Fox School of Business

Conference in honor of J. David Cummins and Mary Weiss
2 and 3 April 2022

Hosted by Department of Risk, Actuarial Science and Legal Studies
Fox School of Business
Temple University

Scientific program

Scientific Committee

Patricia Born, Florida State University (co-chair)
Georges Dionne, HEC Montréal (co-chair)
Martin Grace, Temple University
Scott Harrington, University of Pennsylvania
Robert Hoyt, University of Georgia
Richard D. Phillips, Georgia State University
Sharon Tennyson, Cornell University

2 April 2022

8:45   *Welcome to the conference*
           Patricia Born and a host from Temple University

9:00   *Session 1 – Theory*
           Moderator: Georges Dionne

Thistle, P., Rothschild, C.	Supply, demand and selection in insurance markets: Theory and applications in pictures
Heinzel, C., Peter, R.	Precautionary motives with multiple instruments
Moening, T.	It's RILA time: An introduction to Registered Index-Linked Annuities

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10:30 *Break*

11:00 *Session 2 – Catastrophe Insurance I*
           Moderator: Patricia Born

Collier, B.L., Huber, T., Jaspersen, J.G., Richter, A.	How do households respond to social program reforms? Evidence from the U.S. National Flood Insurance Program
del Valle, A.	Saving lives with pre-arranged disaster aid: Evidence from Mexico
Medders, L., Schwarcz, S.	Securitizing pandemic risk insurance

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12:30 *Lunch*

13:30 *Session 3 – Efficiency in insurance supply*
           Moderator: Martin Grace

Fang, H.	Mutual risk sharing and Fintech: The case of Xiang Hu Bao
Kyeonghee, K., Leverty, T.	Product standardization and firm efficiency: The case of life insurers
Rubio Misas, M.	Analysis of insurers' performance using frontier efficiency and productivity methods. Contributions by David Cummins and Mary Weiss

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15:00 *Break*

15:30 *Session 4 – Statistical analysis*
           Moderator: Greg Nini

Grace, M.	Loss ratio dynamics
Makariou, D.	The multivariate Poisson-generalized inverse gaussian claim count regression model with varying dispersion and shape
Browne, M.J., Hoyt, R.	Excess returns and the underwriting cycle: A long-term view

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18:00 *Conference dinner*

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3 April 2022

9:00	*Session 5 – Insurance regulation* Moderator: Jan Ambrose	
	Richman, B., Tennyson, S.	The effects of state legal environments on automobile insurance costs and compensation: Evidence from the Royal Globe Doctrine
	Browne, M.J., Pooser, D.	The influence of political power on customer satisfaction in auto insurance
	Hilliard, J., Kleffner, A., Regan, L.	Contingent commissions after Spitzer: Agency conflicts and underwriting performance
	Chen, H.	Reconciling mortality forecasts with EVT errors: An application to solvency capital requirement

| 11:00 | *Break* |

11:30	*Session 6 – Catastrophe Insurance II* Moderator: Greg Niehaus	
	Zanjani, G.	The ignorance of crowds: Understanding loss reserving errors in the liability catastrophe of 1997-2001
	Dionne, G. Desjardins, D.	A re-examination of U.S. insurance market capacity to pay catastrophe losses

| 12:30 | *End of the conference* |

Abstracts of papers

Supply, demand and selection in insurance markets: Theory and applications in pictures

Thistle, P., University of Nevada Las Vegas, Rothschild, C., Wellesley College

This paper shows that the supply and demand approach of Einav, Finkelstein and Cullen (2010; EFC) can be extended to analyze a wide range of selection markets and can be applied to analyze policy problems in those markets. We describe how to extend the EFC model to markets with moral hazard and selection thereon, to markets non-exclusive contracting, and to markets with multiple, competitively priced coverage tiers. We show that, in markets with selection on moral hazard, two natural notations of "adverse selection" that coincide in the basic EFC framework may diverge. In a two-tier market, we demonstrate that the welfare effects of coverage mandates or subsidies depend critically on whether the coverage tiers are "layered" or not.

Precautionary motives with multiple instruments

Heinzel, C., INRAE, Peter, R., University of Iowa

Using a unified approach, we show how precautionary saving, self-protection and selfinsurance are jointly determined by risk preferences and the preference over the timing of uncertainty resolution. We cover higher-order risk effects and examine both risk averters and risk lovers. When decision-makers use several instruments simultaneously to respond to income risk, substitutive interaction effects arise. We quantify precautionary and substitution effects numerically and discuss the role of instrument interaction for the inference of preference parameters from precautionary motives. Instruments can differ substantially in the size of the precautionary motive and in the susceptibility to substitution effects. This affects their suitability for the identification of precautionary preferences.

It's RILA time: An introduction to Registered Index-Linked Annuities

Moening, T., Temple University

Registered index-linked annuities (RILAs) are increasingly popular equity-based retirement savings products offered by U.S. life insurance companies. They combine features of fixed-index annuities and traditional variable annuities (TVAs), offering investors equity exposure with downside protection in a tax-deferred setting. This article introduces RILAs to the academic literature by describing the products' key features, developing a general pricing model, and deriving the providers' hedging strategy by decomposing their liabilities into short-term European options. Numerical illustrations show that RILAs offer investors similar risk profiles (in the long run) as TVAs with maturity guarantees, and that many products currently sold appear to be priced quite favorably for investors. For providers, RILAs may be a preferable alternative or complement to TVAs as they greatly simplify the management of the embedded equity risk and can naturally reduce the TVA capital requirements. These features position RILAs as a viable long-term solution for this product space.

How do households respond to social program reforms? Evidence from the U.S. National Flood Insurance Program

Collier, B.L., Temple University, Huber, T., Ludwig-Maximilians-Universität München, Jaspersen, J.G., Ludwig-Maximilians-Universität München, Richter, A., Ludwig-Maximilians-Universität München

How households will respond to reforms of public insurance programs is unclear given recent behavioral findings on consumers' insurance choices. We examine the insurance decisions of an extremely vulnerable group in the U.S. National Flood Insurance Program. Severe repetitive loss (SRL) properties account for only 1% of policies but 25–30% of flood claims. Congress passed a reform that phases out the premium subsidies offered to this group over several years such that their premiums will eventually equal their contract's actuarially fair rate. We measure the effect of the reform using difference-in-differences estimation on a panel of over two million policy-year observations. We find that about one fourth of SRL property owners decided to stop insuring in response to the reform. The reform did not meaningfully affect the coverage limit choices of households that continued to insure. Curiously, the observed effect on nonrenewal begins after the law was ratified but before it was implemented. Our findings thus seem in contrast to canonical and most common behavioral theories of insurance demand. We discuss potential alternative decision-making explanations of our results and are able to rule out some of them. Our findings add to research on public policy design and behavioral insights into insurance demand.

Saving lives with pre-arranged disaster aid: Evidence from Mexico

del Valle, A. Georgia State University

Developing economies are not disproportionately exposed to natural disasters, but they experience significantly more deaths. Exploiting a discontinuity in the eligibility rules to Mexico's pre-arranged disaster fund (Fonden), I show that accelerated reconstruction of public infrastructure can fully reduce postdisaster excess mortality in the short-run and up to 75 percent two years after. Fonden's impact is concentrated in areas with medical infrastructure and among conditions responsive to basic and freely available medical care. These findings suggest that Fonden operates by restoring access to health services. I also show that Fonden is cost-effective, and its benefit-cost ratio is at least 4.9.

Securitizing pandemic risk insurance

Medders, L., Appalachian State University, Schwarcz, S., Duke University

The utilization of catastrophe bonds (CAT bonds) as an instrument for securitizing and sharing the economic risks of disasters is not a new idea. Indeed, CAT bonds have been employed for several years for sharing the economic losses resulting from natural disasters including hurricanes, earthquakes, and—more recently, as used by the World Bank—pandemics. The World Bank's attempt to utilize CAT bonds as a public-private partnership to fight pandemic losses became heavily criticized by many academics and policy makers (Insurance Journal, 2020), however, because the amount was too small and the funds were utilized too late to stop the COVID-19 pandemic. Furthermore, because the World-Bank-sponsored pandemic CAT bonds were subsidized by government donations and, absent the occurrence of covered pandemics, were full recourse to the World Bank, this precedent was not market tested and thus provides insufficient applicable insights regarding the commercial viability of such instruments.

This paper examines CAT bonds and other means of risk securitization for pandemics through the dual lenses of the unmet need within the market for risk financing and the requirements for potential viability of a market for pandemic bonds. Unmet capital needs do exist within the risk-financing marketplace – not only for risk capital to protect against pandemic losses but also for the capital to protect against a wide range of disaster losses. Insurance and reinsurance have limited capacity to either absorb or spread the risks of global-level catastrophes, and risk-securitization instruments have proven effective in some cases for layered risk sharing with private and public insurance markets. Having said this, we argue that pandemic exposures can be made insurable by focusing on insuring those pandemics occurring accidentally/ unintentionally, and by increasing reinsurance capacity to handle the associated losses.

Mutual Risk Sharing and Fintech: The Case of Xiang Hu Bao

Fang, H., University of Pennsylvania

Xiang Hu Bao (XHB), meaning 'mutual treasure' in Chinese, is a novel online mutual aid platform operated by Alibaba's Ant Financial to facilitate mutual sharing of critical illness risks. XHB reached nearly 100 million members in less than one year since its launch and so far has offered its members critical illness protections at significantly lower cost than traditional critical illness insurance. There are three major distinctions between XHB and traditional insurance products. First, XHB leverages the tech giant's platform and digital technology to lower enrollment and claim processing costs. Second, different from insurance applying sophisticated actuarial pricing models, XHB collects no premiums ex ante from members, but instead equally allocates indemnities and administrative costs among participants during each claims period. Third, XHB limits coverage amount, often below that offered by critical illness insurance products, particularly for older participants. We show this restriction potentially leads to separating equilibrium, à la Rothschild-Stiglitz, where low-risk individuals enroll in XHB while high-risk individuals purchase the traditional critical illness insurance. Data shows that the incidence rate of the covered illnesses among XHB members is well below that of comparable critical illness insurance. Our findings further suggest the role of advantageous selection in explaining the cost advantages of the Fintech-based mutual aid programs.

Product standardization and firm efficiency: The case of life insurers

Kyeonghee, K., Florida State University, Leverty, T. University of Wisconsin-Madison

We examine the effect of a regulatory effort to standardize the filing and review process of financial products. The U.S. life insurance industry is regulated at the state level, and, as such, insurers must file their products for review and approval in each state they do business. An interstate agreement across state regulators in the industry, the Insurance Compact, streamlines the product filing and reviewing process with a uniform product standard. We investigate the effect of the Compact on insurer efficiency. We identify the impact of the Compact on firm efficiency by exploiting the staggered adoption dates of the Compact across states and product lines. Preliminary results indicate that the Compact significantly improved insurer efficiency.

Analysis of insurers' performance using frontier efficiency and productivity methods. Contributions by David Cummins and Mary Weiss

Rubio Misas, M., Universidad de Málaga

This article provides an in-depth analysis of the great contributions by J. David Cummins and Mary A. Weiss to research on insurers' performance using frontier efficiency and productivity methods. It surveys 29 empirical papers and a book chapter that gives foundations and a guide in using methodology and defining outputs and inputs. They have used both econometric and non-parametric approaches to estimate frontiers in these analyses, the Data Envelopment Analysis (DEA) being the most frequently used method. In order to define outputs and inputs, they normally use a modified version of the value-added approach. The majority of their studies focus on the U.S, but they have also conducted analyses on other countries (Germany, Italy and Spain) as well as on inter-country samples (mainly European countries but also Islamic countries). I have grouped their empirical papers in this strand of literature into 11 different application areas, where I have discussed the main analyzed issues and/or hypotheses tested as well as the principal findings. Their contributions to this field have received great attention in literature to the point that the leading paper in almost all of these application areas is one conducted by Cummins and/or Weiss.

Loss ratio dynamics

Grace, M., Temple University

Most studies of the insurance profit cycle use industry-level annual data and focus on the existence of an AR(2) process. We take a different approach by adopting the idea of possible hard and soft markets, but that they are not necessarily cyclical in the classic sense. In addition to aggregated data, we use quarterly firm-level data to examine loss ratio behavior over time. This approach allows one to assess the degree of firm-level heterogeneity found in the insurance market. We further use a Markov switching model to assess the heterogeneity of response to economic variables. Using a K-means cluster approach, we examine the different clusters of firms and their different behavior over 2001q1-2020q4.

The multivariate Poisson-generalized inverse gaussian claim count regression model with varying dispersion and shape

Makariou, D., London School of Economics and Political Science

We introduce a multivariate Poisson-Generalized Inverse Gaussian regression model with varying dispersion and shape for modelling different types of claims and their associated counts in non-life insurance. The multivariate Poisson-Generalized Inverse Gaussian regression model is a general class of models which, under the approach adopted herein, allows us to account for overdispersion and positive correlation between the claim count responses in a flexible manner. For expository purposes, we consider the bivariate Poisson-Generalized Inverse Gaussian with regression structures on the mean, dispersion, and shape parameters. The model's implementation is demonstrated by using bodily injury and property damage claim count data from a European motor insurer. The parameters of the model are estimated via the Expectation-Maximization algorithm which is computationally tractable and is shown to have a satisfactory performance.

Excess returns and the underwriting cycle: A long-term view

Browne, M.J., St. John's University, Hoyt, R., University of Georgia

This is a write-up of the initial attempt to replicate and extend the results of the original paper by Browne and Hoyt (1992), which appeared in The Journal of Insurance Regulation (Vol. 11), under the above-mentioned title. The purpose of this document is to assess the accuracy of data and methodology through comparison to the original results, to extend the sample period, and to interpret the empiric results. A preliminary literature review of the underwriting cycle and related literature is also included.

The effects of state legal environments on automobile insurance costs and compensation: Evidence from the Royal Globe Doctrine

Richman, B., Gibson, Dunn & Crutcher LLP, Tennyson, S., Cornell University

The historic 1979 California Supreme Court decision in Royal Globe Insurance Company v. Superior Court unexpectedly extended insurer's good faith duty to settle liability claims to the injured third party claimant, expanding the set of eligible plaintiffs to those with the greatest incentive to sue. Theory predicts two competing effects of this expansion: an increase in insurers' incentives to pay legitimate claims, and a corresponding decrease in insurers' incentives to investigate potentially fraudulent claims. Using data on automobile bodily injury liability claims, we make use of the quasi-experimental nature of this decision to examine the relative importance of these two effects. Estimates indicate a significant increase in compensation amounts but little evidence of an increase in fraud indications or a decrease in insurers' fraud monitoring, among paid claims. Significant differences in treatment effects are found for claims of different characters, with claims without fraud suspicion indicators receiving more beneficial treatment under the expanded duty to settle.

The influence of political power on customer satisfaction in auto insurance

Browne, M.J., St. John's University, Pooser, D., St. John's University

We match individuals' automobile insurance customer satisfaction ratings with demographic, socioeconomic, insurance experience, and state regulatory data in order to examine whether majority groups within a state can exert political power to shift insurance costs to minority groups. We measure majority and minority groups using self-reported racial data and proxy for cost shifting using a price satisfaction rating. Our findings indicate that the majority group is more satisfied in states with elected insurance supervisors and prior approval rating laws, which we believe supports the notion that the majority benefits when it can exert political power. Minority groups exhibit greater satisfaction in states with an appointed supervisor and non-prior approval rating – factors associated with less influence from political decisions.

Contingent commissions after Spitzer: Agency conflicts and underwriting performance

Hilliard, J., Temple University, Kleffner, A., University of Calgary, Regan, L., Temple University

Investigations into insurance compensation practices have drawn attention to the potential conflicts of interest that may be associated with payment of contingent commissions to insurance agents and brokers. However, despite the possible conflicts of interest, contingent commissions have also been recognized as a way to better align agent and insurer incentives. If effective, then contingent commissions should result in better underwriting performance. We investigate whether contingent commissions are associated with improved insurer underwriting performance. We estimate the determinants of contingent commission payments, as well as the relationship between the proportion of contingent commissions paid and underwriting performance. Underwriting performance is proxied by the loss ratio, the combined ratio, and underwriting return on equity. For the period 1996 through 2015, we find a statistically significant relationship between the use of contingent commissions and underwriting performance.

Reconciling mortality forecasts with EVT errors: An application to solvency capital requirement

Chen, H., University of Hawaii at Manoa

In this paper, we propose a new framework to coherently produce probabilistic mortality forecasts by exploiting techniques in extreme value theory (EVT) and forecast reconciliation. We take advantage of U.S. monthly death counts data during the period of 1968{2019 to explore the seasonality and the age-gender dependence structure of mortality. Our results indicate that incorporating EVT and forecast reconciliation greatly improves the overall mortality forecast accuracy, which has important implications for life insurers in terms of rate making, reserve setting, and capital adequacy compliance. Using the solvency capital requirement (SCR) under Solvency II as an example, we show that the SCR calculated by our approach is much higher than those calculated by alternative models, suggesting that failing to account for extreme mortality risk and mortality dependence can result in significant underfunded problems for life insurers.

The Ignorance of Crowds: Understanding Loss Reserving Errors in the Liability Catastrophe of 1997-2001

Zanjani, G., University of Alabama

We estimate first-report company-level ultimate loss ratios by accident year and line using Chain Ladder and Bornhuetter-Ferguson techniques. We find that posted first report loss ratios track closely with Bornhuetter-Ferguson estimates, and that these estimates are more precise than Chain Ladder estimates at the company level. However, when the estimates are rolled up to the industry level, the Chain Ladder rollups are significantly more accurate than both the Bornhuetter-Ferguson rollups and the rollups of the results actually posted. We interpret this as an application of the "ignorance of crowds," driven in this case by the reliance of companies on reserving methods that are essentially Bayesian updates keyed to highly correlated priors.

A re-examination of U.S. insurance market capacity to pay catastrophe losses

Dionne, G., HEC Montréal, Desjardins, D., HEC Montréal

Cummins, Doherty and Lo (2002) presents a theoretical and empirical analysis of the capacity of the US property–liability insurance industry to finance catastrophic losses in the $100 billion range. In their theoretical analysis, they show that the sufficient condition for capacity maximization is for all insurers to hold a net of reinsurance underwriting portfolio which is perfectly correlated with aggregate industry losses. Estimating capacity with insurers financial statement data, they find that the U. S. insurance industry could appropriately fund a $100 billion event. As a matter of comparison, the recent hurricane Ida will cost between 20 to 30 billion to the insurance industry. However, such events may cause numerous insolvencies and severely destabilize insurance markets. According to the authors, the prospect of a mega-catastrophe brings the real threat of insurer failures and unpaid claims. Moreover, surviving insurers may have to reduce the future sale of property–liability insurance causing price increases and availability problems. Some insurers may even leave the market. Our main objective is to update this study with new data available until the end of 2020. We also want to better integrate the role of reinsurers in the analysis and to consider the dynamics of losses over time.