intrinsical claims experience methodology

from a sufficiency and solvency perspective

a brief overview & implications

27th international congress IAA

ICA cancun 2002

ASTIN

Jorge Suzán [MEXICO]

background

ASTIN

just come out from oven, reforms to mexican regulation of jan / 16 / 2002, stablished:

mexican insurance companies are required to prove adequacy of their reserves

AT THE BEGINING of 1990 decade, a solvency requirement was introduced to our regulation under the EEC scheme, where the largest of specific proportions of premiums or claims should be retained as capital requirement...

LATER IN 1999, our firm was contracted by AMIS to negotiate with authorities readequations to the initial solvency requirements, in view of the evidence of a decreasing trend of profitability, which was suposed to be patially caused by a potential over-capitalization

THIS HYPOTHESIS WAS PROVEN TO BE TRUE, leading to the reduction of 500 MM DLLS in capital requirements (20%)...

SINCE THEN, the statutory reserves for short term insurance that accounting principles defined as the unearned premium was subject to examination...

new actuarial concerns

ASTIN

solvency- reserve adequacy

these used not to be common questions in traditional theoretical actuarial framework and textbooks

- a deterministic predominance in actuarial methodologies
- a low volatility environment
- lack of powerful technology

they have become a common place in actuarial discourse

also in México

three accelerators

- growing presence of foreign investment in mexican insurance industry
- growing interchange abroad actuarial international organizations
- growing interchange between insurance commissioners of the world

analysis conclusions

ASTIN

when using an unearned premium resereve method, solvency required levels are exceeded if premiums exceed expected claims cost, or are not met in the opposite case...

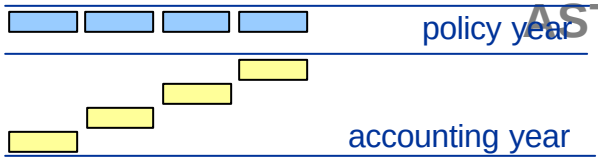
While unearned premium reserve methodology covers an accounting principle that distribute underwriting profit or losses along the insurance period, it does not satisfy a more rigorous definition of the purpose of the reserve, consisting in guaranteeing the capacity of the company to face up future contractual liabilities…

WHAT WE HAVE NAMED ICx (intrinsical claims experience) methodology was developed and has been proposed to mexican authorities to be registered as an approved one, complying with new definition of reserve....

THE PURPOSE OF THIS paper is to obtain feedback from the international actuarial community about the theoretical consistency and pertinence of this methodology, and to discuss what we think are its major implications for insurance developement in our country.

an ilustrative dummy

frequency poisson	**m:**	**25.0%**
severity beta	**m:**	**12.0%**
	sd:	**7.9%**
	A:	**100**
	risk pr.	3
	price level	2
	premium	**6**



	UNITS	exposure				
		0.25	0.50	0.75	1.00	if_1
1	1,000	232.2	200.0	172.2	148.3	55.0%
2	1,200	278.7	240.0	206.7	178.0	55.0%
3	850	197.4	170.0	146.4	126.1	55.0%
4	2,500	580.5	499.9	430.5	370.8	55.0%
1	1,200	278.7	240.0	206.7	178.0	55.0%
2	1,300	301.9	260.0	223.9	192.8	55.0%
3	1,000	232.2	200.0	172.2	148.3	55.0%
4	2,750	638.6	549.9	473.6	407.8	55.0%
T	11,800	2,740	2,360	2,032	1,750	

	PREMIUMS issued	0.25	0.50	0.75	1.00	exposed
1	6,000	1,393	1,200	1,033	890	4,516
2	7,200	1,672	1,440	1,240	1,068	5,420
3	5,100	1,184	1,020	878	756	3,839
4	15,000	3,483	3,000	2,583	2,225	11,291
1	7,200	1,672	1,440	1,240	1,068	5,420
2	7,800	1,811	1,560	1,343	1,157	5,871
3	6,000	1,393	1,200	1,033	890	4,516
4	16,500	3,832	3,300	2,842	2,447	12,420
T	70,800	16,441	14,158	12,193	10,500	53,292

	# claims					
1	184	61	56	34	33	24.4%
2	217	72	57	46	42	24.0%
3	180	59	46	37	38	28.1%
4	476	159	120	99	98	25.3%
1	237	64	60	66	47	26.2%
2	251	81	56	61	53	25.7%
3	196	57	56	47	36	26.0%
4	490	143	128	115	104	23.7%
T	2,231	696	579	505	451	25.1%

	CLAIMS incurred					
1	2,205	709	587	469	440	**48.8%**
2	2,501	769	656	559	517	**46.1%**
3	2,178	740	572	402	464	**56.7%**
4	5,783	2,102	1,371	1,105	1,204	**51.2%**
1	2,860	822	776	818	445	**52.8%**
2	2,874	984	661	597	632	**49.0%**
3	2,338	724	548	630	435	**51.8%**
4	5,879	1,779	1,597	1,261	1,242	**47.3%**
T	26,617	8,630	6,768	5,840	5,379	ic
		52.5%	**47.8%**	**47.9%**	**51.2%**	**49.9%**

definition

ASTIN

intrinsical claims are defined as the result of the basic components of risk: exposure, frequency and severity, without the effect of inflation or lapse rates that might affect claims cost as exogeneous factors...

methodolgy must be a retro-prospective predicting proceess which means that it projects future claims from observed experience independently from pricing assumptions

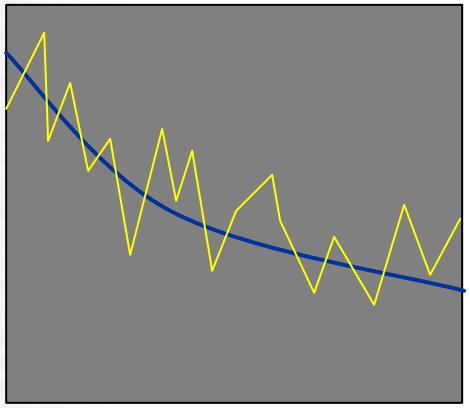
				ICC	**EXF**	
NUMBER OF UNITS EXPOSED TO RISK:	AVERAGE AMAOUNT AT RISK PER UNIT:	FREQUENCY	SEVERITY:	INTRINSECAL CLAIMS COST	EXOGENEOUS FACTORS lapse : inflation	**EXPECTED or OBSERVED**
N	**A**	**f**	**s**	$N \cdot A \cdot f \cdot s$	$\int_{t=0}^{1} if_t(1+\delta)^t dt$	**ICC· EXF**

$$N_o A_o \cdot f \cdot s \cdot \int_{t=0}^{1} if_t(1+\delta)^t dt = P_o \cdot ic \cdot \int_{t=0}^{1} if_t(1+\delta)^t dt = \sum_{p=1}^{12} C_p$$

lapse consideration

ASTIN

1. *not all issued policies will persist to the end of insurance period*
2. *not all issued policies will lapse before the end of insurance period*
3. *lapse in short term has not been tradionally measured*
4. *lapse shows off through the observation of decreasing claims amounts on a specific portfolio*
5. *we propose the adjustment of a exponential function* $if_t = e^{kt}$



t =0 t =1

inforce insurance at time t

$$ic = \frac{\sum_{p=1}^{12} C_p}{P_o \cdot \int_{t=0}^{1} if_t (1+\delta)^t dt}$$

this analysis is made for n generational groups of contracts, i.e. with the same starting date of insurance periods, allowing the observation of pricing trends

inference of lapse and claims ratios

based on minimal information

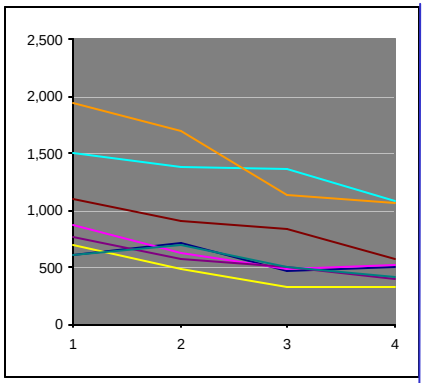
ASTIN

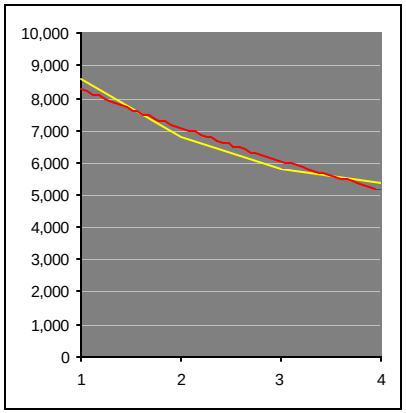
	PREMIUMS issued
1	6,000
2	7,200
3	5,100
4	15,000
1	7,200
2	7,800
3	6,000
4	16,500
T	70,800

CLAIMS incurred

2,205	709	587	469	440
2,501	769	656	559	517
2,178	740	572	402	464
5,783	2,102	1,371	1,105	1,204
2,860	822	776	818	445
2,874	984	661	597	632
2,338	724	548	630	435
5,879	1,779	1,597	1,261	1,242
26,617	8,630	6,768	5,840	5,379

49.9%





claims behavior

$if_1 = 53.2\%$

$if_t = e^{kt}$

k =-0.63%

$$ic = \frac{\sum_{p=1}^{12} C_p}{P_o \cdot \int_{t=0}^{1} if_t (1+\delta)^t dt} = 49.9\%$$

analysis key parameter

ASTIN

depending upon the available information or analysis approach

PREMIUM BASED	ic: intrinsecal claims ratio as a proportion of exposed premium: $P \cdot [N \cdot A \cdot f \cdot s/P]$	$ic = \frac{\sum_{p=1}^{12} C_p}{P_o \cdot \int_{t=0}^{1} if_t (1+\delta)^t dt}$
EXPOSED AMOUNT BASED	icc: intrinsecal claims cost as a proportion of exposed amounts: $N \cdot A \cdot [f \cdot s]$	$icc = \frac{\sum_{p=1}^{12} C_p}{A_o \cdot \int_{t=0}^{1} if_t (1+\delta)^t dt}$
EXPOSED UNITS BASED	ICC: intrinsecal claims cost per exposed unit: $N \cdot [A \cdot f \cdot s]$	$ICC = \frac{\sum_{p=1}^{12} C_p}{N_o \cdot \int_{t=0}^{1} if_t (1+\delta)^t dt}$
EXPLICIT	f,s: relative frecuency and severity related to exposed amount at risk: $N \cdot A \cdot [f] \cdot [s]$	$s = \frac{\sum_{p=1}^{12} C_p}{A_o \frac{NC}{N_o} \cdot \int_{t=0}^{1} if_t (1+\delta)^t dt}$

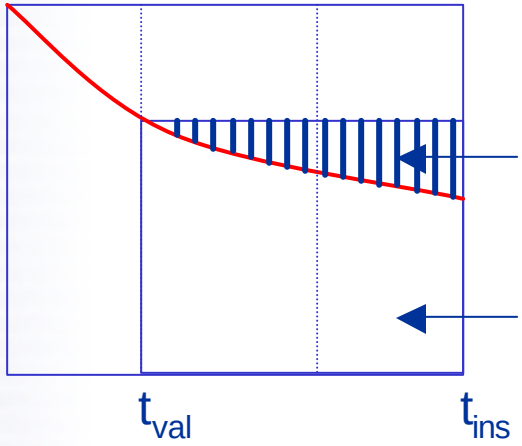
TBAexact ACTUARIOS & CONSULTORES

ICx functions

ASTIN

projection function

$$icx(t_1,t_2,if_t,\delta,i^*)=\int_{t=t_1}^{t_2} if_t(1+\delta)^t(1+i^*)^{t_2-t}\,dt$$



$$fc_{tval}=if_{tval}\cdot icx(tval,tins,1,\delta,i^*)-fr_t$$

$$fr_{tval}=icx(tval,tins,if_1,\delta,i^*)$$

valuation function

$$Vicx_{g,tval}=\frac{P_g}{if_{g,tval}}ic_g\,\frac{fr_{g,tval}\cdot br+fc_{g,tval}\cdot bc}{(1+i^*)^{tvig-tval}}\cdot fe\cdot a\delta_{g,tval}$$

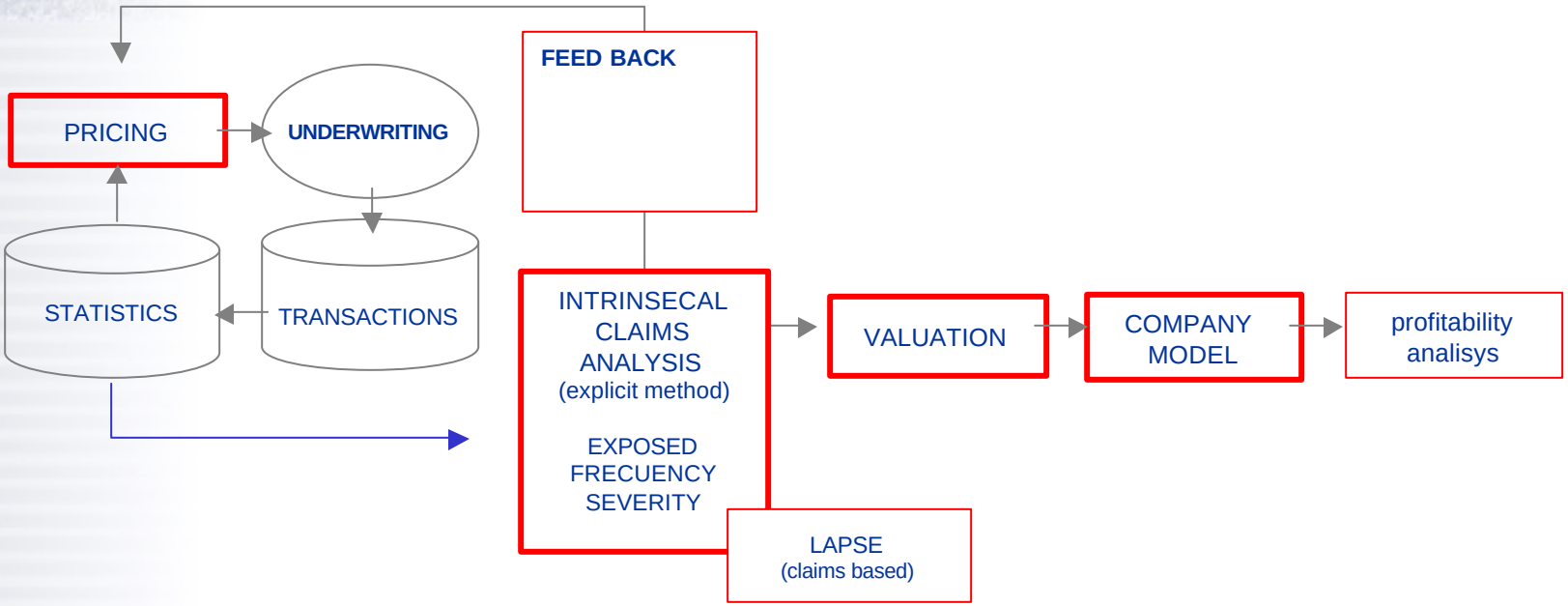
advantages of the method

ASTIN

1	**methodology**	it uses continuos functions which better describe business dynamics
		its structure allows a systematic variation analysis
2	**information quality**	projects from information of the companie's own experience
		observes the complete scheme of liabilities
3	**prudence approach**	inforce model prevents from underestimation of claim ratios
		differentiate liabilities from contracts in force from those expected to lapse
		through observation of trends allow to reduce or increase sensivity in case of decreasing or increasing trends of claims ratios respectively
4	**operation analysis suport**	it measures lapse ratios
		it measures expense and claims efficiency structure
		allows generational analysis to detect atipycal business segments
5	**strategyc support**	allows to detect potential over or sub capitalization trends
		allows cash flow forecasting and assets vs. liabilities matching
		allows pricing trends analysis to suport strategyc decisions making

underwriting cycle

ASTIN



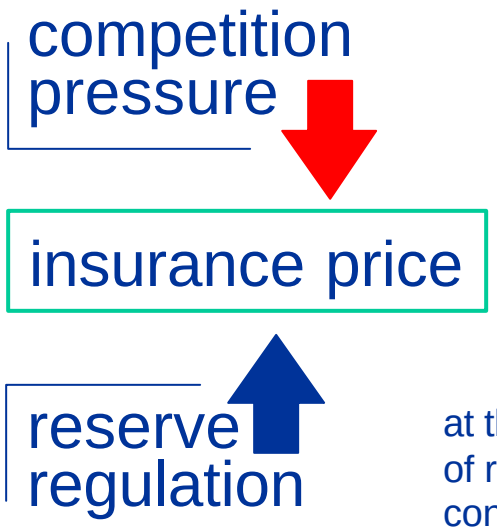
reserve analysis become the keystone of the underwriting cycle articulating experience with pricing policies

market implications

ASTIN

statutory reserves based on a sufficiency model is a clear stimulus to rational competition:

- competition based on price might be penalized with additional equity requirements
- rational price will be prized with lower equity requirements and therefore higher profitability

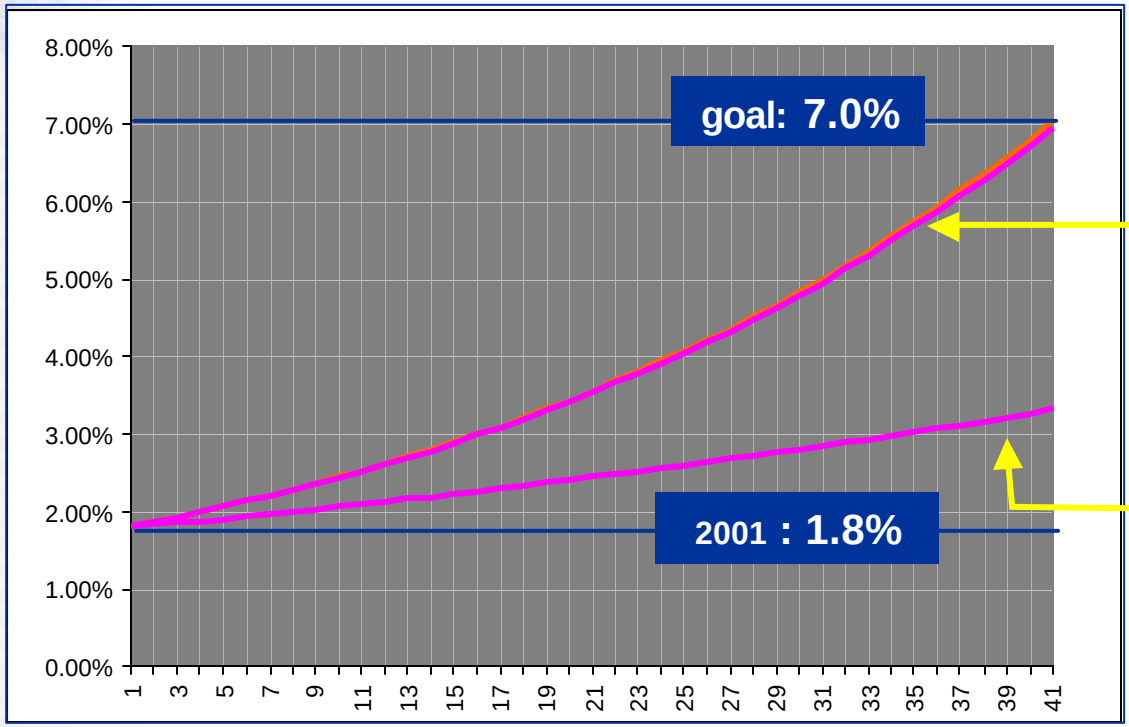


at the same time rationalitation of reserves will not transfer to consumer additional price to meet profitability requirements

long term growth scenarios

ASTIN

INSURANCE PREMIUMS / GDP



GDP growth	insurance growth
7%	1.5X
3%	2.2X
3%	1.5X

insurance industries of emerging economies, which have become a significante part of the arena of insurance globalization, will face up a huge capitalization challenge over the next decades, which will require actuarial design of practices, competition and regulation, to make its developement feaseble.

ASTIN

27th international congress IAA

ICA cancun 2002

thank you, and a good trip back home !!!