

SYSTEMIC RISK AND PROFESSIONAL LIABILITY

Louise Francis, FCAS, MAAA

CAS 2012 RPM Seminar

Francis Analytics and Actuarial Data Mining, Inc.

www.data-mines.com

Objectives

- ▣ Define systemic risk
- ▣ Discuss potential impact of systemic risk on Professional Liability
- ▣ Present a new tool that can be used to model two specific systemic risks
- ▣ Discuss history of systemic risk in Professional Liability lines
 - Underwriting cycle
 - D&O exposure in financial crises

Systemic Risk

- ▣ risk to an entire system or sector
 - conceived as a risk involving financial institutions, but other systems, such as the electric grid, can also suffer systemic risk
 - Wang (2010). Under this definition, the underwriting cycle in property and casualty insurance is an example of systemic risk.
 - Hiemestra focuses more on financial institutions and their role in the financial crisis, defines systemic risk as “the probability that a large number of firms, especially financial firms, could fail during a given time period”. (ERMII May 2010 Systemic Risk Workshop)
 - a risk that spills over into and has a significant effect the general economy

Does Insurance Present Systemic Risk

Weiss List of Systemic Risk Factors

- ▣ Size: A very large company may pose a systemic risk if its bankruptcy can have a significant impact on the economy, i.e., it is “too big to fail”.
- ▣ Substitutability: If one product or company can substitute for another (i.e., catastrophe bonds for catastrophe reinsurance) there is substitutability. The absence of substitutability can be an indicator of systemic risk
- ▣ Interconnectedness or contagion occurs when a stress to one company causes a domino effect on other companies that share components of each others liabilities.
 - The LMX London reinsurance spiral where the same loss to a primary insurer cycled through many reinsurers because each had a share is an example.
- ▣ Concentration occurs when one or a few companies control a large percentage of an important product.
 - It can also involve geographic or type of product concentration.
 - When a large percentage of mortgages and mortgage derived securities were concentrated in the subprime sector, the entire financial system became vulnerable to a failure of this product.

Weiss List of Systemic Factors

- ▣ Liquidity - the availability a market in a security even in a distress situation.
 - a problem with the financial crisis is that not only can mortgage
- ▣ Infrastructure: The financial institution or sector is a critical component of the functioning of the larger economy,
- ▣ Leverage. In finance refers to the asset to capital ratio. In property and casualty insurance it often refers to the liability to capital ratio.
 - The use of leverage multiplies the impact of declines in assets or increases in liabilities.
 - The higher the leverage the higher the risk.

Weiss Conclusions about Systemic Risk

- ▣ Weiss concluded that the insurance industry is not a generator of systemic risk.
 - no one insurance company that is large enough to cause a crisis
 - insurance has relatively low barriers to entry and other products can substitute for insurance
 - insurance companies are not extremely interconnected to other parts of the economy
 - Insurance companies do not show significant concentration
 - relative modest leverage compared to banks

Insurance and Systemic Risk

- ▣ Weiss believes insurers are vulnerable as recipients of systemic risk
 - their asset portfolios
 - for life insurers, some of their products, can (and did) suffer significant declines in a financial crisis

Modeling Systemic Risk

- ▣ JRMS survey identified the following two emerging systemic risk issues
 - Risk of severe inflation/hyperinflation
 - Risk of severe deflation/depression
- ▣ Using these inputs NAAC (North American Actuarial Council) funded a severe inflation/deflation research project

Paper Completed in 2011

- ▣ The Effect of Deflation or High Inflation on the Insurance Industry- **Kevin C. Ahlgrim, ASA, MAAA, Ph.D.****Stephen P. D'Arcy, FCAS, MAAA, Ph.D.**
- ▣ <http://www.casact.org/research/NAACCRG/>

The Web Site With Paper and Model



The screenshot shows the homepage of the Casualty Actuarial Society. At the top left is the CAS logo, a circular emblem with 'CAS' in the center, 'CASUALTY ACTUARIAL SOCIETY' around the perimeter, and '1914' at the bottom. To the right of the logo is the text 'CASUALTY ACTUARIAL SOCIETY'. A banner image shows four people in business attire sitting around a table, engaged in a meeting. Below the banner is a navigation menu on the left with links: My CAS, My Information, My Transactions, My Committees, Member Directory, CE Compliance Status, Welcome, About CAS, Join/Renew, Volunteer, Committee Directory, Admissions/Exams, Be An Actuary, and Career Center. To the right of the menu is a 'RESEARCH PROJECTS IN FINANCE' section. It features a 'SITE SEARCH' box with a 'GO' button and a search input field containing 'Google Custom Search'. The main content of the research project section is titled 'THE EFFECT OF DEFLATION OR HIGH INFLATION ON THE INSURANCE INDUSTRY'. The text describes a research report by the NAAC CRG, mentioning authors Kevin Ahlgrim and Stephen D'Arcy. Below the text is a list of links: 'The Effect of Deflation or High Inflation on the Insurance Industry Final Report', 'Model (Excel 2003) (.xls)', 'Model (Excel 2010) (.xlsm)', 'Model User Guide', and 'Original RFP'.

CASUALTY ACTUARIAL SOCIETY

RESEARCH PROJECTS IN FINANCE

THE EFFECT OF DEFLATION OR HIGH INFLATION ON THE INSURANCE INDUSTRY

The North American Actuarial Council Collaborative Research Group (NAAC CRG) is pleased to make available a research report examining issues in measuring inflation, the effect of inflation or deflation on the insurance industry, and risk mitigation strategies. Also included is a model that can be used to develop inflation/deflation projections under a regime switching approach. The report was authored by Kevin Ahlgrim and Stephen D'Arcy.

The report, model, and model user guide can be accessed below:

- [The Effect of Deflation or High Inflation on the Insurance Industry Final Report](#)
- [Model \(Excel 2003\) \(.xls\)](#)
- [Model \(Excel 2010\) \(.xlsm\)](#)
- [Model User Guide](#)
- [Original RFP](#)

SITE SEARCH
Google Custom Search **GO**

My CAS
My Information
My Transactions
My Committees
Member Directory
CE Compliance Status
Welcome
About CAS
Join/Renew
Volunteer
Committee Directory
Admissions/Exams
Be An Actuary
Career Center

Topics in Paper

- ▣ provides some background on inflation,
- ▣ reviews historical inflation rates.
- ▣ examines the effect of inflation or deflation on the property-liability and life insurance industries. T
- ▣ propose risk mitigation strategies for insurers to cope with either deflation or high inflation rates.
- ▣ describes a publicly available model that can be used to develop inflation/deflation projections under a regime switching format that can readily be adjusted to reflect current financial uncertainty.

The Model

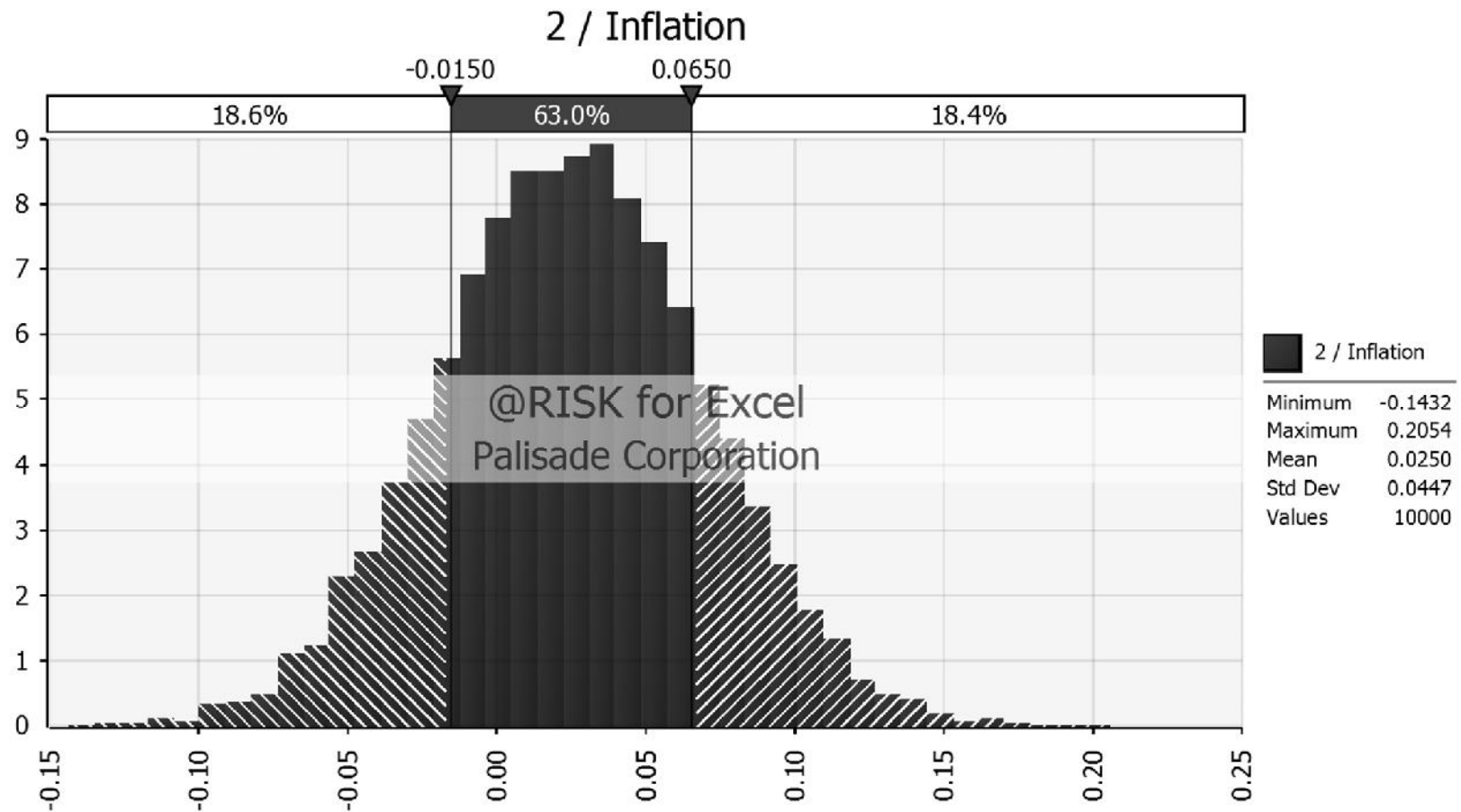
- ▣ Comes with a manual
- ▣ Manual describes the model
- ▣ Mean reverting process

$$= (-) +$$

Parameters

<i>Variable</i>	<i>Value</i>
k	1.0
θ	3.00%
σ	4.00%
<i>Initial inflation</i>	1.00%

Models Inflation over Multiple Years



Volatility Parameter

Projection Year	Std. Dev. of Inflation □ = □ □	Std. Dev. of Inflation □ = □ □	Std. Dev. of Inflation □ = □ □
1	4.00%	4.00%	4.00%
2	4.00	4.47	5.38
3	4.00	4.58	6.28
4	4.00	4.61	6.93
5	4.00	4.62	7.41
6	4.00	4.62	7.77
7	4.00	4.62	8.06
8	4.00	4.62	8.28
9	4.00	4.62	8.46
10	4.00	4.62	8.60
⋮	⋮	⋮	⋮

Regime Switching

- ▣ How do we model a change in inflationary regimes?
 - From stable, moderate inflation to high inflation or hyperinflation
 - From Stable, or moderate inflation to deflation or depression

Model Uses 3 Regimes

		Normal	High	Deflation
<i>Now</i>	Normal	90.0%	7.5%	2.5%
	High	11.0%	88.0%	1.0%
	Deflation	5.0%	5.0%	90.0%

Now Lets Demonstrate the Model

- ▣ We switch to Excel Model and show how it is used

Deflation

- ▣ Example Japan in 1990s
- ▣ US in 1930s

Inflation

- ▣ Examples:
- ▣ High Inflation – US in the 1970s
- ▣ Hyperinflation
 - Inflation rate $> 100\%$
 - Argentina
 - Brazil

Effect of Deflation on Insurance

- ▣ Profitability was mixed during 1930s depression
- ▣ Premium goes down
- ▣ Investment returns low

Effect of Severe Inflation on Insurance

- ▣ underwriting profit margin and insurance investment returns were negatively correlated with the inflation rate during the period 1951-1976.
- ▣ inflation and the underwriting profit margin were not significantly correlated over period 1977-2006
- ▣ investment returns and the year-to-year change in underwriting profit margin were both significantly negatively correlated with inflation over that period.
- ▣ Lowe and Warren (2010) describe the negative impact of inflation on property-liability insurers' claim costs, loss reserves and asset portfolios.
 - Actuaries may be slow to react to changes in inflation rate

Effect of Severe Inflation on Insurance (2)

- ▣ May experience adverse loss development
- ▣ Insurance investment returns were significantly negatively correlated with inflation during the period 1933-1981 and 1977-2006
- ▣ In addition, stock returns were significantly negatively correlated with inflation during the period 1933-1981 although not during the period 1977-2006
- ▣ What is impact of investment returns below insurance inflation rate?

Measures of Inflation

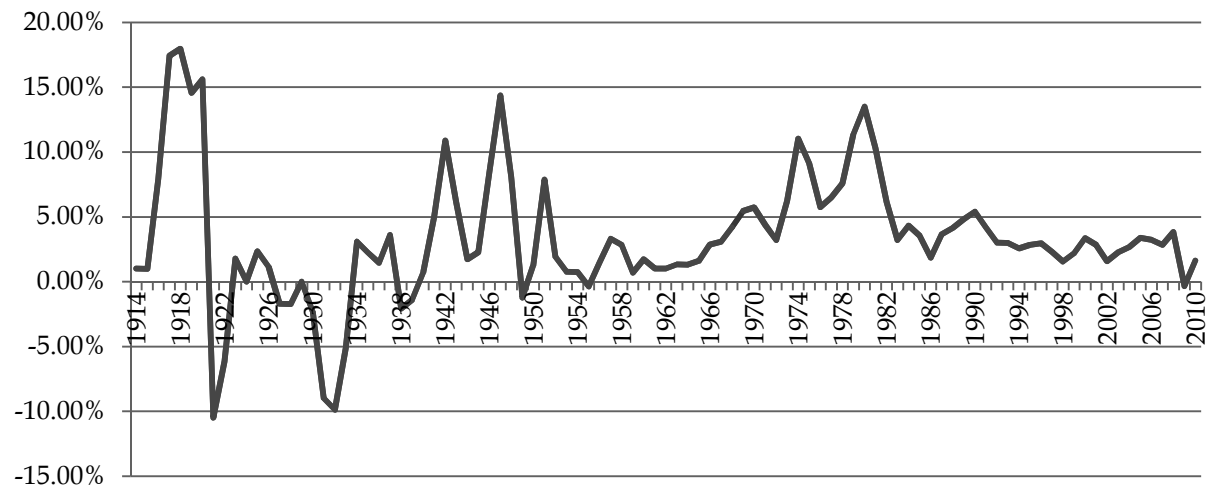
- ▣ CPI
- ▣ Rating Bureau
- ▣ Company Specific data
- ▣ Alternate measures – John Williams

CPI Inflation

▣ From Ahlgrim, D'Arcy paper

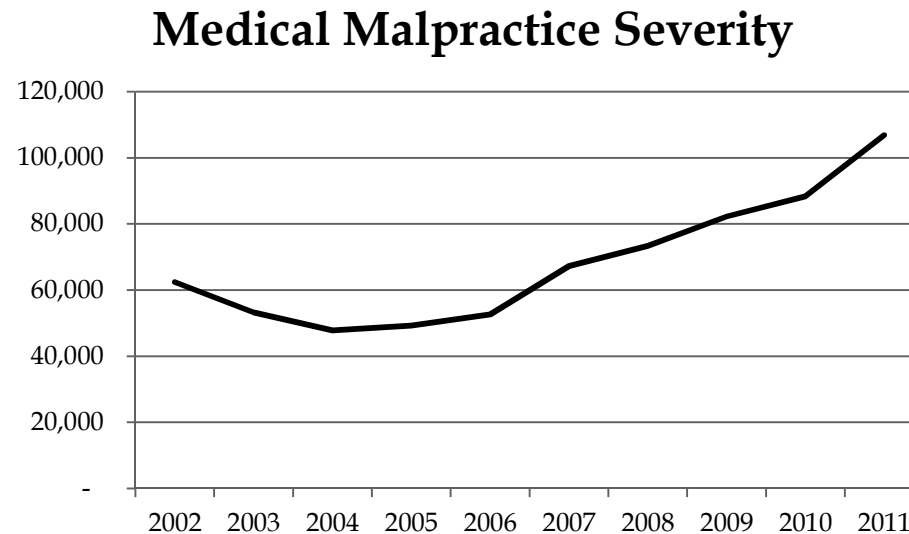
▣

Figure 1: US Annual Inflation Rate (1914-2010)



Medical Malpractice Trend

- ▣ Based on data in 2011 Bests Aggregates and Averages
- ▣ Severity trend averaged 6%-7% in last 10 years



Risk Mitigation

- ▣ Ahlgrim, D'Arcy recommend contingency planning
- ▣ Consider impact of deflation/ depression
- ▣ Consider impact in inflation/hyperinflation