



Liberty Mutual

Look Inside ...

The Actuarial Profession

Liberty Mutual
Who We Are. What We Do.

www.LibertyMutualGroup.com/LookInside



What is an Actuary?

An **Actuary** is a person who:

- Applies mathematical, analytical, and business skills to help solve a variety of financial and social problems
- Develops models to estimate the financial impact of future events
- Puts a price tag on future risks

From www.beanactuary.org

“Actuaries are professionals who provide expert advice and relevant solutions for business and societal problems that involve economic risk. “





Actuary is a Top Rated Job

Jobs Rated Almanac Top Rankings

Year	Rank
1988	1
1992	2
1995	1
1999	2
2000	4
2002	2
2009*	2
2010*	1

*The 2009 and 2010 rankings were based on a study by CareerCast.com, which was published in the Wall Street Journal

Top 10 Jobs of 2010

Job	Rank
Actuary	1
Software Engineer	2
Computer Systems Analyst	3
Biologist	4
Historian	5
Mathematician	6
Paralegal Assistant	7
Statistician	8
Accountant	9
Dental Hygienist	10



- Actuary is consistently ranked at the top of most job surveys, reaching #1 three times since 1988
- The occupations are ranked on the basis of six key criteria: environment, income, employment outlook, physical demands, security, and stress



What work does an Actuary do?

Actuaries are involved in virtually every stage of a product's lifetime.

- Pricing – Calculating a fair price for a new insurance products and analyzing existing insurance rates for cars, homes, or life insurance
- Reserving – Estimating the money to be set aside for claims that have not yet been paid
- Research & Product Development – Creating new products that allows the company to better serve its policyholders
- Financial/Balance Sheet Management – Forecasting the potential impact of a catastrophe and analyzing investment programs





What training is needed?

- College Degree
 - Typically mathematics, finance, economics or related field

- Formal Exam Process
 - Start in school, finish while working with support of employer
 - Two actuarial 'tracks':
 - Society of Actuaries (Life/Health/Other)
 - Casualty Actuarial Society (Property/Casualty)



What professional training is needed?

Casualty Actuarial Society (CAS) 2011 system

Exam 1 – Probability

Exam 2 – Financial Mathematics

Exam 3F – Financial Economics

Exam 3L – Life Contingencies and Statistics

Exam 4 – Construction and Evaluation of Actuarial Models

**Module 1 – Intro to P&C Insurance, Insurance Operations,
Lines of Business, Ratemaking Topics**

Module 2 – Insurance Accounting, Reinsurance

Exam 5 – Basic Ratemaking and Reserving

Exam 6 – Regulation and Financial Reporting

COP – Course on Professionalism

Exam 7 – Advanced Reserving, Reinsurance, and ERM

Exam 8 – Advanced Ratemaking

Exam 9 – Financial Risk and Rate of Return

**Validation by
Educational
Experience (VEE)**

Applied Statistical Methods

Corporate Finance

Economics

**Goal: Fellow of
Casualty Actuarial
Society (FCAS) !!!**



What professional training is needed?

Society of Actuaries (SOA) Examination System

Goal: Fellow of Society of Actuaries (FSA) !!!

Exam P – Probability

VEE Economics

Exam FM – Financial Mathematics

VEE – Corporate Finance

Exam MFE – Actuarial Models (Financial Economics)

VEE – Applied Statistics

Exam MLC – Actuarial Models (Life Contingencies)

FAP – Fundamentals of Actuarial Practice

Exam C – Construction & Evaluation of Actuarial Models

APC – Associateship Professionalism Course

FSA Track:	Finance/ERM	Investment	Individual Life & Annuities	Retirements Benefits	Group Health
<i>Exams</i>	Advanced Finance/ERM	Advanced Portfolio Management	Individual Life & Annuities Company/ Sponsor Perspective (CSP)	Retirement Benefits Company / Sponsor Perspective (CSP)	Group & Health Company/ Sponsor Perspective (CSP)
	Financial Economic Theory & Engineering	Financial Economic Theory & Engineering	Individual Life & Annuities Design and Pricing (DP)	Retirement Benefits Design and Pricing (DP)	Group & Health Design and Pricing (DP)
<i>Modules</i>	Financial and Health Economics	Financial and Health Economics	Financial and Health Economics	Financial and Health Economics	Financial and Health Economics
	Financial Reporting	Investment Strategy	Regulation and Taxation	Social Insurance	Health Systems Overview
	Operational Risk	Operational Risk or Financial Reporting	Operational Risk or Financial Reporting	Operational Risk or Investment Strategy	Pricing, Reserving and Forecasting
				Enrolled Actuaries (EA) Exams – US Only	
	Decision Making and Communication (DMAC)				
	Fellowship Admissions Course (FAC)				



Actuarial Work Environment

Actuaries solve business problems in both an independent and team environment.

- Typical entry-level work focused on recurring actuarial analyses
 - Helps build necessary actuarial and insurance fundamentals
 - Excellent opportunity to learn from peers in a team atmosphere
 - One-on-one coaching/mentoring between employee and manager
 - Projects overlap with exam material
 - Need to be able to communicate results of analyses to peers/management

- Typical credential-level work more complex and diverse
 - By this point, actuaries have a more holistic view of the insurance company
 - Analyze problems that may be have not been solved before
 - More ownership of work
 - Need to be able to persuade people that your results are right



Liberty Mutual

Look Inside ...

Case Study:

Applying Actuarial Reserving Techniques to Basketball Statistics



The goal of reserving is to project ultimate loss payments

Often, the final value of a claim is not known until years after the company initially finds out about the claim. Additionally, many claims are not reported right away. Regardless of these issues, the insurance company must hold money to pay these claims.

An insurance company must hold money to pay for these claims. This money is a liability on their balance sheets called **Reserves**.

$$\text{Paid Loss} + \text{Reserves} = \text{Ultimate Loss}$$

The Actuary must estimate the final value of all past claims:

- Generally based on prior payment patterns
- May include Actuarial Judgment
- Typically are based on both



The goal of reserving is to project ultimate loss payments

These concepts can be applied outside of insurance.....



How many points will Dirk Nowitzki score this season?

Nowitzki is one of the best and most consistent scorers in basketball:

- 10 time NBA All Star
- 2007 NBA Most Valuable Player
- 22.9 Pts/Game for Career
- 23,000+ Career Points
- 1 NBA Championship



Source: ESPN.com



How many points will Dirk Nowitzki score this season?

- 2011-2012 NBA season is shortened to 66 games because of lockout
- Through 15 games, Dirk is off to a slow scoring start this year
- Many possible explanations but will he revert back to historical average?

Season	Games Played	Points	Average
2006-2007	78	1,916	24.6
2007-2008	77	1,817	23.6
2008-2009	81	2,094	25.9
2009-2010	81	2,027	25.0
2010-2011	73	1,681	23.0
2011-2012	15	269	17.9



Source: ESPN.com



Insurance Analogy

What will the ultimate loss be for Commercial Auto policies sold by Liberty Mutual in 2011?

- Maybe the number of autos we insured was much more/less in 2010 than in prior years
- Claims for 2011 policies might not be settled for many years
- The amount paid at this point for 2011 policies could be higher/lower than historical levels



The Expected Technique

Assumption: What has happened in the past will happen in the future

Season	Games Played	Points	Average
2006-2007	78	1,916	24.6
2007-2008	77	1,817	23.6
2008-2009	81	2,094	25.9
2009-2010	81	2,027	25.0
2010-2011	73	1,681	23.0
Average	78	1,907	24.4

Estimate for 2011-2012 Total Points = 24.4 Average * 66 Games
= **1,610 Points**

Source: ESPN.com



The Expected Technique

- For Commercial Auto, we could look at average loss per vehicle insured

- Advantage: Stable over time and easy

- Disadvantage: Does not respond to actual data

- The **Expected Technique** can be used when...
 - Little or no data is available
 - Entering a new line of business



Expected Technique Requires Judgment

Season	Games Played	Points	Average
2006-2007	78	1916	24.6
2007-2008	77	1817	23.6
2008-2009	81	2094	25.9
2009-2010	81	2027	25.0
2010-2011	73	1681	23.0
Average	78	1907	24.4

➤ Dirk

- Downward trend?
- Select a different average because of other factors?

➤ Commercial Auto

- Average cost of claims increasing/decreasing?
- Is book of business that we're insuring in 2011 different than prior years?

Source: ESPN.com



The Development Technique

Looks at how the cumulative claims' values change over time

Assumes that the future claims will develop like the past

Cumulative Points				
Season	Games			
	15	30	45	66
2006-2007	366	695	1,125	1,644
2007-2008	316	652	1,015	1,552
2008-2009	359	776	1,164	1,683
2009-2010	408	739	1,119	1,623
2010-2011	386	714	1,030	1,546
2011-2012	268	?	?	?

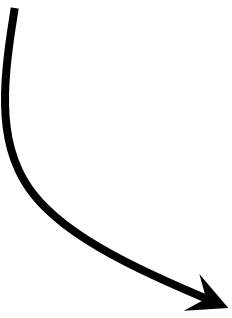
Source: ESPN.com (some estimated)



The Development Technique

Cumulative Points				
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2011-2012	268	?	?	?

$$\begin{aligned} \text{Estimate for 2011-2012} &= \\ 268 * 1.96 * 1.53 * 1.48 &= \\ & \mathbf{1,189} \end{aligned}$$



Development Factors			
Season	Games		
	15-30	30-45	45-66
2006-2007	1.90	1.62	1.46
2007-2008	2.06	1.56	1.53
2008-2009	2.16	1.50	1.45
2009-2010	1.81	1.51	1.45
2010-2011	1.85	1.44	1.50
Average	1.96	1.53	1.48

Source: ESPN.com (some estimated)



The Development Technique

- For Commercial Auto, we could loss development factors
- Advantage: One of the most responsive methods and also the most common method
- Disadvantage: Does not work well for lines have very little or volatile data
- The **Development Technique** can be used when...
 - Ample historical data is available
 - Development is relatively stable



Bornhuetter Ferguson Technique

- Combines both the **Development** and the **Expected Techniques**
- Takes the claims that have already developed as “given”
- Assumes the claims will develop as “expected”

- Ultimate = What we know + Prior Expectation On What We Don't Yet Know
- Ultimate = Paid Loss + Expected * % Unpaid



Bornhuetter Ferguson Technique

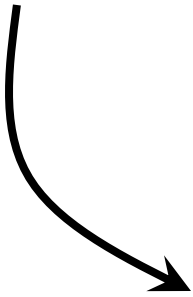
Cumulative Points

Season	Games			
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2006-2007	366	695	1,125	1,644
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2009-2010	408	739	1,119	1,623
2010-2011	386	714	1,030	1,546
2011-2012	268	?	?	?

Estimate for 2011-2012 =
 $268 + (1 - 23\%) * 1,610 =$
1,508

% Cumulative Points Scored

Season	Games			
	15	30	45	66
2006-2007	22%	42%	68%	100%
2007-2008	20%	42%	65%	100%
2008-2009	21%	46%	69%	100%
2009-2010	25%	46%	69%	100%
2010-2011	25%	46%	67%	100%
Average	23%	44%	68%	100%





Bornhuetter Ferguson Technique

- In Commercial Auto, we'll use paid losses and an estimate of the payment pattern and expected ultimate loss based on past experience
- Advantages: Softens effect of randomness in early maturities but still uses actual period's data
- Weakness: Sensitive to a priori expectation
- Useful blend of Expected and Development techniques



Comparison of Techniques

	Ultimate Loss
Expected	1,610
Development	1,189
Bornhuetter Ferguson	1,508
Selected	???

What's your estimate?

Any other suggested techniques?



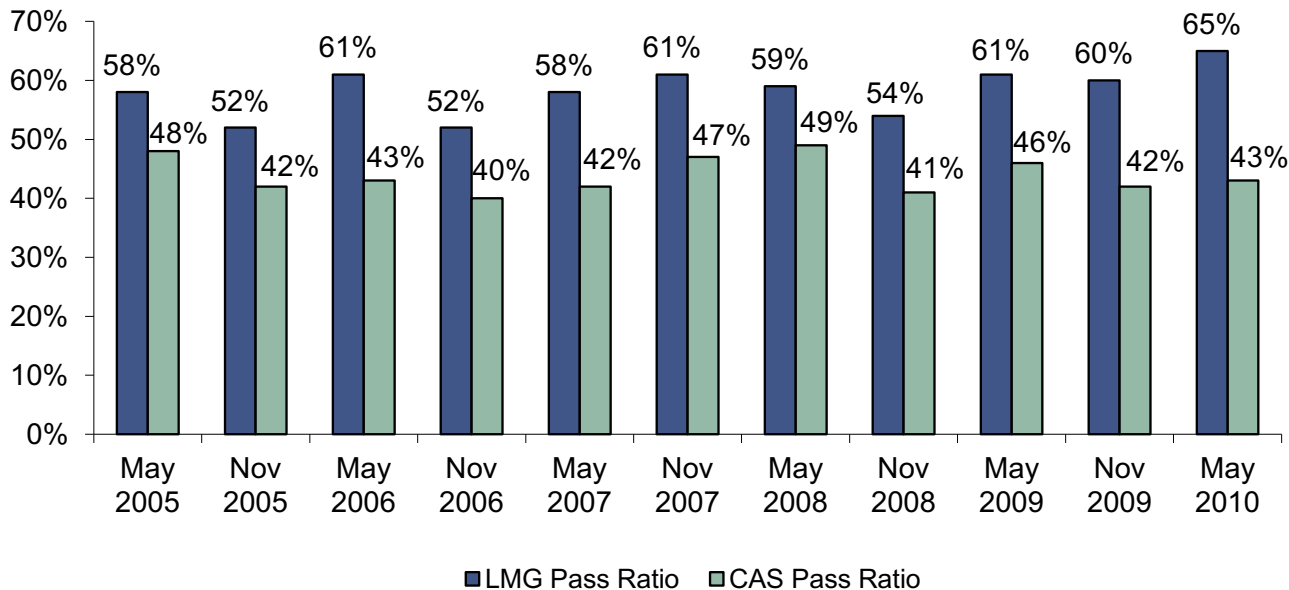
Conclusion

- There are a variety of methods or techniques, each with strengths and weaknesses – not a single “silver bullet”
- Actuaries use judgment to decide which method is the best to use
- Take external information into account
- More sophisticated techniques, but sometimes simple is better



Actuarial Student Exam Success at Liberty Mutual

CAS Exam Pass Ratio
Liberty vs Total



- Actuarial students at Liberty Mutual consistently achieve exam pass ratios that are 10-15% higher than the total exam taking population, due in part to the outstanding exam support that the company provides
 - Exam materials and study manuals
 - Exam seminars, including travel expenses
 - Paid study hours during work time
 - Support and encouragement from managers and peers



What it takes to be a Liberty Mutual Actuarial Intern or Student ...

- **Commitment to continuous learning**
- **High initiative - Driven to succeed**
- **Enjoy problem solving**
- **Business oriented - Sees the big picture**
- **Functions comfortably in the absence of complete information**

Actuarial Intern Candidates:

- ✓ Proven math and analytical skills as normally acquired through pursuit of a bachelors degree in Mathematics, Statistics, Economics, Actuarial Science, or related field
- ✓ A record of academic achievement, including a GPA of at least a 3.0
- ✓ Actuarial Exam experience is not required, but is preferred
- ✓ Solid oral / written communication skills
- ✓ Solid interpersonal skills and the ability to work in a team environment as well as independently
- ✓ MS Office proficiency, with solid Excel skills preferred

Full-time Actuarial Student Candidates:

- ✓ Commitment to achieving Actuarial Fellowship
- ✓ Passing grades on 1-2 Actuarial Exams is preferred
- ✓ Prior Actuarial experience as gained through Actuarial Internship/s is preferred
- ✓ SAS and Programming skills are desirable



Actuarial Internships & Student Development Program

Training and Development Curriculum Plans for Actuarial Student positions:

- ✓ Focus on broadening business skills and company and industry knowledge
 - ✓ Provide managers and employees with a framework for identifying learning activities
 - ✓ Incorporates professional development courses, online courses, self study, on the job assignments, and project work
-
- **Classroom style training**
 - **Lunch & Learn Workshops**
 - **Actuarial Forums**
 - **Buddy Program**
 - **Mentor Program**
 - **Specialized training depending on assignment**
 - **Building Business & People Acumen Workshops**
 - **CAS/SOA and Regional Meetings and Seminars**
 - **Paid exam materials and seminars**
 - **Paid study time**



Example of Student/Intern Projects

Liberty actuarial students and interns are introduced to actuarial concepts by working on a variety of projects. These projects help teach the student the fundamentals of insurance and help deepen our understanding of various aspects of the business.

Below are some examples of projects assigned in the past year.

- Design an exhibit that calculates the impact of converting policies to a new rating system.
- Given policyholder attributes, model the likelihood that a policyholder will add points to driving record and likelihood an auto policyholder will later buy a homeowner policy.
- Analyze the reasons behind the decrease in McDonald's franchisees premiums over the last few years.
- Observe current trends in medical settlement to identify where early settlement opportunities exist to alleviate the risk of increasing medical inflation.
- Analyze countrywide home, renter and condo profitability based on historical and projected trends to determine what future price levels are needed to maintain profitability.
- Research the impact of the California Workers Compensation benefit change.





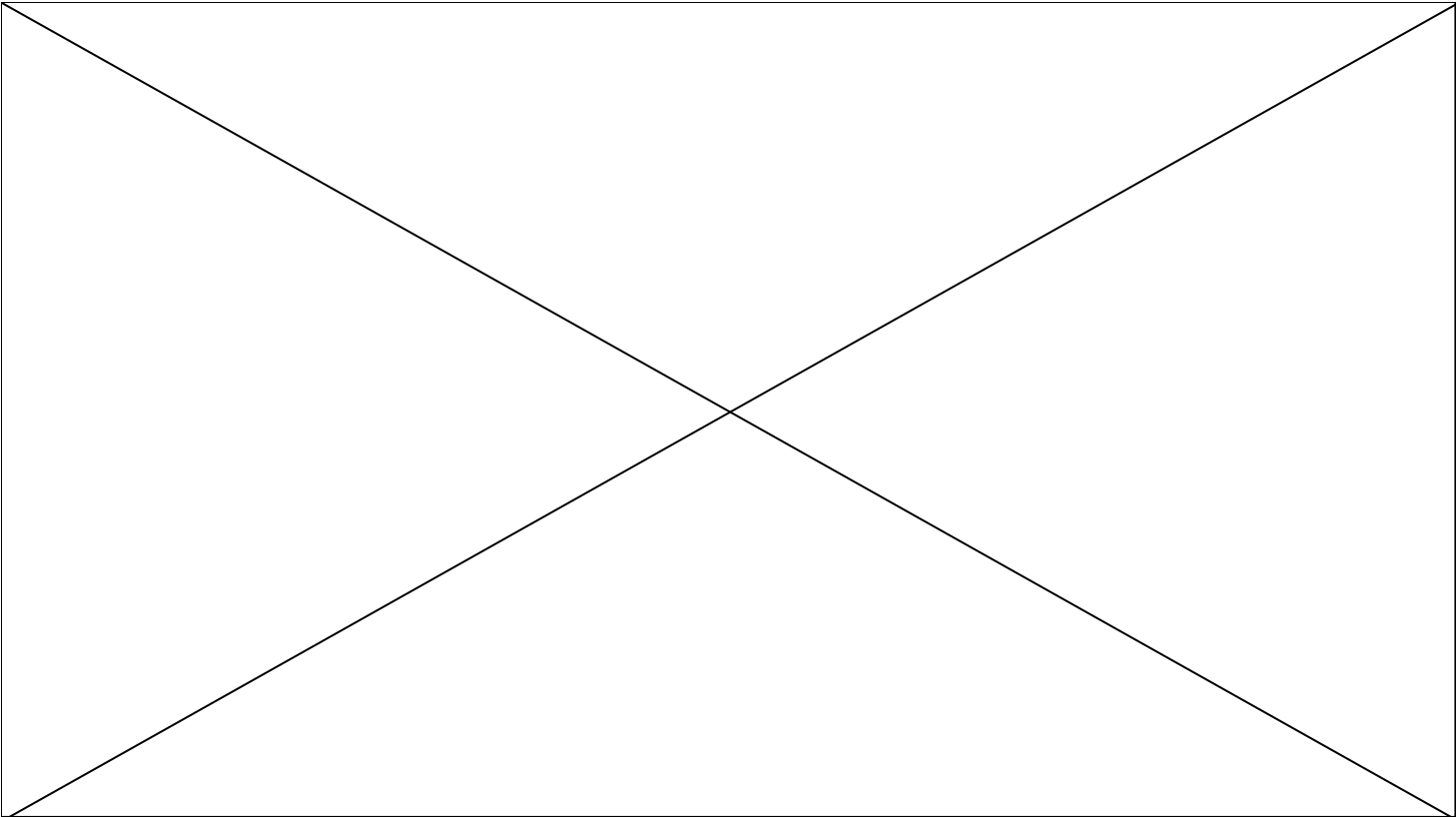
Actuarial Rotational Program

- The Actuarial Student Development Program includes a rotational program in which students rotate positions every 12 – 18 months
- Students are given the opportunity for movement
 - Across **SBU**s - Personal, Commercial, Agency, Corporate
 - Across **Functions** - Pricing, Reserving, Research, Reinsurance, Product Development, etc
 - Across **Campuses** - Boston, Chicago, Keene, Wausau, Fairfield, Seattle
- Benefits
 - Gain experience with both Personal and Commercial products
 - Acquire a wide range of business experience within multiple markets
 - Develop well-rounded abilities and a variety of actuarial skills
 - Facilitate professional development
 - Build network of professional contacts





Responsibility. What's your policy?





Who We Are.



FORTUNE 500

Rank	Company	Revenue (\$ millions)	Profit (\$ millions)
56	Apple	36,537.0	5,704.0
71	Liberty Mutual Insurance Group	31,094.0	1,023.0
98	Travelers Cos.	24,680.0	3,622.0
102	Google	23,650.6	6,520.4
161	Progressive	14,563.6	1,057.5



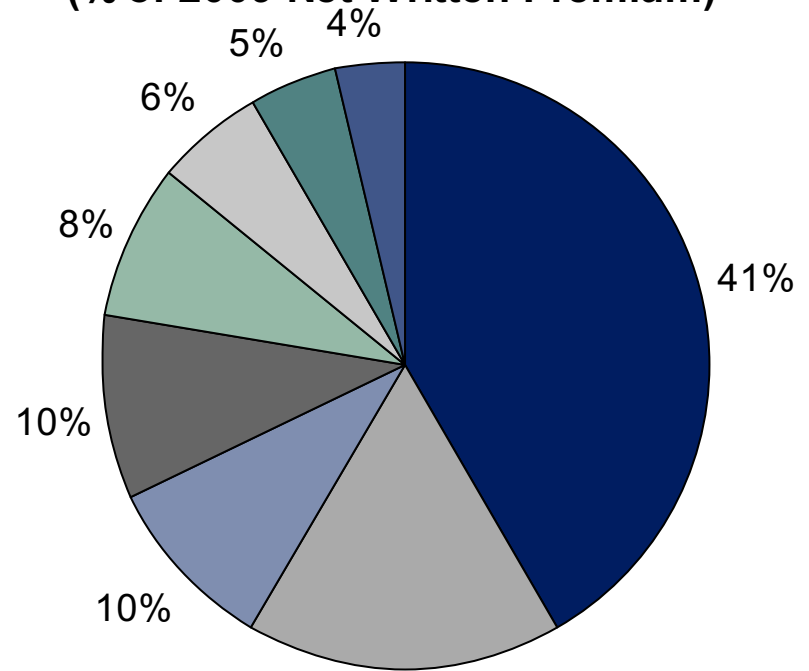
Liberty Mutual Group is a diversified global insurer and is the 5th largest property and casualty insurer in the U.S. Headquartered in Boston, Liberty Mutual Group employs approximately 45,000 people in more than 900 offices throughout the world.



Our Company, Our Products

- Liberty Mutual Group operates under a mutual holding company structure.
 - Advantages of stock companies - ability to raise capital by selling stock
 - Benefits of a mutual company - working together with customers to provide exceptional products and services at competitive costs.
- Our products are distributed via direct sales force, independent and exclusive agents, brokers, and online at LibertyMutual.com.

Business Mix
(% of 2009 Net Written Premium)



- Private Passenger Auto
- Commercial Multi-Peril/Fire
- International Local Business
- General Liability
- Workers Compensation
- Homeowners
- Commercial Automobile
- Reinsurance (LIU)



Job Functions

Actuarial

Analyze historical data and use it to make projections about the company's current and future business.

Product Management

Conduct analysis and research to support profitability of personal lines products.

Finance & Accounting

Develop and apply analytical, technical, and leadership skills in accounting, taxation, treasury, and internal audit.

Underwriting

Evaluate risks and establish appropriate coverage to present competitive products and pricing to customers.

Other functions:

Information Technology

Sales

Claims

Loss Control

Human Resources

“It was important for me to find a company that stands behind its employees as much as it does its products. Ranked among the top employers to launch a career, Liberty Mutual is more than just insurance.” – Nathan





Liberty Mutual Community Involvement

Liberty Mutual is a responsible company that recognizes the importance of giving back to the communities where its employees work and live.

- Give with Liberty is a charitable donation program that was launched three years ago
- The program gives Liberty Mutual employees the opportunity to make a company-matched donation to a health and human services charity of their choice
- Last year, employees donated more than \$7.6 million to over 4,500 charities nationwide





Liberty Mutual Responsible Scholars



National Scholarship Awards:

Challenges students in undergraduate programs with excellent academic achievements to demonstrate what it means to be responsible. We will award five \$10,000 scholarships to students who have initiated a sustainable service or volunteer program that has a widespread impact on their college campus.



Alternative Spring Break Grants:

The Liberty Mutual Responsible Scholars™ Alternative Spring Break Grants program will provide funding to 10 student organizations that plan to engage in community work over their vacation. Organizations can be awarded \$1000 or \$2500 depending on the number of students who participate.

*Carnegie Mellon University Panama
Brigade 2009 spring break*

For more info, visit www.ResponsibleScholars.com



Current Opportunities

You do the right thing in your everyday life; take a look inside a Fortune 100 company where you can do that in your everyday job.

For more information about Liberty Mutual and our opportunities for undergraduates, visit www.LibertyMutualGroup.com/LookInside.

To apply for an internship or a full time Actuarial student position, go to <https://lmig.taleo.net/careersection/lmigcampus/jobsearch.ftl> and search for job number:

24067 for Actuarial Internship



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Look Inside ...

Questions ...?



Closing Advice

- Passion
- Hard Work
- Strengths & Weaknesses
- Mentor
- Show Initiative / Research
- Have Fun