

**North Carolina**  
**Dwelling Insurance - Extended Coverage**  
**Calculation of Ratio of GAAP Net Worth to Statutory Surplus**

	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
<b>Policyholder Surplus</b>	587,061,063,988	653,380,281,255	675,233,591,461	674,150,481,028	700,833,588,840
<b>+ Deferred Acquisition Costs</b>	28,717,782,350	30,010,149,317	31,242,614,928	32,401,590,297	33,046,102,666
<b>+ Non-Admitted DTA Provision</b>	12,829,214,564	11,638,345,594	11,237,499,832	12,112,807,244	11,544,280,333
<b>+ Non-admitted Assets (non-tax part)</b>	36,238,971,886	33,348,888,924	33,563,586,431	40,260,421,135	43,722,898,341
<b>+ Provision for Reinsurance</b>	2,595,871,371	2,471,928,096	2,392,301,235	2,251,585,712	2,185,395,913
<b>+ Provision for FASB 115(after-tax)</b>	42,220,449,087	14,722,750,582	25,814,318,855	16,081,984,811	10,015,172,605
<b>- Surplus Notes</b>	(12,279,333,642)	(12,190,299,603)	(11,673,768,635)	(12,446,044,946)	(12,027,889,160)
<b>GAAP-adjusted Net Worth</b>	697,384,019,604	733,382,044,165	767,810,144,106	764,812,825,281	789,319,549,538
<b>Ratio of Net Worth to Surplus</b>	1.19	1.12	1.14	1.13	1.13
<b>Five Year Average</b>	1.14				

Source: ISO

## Sample of Findings on the Private Company Discount

Study	Years	Discount	Type
Emory (1994)	1992-1993	45%	IPO
Willamette Management Associates (various)	1975-1997	29% to 60%	IPO
Garland and Reilly (2004)	1998-2002	35%	IPO
Larcker et al. (2018)	2017	39% to 47%	IPO
Koeplin et al. (2000)	1984-1998	20% to 30%	Acquisitions
Block (2007)	1999-2006	20% to 25%	Acquisitions
Officer (2007)	1979-2003	15% to 30%	Acquisitions
Paglia and Harjoto (2010)	1993-2008	65% to 70%	Acquisitions
Jaffe et al. (2018)	1985-2014	0%	Acquisitions
Silber (1991)	1981-1988	34%	Restricted Stock
Johnson (1999)	1991-1995	20%	Restricted Stock
Bajaj et al. (2001)	1990-1995	7%	Private placements
Comment (2012)	2004-2010	5% to 6%	Private placements
Finnerty (2013)	1991-1997	21%	Private placements
Finnerty (2013)	1997-2007	15%	Private placements
Chen et al. (2015)	1999-2012	10%	Private placements

William L. Silber (1991), "Discounts on Restricted Stock: The Impact of Illiquidity on Stock Prices," *Financial Analyst Journal*, July-August 1991, 60-64.

John D. Emory, "The Value of Marketability as Illustrated in Initial Public Offerings of Common Stock-February 1992 through July 1993," *Business Valuation Review*, March 1994, 3-7.

BA Johnson (1999), "Quantitative Support for Discounts for Lack of Marketability" *Business Valuation Review* 16, 152-55.

John Koeplin, Atulya Sarin, Alan C. Shapiro (2000), "The Private Company Discount," *Journal of Applied Corporate Finance* 12, 94-101.

Mukesh Bajaj, David J. Denis, Stephen P Ferris, and Atulya Sarin (2001), "Firm Value and Marketability Discounts," *Journal of Corporation Law* 27, 89-115.

Garland, P.J., and Reilly, A.L. (2004), "Update on the Willamette Management Associates Pre-IPO Discount for Lack of Marketability Study for the Period 1998-2002," *Willamette Management Associates Insights*, Spring 2004, 38-44.

Block, S. (2007), "The Liquidity Discount in Valuing Privately Owned Companies," *Journal of Applied Finance* 17(2), 33-40.

Officer, M.S. (2007), "The Price of Corporate Liquidity: Acquisition Discounts for Unlisted Targets," *Journal of Financial Economics* 83(3), 571-598.

John K. Paglia and Maretno Harjoto (2010), "The Discount for Lack of Marketability in Private Companies: A Multiples Approach," *Journal of Business Valuation and Economic Loss Analysis* 5(1), Article 5.

Robert Comment (2012), "Revisiting the Illiquidity Discount: A New (and Skeptical) Restricted Stock Study," *Journal of Applied Corporate Finance* 24, 80-91.

John D. Finnerty (2013), "The Impact of Stock Transfer Restrictions on the Private Placement Discount," *Financial Management* 42, 575-609.

Chen, Linda H., Edward A. Dyl, George J. Jiang, and Januj A. Juneja (2015), "Risk, Illiquidity, or Marketability: What Matters for the Discounts on Private Placements?" *Journal of Banking and Finance* 57, 41-50.

Jeffrey F. Jaffe, Jan Jindra, David J. Pedersen, and Torben Voetmann (2018), "Do Unlisted Targets Sell at Discounts?" *Journal of Financial and Quantitative Analysis*, forthcoming.

David F. Larcker, Brian Tayan, and Edward Watts (2018), "Cashing it In: Private Company Exchanges and Employee Sales Prior to IPO," *Stanford Closer Look Series*, CGRP-73

\* The Willamette research studies were unpublished but reported in [Business Valuation Discounts and Premiums](#), Chapter 5, by Shannon Pratt (New York: John Wiley & Sons, Inc., p. 85).

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### Education

**Ph.D.**, Economics, University of Chicago, 2000  
**ACAS**, Casualty Actuarial Society, 1994  
**A.B. / B.S.**, Economics and Biology, Stanford University, 1990

### Work Experience

#### **University of Alabama (Tuscaloosa, Alabama)**

**Professor of Finance and Frank Park Samford Chair of Insurance, 2017-**

#### **Georgia State University (Atlanta, Georgia)**

*AAMGA Distinguished Chair in Risk Management & Insurance, 2011-2017*  
*Associate Professor, 2008-2017*

#### **Nanyang Technological University (Singapore)**

*Visiting Senior Research Fellow, 2011-12, 2013-2014*

#### **Federal Reserve Bank of New York (New York, New York)**

*Senior Economist, 2006-2008*  
*Economist, 2000-2006*

#### **Fireman's Fund Insurance Companies (Novato, California)**

*Senior Actuarial Analyst, 1993-94*  
*Actuarial Analyst, 1991-1993*  
*Assistant Actuarial Analyst, 1990-1991*

### Publications: Refereed Scholarly

"Dynamic Capital Allocation with Irreversible Investments," (with Daniel Bauer, Shinichi Kamiya, and Xiaohu Ping), *Insurance: Mathematics and Economics* 85: 138-52, (2019)

"What Drives Tort Reform Legislation? Economics and Politics of the State Decisions to Restrict Liability Torts," (with Yiling Deng), *Journal of Risk & Insurance* 85: 959-991, (2018)

"Egalitarian Equivalent Capital Allocation," (with Shinichi Kamiya), *North American Actuarial Journal* 21: 382-96, (2017).

"The Marginal Cost of Risk, Risk Measures, and Capital Allocation," (with Daniel Bauer), *Management Science* 62: 1431-1457 (2016)

"Economic Analysis of Risk and Uncertainty Induced by Health Shocks: A Review and Extension," (with Tomas J. Philipson), in *Handbook of the Economics of Risk and Uncertainty*, Volume 1, Mark J. Machina and W. Kip Viscusi (eds.), North Holland: Elsevier (2014)

"Capital Allocation and Its Discontents," (with Daniel Bauer), in *Handbook of Insurance* (2<sup>nd</sup> edition), Georges Dionne (ed.), New York: Springer (2013)

"Financial Pricing of Insurance," (with Daniel Bauer and Richard D. Phillips), in *Handbook of Insurance* (2<sup>nd</sup> edition), Georges Dionne (ed.), New York: Springer (2013)

"Insurance Risk, Risk Measures, and Capital Allocation: Navigating a Copernican Shift," (with Michael R. Powers), *Annual Review of Financial Economics* 5: 201-223 (2013)

"Catastrophe Bonds, Reinsurance, and the Optimal Collateralization of Risk Transfer," (with Darius Lakdawalla), *Journal of Risk & Insurance* 79, pp. 449-76 (2012)

"An Economic Approach to Capital Allocation," *Journal of Risk and Insurance* 77, pp. 523-549 (2010) [Winner of Casualty Actuarial Society ARIA Award, 2010]

"Federal Financial Exposure to Catastrophic Risk," (with J. David Cummins and Michael Suher), in *Measuring and Managing Federal Financial Risk*, Deborah Lucas (ed.), Chicago: University of Chicago Press (2010)

"Public versus Private Underwriting of Catastrophe Risk: Lessons from the California Earthquake Authority," in *Risking House and Home: Disasters, Cities, Public Policy*, John M. Quigley and Larry A. Rosenthal (eds.), Berkeley: Berkeley Public Policy Press (2008)

"Regulation, Capital, and the Evolution of Organizational Form in U.S. Life Insurance," *American Economic Review* 97, pp. 973-983 (2007)

"Insurance, Self Protection, and the Economics of Terrorism," (with Darius Lakdawalla), *Journal of Public Economics* 89, pp. 1891-1905 (2005)

“Terrorism Insurance Policy and the Public Good,” (with Darius Lakdawalla), *St. John's Journal of Legal Commentary* 18, pp. 463-469 (2004)

“The Production and Regulation of Health Insurance: Limiting Opportunism in Proprietary and Non-Proprietary Organizations,” (with Tomas Philipson) in *Individual Decisions for Health*, Bjorn Lindgren (ed.), pp. 194-206, Routledge International Studies in Health Economics, Routledge: London (2003)

“Pricing and Capital Allocation in Catastrophe Insurance,” *Journal of Financial Economics* 65, pp. 283-305 (2002) [reprinted in *Insurance and Risk Management Volume I: Economics of Insurance Markets*, Gregory Niehaus (ed.), Northampton: Edward Elgar Publishing, (2008)]

### **Publications: Professional/Practitioner**

Book review of “Moral Hazard in Health Insurance,” *Journal of Economic Literature* 53, pp. 682-3 (2015).

“Microinsurance Lessons from History,” (with Rick Koven), *Microinsurance Learning and Knowledge (MILK)* (2013).

“Institutional Investors and Asset Allocations: Accounting and Regulation of Private Defined Benefit Pension Plans and Other Institutional Investors in the United States, Mexico, and Australia,” (with John Broadbent, Michael Palumbo, and Julio Santaella), *CGFS Publication No. 27, Working Group on Institutional Investors, Global Savings, and Asset Allocation* (2006)

“An Overview of Political Risk Insurance” (with Kausar Hamdani and Elise Liebers), *CGFS Publication No. 22, Working Group on Foreign Direct Investment in the Financial Sector of Emerging Market Economies* (2005)

### **Work in Progress**

“Market Discipline and Guaranty Funds in Life Insurance,” (with Martin Grace, Shinichi Kamiya, and Robert W. Klein), working paper, 2019.

“The Effect of Government Guarantees on Market Discipline in the Property-Casualty Insurance Industry,” (with Yiling Deng and Ty Leverty), working paper, 2019

“The Marginal Cost of Risk in a Multi-Period Model,” (with Daniel Bauer), working paper, 2019. [Winner of Casualty Actuarial Society Hachemeister Prize, 2015]

“An Integrated Approach to Measuring Asset and Liability Risks in Financial Institutions,” (with Daniel Bauer), working paper, 2019

“Optimal Insurance Contracts with Insurer Background Risk,” (with Xiaohu Ping), working paper, 2015

“The Effect of Banking Crises: Evidence from Non-Life Insurance Consumption,” (with Shinichi Kamiya and Jackie Li), working paper, 2015

“Bankruptcy in the Core and Periphery of Financial Groups: The Case of the Property-Casualty Insurance Industry” working paper, 2010

“The Rise and Fall of the Fraternal Life Insurer: Law and Organizational Form in U.S. Life Insurance, 1870-1920,” working paper, (*revise and resubmit, Journal of Law & Economics*), 2007

“Organizational Form and the Underwriting Cycle: Theory with Evidence from the Pennsylvania Fire Insurance Market, 1873-1909,” working paper, 2004

“Consumption versus Production of Insurance,” (with Tomas Philipson), *NBER Working Paper #6225*, 1997

## **External Research Projects and Consulting**

- 2017 Expert Witness, Florida Workers’ Compensation Rate Hearing
- 2016 Expert Witness, Virginia Assigned Risk Workers’ Compensation Rate Hearing
- 2015 Expert Witness, Florida Workers’ Compensation Rate Hearing
- 2015 NCCI Revision of Underwriting Profit and Contingency Internal Rate of Return Model
- 2015 An Extension of the Project on the Costs of Holding Capital, sponsored by the CAS
- 2013 Microinsurance Centre Lessons from History Project
- 2012 Allocation of the Costs of Holding Capital, sponsored by the CAS,
- 2011 CRO Risk Index Project, co-sponsored by SOA and Bloomberg, co-founder
- 2009 “The Financial Crisis and Lessons for Insurers,” \$50,000 SOA grant, role: report co-author

## **Papers Presented at Professional Meetings**

- 2019 “An Integrated Approach to Measuring Asset and Liability Risks in Financial Institutions,” ARIA Annual Meeting, San Francisco, CA
- 2019 “An Integrated Approach to Measuring Asset and Liability Risks in Financial Institutions,” RTS Annual Seminar, Tuscaloosa, AL
- 2017 “The Effect of Government Guarantees on Market Discipline in the Property-Casualty Insurance Industry,” NBER Insurance Project Workshop, Boston, MA
- 2015 “The Marginal Cost of Risk in a Multi-Period Model,” NBER Insurance Project Workshop, Stanford, CA
- 2015 “The Marginal Cost of Risk in a Multi-Period Model,” CAS Annual Meeting, Philadelphia, PA
- 2015 “Dynamic Capital Allocation,” IME Annual Conference, Liverpool UK

- 2015 "What Drives Tort Reform Legislation? Economics and Politics of the State Decisions to Restrict Liability Torts," ASSA Annual Meeting, Boston, MA
- 2014 "The Marginal Cost of Risk in a Multi-Period Model," CAS Centennial, New York, NY
- 2014 "Market Discipline and Guaranty Funds in Life Insurance," EGRIE Annual Seminar, St. Gallen, CH
- 2014 "Dynamic Capital Allocation with Irreversible Investments," EGRIE Annual Seminar, St. Gallen, CH
- 2014 "What Drives Tort Reform Legislation? Economics and Politics of the State Decisions to Restrict Liability Torts," ARIA Annual Meeting, Seattle, WA
- 2014 "The Marginal Cost of Risk in a Multi-Period Model," ARIA Annual Meeting, Seattle, WA
- 2014 "Market Discipline and Guaranty Funds in Life Insurance," ARIA Annual Meeting, Seattle, WA
- 2014 "The Marginal Cost of Risk in a Multi-Period Model," IME Conference, Shanghai, CN
- 2014 "The Effect of Banking Crises: Evidence from Non-Life Insurance Consumption," Risk Theory Seminar, Munich, Germany
- 2013 "The Effect of Banking Crises: Evidence from Non-Life Insurance Consumption," ASSA Annual Meeting, Philadelphia, PA
- 2013 "Optimal Insurance Contracts with Insurer Background Risk," EGRIE Annual Meeting, Paris, FR
- 2013 "The Effect of Banking Crises: Evidence from Non-Life Insurance Consumption," ARIA Annual Meeting, Washington D.C.
- 2013 "The Marginal Cost of Risk, Risk Measures, and Capital Allocation," IRFRC Catastrophe Risk Conference, Singapore
- 2013 "Optimal Insurance Contracts with Insurer Background Risk," ARIA Annual Meeting, Washington D.C.
- 2013 "The Marginal Cost of Risk, Risk Measures, and Capital Allocation," CEAR/ETH Indices of Risk and New Risk Measures Conference, Zurich, CH
- 2012 "The Marginal Cost of Risk, Risk Measures, and Capital Allocation," CAS Spring Meeting, Phoenix, AZ
- 2012 "The Marginal Cost of Risk, Risk Measures, and Capital Allocation," Symposium: Risk and Catastrophic Events, State College, PA
- 2012 "The Marginal Cost of Risk, Risk Measures, and Capital Allocation," ASSA Annual Meeting, Chicago, IL
- 2011 "The Marginal Cost of Risk, Risk Measures, and Capital Allocation," NBER Insurance Project Workshop, Cambridge, MA
- 2010 "Bankruptcy in the Core and Periphery of Financial Groups: The Case of the Property-Casualty Insurance Industry," ASSA Annual Meeting, Atlanta, GA
- 2009 "Bankruptcy in the Core and Periphery of Financial Groups: The Case of the Property-Casualty Insurance Industry," Risk Management and Corporate Governance Conference, Loyola University of Chicago
- 2009 "Bankruptcy in the Core and Periphery of Financial Groups: The Case of the Property-Casualty Insurance Industry," ARIA Annual Meeting, Providence, RI
- 2008 "An Economic Approach to Capital Allocation," Risk Theory Society, Annual Meeting, Fort Collins, CO
- 2007 "Federal Financial Exposure to Catastrophic Risk," ARIA Annual Meeting, Quebec City, CA
- 2007 "Catastrophe Bonds, Reinsurance, and the Optimal Collateralization of Risk Transfer," EFMA Annual Meeting, Vienna, AT
- 2007 "Catastrophe Bonds, Reinsurance, and the Optimal Collateralization of Risk Transfer," 5<sup>th</sup> Infiti Conference on International Financial Integration, Dublin, IE
- 2007 "Federal Financial Exposure to Catastrophic Risk," NBER Conference on Measuring and Managing Federal Financial Risk, Evanston, IL
- 2006 Insuring Catastrophic Losses: The Status of TRIA and Proposed Natural Disaster Backstops, Wash., D.C.
- 2006 "Catastrophe Bonds, Reinsurance, and the Optimal Collateralization of Risk Transfer," Risk Theory Society, Annual Meeting, Richmond, VA
- 2006 "Public versus Private Underwriting of Catastrophe Risk: Lessons from the California Earthquake Authority," Berkeley Symposium on Real Estate, Catastrophic Risk, and Public Policy
- 2006 "Catastrophe Bonds, Reinsurance, and the Optimal Collateralization of Risk Transfer," NBER Insurance Project Workshop, Cambridge, MA
- 2005 "Regulation, Capital, and the Evolution of Organizational Form in U.S. Life Insurance," NBER Insurance Project Workshop, Cambridge, MA

- 2004 “The Rise and Fall of the Fraternal Life Insurer: Law and Organizational Form in U.S. Life Insurance,” NBER Insurance Project Workshop, Cambridge, MA
- 2004 “Regulation, Capital, and the Evolution of Organizational Form in U.S. Life Insurance,” American Finance Association, Annual Meeting, San Diego, CA
- 2003 “Insurance, Self-Protection, and the Economics of Terrorism,” Risk Theory Society, Annual Meeting, Atlanta, GA
- 2003 “Terrorism Insurance Policy and the Public Good,” St. John’s Journal of Legal Commentary 10<sup>th</sup> Annual Legal Symposium: Terrorism and its Impact on Insurance: Legislative Responses and Coverage Issues, Queens, NY
- 2003 “Insurance, Self-Protection, and the Economics of Terrorism,” NBER Insurance Project Workshop, Cambridge, MA
- 2002 “Pricing and Capital Allocation in Catastrophe Insurance,” CAS Risk and Capital Management Seminar, Toronto, CA
- 2002 “Market Discipline and Government Guarantees in U.S. Life Insurance,” Risk Theory Society, Annual Meeting, Urbana-Champaign, IL
- 2001 “Pricing and Capital Allocation in Catastrophe Insurance,” Risk Theory Society, Annual Meeting, Montreal

*Other Conferences Talks and Panel Participation*

- 2017 International Conference on Business Sciences, Cairo University, Egypt
- 2016 IIF Insurance Colloquium, Basel, Switzerland
- 2016 Surplus Lines Association of California, California (keynote)
- 2014 Surplus Lines Automation Conference, Florida
- 2011 PRMIA Annual Risk Leadership Conference, Atlanta, GA
- 2011 7<sup>th</sup> International Microinsurance Conference, Rio de Janeiro, Brazil
- 2010 Property Loss Research Bureau Eastern Adjusters Conference, Atlanta, GA (keynote)
- 2008 NCOIL Annual Meeting, Duck Key, FL
- 2007 Capital Markets Symposium on Securitizing Insurance Risk, New York, NY
- 2006 Insuring Catastrophic Losses: The Status of TRIA and Proposed Natural Disaster Backstops, Wash., D.C.
- 2006 Catastrophe Bonds and Insurance Linked Securities Summit, New York, NY
- 2005 12<sup>th</sup> Annual International Conference Promoting Business Ethics, New York, NY

## **Service Activities in Academic and Professional Organizations**

American Risk & Insurance Association President (2012-13)  
Risk Theory Society President (2011-2012)  
American Risk & Insurance Association Board Member (2007-2014)  
International Research Advisory Board, Risk and Insurance Research Center, NCCU, Taiwan  
Editorial Board, *Journal of Insurance Issues* (2012-2014)  
Huebner Colloquium Panelist (2016-2019)

### External Committees

*American Risk & Insurance Association Program Committee, 2006, 2011, 2012; ARIA Nominations Committee, 2015, 2016; Kulp-Wright Book Award Committee, 2005*

Discussant: *ARIA Annual Meeting, San Francisco, 2019; ARIA Annual Meeting, Chicago, 2018; ARIA Annual Meeting, Boston, 2016; SIFR Insurance Conference, Stockholm, 2015; EGRIE Annual Seminar, St. Gallen, 2014; ARIA Annual Meeting, Seattle, 2014; ARIA Annual Meeting, San Diego, 2011; CEAR Workshop on Insurance for the Poor, Atlanta, 2010; CEAR Workshop on Risk Perception and*



*Subjective Beliefs, Atlanta, 2010; Midwest Finance Association Annual Meeting, Chicago, 2009; 5<sup>th</sup> Infiniti Conference, Dublin, 2007; EFMA Annual Meeting, Vienna, 2007; AEA Annual Meeting, San Diego, 2004*

Session Chair: *ARIA Annual Meeting, Chicago, 2018, ARC, Atlanta, 2017; IME, Atlanta, 2017; ARIA Annual Meeting, San Diego, 2011; Midwest Finance Association Annual Meeting, Chicago, 2009; ARIA Annual Meeting, Quebec City, 2007; EFMA Annual Meeting, Vienna, 2007;*

Referee for *Asia-Pacific Journal of Risk and Insurance, Astin Bulletin, Australian Social Monitor, Contemporary Economic Policy, Current Issues in Economics and Finance, Defense and Peace Economics, European Economic Review, Financial Review, Geneva Papers: Issues and Practice, Geneva Risk and Insurance Review, Health Affairs, Insurance: Mathematics and Economics, Journal of Banking and Finance, Journal of Business, Journal of Finance, Journal of Financial Intermediation, Journal of Financial Services Research, Journal of Law and Economics, Journal of Money, Credit, and Banking, Journal of Political Economy, Journal of Risk and Insurance, Management Science, North American Actuarial Journal, Proceedings of the National Academy of Sciences, Review of Financial Studies, Risk Management and Insurance Review, Scandinavian Actuarial Journal, and Science.*

#### Working Group Participation

*Committee on the Global Financial System, Working Group on Institutional Investors, Global Savings, and Asset Allocation (2006); Presidential Working Group on Financial Markets, Working Group on Terrorism Insurance (2006)*

### **Continuing Education Activities**

- |           |   |
|-----------|---|
| 2004-2007 | Central Banking Seminar, Federal Reserve Bank of New York, Topics: Introduction to U.S. Financial Markets; Introduction to Non-bank Financial Institutions              |
| 2009      | Texas Farm Bureau Program, Georgia State University, Topic: Securitization, the Insurance Industry, and the Panic of 2007   |
| 2009-2012 | Horst K. Jannott Visiting Fellows Program, Georgia State University, Topics: Securitization, the Insurance Industry, and the Panic of 2007; Introduction to Statistics; |