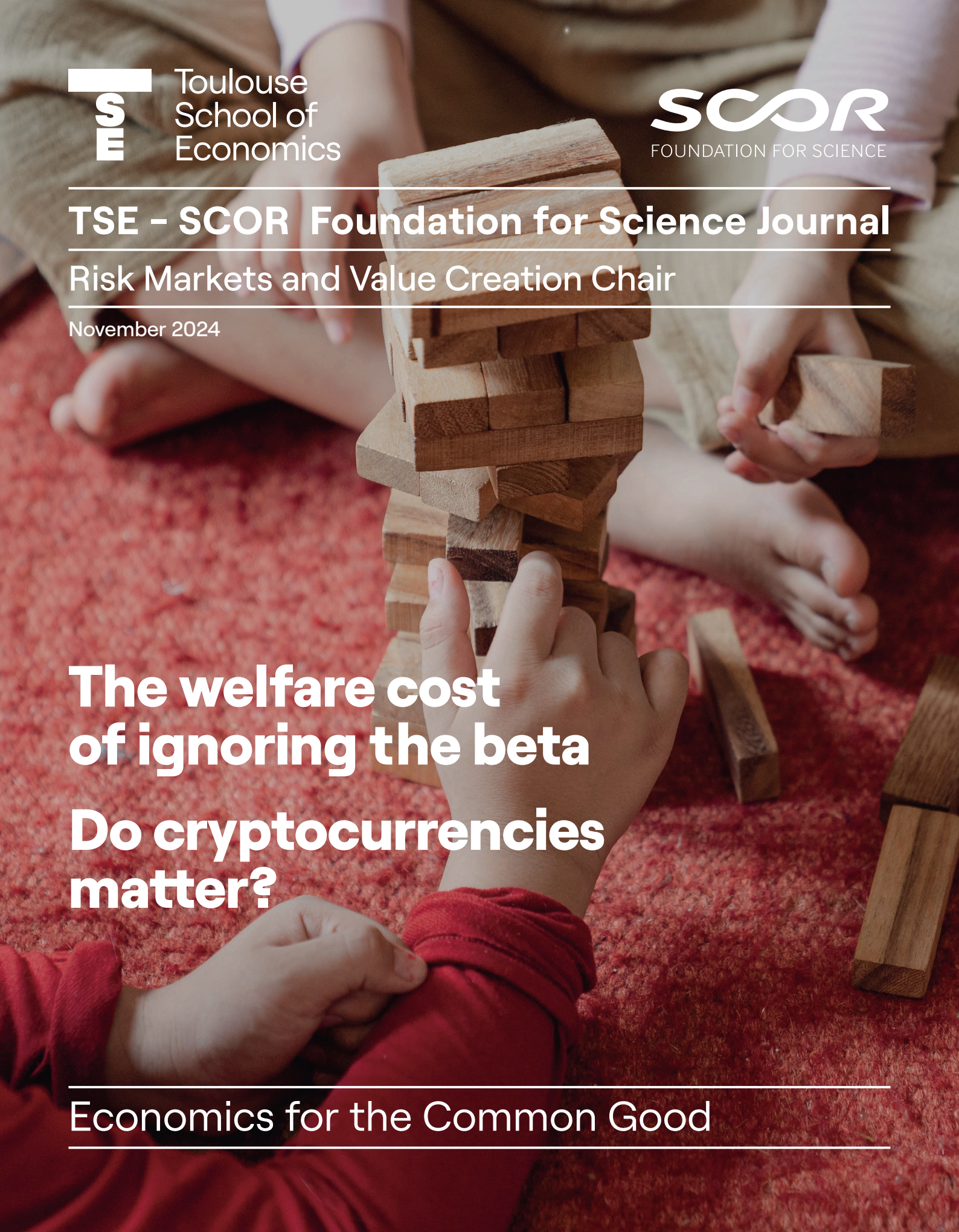

Toulouse School of Economics

SCOR FOUNDATION FOR SCIENCE

TSE - SCOR Foundation for Science Journal

Risk Markets and Value Creation Chair

November 2024

The welfare cost of ignoring the beta

Do cryptocurrencies matter?

Economics for the Common Good

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Insights and news from our Chair

Dear readers,

The global political landscape is in a state of constant flux, from France to the Middle East, Eastern Europe, and the USA. At the same time, climate change continues its relentless progression, joining the ranks of other looming crises that threaten to reshape the balance of the global economy.

Against this backdrop, research into managing risk and uncertainty, is more crucial than ever for sound decision-making by individuals, businesses, and policymakers. The Risk Markets and Value Creation Chair hosted at TSE with the support of the SCOR Foundation for Science aims to foster exactly this kind of research.

This new issue of our Chair's newsletter features two interviews. The first highlights the work of Christian Gollier on the welfare cost of ignoring the beta: Christian's research began with the observation that, in practice, most public institutions apply a discount rate that is relatively unresponsive to the risk profile of their investment projects. The second interview focuses on my work with Bruno Biais and Jean-Charles Rochet on the importance of cryptocurrencies and their use by economic agents, which I presented during a webinar organized by the SCOR team in September.

We also revisit the SCOR-EGRIE prizes awarded at the annual seminar of the European Group of Risk and Insurance Economists and highlight upcoming events organized by the Chair.

Stéphane Villeneuve,
Scientific Director, SCOR-TSE partnership

SAVE THE DATE:

January 2025: Workshop on Machine learning

March 20, 2025: Academic conference in tribute to Denis Kessler

Research highlights

The welfare cost of ignoring the beta

Christian Gollier

Christian is a professor of economics aand Director of TSE, overseeing its new role as directior of the "Grand Etablissement" since June 2023. His research spans the economics of uncertainty, environmental economics, finance, consumption, insurance, and cost-benefit analysis, with a particular focus on long-term sustainability.

How should we weigh up the costs and benefits of public policies? Most economists believe that discount rates should reflect a project's contribution to the aggregate risk faced by society. Yet most countries stubbornly refuse to adopt risk-sensitive evaluation of their investments. In a new working paper supported by the SCOR Risk Markets and Value Creation Chair, TSE director Christian Gollier calculates the eye-watering inefficiencies of this short-sighted practice.

What is the social discount rate and why is it important?

The social discount rate is a measure of the relative importance of consequences that occur at different points in time. By putting a present value on the future costs and benefits of projects such as schools, hospitals or solar power subsidies, it allows policymakers to allocate limited resources according to the merits of each initiative. Although this is a widely accepted tool for evaluating investment projects and public policies, there is still much controversy about which discount rate should be used in practice, particularly for the distant future.

Economics cannot provide a complete answer to this question, which involves deep ethical issues. However, the emergence of major challenges to the sustainability of our societies – from climate change and biodiversity to pension-fund liabilities and the reduction of public debt – has put pressure on economists to guide and inform humanity in its choices about how to value long-run costs and benefits. These choices can have huge implications. The present value of $1 million received in 200 years is equal to either $137,000 or $1 depending upon the use of a discount rate of 1% or of 7%, as suggested by different experts.

Why do we need to adjust discount rates for specific projects?

Because society is risk-averse, any sensible investment valuation system needs to account for a project's risk profile. Investing in a new hospital, for example, offers insurance value as the hospital will be most useful in the next health crisis, when the economy will suffer. Like other investments which reduce risk – such as earthquake-resistant construction norms, strategic petroleum reserves, or supplies for the next pandemic – the hospital project should therefore have a discount rate that is lower than the interest rate.

> **Building a railway line exacerbates macroeconomic volatility because its greatest benefits will be felt during the next boom, and its smallest benefits in a recession**

In contrast, building a railway line exacerbates macroeconomic volatility because its greatest benefits will be felt during the next boom, and its smallest benefits in a recession. The discount rate for evaluating pro-cyclical investments such as energy or transport projects, especially those that depend on future tax revenues, should therefore include a positive risk premium. The large market risk premium observed over the past century adds support to the idea that risk adjustment should play a crucial role in investment evaluation.

In a 2023 survey, my coauthors and I find that more than 75% of professional economists agree that discount rates should be adjusted to a project's consumption beta, which measures its contribution to the aggregate risk. The Consumption-based Capital Asset Pricing Model (CCAPM) provides a theoretical framework for doing so.

15%

If all agents use the same inefficient discounting system with a single discount rate equaling their average cost of capital, the welfare loss is around 15% of global wealth

Why do most countries use a single discount rate?

France is currently the only country in which public investments must be evaluated using a discount rate that is sensitive to the project's risk profile. While Norway and the Netherlands have experimented with a simplified CCAPM, all other countries that have published discounting guidelines use a single discount rate that fails to account for risk, aversion to risk, and hedging possibilities. As I noted in my 2023 paper with Frédéric Cherbonnier, this means that no insurance value is recognized for policies that hedge the macroeconomic risk. Symmetrically, no penalty is imposed to policies involving benefits that mostly materialize in good times.

The dogma of a single discount rate for the public sector has long been supported using the Arrow-Lind theorem (1970), which argues that "the government invests in a greater number of diverse projects and is able to pool risks to a much greater extent than private investors", thereby washing out risk completely. This claim has often been used to argue that all public investment projects should be discounted at the risk-free interest rate. But, as widely recognized by economists, it is valid only for projects with a zero CCAPM beta. Because a vast majority of projects have a positive beta, using a risk-free rate implies that projects with a positive net present value (NPV) will exceed the capacity of public funding, forcing governments to impose capital rationing on top of the valuation process.

One of the most puzzling features of the debate on the public discount rate is its reliance on the Ramsey rule (1928). Adjusted for the uncertainty affecting economic growth, this rule provides the right basis to estimate the rate at which risk-free benefits and costs should be discounted. However, using it to recommend an all-purpose discount rate is highly dangerous and undermines constructive debate about how to value the future. The continuing stalemate over the social cost of carbon is a vivid illustration of our collective inability to transform consensual asset pricing theory into practical evaluation rules. From climate disasters to pandemics, this has led to a catastrophic undervaluation of policies that protect society.

What does your paper reveal about the social cost of this failure?

My modelling suggests that the economic consequences of the implied misallocation of capital are severe. I first measure the welfare loss incurred by an isolated agent who uses a single discount rate to value assets and determine portfolio choices. If this agent uses the average cost of capital prevailing in the rational equilibrium as the unique discount rate to value all projects, the welfare loss is equivalent to an immediate reduction of this agent's wealth by 27%. If all agents use the same inefficient discounting system with a single discount rate equaling their average cost of capital, the welfare loss is around 15% of global wealth.

If all agents use the equilibrium interest rate as their single discount rate, capital rationing is required. With a scheme that only implements 60% of projects with a positive NPV, the welfare loss is then equivalent to a 45% drop in initial global wealth compared to the optimal discounting system. This is a reminder of the importance of capital allocation in generating collective prosperity.

Does the private sector use more efficient rules?

Standard textbooks in finance strongly recommend the CCAPM rule to evaluate investment projects and most CFOs claim to use it. However, there is ample evidence that the CCAPM pricing rule is only partially able to explain observed asset prices. The Security Market Line – which links expected returns to betas – is too flat. This generates a problem similar to the one observed in the public sector, with undervalued low-beta projects and overvalued large-beta projects. Another common misunderstanding is that an institution can use its weighted average cost of capital (WACC) as a single discount rate to reliably evaluate its investment opportunities. This "WACC fallacy" is the private-sector version of the misinterpretation of the Arrow-Lind theorem.

KEY TAKEWAYS

- ***Failure to adjust discount rates to a project's risk profile generates huge inefficiencies, with potentially catastrophic consequences for society.***
- ***The welfare loss of using a single discount rate is equivalent to a permanent reduction in consumption of between 15% and 45%. This reminds us of the importance of the allocation of capital for our collective prosperity.***

FURTHER READING

'The welfare cost of ignoring the beta' and other publications by Christian, including 'Risk-adjusted social discount rates', are available to read on his TSE webpage. For research conducted as part of the TSE-SCOR initiative, see the partnership's dedicated web page.

Do cryptocurrencies matter?

Stéphane Villeneuve

Stéphane is a professor of applied mathematics at TSE. His research centers on stochastic methods in finance, with a particular emphasis on applications in dynamic contracting. He also leads the Risk Markets and Value Creation Chair, sponsored by the SCOR Foundation for Science under the aegis of The Risk Foundation.

How can society benefit from cryptocurrency? Since 2008, the SCOR Risk Markets and Value Creation Chair has helped to expand TSE research on sustainable finance, including cutting-edge analysis of the impact of new financial technologies on social welfare. As part of a TSE-HEC collaboration backed by the French prudential regulator (ACPR), a new working paper examines whether digital innovation can realize Friedrich Hayek's vision of denationalized money.

In which contexts are cryptocurrencies likely to be most useful?

Despite the hype about cryptocurrencies since the launch of Bitcoin in 2009, a genuine revolution in the way people access and control their money has not materialized. Backed by trusted banking institutions and a legal obligation to accept them as a mean of payment, traditional currencies such as the dollar or the euro are generally preferred to cryptocurrencies which suffer from high transaction fees, slow validation processes and substantial volatility.

However, when monetary and financial institutions are dysfunctional, digital assets may provide protection against predatory governments, hyperinflation and high political risk. This may be why ownership and use of cryptocurrencies is very high in countries like Argentina, Egypt, Lebanon, Nigeria, Turkey and Venezuela. In such countries, cryptocurrencies can be seen as a lifeline, as a more reliable store of value than the depreciating official currency.

Why is Friedrich Hayek an inspiration for this research?

High inflation is often blamed on governments that rely on printing money to fund unsustainably high public spending. In particular, researchers have identified excessive money creation as a key causal mechanism for hyperinflation in interwar Europe and in Venezuela. In his 1976 essay entitled "Denationalisation of Money", Hayek argued that these problems could be avoided with "the replacement of the government monopoly of money by competition in currency supplied by private issuers who, to preserve public confidence, will limit the quantity of their paper issue and thus maintain its value".

When monetary and financial institutions are dysfunctional, digital assets may provide protection against predatory governments, hyperinflation and high political risk

Cryptocurrencies are an interesting laboratory to test Hayek's proposition. They offer a privately supplied means of payment and store of value. They also rely on a blockchain protocol which is quite difficult to change, allowing for a credible commitment to a predetermined issuance rate which helps maintain the cyptocurrency's value.

The goal of our paper is to examine whether cryptocurrencies can fulfill the role of denationalized currencies. Can cryptocurrencies be used by private agents when the value of public currencies is undermined by non-benevolent governments' policies? Can competition from cryptocurrencies discipline non-benevolent governments' monetary and fiscal policies?

> Cryptocurrencies have been attracting a lot of attention in recent years. The recent surge in inflation has drawn investors' attention to the protection that cryptocurrencies could offer them. Moreover, the recent decision of the Securities and Exchange Commission (SEC) - the U.S. regulatory authority overseeing securities markets, to allow cryptos such as the bitcoin to be used as an investment asset within Exchange Traded Funds and trackers has greatly boosted demand for cryptos. But what is rational and understandable about cryptocurrency investment? Is it purely speculative or could it be a true diversifying investment in the long term? These are strategic questions, often tied to stress testing in financial decision-making.

Philippe Trainar

Director, SCOR Foundation for Science

How do you conduct your analysis?

We rely on a simple theoretical model, featuring agents who operate technologies that share some of the main characteristics of cryptocurrencies. The pace of cryptocurrency monetary creation is set in advance by the protocol of the blockchain on which ownership of the cryptocurrency is registered. This shields the cryptocurrency from the excessive inflation risk plaguing the official currency issued by the government. Cryptocurrency is not easily taxed by the government but it is risky and may crash.

With production technologies that are subject to random productivity shocks, the agents value the opportunity to hold a safe asset. This is why money is valuable in our setting, despite having no intrinsic value. In this context, agents decide how much to invest in the risky "crypto" asset and the safe "fiat money" asset. The government chooses how much money to issue, how much agents' wealth should be taxed, as well as the level of public spending. Its budget constraint is that public spending is funded by the combined revenue from seignorage and the wealth tax.

What are your main findings and their implications?

As a benchmark, we first consider the case in which there is no cryptocurrency, leaving the government with monopoly power on the issuance of money. In this context, a non-benevolent government will run an expansionary monetary policy to extract rents from agents using seignorage. This leads to hyperinflation, as agents are unwilling to hold the public currency.

> **Many countries, governments and central banks oppose the development of cryptocurrencies that compete with the existing national currency**

However, when the official currency faces competition from a cryptocurrency, the non-benevolent government is obliged to follow a more restrained monetary policy. If it allows runaway inflation of the public currency, agents will switch to the cryptocurrency. Thus, the presence of the cryptocurrency effectively caps inflation, raising agents' welfare by reducing their risk exposure. This result lends support to Hayek's advocacy for the denationalization of money.

If governments are benevolent, they will avoid pursuing an inflationary policy. Competition from a cryptocurrency then has no impact, as agents will prefer to hold the public currency.

Our findings rationalize the widespread empirical evidence that many countries, governments and central banks oppose the development of cryptocurrencies that compete with the existing national currency. Our paper also offers an explanation for why ownership of cryptocurrencies is greater in countries where high inflation is caused by the dysfunctionality of governments and central banks.

KEY TAKEWAYS

- ***Without a cryptocurrency, predatory governments use monetary policy to extract rents from agents. This leads to hyperinflation.***
- ***A competing cryptocurrency can prevent greedy governments from ramping up inflation. If they do, agents will abandon the public currency.***
- ***However, cryptocurrency is useless if the government is benevolent as it will avoid inflationary policies.***

FURTHER READING

Publications by these researchers are available to view on the TSE website. For research conducted as part of the TSE-SCOR initiative, see the partnership's dedicated web page.

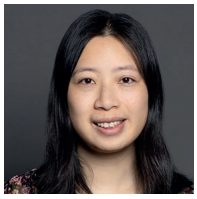
Prizes and scientific contributions

Prizes

Two prizes were awarded during the annual seminar of EGRIE (European Group of Risk and Insurance Economists) on September 15-18, at the Universität Hamburg (Germany).

These prizes were organized under the supervision of the Risk Markets and Value Creation Chair at TSE-P and Dauphine University, and they were sponsored by SCOR and the Fondation du Risque.

SCOR-EGRIE Young Economist Best Paper Award



Yaming Cao

Congratulations to **Yaming Cao** (The ZEW - Leibniz Centre for European Economic Research) who received the SCOR-EGRIE Young Economist Award for her paper: "Earnings dynamics and selection in health insurance markets".

The members of the selection committee for the SCOR-EGRIE Young Economist Best Paper Award were Stéphane Villeneuve, Bertrand Villeneuve, Philippe Trainar, Christophe Courbage, and Elyès Jouini.

SCOR–The Geneva Risk and Insurance Review Best Paper Award

Johannes G. Jaspersen

Richard Peter

Marc A. Ragin

Congratulations to **Johannes G. Jaspersen** (Munich School of Management of LMU Munich), **Richard Peter** (University of Iowa), and **Marc A. Ragin** (University of Georgia) who are the 2024 laureates for their paper: Probability weighting and insurance demand in a unified framework

The selection committee for the SCOR-Geneva Risk and Insurance Review Best Paper Award was composed of the editors and associate editors of *Geneva Risk and Insurance Review*.

Working papers

- **Louise Guillouet et David Martimort**, "Acting in the Darkness: Towards some Foundations for the Precautionary Principle", TSE Working Paper, n° 23-1411, february 2023, revised Juilly 2024.
- **Helmuth Cremer et Jean-Marie Lozachmeur**, "Nonlinear reimbursement rules for preventive and curative medical care" TSE Working Paper, n° 24-1527, 2024, revised June 2024.
- **Jean-Paul Décamps, Thomas Mariotti et Fabien Gensbittel,** "Mixed Markov-Perfect Equilibria in the Continuous-Time War of Attrition", TSE Working Paper, n° 24-1562, August 2024.

Toulouse School of Economics

Economics for the Common Good

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Toulouse School of Economics
1, Esplanade de l'Université
31080 Toulouse Cedex 06
Tel: +33 (0)5 67 73 27 68
www.tse-fr.eu
partnership@tse-fr.eu

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