

**Zhan Jiao**

**Effect of political and macroeconomic shock on  
insurance pricing**

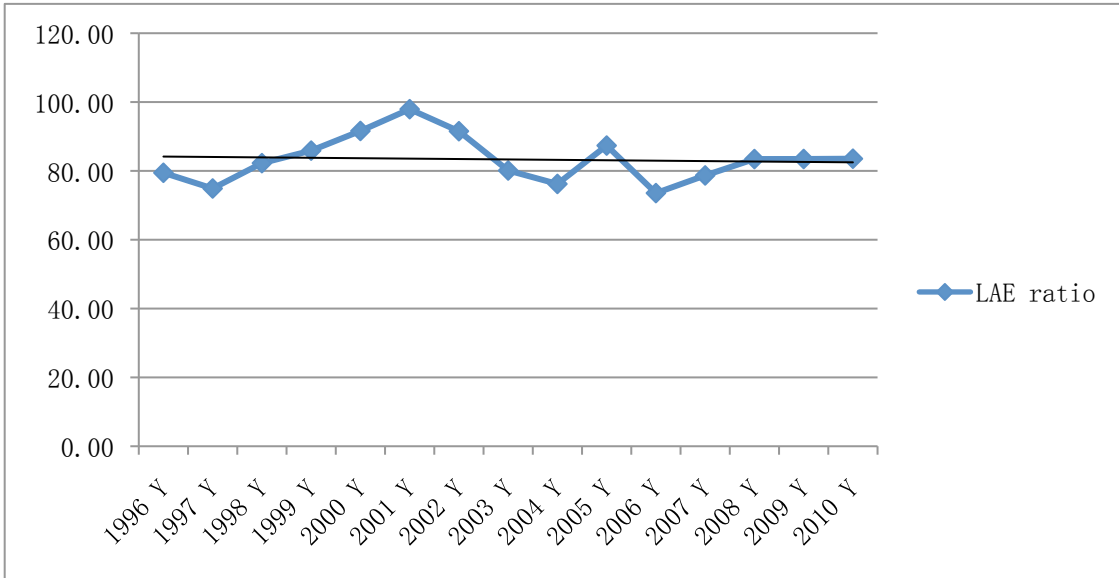
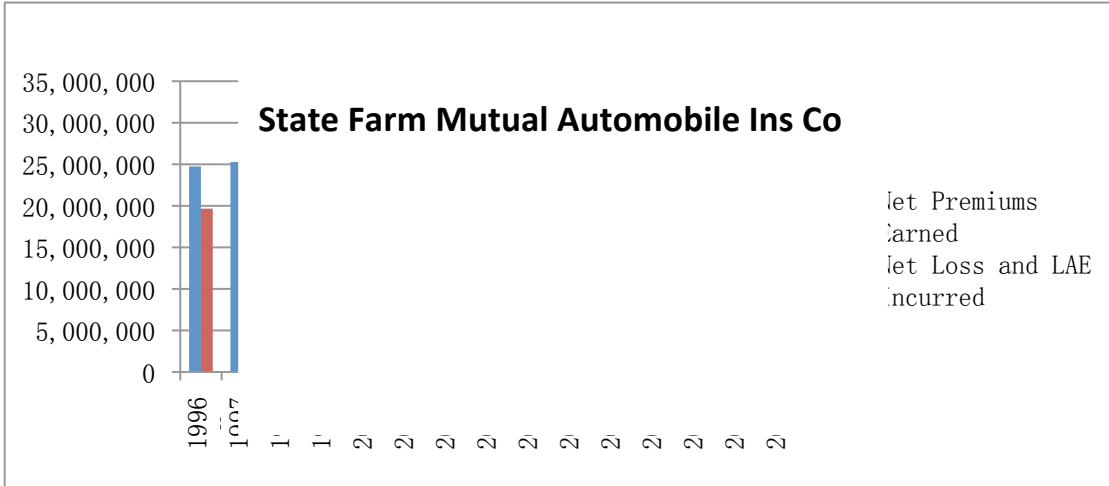
**Master project**

Terrorism attacks and weather events become more frequent and more catastrophic, caused insurance premiums in America are overpriced in recent years. In spite of this fact, insurers did not even bother to charge a separate price for terrorism coverage in their rating structures. September 11th changed this practice, but even that attack was a “small” insured event compared to the industry’s mammoth capital and surplus, which has grown significantly since 2001. It seems every insurer have had to pay claims for the losses associated with the September 11th terrorist attacks and several of the most destructive weather events in U.S. history.

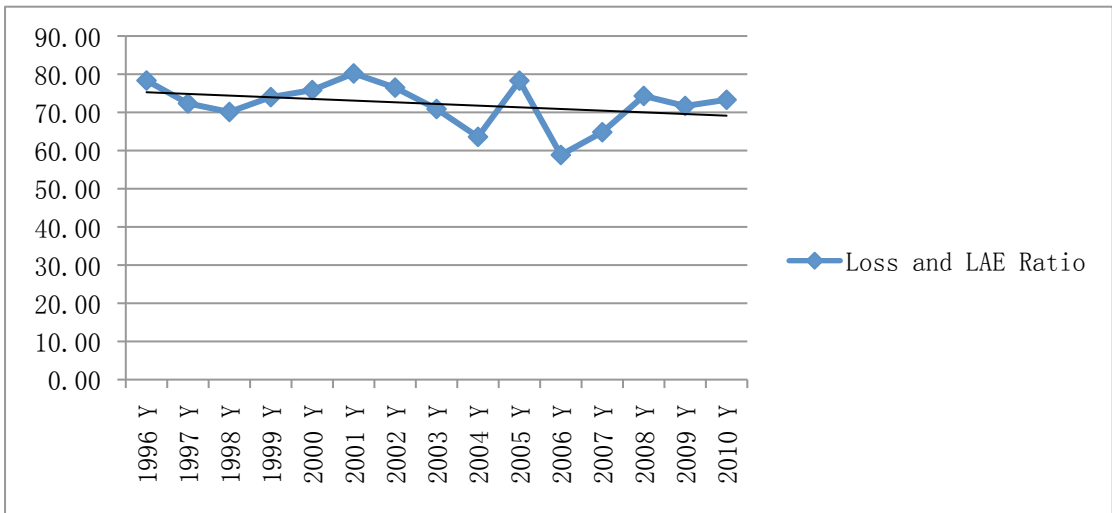
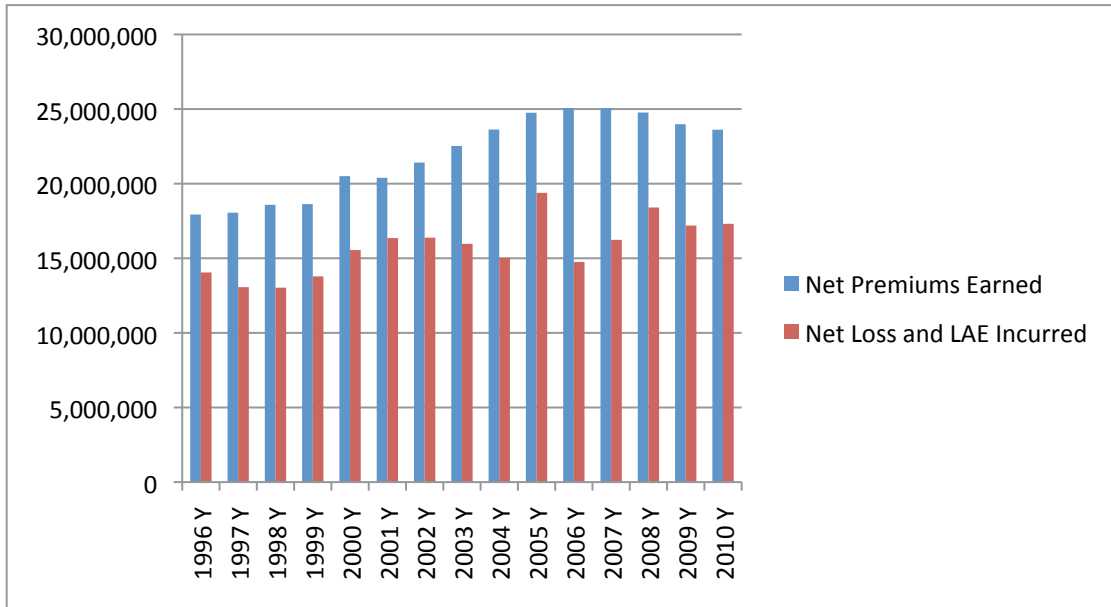
The insurance industry can’t be expected to provide comprehensive catastrophe coverage without adequate financial backstops for the most extreme events. In response to this increased risk, insurers must accumulate substantially larger reserves or purchase reinsurance (an insurance policy purchased by insurance companies to cover large losses) to pay claims in case of disaster. Either approach naturally raises the premium for disaster insurance.

Meanwhile Senators and Representatives are inclined to believe some assistance may be necessary. When coastal states are asked to create risk pools, so that insurers have a place to steer higher risk. Consumers, state regulators and legislators often agree that insurance companies are not in a financial position to cover such risk. When insurers sharply boost premiums on the coasts, increase deductibles, refuse to renew policies or otherwise cut back coverage, policymakers often accept these steps as necessary to help the property/casualty insurance business meet the huge challenges it faces in a risky world filled with dangers that it cannot adequately measure.

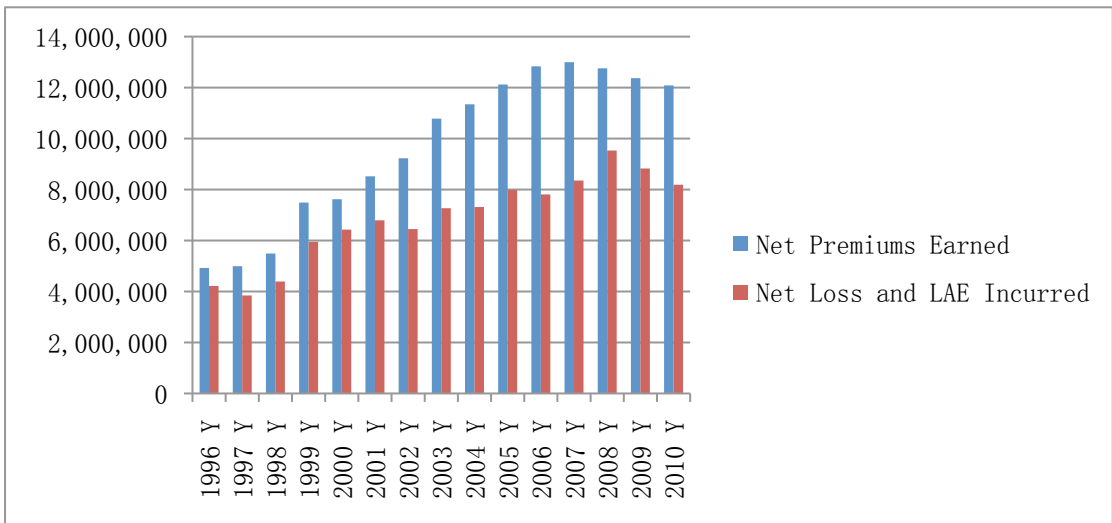
Insurer profits are measured in several methods. First is the pure loss ratio. Ratio of losses paid or accrued by an insurer to premiums earned, usually for a one-year period. Another method of evaluating profitability is the loss and loss adjustment expense (LAE) ratio, which adds the cost of adjusting claims to the pure loss ratio. The lower the loss ratio the better. Higher loss ratios may indicate that an insurance company may need better risk management policies to guard against future possible insurance payouts. This study documents LAE ratio and loss adjustment ratio for the top 3 insurance companies and the average of the P&C industry.

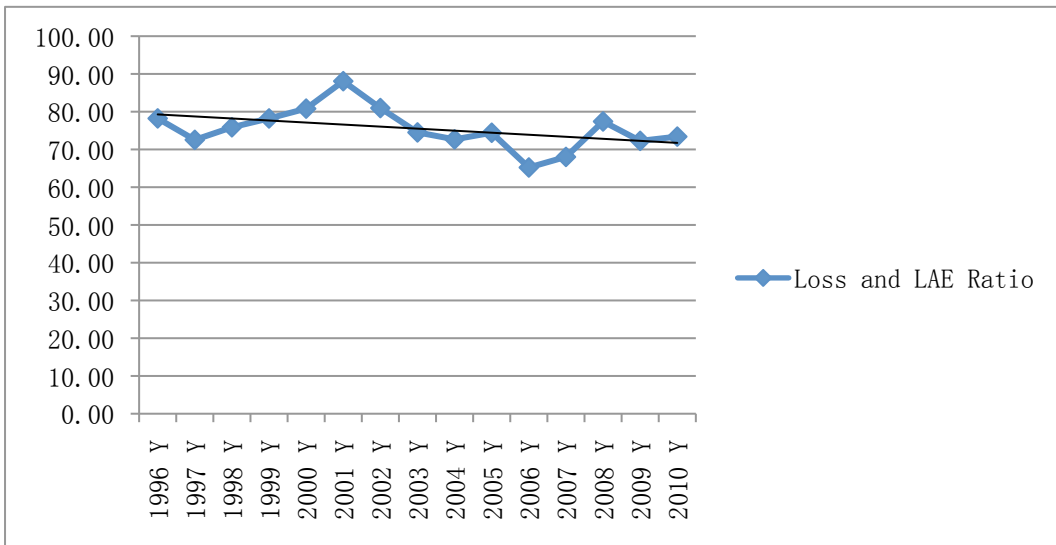
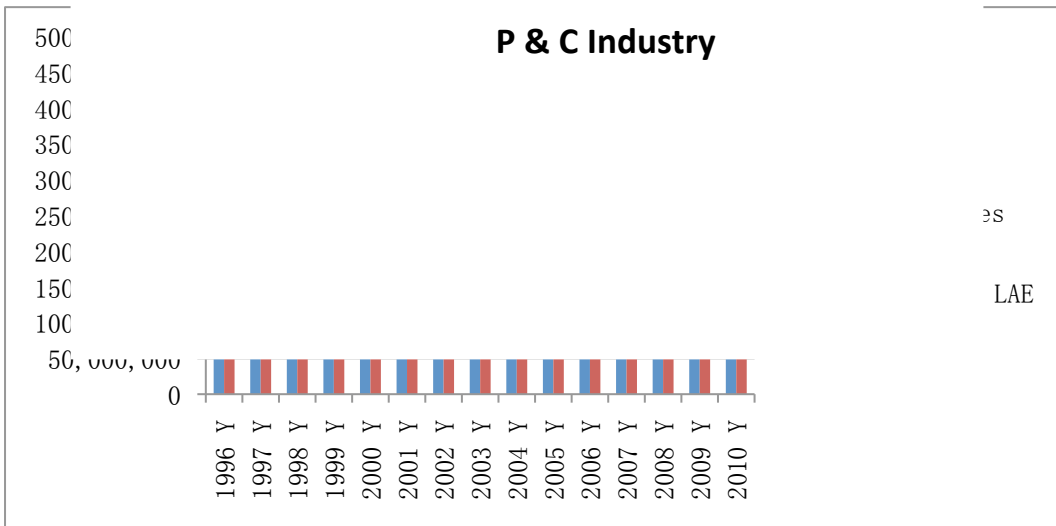
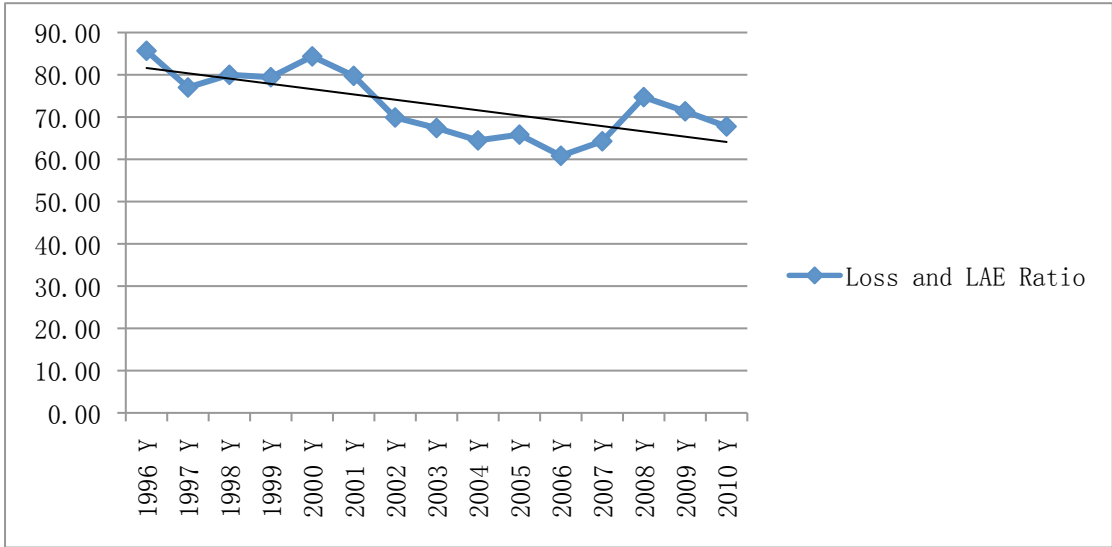


**Allstate Insurance Company**



### Nationwide Mutual Insurance Company



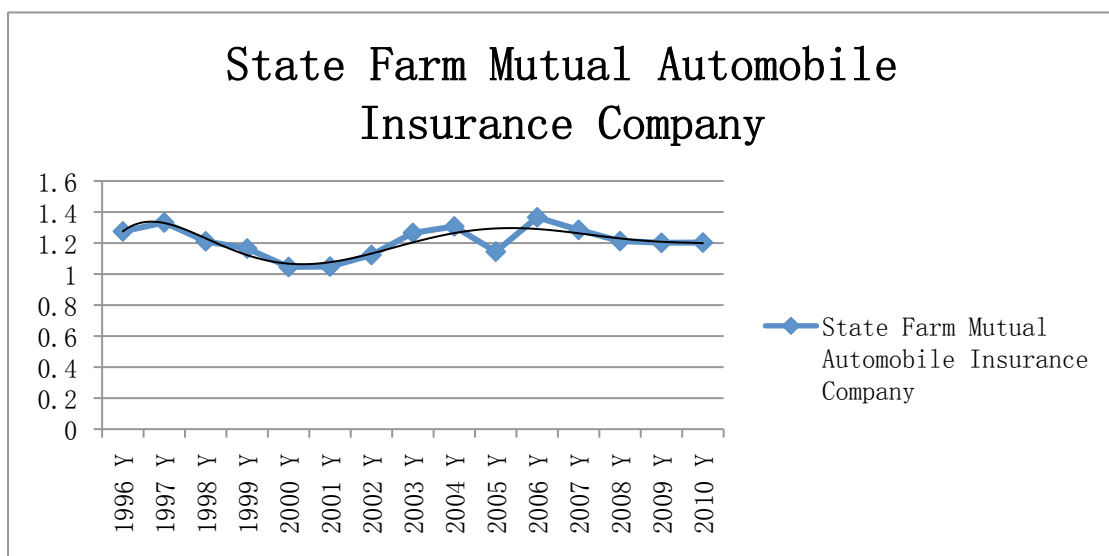


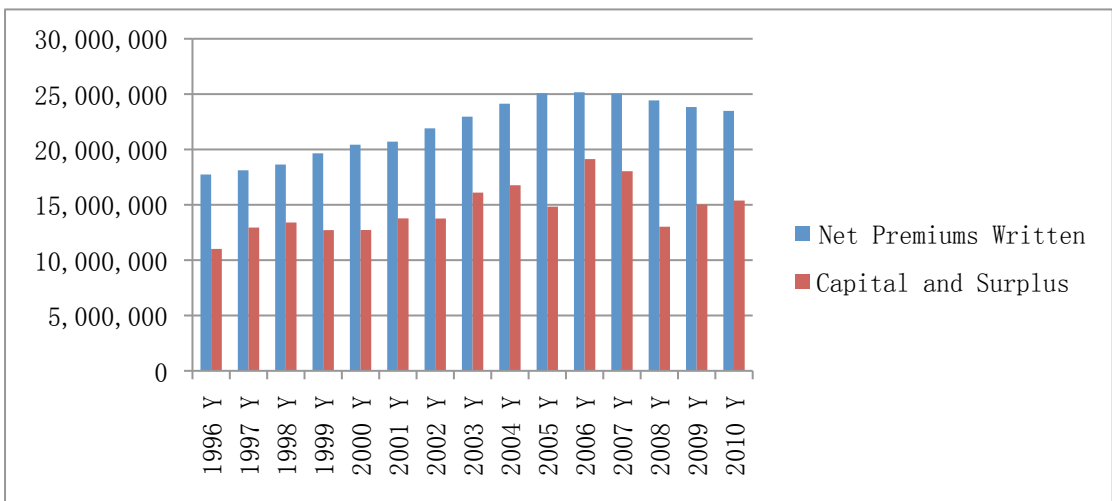
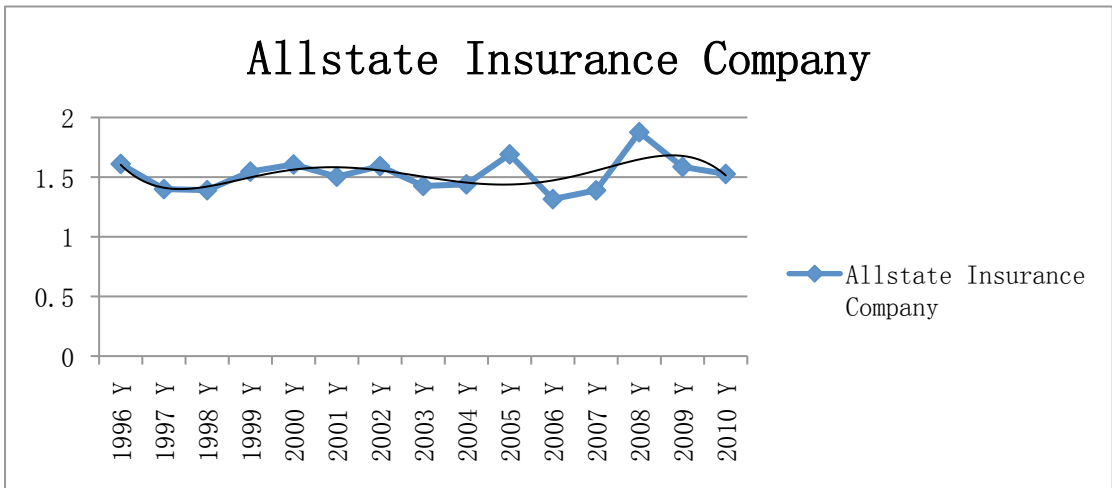
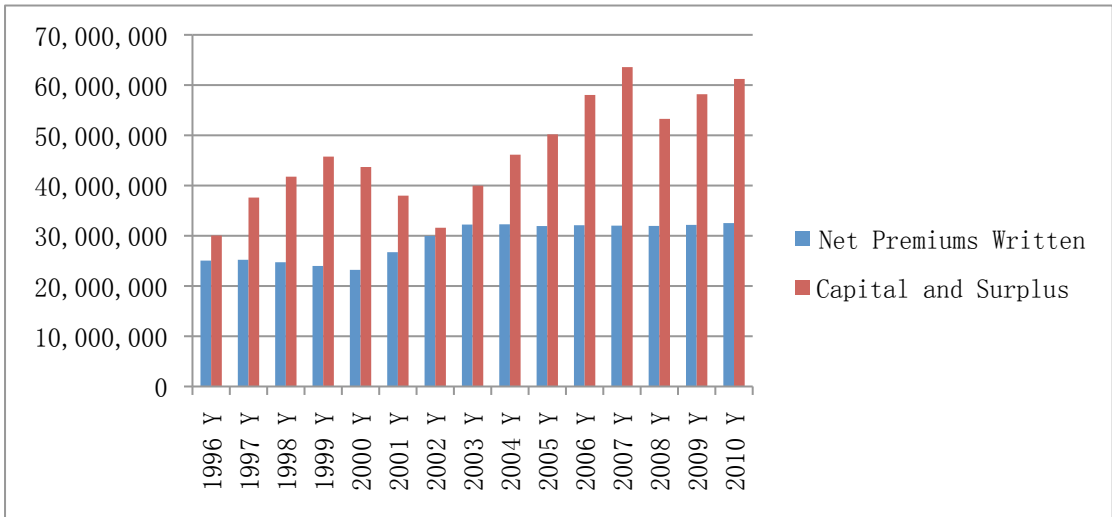
So we can see in these diagrams loss ratios are all decline in the last ten years. A low LAE ratio indicates poor value for consumers even if

insurers are not earning high profits, as they have been in recent years.

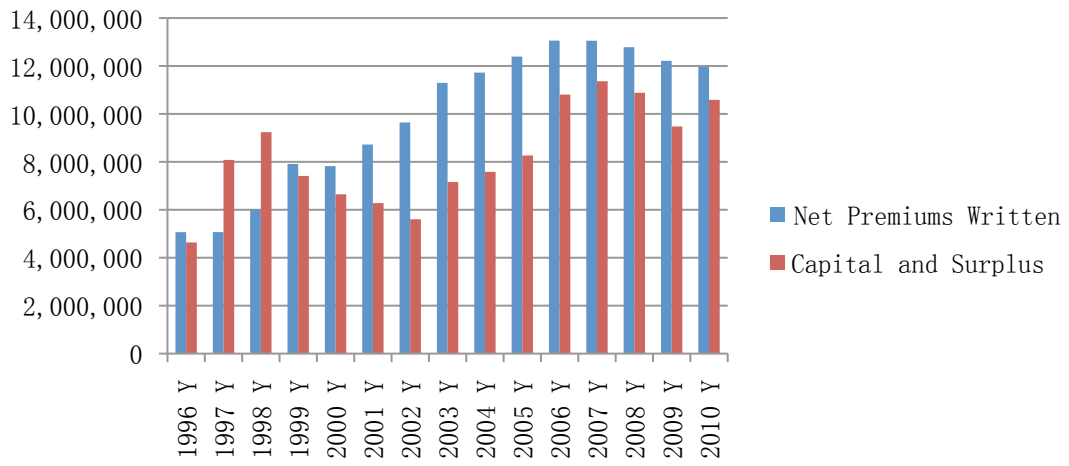
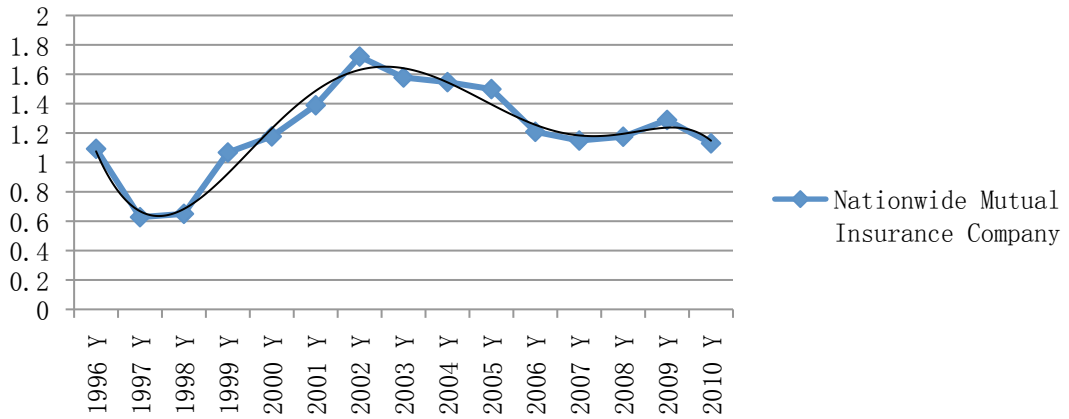
NPW, net premiums written to capital and surplus. This is a measure of the company's ability to absorb financial shocks. The higher the ratio of premiums to surplus, the greater is the potential risk borne by the company in relation to the surplus available to absorb loss variations. It is used only to judge the magnitude of an insurer's exposure to risk through policy issuance in excess of the surplus strain the company may be able to absorb. For example, a company with \$2 in net premiums written for every \$1 of surplus has a 2-to-1 premium to surplus ratio. The lower the ratio, the greater the company's financial strength. State regulators have established a premium-to-surplus ratio of no higher than 3-to-1 as a guideline.

Net premium written to surplus ratios for the 3 of top 5 insurances companies from 1996 to 2010 as follows:

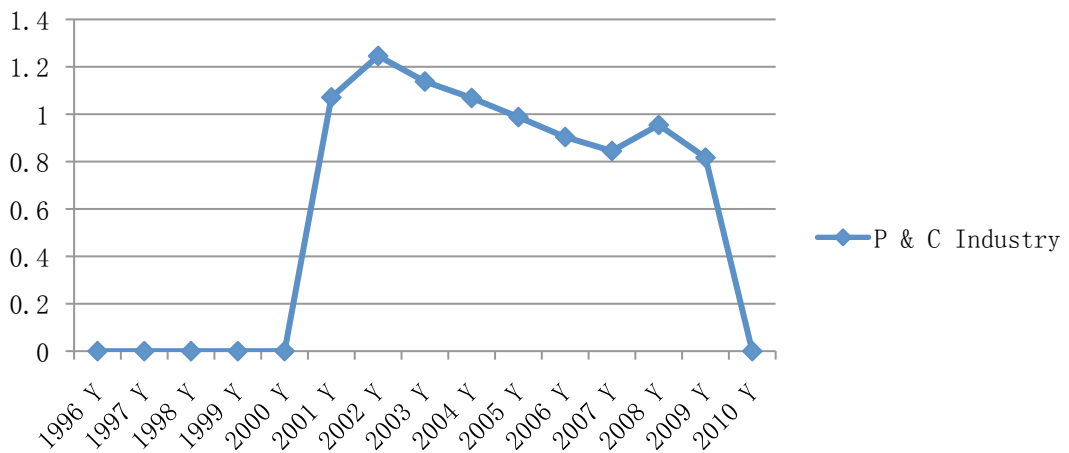




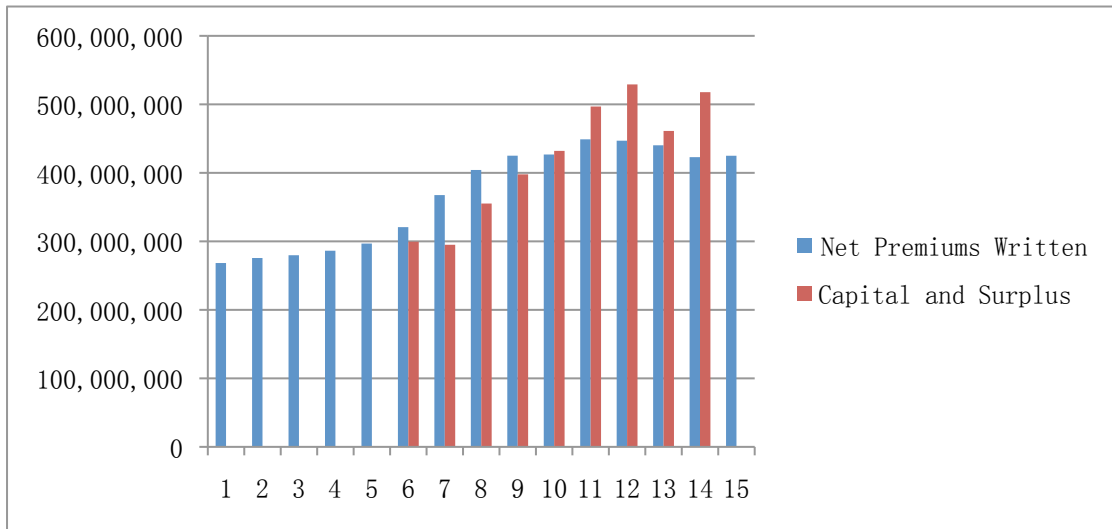
## Nationwide Mutual Insurance Company



## P & C Industry



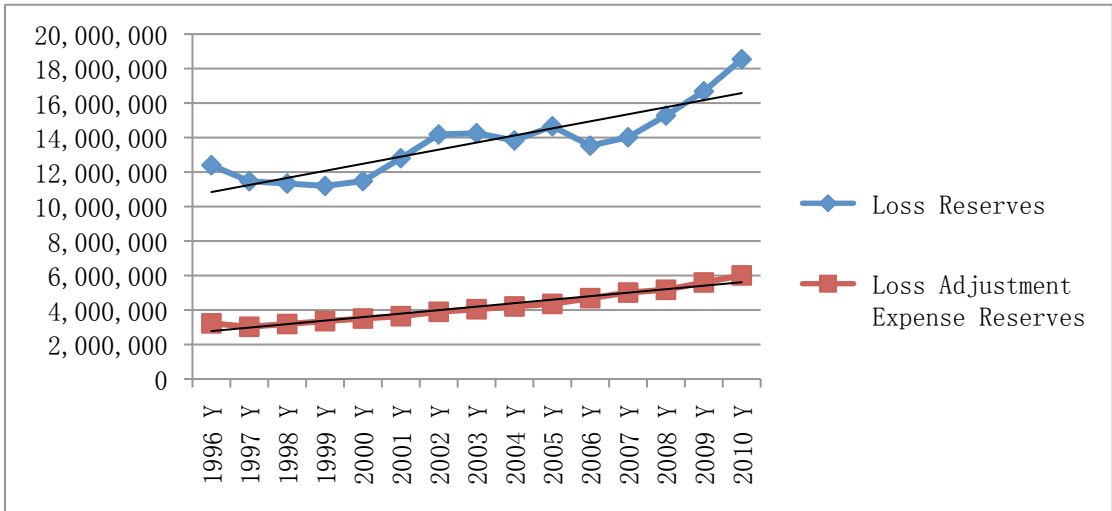




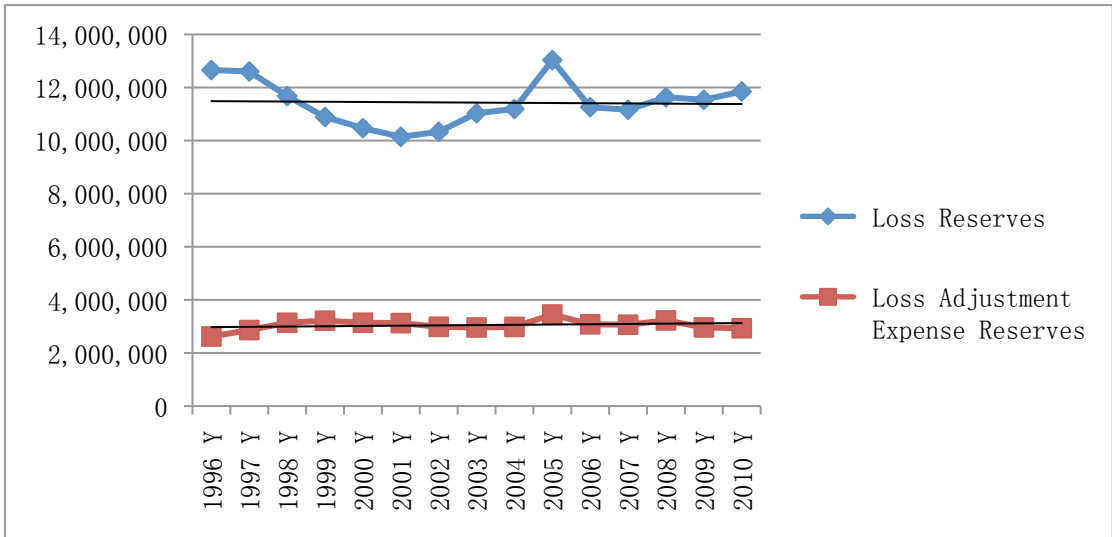
Property/casualty insurers have not exceeded the conservative 1.5 to 1 ratio of NPW to surplus in over twenty years. The sharp downward trend in this key leverage ratio is very clear, demonstrating that the industry is now significantly overcapitalized.

Inflated Reserves, there are several types of reserves that property/casualty insurers establish on their accounting books. There are loss reserves (including reserves for known claims and reserves for claims not yet known – called “Incurred but Not Reported” or “IBNR” reserves), reserves for claims expense (called “Loss Adjustment Expense” or “LAE,” which also includes known and IBNR), and reserves for unearned premiums held by the insurer. Excessive reserves are called “redundant” reserves in the insurance industry’s lexicon.

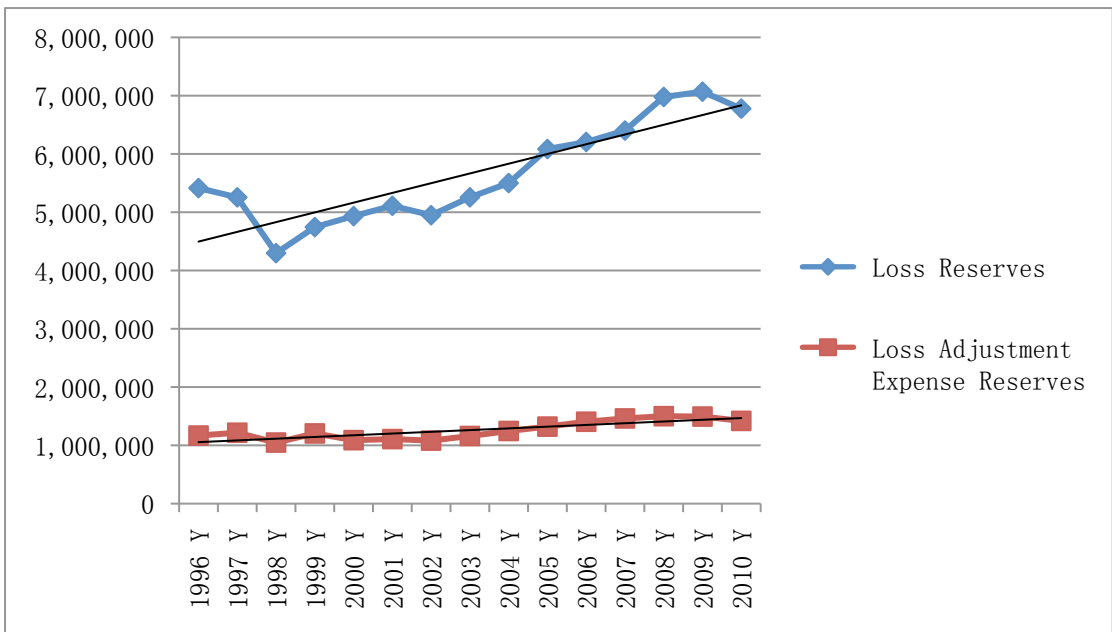
**State Farm Mutual Automobile Ins Co**



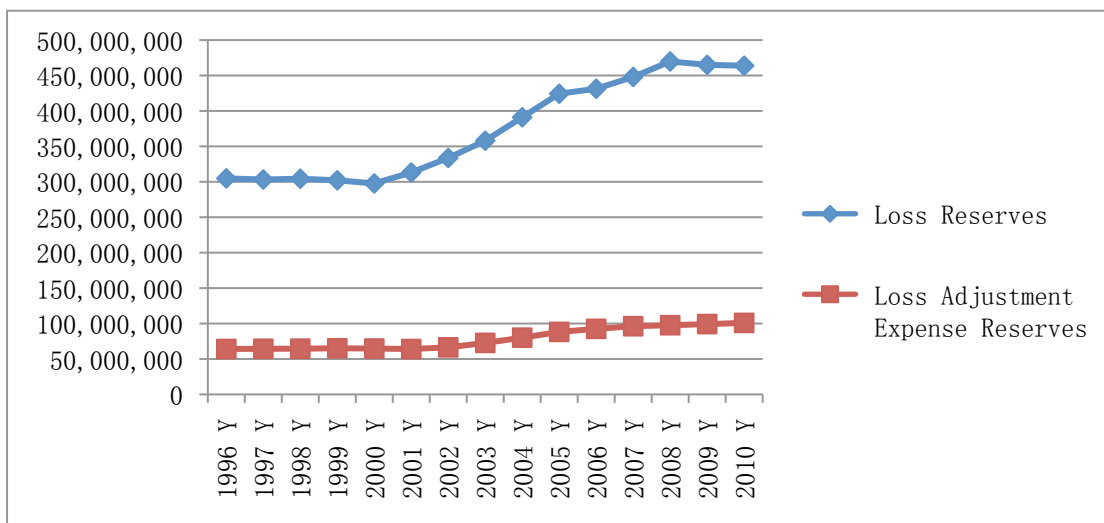
### Allstate Insurance Company



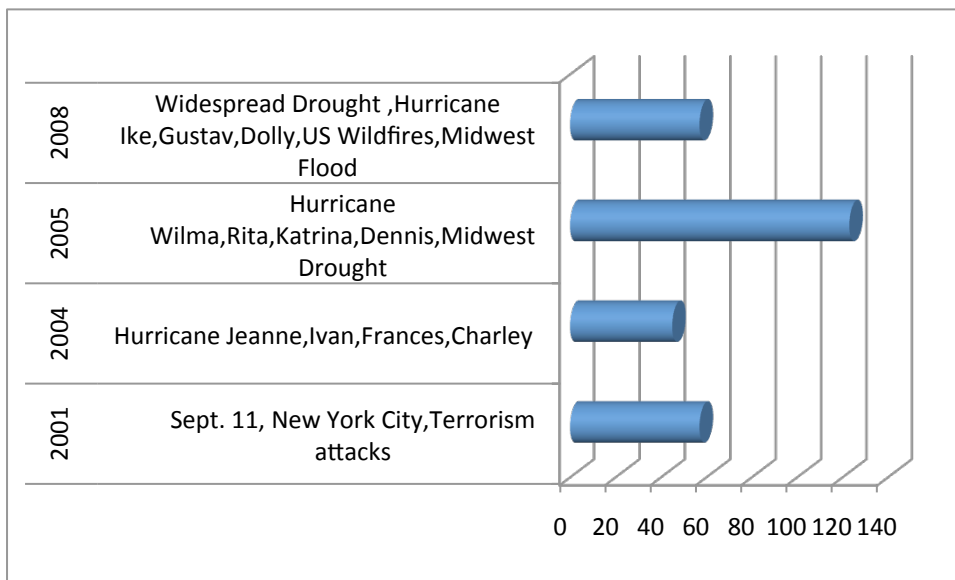
### Nationwide Mutual Insurance Company

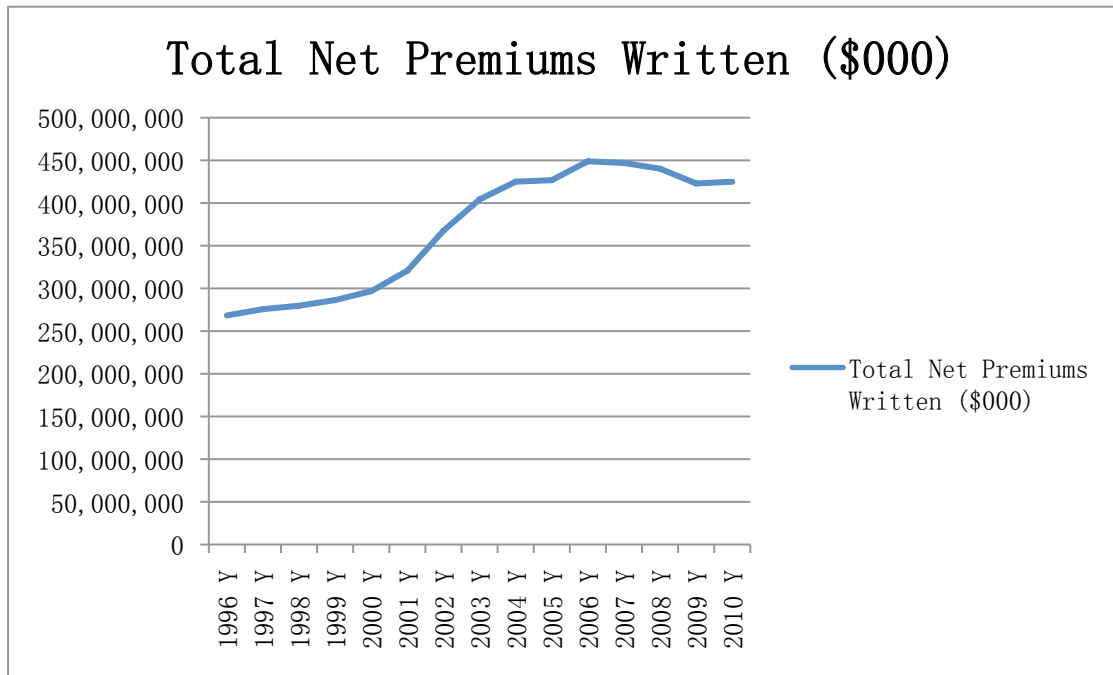


### P & C Industry



What cause the premiums keep increase? Is it because of the Terrorism attacks and weather events become more frequent and more catastrophic? Here are some big disasters in US history:





	Weather and Terrorism lost	Net Investment Income	Net Premiums Earned
1996	14	NA	24,740,732
1997	8	NA	25,276,658
1998	19	NA	24,824,362
1999	10	NA	23,983,116
2000	6	NA	24,234,434
2001	57	38,431,105	26,038,101
2002	12	39,510,765	29,147,700
2003	13	39,656,060	31,794,422
2004	45	40,485,763	32,409,478
2005	123	50,107,385	31,947,621
2006	12	53,163,482	31,946,685
2007	8	56,495,186	31,664,392
2008	57	53,109,254	31,584,063
2009	11	48,401,892	32,064,312
2010	7	NA	32,359,049

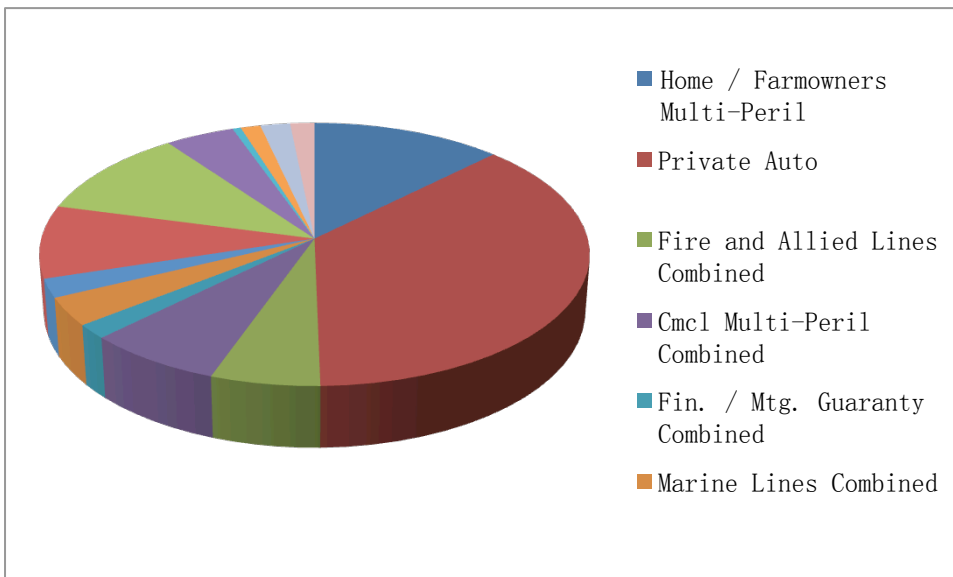
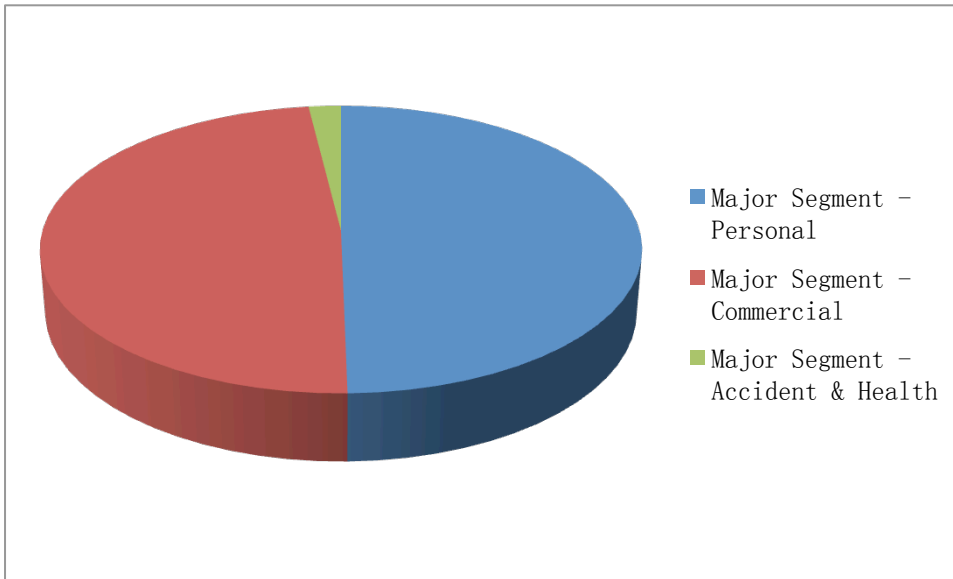
In order to analyze the relation between Net Premium earned and Weather and Terrorism lost, I run the regression on the two variables. The R square in the output is so small, so they do have some connections. But it seems that the insurance companies set their premiums didn't based just on these events. There may be some other reasons: Investment income that insurer's earn, could compensate large

amount of losses. So I add the variable net investment income into the regression model, get the R square increase a lot. So the investment did have a great affection on the premiums price. P&C companies have earned in recent years. In 2004, insurers posted their largest dollar net (after tax) profit in history (\$40.5 billion) despite the fact that four major hurricanes caused significant damage in Florida. Insurers achieved another record of \$48.8 billion in 2005, despite the unprecedented losses caused by hurricanes Katrina, Rita, and Wilma. In 2006 the investment profits are the highest record of \$86.4 billion. The profit of investment from the insurance industry is well above the average of the Fortune 500 companies. This is the main reason why they didn't increase the premium dramatically when they met terrorism attacks and weather event.

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.26432							
R Square	0.069865							
Adjusted R Square	-0.00168							
Standard Error	3561733							
Observations	15							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	1.24E+13	1.24E+13	0.976466	0.341109			
Residual	13	1.65E+14	1.27E+13					
Total	14	1.77E+14						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	28154067	1212118	23.22716	5.71E-12	25535445	30772690	25535445	30772690
X Variable	29348.33	29699.89	0.988163	0.341109	-34814.4	93511.04	-34814.4	93511.04

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.527992							
R Square	0.278776							
Adjusted R Square	0.038368							
Standard Error	2032310							
Observations	9							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	2	9.58E+12	4.79E+12	1.159595	0.375155			
Residual	6	2.48E+13	4.13E+12					
Total	8	3.44E+13						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	23960220	4808214	4.983185	0.002494	12194945	35725495	12194945	35725495
X Variable 1	-4157.57	18816.95	-0.22095	0.83246	-50201	41885.86	-50201	41885.86
X Variable 2	0.15345	0.101465	1.51235	0.181204	-0.09482	0.401725	-0.09482	0.401725

There are many categories in the P & C industry. I want to find out which ones are most overpriced. I use loss ratios to measure the premiums price. Loss ratios for property and casualty insurance, typically range from 40% to 60%. Here is the percentage of the average from 1996-2010.



We can see personal and commercial almost take the same percentage. We continue classify, we find Private Auto, Home/Farmowners Multi-Peril, Workers Comp take major part of the industry.

Base the on the data from 1996-2009, I use one sample T test to find out which categories is overpriced.

U=60%

Ua>60%

$\alpha = 0.05$  so  $T^{\alpha} = 0.05$   $14=2.533$

	MEAN	S-SQUARE	T Value
Home / Farmowners Multi-Peril	75.70	9.664268	6.08
Private Auto	75.59	4.568975	12.76
Fire and Allied Lines Combined	65.73	12.76727	1.68
Comcl Multi-Peril Combined	71.67	9.492085	4.60
Fin. / Mtg. Guaranty Combined	63.82	70.65218	0.20
Marine Lines Combined	60.35	5.014274	0.26
Medical Malpractice	91.87	23.46765	5.08
Workers Comp	79.39	6.954475	10.43
Other Liability	85.47	12.64244	7.54
Commercial Auto	76.67	10.28156	6.07
Aircraft	66.08	17.39444	1.31
Fidelity / Surety Combined	45.69	14.36145	(3.73)
A&H Lines Combined	67.38	6.196373	4.46
Other Commercial	63.87	7.361462	1.97
Non Proportional Reinsurance	89.57	42.64005	2.60

So I find the Fire and Allied Lines Combined, Fin. / Mtg. Guaranty Combined, Marine Lines Combined, Aircraft, Fidelity / Surety Combined are somehow overpriced. The reason could be: the investment profits which derives from the investment "float" that is earned between the time premiums are paid to the insurer and when the insurer pays out losses. In some categories of insurance, like Fire and Allied Lines Combined, the period is relatively short, so the investment profit earned is relatively small. But in other categories, like Private Auto, the float exists for long periods of time, so the investment income is large.

Most people think the risk insurance companies take increase every year due to the weather events and terrorist attacks seem to be more frequent and more catastrophic. So when the insurance companies



increase the premium, reduce the coverage. Most people didn't complain about it. But they all ignore the high investment profit they gain. As a result, the consumers, receiving substantially less value. So I suggest federal government could take to further assist to strengthen their regulatory systems and gain control of excessive rates, inadequate coverage and claims abuses.