

INSURANCE WORLD 2

A COMPLEX MODEL FOR MANAGING RISK IN THE AGE OF GLOBALIZATION

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Abstract : Iw2 focuses on issues associated with managing the total risk within an enterprise including the risks (insurable, financial and investment) associated with large losses using the modern science of complexity.

Keywords : simulation, complexity, insurance, reinsurance, strategy

Dramatic events of the past several years have drawn worldwide attention to the destruction caused by natural catastrophes. Some scientists allow researchers to measure the vulnerability of societies to losses from catastrophes and helping them to understand the potential consequences of these events .

Insured losses in 1999 were equal to USD 28,4 billions – being the second most expensive year in insurance history -. In Europe Anatol, Lothar and Martin caused the major winter storm after a quite period of several years . The insured losses of Lothar and Martin are estimated at nearly USD 7 billions whereas Anatol caused approximately USD 500 millions of insured losses in the Northern Europe.

The landslide catastrophe caused by torrential rain in Venezuela caused about 400 millions US of insured losses.

Another important event is the earthquake in Turkey (total losses estimated for USD 20 billions against insured losses for USD 2 billions).

In light of the increase of the catastrophe losses in term of frequency and insured amount, the Insurance Industry felt the necessity to limit the fluctuation of catastrophe losses in order to obtain a positive result of technical balance sheet and financial prosperity .

1. THE BIRTH OF INSURANCE WORLD

The Insurance World simulator grew out of the wish of several firms in the catastrophe insurance industry to create a kind of “laboratory” with which to experiment with various risk scenarios. For instance, suppose a force 5 hurricane drops on Miami Beach. Who are the winners and who are the losers in the aftermath of such a major catastrophe? And what kind of companies spring up to fill the niches left behind by firms that disappear after such event? These are the type of questions that are of vital concern to catastrophe insurance companies – but for which no experimentation is possible.

The foundation of the Insurance World simulator is the Science of Complexity – the science of simple entities creating surprising and unexpected outcomes through simple interactions. Complex Systems produce behavioural patterns that cannot be predicted from knowledge of the parts in isolation . The Catastrophe Insurance Industry is just such a Complex System. No one predicted the extensive changes to the industry, the creations of new companies, and flow of capital that occurred after Hurricane Andrew struck Florida in 1992. Forward thinking people in the industry recognized that there was much to be gained by applying this new way of thinking to their industry. Much of the understanding of Complex System Theory was developed by John Casti and others at Santa Fe Institute in New Mexico .

The development of Insurance World was driven by the industry. Industry shareholders formed a consortium of reinsurance companies, insurance companies, and research institutions and companies to clarify and address the issue. The first phase of the Insurance World project began in the fall of 1997 and ran for one year.

The end result of this first phase was a software package termed “Insurance World Simulator”. It represents a “toy model” of the real world of catastrophe insurance, incorporating only two types of catastrophe – hurricanes and earthquakes – occurring in three geographic areas: Japan, California and the Eastern Atlantic Coast . In this world there are five insurance firms and five reinsurers considering a ten years period – quarterly simulated. At the outset, the user sets parameters for the external economic climate, estimates of the climate and earthquake conditions and various factors distinguishing one firm from another.

The simulation then traces out the implications of the decisions each firm makes in regard to developing market shares, repayment of loans, attitudes toward risk, amount of risk assigned to reinsurers and so forth. In this way, various management strategies can be tried in an attempt to find those that lead to prosperity, or at least avoidance of extinction .

The success of Insurance World 1 – IW1 – led to the formation of a new consortium, **Insurance World 2 – IW2** - which began in early 2000.

2. INSURANCE WORLD 2

The members of the Insurance World 2 Consortium are:

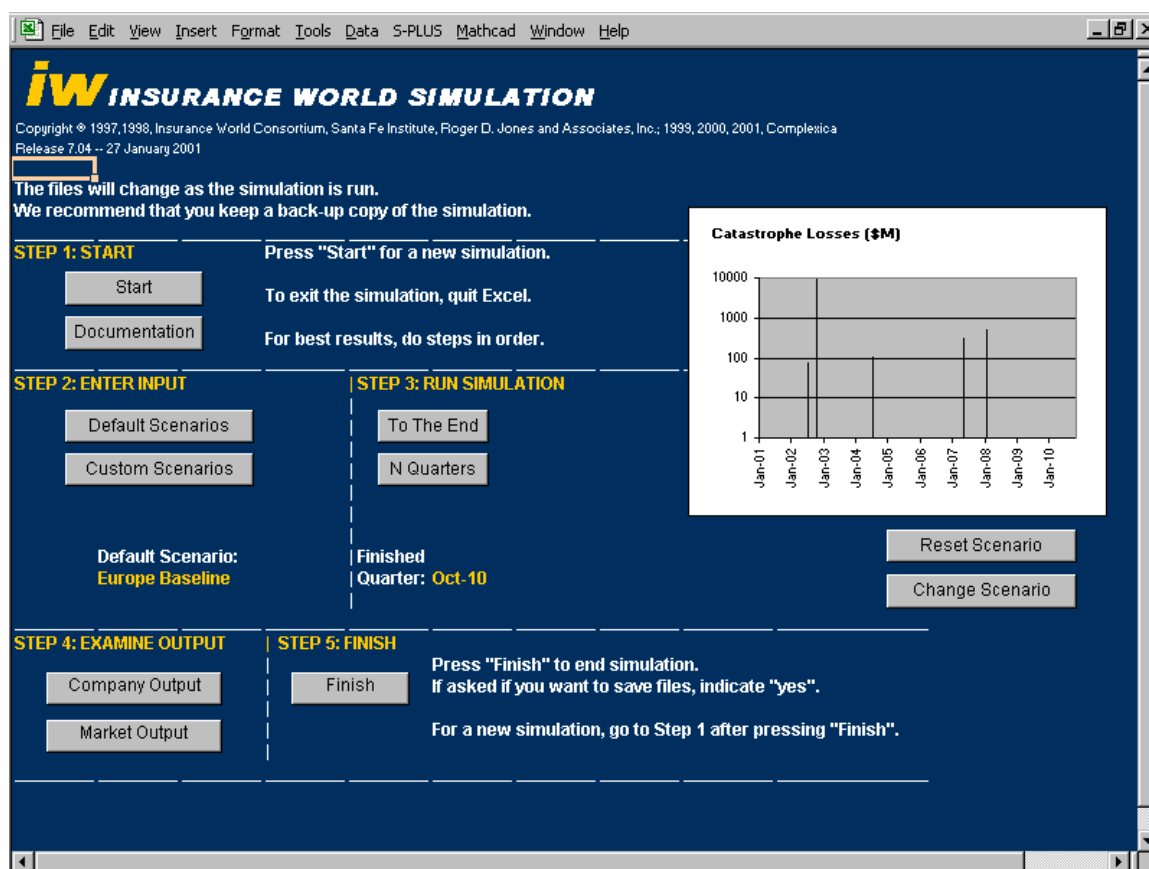
- Italtre / Victoria Rueck
- California Housing Loan Administration
- American Management Administration
- Ernst & Young
- Complexica

Insurance World 2 focused on issues associated with managing the total risk within an enterprise including the risks associated with large losses and catastrophe. These risks include not only insurable risks, but also financial and investment risks.

Using the technique of modern science of complexity, the consortium developed a software tool to assist insurance companies in managing their activities in the competitive consumer and economic environment of the Information Age, answering to many questions concerning the activity of a company, for instance :

- ✓ How do the frequency, magnitude and geographical distribution of natural catastrophes affect the probability of (Re) Insurance Company ?
- ✓ How is risk spread among the companies ?
- ✓ What is the effect of various pricing strategies on the Industry as a whole and on individual companies ?
- ✓ How do the consumer affect the risk of the companies ?
- ✓ What affect does the availability of capital have on the risk ?
- ✓ What are the conditions for the formation of new companies ?
- ✓ What are the conditions for the bankruptcy ?
- ✓ What is the effect of marketing strategies ?
- ✓ What is the effect of the structure of (Re) Insurance contracts ?

The following screen captures give an overview of the operation and features of Insurance World 2 .



Main screen of Insurance World simulation .

The modern business environment has become global and interconnected. An earthquake in Japan can lead to the failure of a major bank in Britain. Just in time inventory control in manufacturing processes increases supply chain risks. A dip in foreign exchange rates can flip the advantage between two competitors. So it is no longer possible to manage different risks independently. Risk can no longer be divided into risks that can be insured, like interruptions due to fire or supply interruption, and risks that can be financed, such as price uncertainty.

The interaction of the global economy forces enterprises to manage uncertainty and volatility as a portfolio of risks, not as independent events. The science of complexity adaptive systems is the science of interaction. As such it is well suited to address the issues of risk management at the portfolio level .

One of the main accomplishments of Insurance world 2 was to develop a set of complexity based intellectual and software tools to help today's manager make sense of enterprise-wide risk .

IW2's approach is to create more realistic scenario about the interconnections between the (Re) Insurance and Economic & Financial Market .

Each (Re) Insurance Company has four goals, as follows:

$$F = f (CR; \gamma; \eta; dMS)$$

- to achieve its desired Net Combined Ratio – the ratio of (expected annual retained losses R + costs C) to retained premium π

$$CR = (R + C) / \pi$$

- to achieve its desired premiums to Total Assets

$$\gamma = \pi / TA = (R + C) / (TA * CR)$$

- to achieve its Efficiency of Capital Use – the ratio of Subscribed Capital to Total Assets

$$\eta = SC / TA$$

- to achieve its desired Market Share, dMS

Each firm obtains its best result through a mechanism of interaction which works on three different key levels:

- simulation of natural catastrophes and their impact on the worldwide economy in term of amount
- analysis of technical components of developing company growth and their vulnerability to natural catastrophes
- the natural catastrophes's impact on the (Re) Insurance Companies' balance sheets, following the strategy of each company (market, investment, etc ...)

The mechanism of interaction works on three principal factors as the price, the desired supply of capital and the desired risk retention: each company adjusts the price of its policies to balance the supply of capital with the demand for capital (risk retention).

The current level of overcapitalization in the insurance industry may conflict with the goal of achieving an high return of equity, but how much capital should an insurer hold ?

The activities of insurance companies are subject to supervision in the interest of consumer protection. In Europe and USA, the importance of minimum solvency margin is due to deregulation of price and different type of products .

In Usa, the minimum amount of capital funds for insurance companies is calculated using complex formulae which take into account underwriting risk, assets risks and credit risk whereas in EU, the capital funds required are calculated only on the basis of underwriting risks.

The impact of catastrophe losses on solvency margin can give a negative annual result although the company has the financial instruments at its disposal to bring losses under control.

With an adequate reinsurance programme, an Insurance company can avoid a balance sheet loss and thus a reduction in capital fund by releasing reserves and selling some investments.

It is important to highlight that – with the globalization of the market – an Insurance Company will overexpose its portfolio if the firm does not know and check each single risk underwritten and / or will obtain a financial loss if the exchange / interest rates go down too fast .

The availability, the quality and the continuous adjournment of the portfolio's information (earthquake, flood, windstorm, etc...) permit to have the right catastrophic exposure according to the firm's capacity . For this reason, the Insurer Company has to know the markets where it works and its total portfolio .

In IW2, the premium is one of the company's principal parameter because it permits to achieve the desired Net Combined Ratio and market share, which is based on each company's efforts to maintain its customers (a measure of whether consumers in a market tend to choose their insurance company for low price or high brand recognition).

In addition, the firm determines the availability of capital on the risk through the "risk attitude", the solvency margin and the desire of market share over the profit (it is a measure of whether the company set its premium price low in order to capture long-term market share or high to capture short-term profit).

IW2 - having much refinement of the Insurance World Simulator -, shows new characteristics as follows:

- the external environment (natural catastrophes, consumers market, more informations about the financial market)
- more complex technical and economic models for the (Re) / Insurer Companies
- the ability to change company strategy during the simulation
- more comprehensive company balance sheets and earnings statements

The external environment

The original project was developed to include Europe and natural catastrophes such as floods, windstorms, earthquakes.

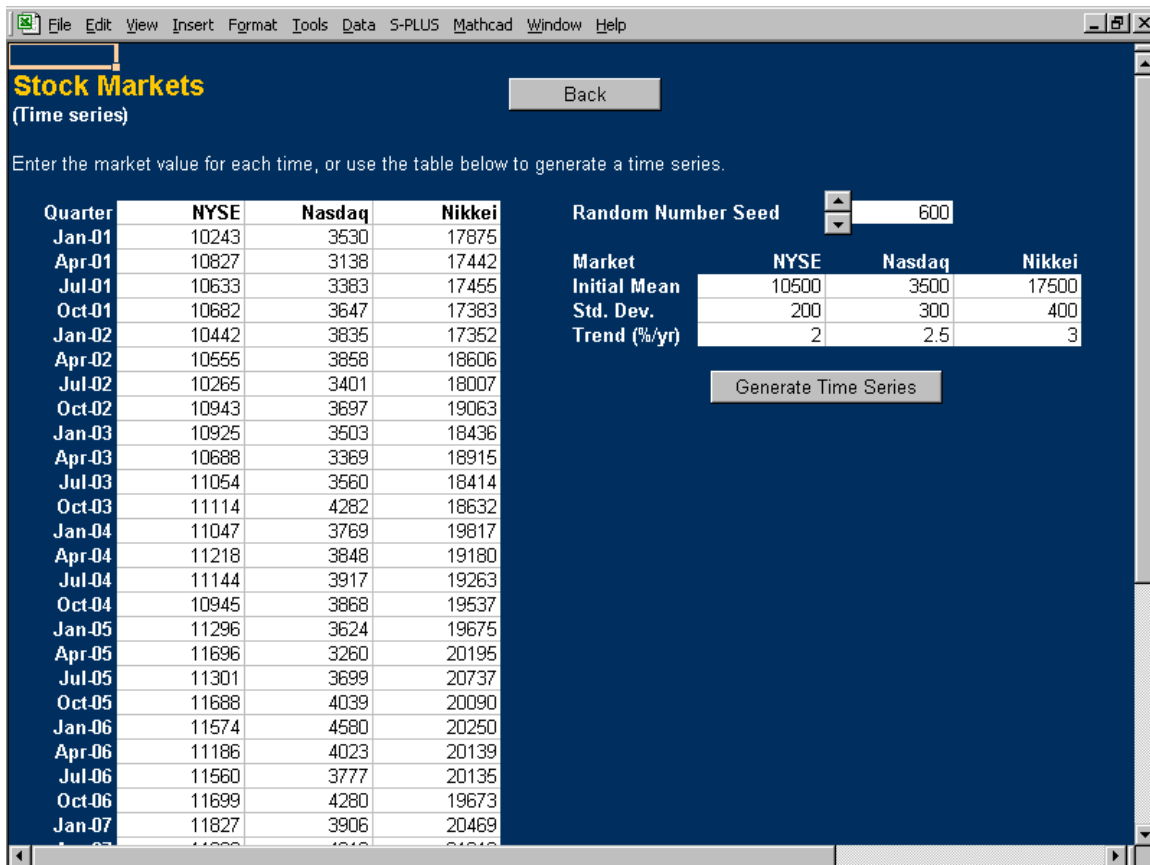
It is important highlight that IW2 does not include the Asian Area except Japan. This choice depends on the low catastrophe losses frequency against the other two areas North America and Europe .

In addition, it considers ten different regional markets which can be affected by several natural catastrophes (the amount of each loss depends on the random parameter and the probability of catastrophe per year). Each market is also characterized by a “Growth Index“ and typical “consumer’s trend” which tends to change the insurance company with the lowest premium or the best brand image .

Market	Name of Market	Probability of a Catastrophe, per year (%)	Expected Loss (\$M) Given a Catastrophe	Expected 100-Year Loss (\$M)	Annual Expected Regional Loss (\$M)	99% P (Qu)
Market 0	W Europe Earthquake	7	2000	4159	140	
Market 1	W Europe Flood	7	500	1040	35	
Market 2	W Europe Windstorm	7	500	1040	35	
Market 3	N Europe Earthquake	7	2000	4159	140	
Market 4	N Europe Flood	7	500	1040	35	
Market 5	N Europe Windstorm	7	500	1040	35	
Market 6	S Europe Earthquake	7	2000	4159	140	
Market 7	S Europe Flood	7	500	1040	35	
Market 8	S Europe Windstorm	7	500	1040	35	
Market 9	Other Large Cats.	7	1000	2079	70	

In a custom scenario, the user first specifies the catastrophe markets.

In the above screen, the model analyzes the effect of Windstorm ,Flood and Earthquake in Europe, however, as previously indicated, it can study other countries too, as well Usa, Japan...



Capital markets include short- and long-term bonds, stocks, real estate, and catastrophe bonds.

The Capital Market information consider the trend of the different types of investment such as Short Term Bond (6 / 9 / 12 months), Long Term Bond (5 / 10 / 15 years), Stock Market (NY / Nasdaq / Nikkei), Reale Estate (in three different markets), Cat bond (before and after a catastrophe).

More complex technical and economic models for the (Re) Insurer Companies

The simulator was improved considering parameters such as fixed and variable costs, inflation, outstanding losses, premium reserve, company solvency requirements, antitrust regulation, ect...) which characterize each (Re) / Insurance Company both in terms of real value and strategy .

IW2 determines also the retention of each firm in relation to the amount of the expected annual loss retained in each regional market. This retention level is “optimum” because it comes from the technical & financial characteristics associated with the strategy of company during the simulation period.

The screenshot shows a software window titled 'PRIMARY INSURER' with a menu bar (File, Edit, View, Insert, Format, Tools, Data, S-PLUS, Mathcad, Window, Help). The main area is titled 'COMPANY INPUT' and contains a 'Back' button. Below this, the 'Company Name' is set to 'Zurich'. A vertical label 'PRIMARY' is on the left. The 'Strategic Parameters' section includes the following:

Parameter	Value	Description
Desired Growth Rate (%)	11	(Company valuation is meaningful only if growth rate is less than WACC and ROIC)
Desired Weight Adjusted Cost of Capital (WACC) (%)	12	
Desired Return on Invested Capital (ROIC) (%)	304.9	
Net Operating Profit Less Adjusted Taxes (NOPLAT) (\$M)	1451.2	
Desired Net Combined Ratio (Annual Retained Losses + Costs)/Premiums (%)	90	
Desired ratio of total Premiums to Capital	2.5	
Desired ratio of Premium Reserves to (Expected Annual Retained Losses + Costs) (%)	37.5	
Desired Efficiency of Capital Use (Subscribed Capital/Total Assets) (%)	68	
Percent of assets in Current Assets (the remainder in Fixed Assets)	4.8	
Preference for Portfolio Diversification (%)	0	
Number of Companies Represented	1	
% of Retention Deficit to convert to Cat. Bonds	0	

After specifying the market conditions, the user sets strategic parameters and the distribution of assets for each primary insurance company and each reinsurance company.

The screenshot shows a software window titled "Market Share Primary Insurers" with a menu bar (File, Edit, View, Insert, Format, Tools, Data, S-PLUS, Mathcad, Window, Help) and a "Back" button. The main content is a table with the following data:

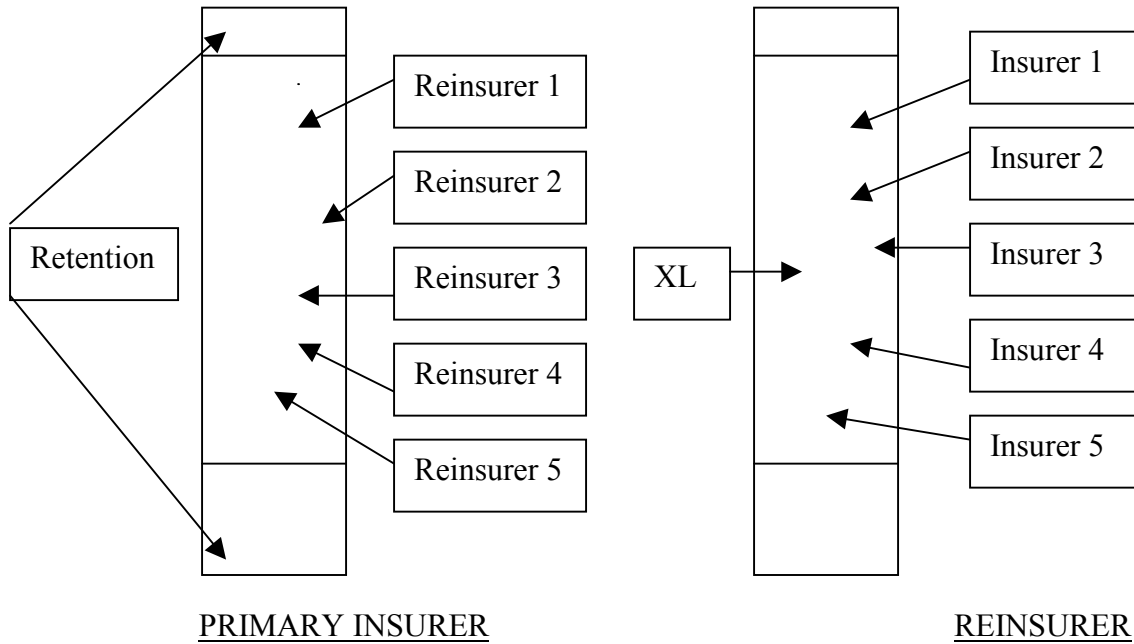
	Zurich	Allstate	State Farm	Prudential	Nationwi
	%	%	%	%	
W Europe Earthquake	16	18	20	22	
W Europe Flood	18	20	22	24	
W Europe Windstorm	20	22	24	16	
N Europe Earthquake	22	24	16	18	
N Europe Flood	24	16	18	20	
N Europe Windstorm	16	18	20	22	
S Europe Earthquake	18	20	22	24	
S Europe Flood	20	22	24	16	
S Europe Windstorm	22	24	16	18	
Other Large Cats.	24	16	18	20	

Finally, the user sets the initial market share for each company.

In a competitive market, it is important to determine the best retention according to objective technical characteristics (such as portfolio, technical reserves, reinsurance programmes, total assets, etc ...) and subjective characteristics (such as limitation of portfolio's fluctuations, desired LR, desired profit margin, risk's propensity, ect) because a level too high or too low could limit the Insurance Company's economic and financial potentiality .

In IW2, the total amount ceded to all reinsurance companies plus the total amount retained by all insurance companies is approximately equal to the maximum expected loss for a region .

Example : Expected Loss Distribution in a Market



At the same time, the simulator calculates the amount of premiums :

- paid by insured parties

$$\pi_0 = (1 + \epsilon_0) E$$

where π_0 are the total premiums to a company from a region and ϵ_0 is a profit factor associated with the insurance company (this factor is also called “safety factor”)

- retained by an Insurance Company

$$\pi_1 = (1 + \epsilon_1) R$$

- paid to a Reinsurance Company

$$\pi_2 = (1 + \varepsilon_2) XL$$

where π_2 are the total premiums ceded by all Insurance Companies to Reinsurance Company from a region and ε_2 is a safety factor associated with the last firm .

In the old “game” of demand and supply, each insurance company offers to cede a given amount of risk to each reinsurance company, which in turn decides to accept it . The actual amount of risk that is ceded is the weighted average of the offered amounts to the reinsurer and the market share of each company determines the weights: obviously, the larger the market share of a company , the greater is its clout in the negotiation.

IW2 will calculate the retention per each (Re) / Insurance Company as follows:

$$\text{Retention} = F((M_p * (1 + E_p) * R_p + \sum M_r * (1 + E_r) * R_r) / (M_p + \sum M_r))$$

M_p = Insurance Company’s market share

M_r = Reinsurance Company’s market share

R_p = Insurance Company’s desired market share (associated to strategic & financial parameters)

R_r = Market share offered by Reinsurance Company

E_p / E_r = safety factors

REINSURANCE CONTRACTS								
W Europe Earthquake								
RETENTION (\$M)								
Primary	Jan-01	Jan-02	Jan-03	Jan-04	Jan-05	Jan-06	Jan-07	Jan-08
Zurich	359	390	397	403	402	395	390	383
Allstate	383	473	487	498	518	517	548	548
State Farm	404	573	590	607	618	634	647	647
Prudential	424	698	737	762	773	801	815	815
Nationwide	442	823	875	976	988	990	974	974
TOTAL	2012	2956	3088	3244	3300	3337	3375	3375

CatXL (\$M)								
Reinsurer	Jan-01	Jan-02	Jan-03	Jan-04	Jan-05	Jan-06	Jan-07	Jan-08
Swiss Re	429	229	204	169	155	143	131	131
Munich Re	429	235	210	175	165	158	151	151
General Re	429	241	215	187	178	174	170	170
ACE	429	245	218	190	182	181	180	180
Centre Re	429	252	224	194	179	166	152	152
TOTAL	2147	1202	1071	915	859	822	784	784

The user may also review the reinsurance contracts in each market.

Ability to change the company's strategy during the simulation

IW2's considers ten years - in steps of a quarter each – and the user has the possibility to choose the number of quarters of simulation period. Beside - year by year - it is possible to change company strategy during the simulation and define a new behaviour due to the new market conditions and / or economic worldwide situation.

More comprehensive company balance sheets and earnings statements

In light of these new technical, economic and financial parameters, IW2 considers the impact of insurance risks (natural catastrophes occurred in each regional market) and / or economic – financial risks (spread of investments portfolio in relation to the trend) on the company's balance sheet and earning statement.

The user has the possibility to choose two different types of information: one more detailed than the other (executive summary).

In the first , IW2 shows the effect of the company’s investments strategy in term of fixed / current asset and interests coming out, the losses occurred and premiums according to each single market, etc

EXECUTIVE SUMMARY

Zurich Back Detailed Financials Summary

BALANCE SHEET (\$M)

Yearly Average	Initial	2001	2002	2003	2004	2005	2006	2007	2008
Current Assets	24.09	569.94	1446.65	1510.22	1501.52	1513.82	1492.46	1473.46	1485.75
Fixed Assets	475.91	243.78	946.06	1746.66	3594.39	5673.27	8255.45	11395.69	15260.26
Total Assets	500.00	813.73	2392.71	3256.88	5095.91	7187.09	9747.91	12869.16	16746.02
Solvency Margin	1.54	67.31	93.24	97.06	96.17	96.79	95.32	94.45	
Subscribed Capital	350.00	553.33	1627.04	2214.68	3465.22	4887.22	6628.58	8751.03	11387.29
Premium Reserves	14.46	631.06	874.17	909.93	901.57	907.43	893.61	885.43	886.77
Outstanding Loss Reserves	0.00	0.00	96.39	43.67	2.59	0.24	0.00	8.56	13.35
Debt	10.00	9.64	8.75	7.99	7.28	6.61	6.00	5.44	4.94
Total Liabilities	374.46	1194.04	2606.36	3176.27	4376.66	5801.50	7528.19	9650.47	12292.35
Equity (Free Reserves)	125.54	-380.32	-213.65	80.61	719.25	1385.58	2219.72	3218.69	4453.67
Total Liabilities & Equity	500.00	813.73	2392.71	3256.88	5095.91	7187.09	9747.91	12869.16	16746.02

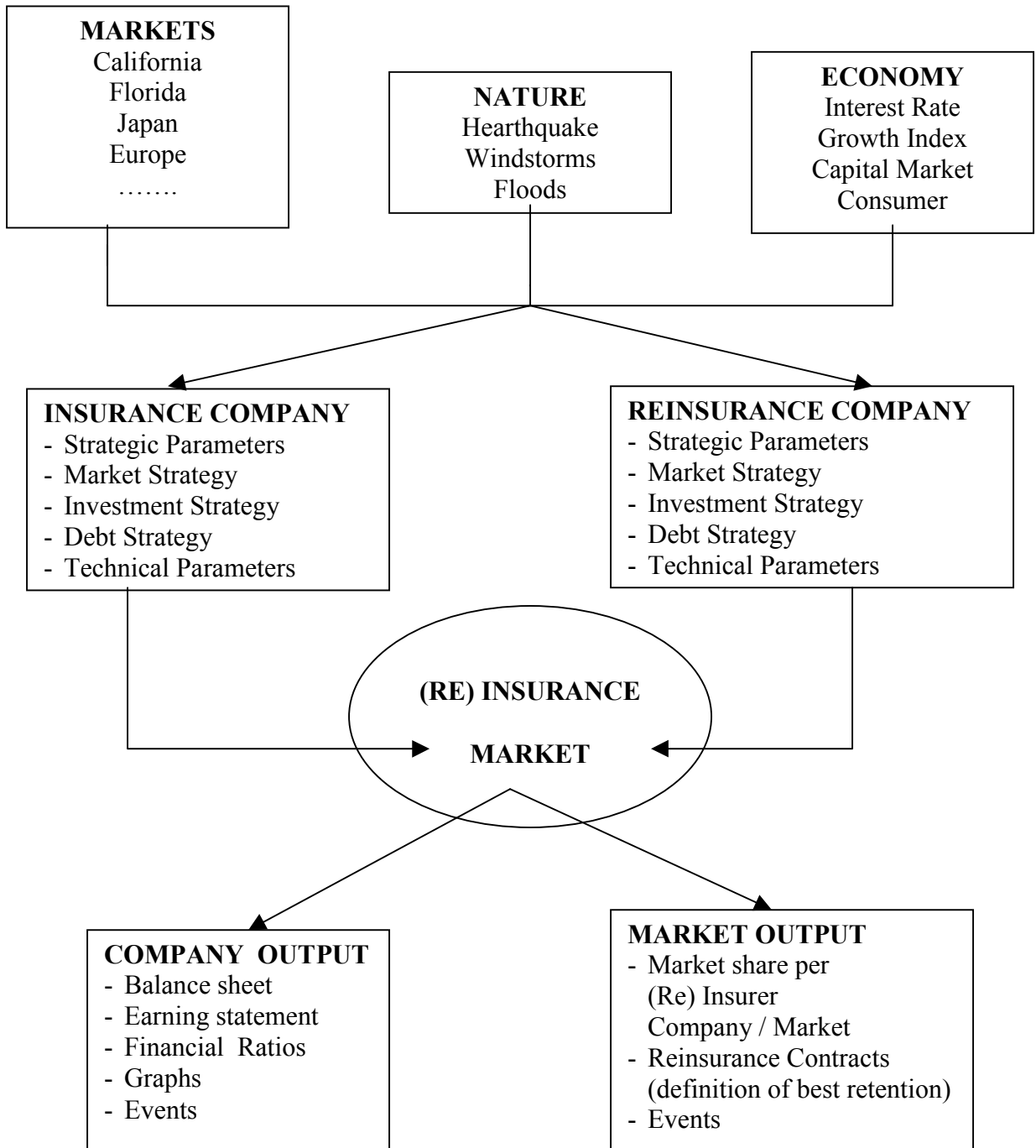
EARNINGS STATEMENT (\$M)

Yearly Total	2001	2002	2003	2004	2005	2006	2007	2008
Total Retained Premiums	1682.8	2331.1	2426.5	2404.2	2419.8	2382.9	2361.2	2364.7
Net Non-Cat. Earnings	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Total Retained Losses	0.0	718.7	512.4	23.7	2.0	0.0	74.8	116.2
Total Costs	440.7	602.8	626.6	621.0	625.0	615.7	610.3	611.2
Operations Earnings	1322.1	1089.7	1367.5	1839.5	1872.9	1847.2	1756.0	1717.3
Total Interest Income	33.1	152.0	266.8	575.3	727.8	1769.3	2964.5	3048.6
Total Cat. Bond Payout	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0
Interest Expense (on Debt)	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5
Total Cat. Bond Payin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

After running the simulation (for any number of quarters), the user may examine detailed financial statements or an executive summary of each company’s performance.

IW2 may be difficult to understand being a complex model, displaying the interactions of all technical and economic / financial parameters , however the following graph shows the connections between all the parameters.

WHAT DOES THE INSURANCE WORLD 2 MODEL SIMULATE ?



3. INSURANCE WORLD: THE FINAL PRODUCT

Insurance World is now behind the research and development phase and is a powerful tool to assist to the (Re) Insurance Company in relation to the Catastrophe business . It is being used as decision support tool, management-training tool and is being customized to serve the proprietary needs of individual clients .

The product is a set of business simulation software with consulting support :

- IW Decision Support through software based on a common platform and Applications Service Provider (ASP) for managing reinsurance and insurance companies through large catastrophes such as earthquakes, hurricanes Marketing to European clients is done through a strategic partnership between Complexica and Italtre.
- IW Management Training of reinsurance and insurance personnel in Europe and the U.S. . This will help senior management build an expertise in the case of catastrophic events. The training is done through a strategic partnership between Complexica and Alliance Performance, a Florida based management training and facilitation firm.
- IW Tools is a modified decision software development for specific needs and clients. In this case, the marketing partners are Italtre in Europe and Alliance Performance in the U.S. .

Decision support, management training and modified software development are bundled into a single customized package for the client .

4. EXAMPLE

The Insurance Companies and Reinsurance Companies are characterized by the same technical parameters but different economic and financial strategies which show an aggressive Insurer Company – “Blue” - among conservative Insurer Companies .

The scenario used is as follows:

- ✓ Five Insurance Companies: one aggressive – four conservative
- ✓ Five Reinsurance Companies
- ✓ Ten European Markets (West – North – South)
- ✓ Different types of natural catastrophe (Earthquake – Flood – Windstorm) which come from a random losses distributions
- ✓ Technical parameters : the same for each Insurance Companies
- ✓ Economic and Financial strategies: an aggressive Insurance Company – “Blue” - among conservative ones
- ✓ Antitrust regulation: the Insurance Company’s maximum market share is not higher than 40% .

The principal strategy factors of “Blue” Company are as follows:

- ✓ During the first phase, it aggressively seeks market shares in West Europe Market by underwriting risks characterized by earthquake – flood – windstorm exposures whereas in the other markets (North and South Europe) it does not want to lose its portfolio.

In a second phase, Blue’s strategy changes. It decides to maintain its leadership in West Europe but, at the same time, it seeks market share in South Europe .

In the ten years period, the strategies of the other four companies is mainly devoted to a portfolio well geographically spread .

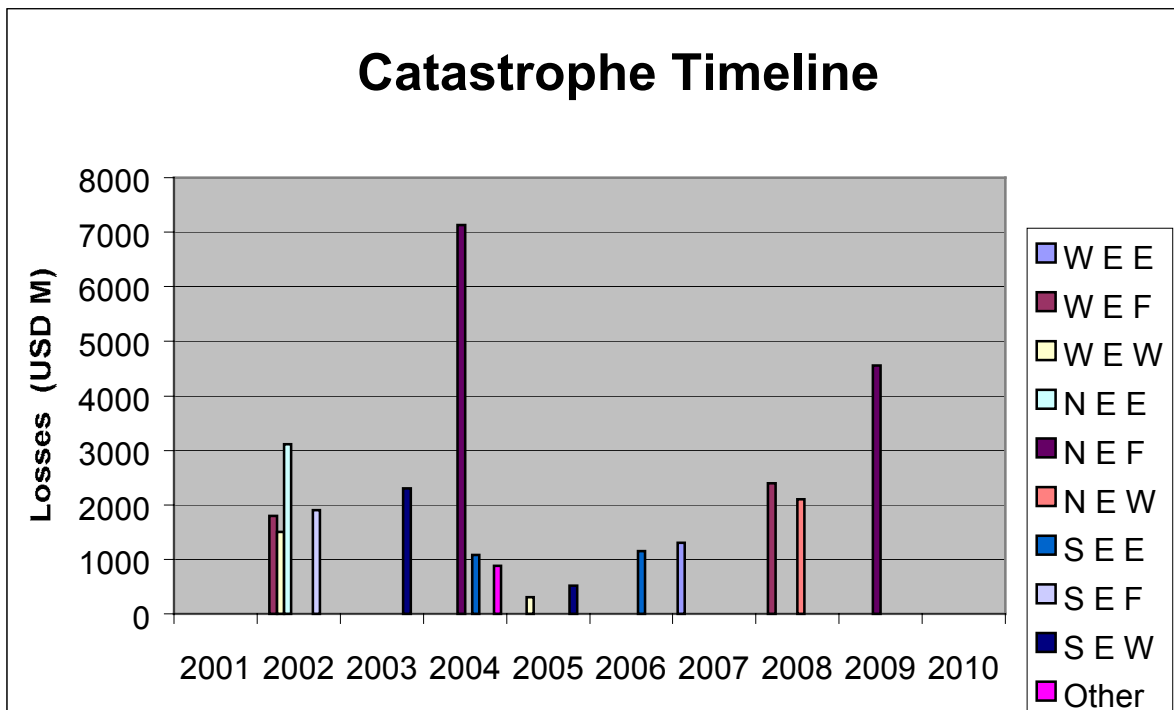
- ✓ Blue's market share search is increased by a desire for market share over profits; it means that the Company prefers to maintain the pricing lower than the others to obtain market share instead of profits .
- ✓ It has a desired Net Combined Ratio $((\text{Annual Retained Losses} + \text{Costs}) / \text{Premiums})$ higher than the others Companies – it emanates from Blue's choice to risk more .

There is an optimum amount of risk to retain, in fact if :

- an insurance company retains too little risk, its return on capital is too low
→ the firm fails
 - an insurance company retains too much risk, its capital volatility is too high
→ the company fails
 - an insurance company retains a "just right" level of risk based on risk exposure and the behaviour of the competition & market
→ the company does not fail
- ✓ Blue's goals are market share and long term profit, as a consequence the excess of capital is used to focus on capturing market share .
 - ✓ Blue' aggressive behaviour - with the choice of an high LR – is characterized also by the decision not to write Cat Bond in order to retain more catastrophe risks .
On the contrary, the conservative firms's strategy is to use the Cat Bond to protect themselves from the financial risk of a catastrophic event .

The catastrophe losses scenario is represented in the figure 1.

Figure 1.



W E E = West Europe Earthquake
 W E F = West Europe Flood
 W E W = West Europe Windstorm
 N E E = North Europe Earthquake
 N E F = North Europe Flood

N E W = North Europe Windstorm
 S E E = South Europe Earthquake
 S E F = South Europe Flood
 S E W = North Europe Windstorm
 Other

Blue's strategy is based on capturing market share in the West & South Europe maintaining its position in the North .

After a ten years period, Blue's strategy seems to be winning for the following reasons:

Market Share (figure 2., 3., 4.)

- after 4 year Blue Company will be leader in Western Europe obtaining the maximum permitted to a firm by antitrust regulation (40%) and maintaining its market share in the rest of Europe

- at the end of the ten years period, European Market will be characterized by Blue's leadership in West and South Area whereas the North market will be well balanced among all the firms

Total Assets & Net Earnings (figure 5., 6.)

- Blue's search of market share in West and South Europe was increased by using a pricing lower than the other Companies to obtain a market share instead of profit on the short period and as a consequence a return on equity focused on long time period. The Figures 5. and 6. show the impact of the "preference for market share over the profit" in the first period, when Blues's strategy was totally referred on capture of market share (in this first phase the Net Earning value of Blue is lower than the other Companies).
- In 2005 and 2007, there are different important losses which have a negative impact on the balance sheet result of the conservative firms due to the financial loss of Cat bond selling .
In this case, Blue's choice of aggressive behaviour – from a technical and financial point of view – permits a positive balance sheet result obtaining a positive ROE (strategy based on long term) also in the years characterized by high losses in term of amount and frequency .
- In the last two years (2009 / 2010), the scenario seems to change again because Blue, being leader in West and South Europe (it has the maximum market share permitted by the antitrust regulation), maintains its strategy based on long term with ROE lower than conservative companies .

Figure 2.

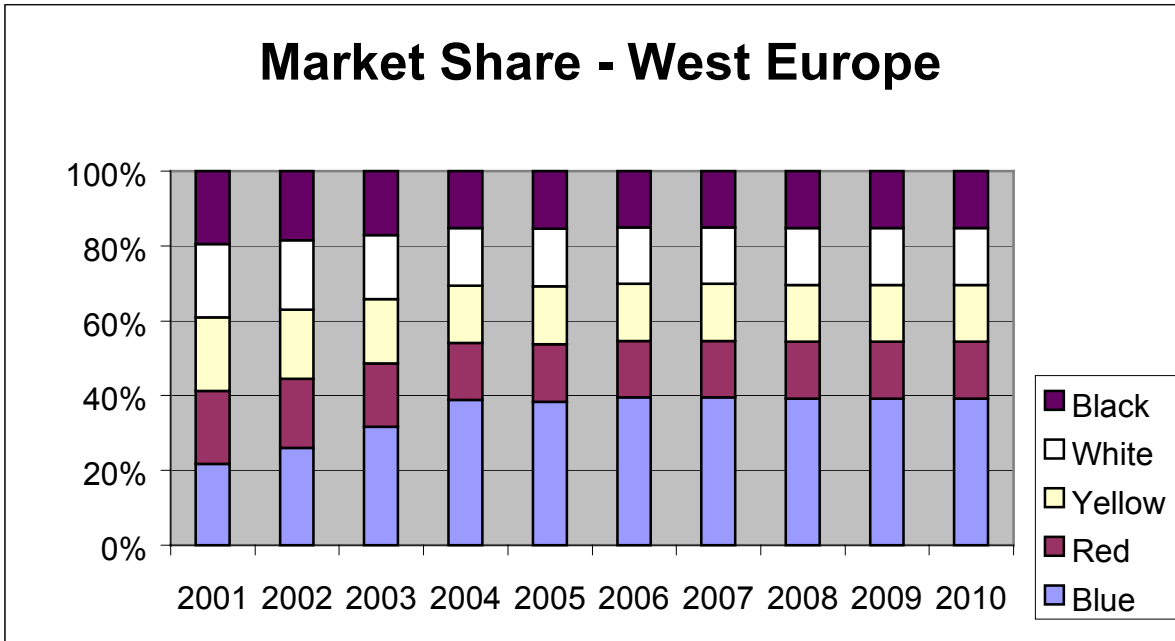


Figure 3.

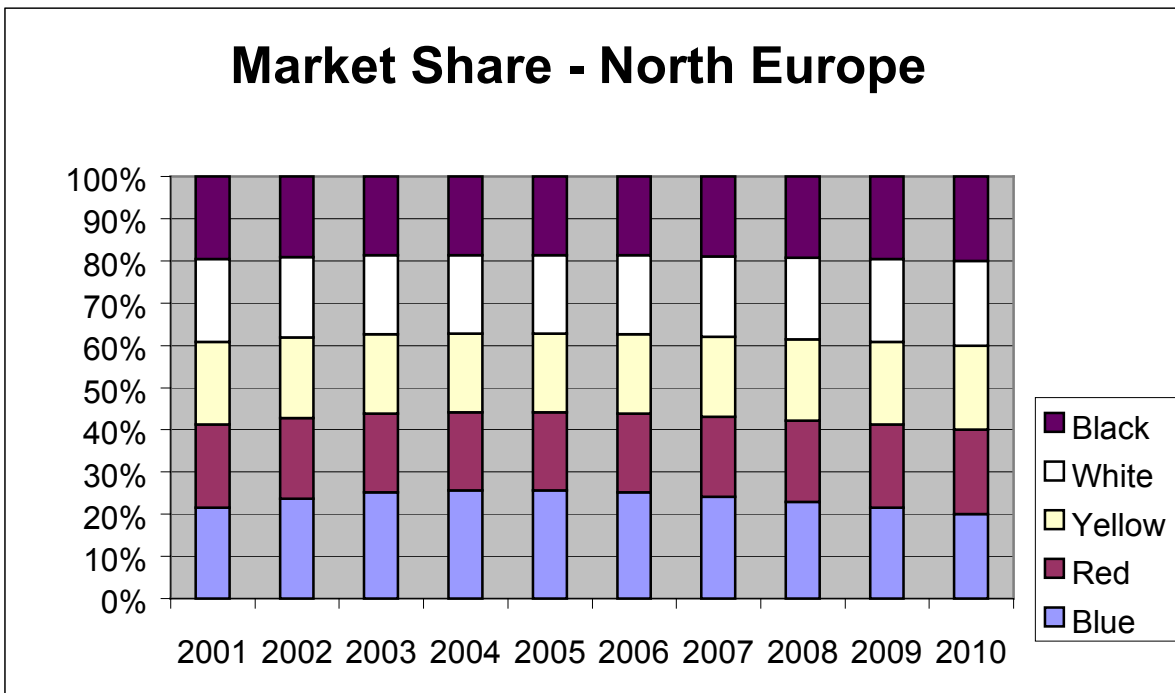


Figure 4.

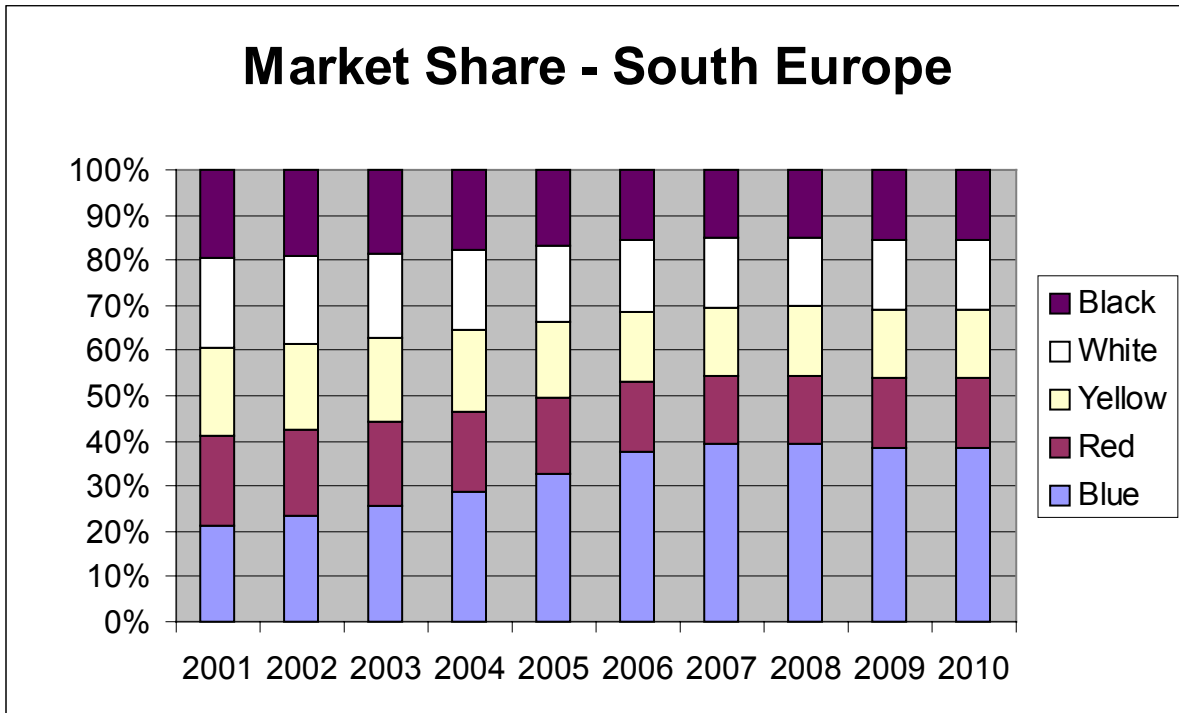


Figure 5.

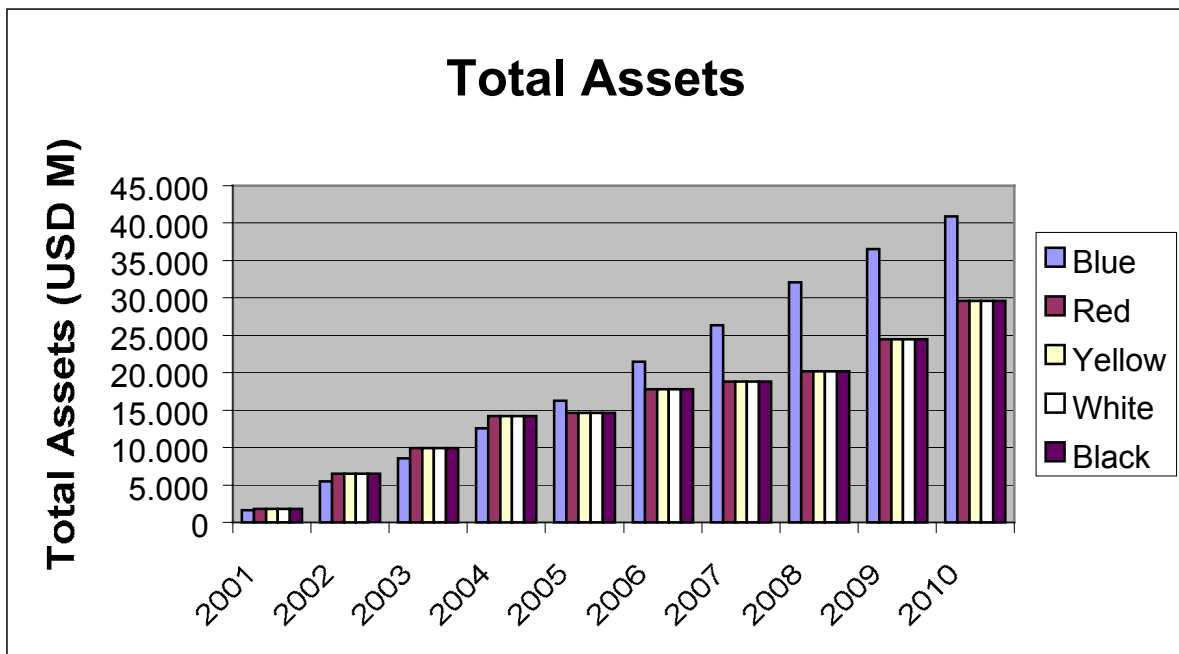
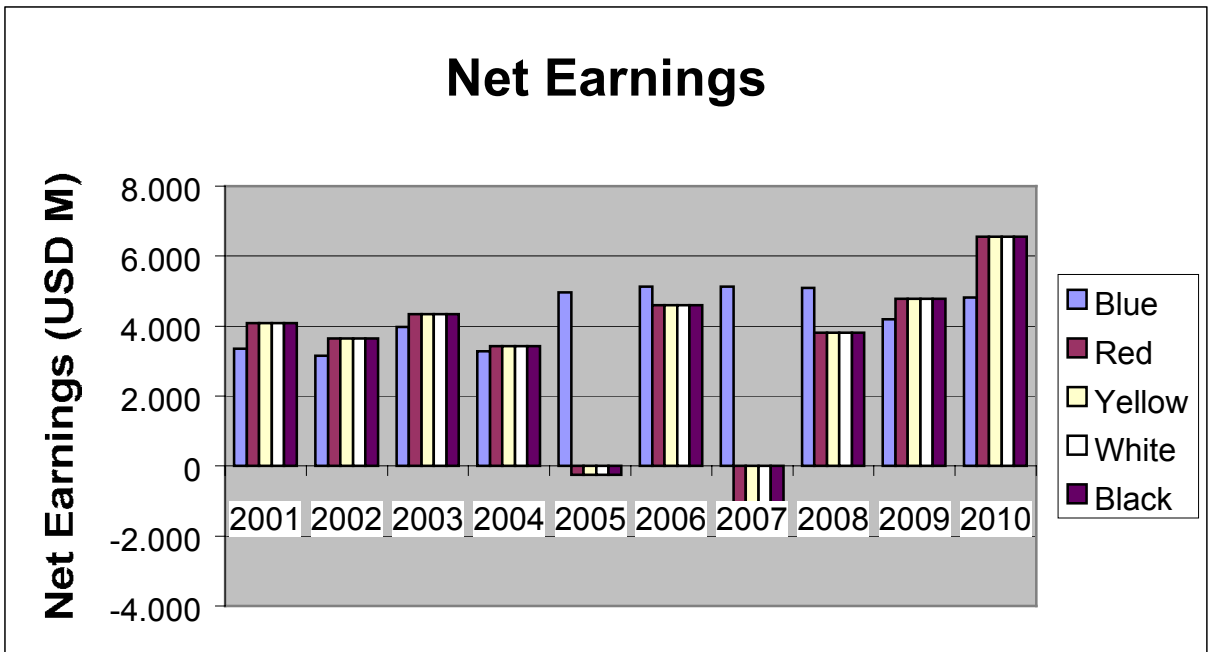


Figure 6.



Appendix

Italre Group

Italre Group was founded in 1987. The Capital Stock and Reserves at 31.12.99 is 1.0 Million Euro. The Group is composed of an Italian Holding Company Italre Spa and Italre International Ltd .

The Group has developed a Reinsurance Portfolio Business amounting to 130 millions Euros between traditional and non traditional reinsurance and it is one of the few independent reinsurance intermediary and consultant in Europe owned by the management .

Italre Group's business is produced in Europe, United States and in South America and it is placed with over 100 reinsurance companies in 20 countries .

Italre founded the consortium A.F.R.A.I.D. (A Flood Risk Analysis for Insurance Damage) a tool to calculate the risk of inundation thanks to the satellite technology and is also consultant to FUNENSEG (the Brazilian School of Insurance) and a supporting member of COMPLEXICA/IW2 .

Complexica / Santa Fe Institute

Professor John Casti* of Santa Fe Institute and Dr Roger Jones**, formerly of Los Alamos National Laboratory, founded Complexica in 1999 with the idea to use complexity science and machine learning technology to solve business and engineering problems.

Insurance World simulator was the first Complexica's project and it was focused on the behaviour of the insurance industry after the impact of natural catastrophes. The success of IW1 led to formation a new consortium – IW2 – which began in early 2000 and developed the previous simulator .

At the beginning 2001's, Complexica announced a new joint collaboration to develop a new safety device which will significantly reduce the number of traffic fatalities caused by drowsy or impaired drivers behind the wheel.

* John Casti is a member of the faculty of the Santa Fe Institute and a professor at the Technical University of Vienna. His current research interests center on the use of large-scale microsimulation to study the properties of complex adaptive systems like stock markets, the business world and the bad-traffic networks.

** Roger Jones is CEO and Chief Scientist of Complexica . He is also a member of Los Alamos National Laboratory .