Gerencia de Riesgos

y Seguros

ENGLISH APPENDIX

A look at the future

We are drawing towards the end of a year that has been very tough for too many people.

What with the jobless figures, house evictions and job insecurity, the upcoming festive season, ostensibly a time of joy and fun, will in fact be pretty grim for many people, their dearth and despondency only brought into greater relief by the party atmosphere elsewhere.

As right-minded citizens, however, we should not give in to a paralysing sense of impending doom. This festive season could serve as a mirror for taking stock and even for trying to peer into the future by powers of magic. It is time to take on board the fact that future is no longer a foreseeable prolongation of the past. We can no longer carry on with knee-jerk reactions that served in the old days but are useless today.

No, we are not in a crisis. What has happened is that the game rules have changed. Little does it avail us now to continue seeking excellence from hackneyed, dull-witted shibboleths. The good news is that, quite apart from lip-service formulae, creativity and ingenuity still have to be sought in the responses that, with the passing of time, we have built up to cope with the recurrent problem of change.

We hold the solution in our hands and we should never forget in this endeavour that skilfulness and innovation are the fountainhead of our future prosperity.

The first of the three studies published in this copy of the review deals with the predictive models used for modelling personal risks; the author proposes a new approach for correct modelling of insurance business in relation to changes in business culture driven by social networking sites.

The second study designs a new methodology for calculating the probability of survival and death after the prohibition of using gender as an insurance premium variable with the passing of the European Union's Gender Directive.

The third study examines the reasons for the mid-C19th boom in Barcelona of insurance companies specialising in the maritime insurance business. This led to the signing of two conventions with a single aim: to streamline and rationalise a market that tended to cramp the style of the maritime insurance companies.

The closing report, drawn up by FUNDACIÓN MAPFRE's Instituto de Ciencias del Seguro (Insurance Science Institute), looks at the Ibero-American insurance market, giving information on the 25 biggest insurance groups in 2011. This report shows an increase in the business concentration of these 25 groups, now cornering between them 65.3% of the market. This increase has been fuelled by takeovers and business agreements reached during the year.

So let's shrug off a sense of gloom and gift ourselves a holiday worthy remembering. This year's midnight toast will be the memory of holidays to come, and what better future than being part of a good memory?

Merry Christmas.

Predictive models *applied to* life assurance

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There is a unique opportunity for the measurement of personal insurance risks, with both the actuarial techniques used and with the variables that intervene in the processes for determining the underwriting and/or price fixing.

This scenario goes further than strict biometric risk management as it represents a new way of understanding life or health insurance and, therefore, the business model should be reconsidered by companies' management.

The object of this article is to analyse the main characteristics of these models, to identify the opportunities that arise in the different business areas and reflect specifically on the use of predictive models in relation to social networks.

The personal lines private insurance industry will gradually adopt these models and this has already started to occur in other markets. They will be commonly used in the next few years and, in short, we are looking at a major change in the actuarial techniques that have been used since statistical techniques started being applied to life insurance.

PREDICTIVE MODELS.

The usual rating method for life assurance is based on calculating the probability of the death or survival of an individual which is obtained from a mortality table. In the majority of the cases, the variables that are considered in the price

are age and, up until now, the gender of the candidate.

The development of actuarial statistics provides us with modern calculus tools which enable us to develop predictive algorithms incorporating parameters which facilitate the evaluation of the risk of death based on the behaviour of the insured.

The predictive techniques, amongst others, are:
–General linear models.
–Decision trees.
–Neural networks.

In the family of predictive models the most common is the Generalized Linear Model (GLM), which aims to describe the effect of one or more explanatory variables (independent) on one or more response variables (dependent).

These models make it possible to construct tariff systems that are sustainable over time and incorporate a set of variables that can predict the biometric risk with sufficient statistical reliability.

In order to be able to opt for these models, the actuary needs to have a broad and robust data base, as well as having experience in handling them since the different results need to be interpreted.

These techniques, which are used in other sectors of business activity, are also commonly used in the insurance industry for certain non-life mass risks such as the motor class of business. The consultancy firm, Deloitte, refers us to the fact that the techniques of predictive modelling have been effective in a surprisingly diverse variety of applications such as:
■ Predicting criminal reoffenders.
■ Making psychological diagnoses.
■ Helping emergency room physicians.

■ Selecting players for professional sports teams.
■ Forecasting the auction price of Bordeaux wine vintages.
■ Forecasting the box office returns of Hollywood movies.
■ amazon.com and netflix.com make book and movie recommendations without any human intervention.

CIRCUMSTANCES THAT FAVOUR THE USE OF PREDICTIVE MODELLING

The implementation of these techniques applied to personal risks will be common in the near future and will cause a real disruption in the daily work of actuaries and underwriters.

This opportunity is justified by three circumstances that have coincided in time:
● The recent limitation in the use of the usual variables in the pricing process such as gender and others that could be considered to be discriminatory. This would be the case of using age as a variable for determining price; the

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concern stems from the fact that the arguments used by the European Legislator could be assimilated to age, i.e. gender or age are biologically intrinsic characteristics of an individual who has no capacity to modify them and, therefore, they form part of characteristic elements of the individual´s biological property and cannot be discriminated against.

This leads to a greater uncertainty in the risk underwritten by the insurers who are faced with volatility in their results. The predictive models contribute to measuring the biometric risk in a precise way and, as a result, the amount of capital reserved for volatility reduces considerably.

● The recent automation of the risk selection process by means of tele-selection has brought about the availability of structured data bases, with a multitude of risk factors, which, up until now, have not been available with such wealth of data. In the Spanish market this process already represents 80% of the analysis of the risks that should be evaluated through specific risk admission processes.

This enormous amount of data available to insurers which is not taken into consideration when modelling a risk, together with others such as purchasing habits, driving record, healthy lifestyle…, will enable the construction of very robust and valid models for such a radical change as that brought about by a predictive model.

● The existence of variables related to life styles can explain, together with health variables in a correlated manner, an individual's risk of death. And it is precisely the causal studies that make it possible to identify genetic variables, phenotypes and certain biomarkers are now capable of explaining up to 80% of the death – longevity risk.

We should consider these new variables with some caution before using them since, in the opinion of the Legislator, they could be either discriminatory or have insufficient predictive capacity.

FIELD OF APPLICATION FOR PREDICTIVE MODELS

Predictive modelling, applied to life insurance by means of GLM techniques, is not only useful for tariff fixing, called lifestyle underwriting, but also opens up the field of action in other areas of a company´s strategy.

Let us look at the opportunities that are opening up; the article *Predictive modelling, a life underwriter's primer*, published in *On the Risk* vol.27 n.2 (2011), helps us to understand and relate the implications:

■ Marketing, carrying out price segmentation after identifying specific risks profiles.

■ Selection, undertaking scoring for types of risk such as super-preferential, preferential, standard or substandard.

■ Fraud detection strategies.

■ Loss of portfolio profiles and cross-selling models

■ Reserving.

■ Agency network evaluation.

The importance of predictive analysis in the framework of the development of analytical capacities has become apparent in a recent report of the consultancy firm, Accenture, in November, 2011 which, under the title *Achieving high performance through effective consumer-driven innovation*, states that 59% of companies have invested in, or are thinking of investing in these kinds of techniques in the next three years, and 98% of them consider that this is an important or critical investment.

To identify the benefits of the predictive models, we would refer to *F. Bringing Predictive Models to life* (AAA 2009), who refers to the following:

● Helps to be more effective for business objectives.

● Client retention.

● Eliminates underwriting requirements, increasing the guaranteed issuing for certain segments of the population.

● More economic and consistent underwriting decisions.

● To achieve more refined pricing.

Predictive models have to combine health, life-styles, socio-economic and transactional variables,

specific to the insurance product (banking and purchasing habits, the use of payment or loyalty cards.....). The choice of the set of variables chosen under the statistical principle of parsimony should produce, as a result, a very precise pricing system. Also, prior analysis is necessary for each of the predictors in respect of the correct legal security in terms of data protection.

To look at the level of application of predictive models applied to life insurance we will refer to the USA, where in a report from 2009, the SOA (Society of Actuaries) established that only 1% of companies used these techniques for life insurance. However, a report of the same body, in January, 2012, under the title *Report of the Society of Actuaries Predictive Modelling Survey Subcommittee*, defined the level and use of this technique. In respect of their use for marketing or increasing sales techniques, 40% of companies use or intend shortly to use these models.

But if we refer to underwriting processes using predictive modelling techniques, the usage increases to 50%. Therefore, it is in these two areas where its usage begins to be relevant and less so for claims management or risk mitigation applications.

Returning to the underwriting process, the variables that form part of the model are a combination of data related to the person, such as age, gender-lifestyle, family and personal health, psychosocial and financial, transactional variables. The number of variables that were referred to were 18 and each company will use those that it considers suitable for constructing the model.

We would emphasize the challenge involved in breaking away from the process of fixing the price of a life insurance through chronological age or reducing its importance which is currently the central element for measuring the risk of death.

The process of constructing and implementing a predictive model, which generates obvious competitive and sustainable advantages, is
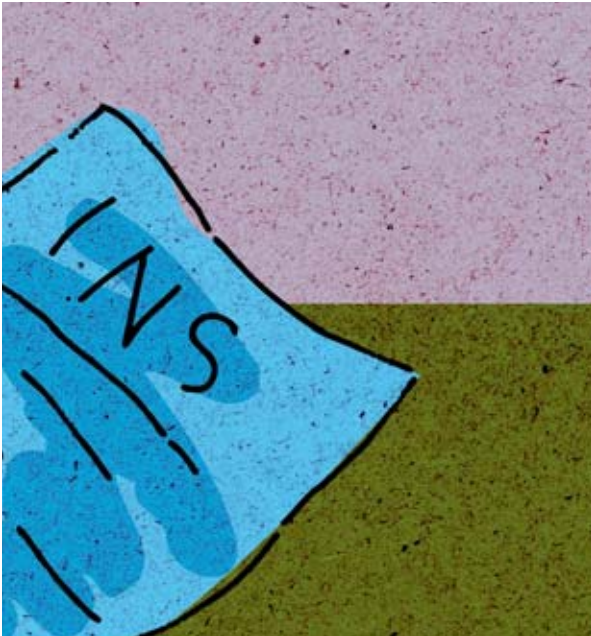
complicated, will take time and require starting with the most contrasted factors such as the actual automatic selection processes. Then, new lifestyle and socio-demographic variables can be incorporated, followed by biomedical variables, and all of this will capture in a precise manner the biological age of an individual, substituting the chronological age variable.

EVALUATION OF THE PREDICTION CAPACITY OF A VARIABLE

It has been said that these advanced statistics techniques represent the control of the machine over man. Perhaps this statement is exaggerated in that, in the construction and determination of the variables that intervene in the model, the actuary must interpret using professional criteria during the process of preparation and final conclusions.

In addition to the involvement of the actuary, it is necessary to incorporate marketing experts, underwriters, doctors, technological and legal staff. The latter must analyse whether the proposed model is compatible with data privacy, non-discrimination legislation and private insurance law.

In order to evaluate the importance of the role of the underwriter, we looked at the degree of responsibility of an underwriter as laid down by The Academy of Life Underwriting and the AHOU (Association of Home Office Underwriters) in Canada, which, amongst others, establishes the obligation to:

–Follow established risk classification principles that differentiate fairly on the basis of sound actuarial principles and/or reasonable anticipated mortality or morbidity experience.
–Treat all underwriting information with the utmost confidentiality, and use it only for the express purpose of evaluating and classifying risk.
–Comply with the letter and spirit of all insurance legislation and regulations, particularly as they apply to risk classification, privacy, and disclosure.

The process of decision to incorporate a variable should include three requisites which are normally demanded of the variables in the admission or pricing process in life insurance, i.e.:

–that it is a risk predictor which we should explain. In life insurance, it refers to the risk of mortality.
–that there is no variable that carries out the same function, i.e. that it should provide new information.

THE PROCESS OF CONSTRUCTING AND IMPLEMENTING A PREDICTIVE MODEL, WHICH GENERATES OBVIOUS COMPETITIVE AND SUSTAINABLE ADVANTAGES, IS COMPLICATED, WILL TAKE TIME AND REQUIRE STARTING WITH THE MOST CONTRASTED FACTORS SUCH AS THE ACTUAL AUTOMATIC SELECTION PROCESSES

–that it is based on evidence, i.e., the risk factor that is incorporated should be related to the event that we want to predict and this relation must be verifiable.

Having defined the model, we must ask ourselves if it complies with what the European Commission in its document of January, 2012 entitled *Consultation of predictivity, genetic testing and insurance defines as actuarial fairness*. When treating the predictability, or otherwise, of genetic testing in the context of insurance policies, this concept modernizes the principle of equity when referring to the principle of the mutualisation of risks, policyholders are categorised in homogenous groups and pay the average premium corresponding to the recognised level of risk. Moreover, it reaffirms that principles of relevance, reliability and proportionality must be present in the choice of each predictive variable.

The above principles are the guide for insurers when they need to analyse the inclusion of a variable in the model. In short, the predictive capability has to be clear and relevant.

Once these techniques have been decided upon, the natural process is the creation of niche products and, if we refer to the underwriting of potential clients, to identify the segmentation into categories such as super-preferential, preferential, standard, sub-standard and declined risks.

It should not be overlooked that one of the main advantages of predictive underwriting is to be able to identify preferential profiles of clients that have a high likelihood of purchasing insurance, in such a way that a pre-conceived insurance offer can

be constructed by filling in a questionnaire with less than three questions on health.

Alternatively, personalized products with hyper-segmented tariffs can be marketed, with a very short time for launching into the market and significantly reducing the sales costs through minimizing the need for requiring check-ups during the underwriting process.

By way of prudent criteria, and until experience in the time axis is available, it is advisable not to guarantee the premiums in the policy. In order to mitigate the risk of insufficient premium for subsequent portfolios, the insurer can modify the premiums or look for reinsurance formulae with companies that share this actuarial modelling.

Experience in the use of these models applied to predictive underwriting in Anglo-Saxon markets shows us that the benefits in economic terms in the underwriting process can represent 8% of the original premium and also reduces the issuing process time to those of automatic and guaranteed underwriting.

Apart from the benefits shown in these techniques in the underwriting and price fixing processes, one of the areas of application is the modelling of loss of portfolio profiles which will enable the insurer to determine client retention and loyalty strategies.

To illustrate the relevance of these techniques applied to the retention, in a recent course by the Price Waterhouse Professorship – Madrid´s Carlos III University on Actuarial Innovation on predictive models applied to life and health insurance, I had the opportunity to speak together with Professor Miguel Usabel, and a practical exercise was carried out with a real data base on the fall in portfolio of an insurance company.

PREDICTIVE UNDERWRITING IS ABLE TO IDENTIFY PREFERENTIAL PROFILES OF CLIENTS WITH A HIGH LIKELYHOOD OF PURCHASING INSURANCE, IN SUCH A WAY THAT PRE-CONCEIVED INSURANCE OFFER CAN BE CONSTRUCTED BY FILLING IN A QUESTIONNAIRE WITH LESS THAN THREE QUESTIONS ON HEALTH

The application of the model enabled the identification of client profiles which, in some cases, predicted up to an 87% probability of cancellation of the insurance. With just this figure, we can get an idea of the management capability that these techniques offer; once the insurance company has classified its clients by the likelihood of continuance, specific actions can be established for each identified cluster.

A company that analyses the loss of portfolio with these techniques is using a very valuable instrument for creating models called dynamic lapses, which enable the metrics for determining the company´s embedded value to be improved.

In this way the actuarial liabilities look at the losses of the risk contingencies covered as well as the expected behaviour in terms of policy cancellation.

PREDICTIVE MODELS AND SOCIAL NETWORKS

The development of predictive models applied to life insurance, as just described, has different applications from the determination of price, based on the so-called admission process of life-styles to the modelling of loss of portfolio and fraud detection.

Regardless of the purpose of this modelling, one of the advantages is to use knowledge of the client that the company possesses to carry out commercial campaigns that are specific to the client´s profile, always respecting the principles of equity (actuarial fairness) and non-discrimination.

With this new vision of the client, the insurer tries to minimize the admission questionnaires in favour of the prior knowledge of the client and, in this way, can offer products and/or prices with guaranteed admission prices.

In this way, specific commercial actions can be undertaken which transform the traditional price determining process, i.e. the client receives an insurance offer with a pre-agreed price, prior to the policy request. The information which the insurer uses to determine predicting behaviour may include information that the client has provided voluntarily on social networks, blogs, videos, etc.

It is calculated that there are currently 8,900 million people in the world connected to internet and that in the year 2020, this figure will rise to 24,400 million. More and more information is generated which, once analysed, can be used to predict behaviour. According to information in the *ABC* newspaper on 26th. February, 2012, in its society supplement, «IBM have 200 mathematicians that work with algorithms that intend to model businesses to make them more profitable and for this they filter variables and masses of data. Every day 2.5 quintillions of bytes of data of all types are generated (a quintillion is a million quadrillions)».

At the last International Forum for Digital Content (FICOD), it was recognised that 90% of the information generated on internet is not analysed. «Refineries» are talked about in respect of managing the oil of the 21st Century. Tim O´Reilly, a guru on these matters, states that in Silicon Valley there is only talk of the business of data.

We should be aware of the following piece of data: in Europe, 374.4 million internauts connect daily with an average connection time of 27.8 hours per week.

The meta search engines learn from our searches and, thus, are able to filter content and advise us of up-dates. For this reason, the trend is for *customisation* by combining search engine, e-mail, social network, calendar and YouTube.

A recent study by Forrester Research on the uses of internet tells us that those over 50 use it to keep informed -economy, markets..., look for references for leisure matters and, last of all, for being in touch with family and friends.

The report *enREDados: Cómo hacer rentables las social networks* (*How to make social networks profitable*), recently published by the consultant, Price Waterhouse, forecast that the use of these tools is going to become more commercial. Currently, according to the report, only 6% of the users of social networks in Spain use them for purchasing, although it is expected that this activity will increase to 16%.

The consultant states that the most influential aspects for *online* purchasing are economic (pricing and offers have an influence in 53% of the cases), the

opinion of friends and unknown users (25%), the opinion of experts (14%) and information provided by brands (8%).

The report emphasizes that there is «clear correlation» between belonging to a social network and the access to electronic commerce: 90% of these network users purchase on internet, whilst 60% of those interviewed do not use them, do not buy online.

Advertising on social networks is more persuasive and captures greater attention from the users than traditional advertising, but the advertising messages need to be more personalized.

On the other hand, the use of mobiles for carrying out commercial activities increased by 88% in 2011 over the previous year, according to a study made by comScore undertaken by Zeerca, a firm specializing in 'smart commerce' and published in información.com on 17th. April, 2012.

Amongst the most recurring activities, those that stand out are locating shops (6.6%), comparing prices (6.4%) and searching for promotions (3.9%), according to the aforementioned study, that concludes that consumers at home perceive mobile commerce as something «more normal».

Specifically, 52% of the owners of smartphones (intelligent telephones) in Spain now make purchases from these appliances according to comScore data.

The users of social networks that, in some cases, have substituted their friends in the present by on-line ones, share information and experiences voluntarily and configure these networks as tools for social pressure. In this way, the users are the new vertebrae of public opinion and are generating a new ecosystem where friends buy what other friends have already purchased.

In conclusion, social networks have become communities with the capacity to influence.

In this scenario, the decision to purchase moves from the intermediaries to the clients who, on the

more of supply rather than demand and the insurer requires a commercial network to awaken buying interest.

Behavioural targeting

Companies are starting to position themselves in the internet market by means of geo-localization of their clients and the process involves the reception of an e-mail with daily offers, web visits and specific published offers. The promotions in social networks act as accelerators in searches of fans/friends/followers and, thus, the clients consider themselves to be *smart-buyers* or preferential clients.

In this way micro segmentation is constructed by affinities, with whom we interact, we look for and who are our friends. And the networks we create are much more relevant than age or sex. The company can profile the potential client according to the level of engagement that it can obtain and how to achieve it.

What is important, therefore, is to automate the transactions and generate analytical predictive models in order to predict the behaviour of the potential client.

The new segmentation of the internet user clients is achieved with the following criteria:

–Demographic segmentation. This involves the study of the profiles of the people that visit a particular website.

–Behavioural segmentation. The type of pages visited in order to ascertain what subjects the client is interested in.

–Contextual segmentation. Identification of key words in on-line content.

other hand, demand a simplification in the design of products and greater pressure on price.

According to the experts on social networks, the final scenario will be as follows: The users of social networks will organise themselves into what is starting to be called a prosumer, that is, a producer and consumer at the same time. This is where an affinity group acts as a wholesaler in the need for insurance and buys it through auction, depending on the conditions proposed by the insurers.

In this way, the normal purchasing process for life insurance is reversed since it becomes a product

THE USERS OF SOCIAL NETWORKS WILL ORGANISE THEMSELVES INTO WHAT IS STARTING TO BE CALLED A PROSUMER, THAT IS, A PRODUCER AND CONSUMER AT THE SAME TIME. THIS IS WHEN AN AFFINITY GROUP ACTS AS A WHOLESALER IN THE NEED FOR INSURANCE AND BUYS IT THROUGH AUCTION

–Demographic segmentation. To ascertain where the visit has come from through the IP address.

We should not forget that the predictive models combine information about the client that we possess with external information that determines, in a precise fashion, the propensity to purchase a product at a predetermined price. In this way, sustainable competitive advantage can be generated.

Smartphones are becoming an accelerator of this new business vision and, in the area of insurance, should permanently improve the relationship between the insurer and the client and facilitate the use of services and even product proposals for specific situations. It is expected that in 2012 there will be 2 million App type applications for the 4,500 million mobiles that there are in the world and, therefore, the challenge is how to help the user to choose from what are now the so-called inspirational elements, such as education, games, music, leisure …

The developments in advertising focus on spectators being converted into a player, in such a way that the client interacts with the company´s publicity. The advertiser selects where to position the message depending on demographic, contextual, behavioural and geographic factors and, in this way, the advertiser will situate standard, unfolding banners with audio or video… The company attempts to dialogue with the client via corporate blogs, Twitter, Facebook or Tuenti. Through *cookies* – files that store our information on internet browsing – companies on internet know our

interests, although the information we receive depends on how we wish to configure our appliances for connection to the internet. In fact, the Chrome browser allows anonymous browsing.

Mirror biscuits do not know our identity, name, age, or sex, but they do know our tastes and identify our navigation habits.

A report by the American consulting firm, Gartner, on the main trends in technology matters for the insurance industry for 2012, warns that, apart from experimenting with the next generation of technologies, the analysis of data must be reinforced and states specifically: the capacity to examine large amounts of information and to convert them into data that is useful for the development of new products has already become essential.

In reference to health insurance, the same consultant recommends predictive solutions for underwriting products. They also refer to the use of internet portals, considered as meeting points between clients and intermediaries, not forgetting the huge irruption of mobile technologies.

These considerations enable us to identify the opportunities to use the predictive models for the near future in the area of health and this is borne out by the initiatives that we observe in the insurance sector which is a principal actor in the market. There are currently 270,000 medical applications which are already being developed today for tablets or mobile telephones where the doctor can consult data bases with medicines, pathologies or procedures depending on the medical speciality.

However, these applications are not just for the medical profession but are used for the relationship

PREDICTIVE MODELS CONSTRUCTED WITH GLM TECHNIQUES, APPLIED TO LIFE AND HEALTH INSURANCE, ARE TAKING SHAPE AS THE APPROPIATE STATISTICAL-ACTUARIAL TOOL FOR MODELLING RISKS OF A PERSONAL NATURE

with the patient, chronic cases, old people… and there are even applications for particular pathologies such as autism, ELA, language…, and used exclusively by the user-patients. This will provide knowledge on the needs of each user person.

The social media risk

In the insurance sector, the essential elements in the publicity message will be the values of security, loyalty and commitment. And in any event the insurer must consider:

–Avoidance of damaging the reputation of third parties.
–Breaching brand rights or intellectual property.
–Invasion of privacy.
–Damage due to virus transmission.

For these reasons, it is advisable to prepare a social media manual.

As a result of the above, an ethical and legal debate is opening up which has not reached the insurance sector, i.e., the knowledge of the personal profile which certain search engines now have and which allows the client to be segmented and profiled according to their activities and interests may or may not violate principles contained in data protection, consent or non-discrimination legislation.

Debate is necessary since advanced actuarial techniques already permit this positioning of business. In fact, these techniques are common in other fields, such as predictive scoring in banking for granting pre-conceived loans or the same clinical psychology that allows predictive diagnostics to be carried out and to profile candidates with proven levels of success in excess of 95%. To apply it to the information available in internet is the element under discussion.

Before deciding on this model, the insurers must have absolute judicial certainty that they do not violate any principle by preparing preconceived insurances based on the determination of risk profiles built on data available in social networks and they must analyse the veracity or otherwise of certain information available on internet.

Conclusion

Predictive models constructed with GLM techniques, applied to life and health insurance, are taking shape as the appropriate statistical –actuarial tool for modelling risks of a personal nature. The different applications that permit these techniques in areas such as underwriting, price determination, loyalty and crossed-selling, present a unique opportunity that offers an actuarial technique for improving business processes and, in particular, the correct management of the insurance business model with regard to social networks.

The management of insurance companies must understand that predictive models involve significant changes in their business culture. ▌
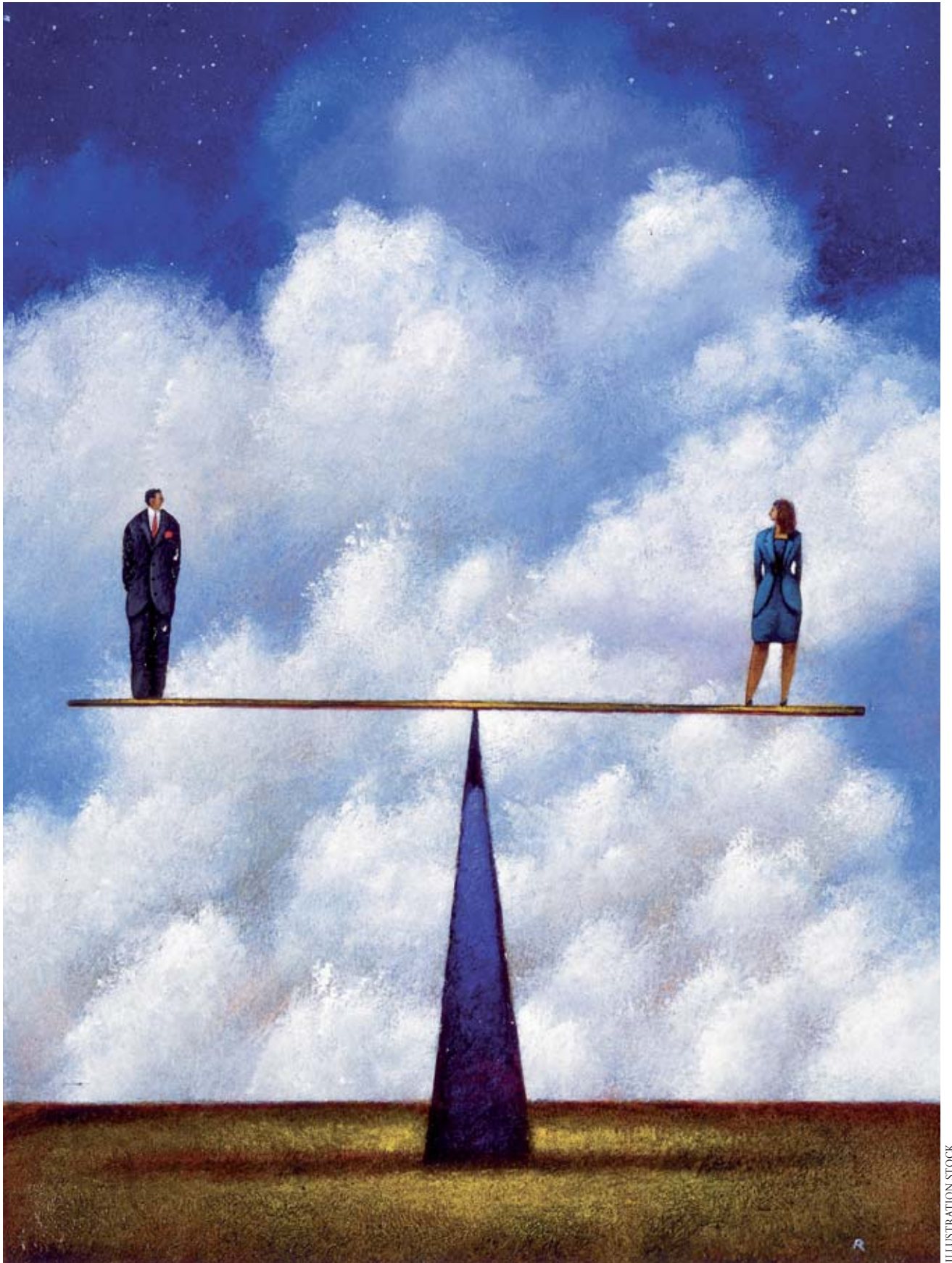
IMPACT *of the Gender Directive on the insurance sector*

PROPOSAL OF A NEW

PREDICTIVE MODEL

MÓNICA SALDAÑA SANZ
Professor of the Quantitative Methods department ICADE.

The survival probability in today's life tables is calculated from two basic risk factors: the individual's age or biometric time and his or her gender. This methodology, used in life tables hitherto for pricing insurance products, now has its days numbered.

Indeed we are now in the countdown to the cut-off date of 21 December, after which gender can no longer be used as an insurance-premium calculation variable due to a European Court of Justice ruling under Council Directive 2004/113/EC implementing the principle of equal treatment between men and women in the access to and supply of goods and services, published in the *Official Journal of the European Union* on 13 December 2004. This directive was then implemented into Spain's body of law by *Ley Orgánica* 3/2007 of 22 March (Spanish Gender Equality Act). Directive 2009/138/EC of the European Parliament and of the

Council of 25 November 2009, on the taking-up and pursuit of the business of Insurance and Reinsurance, also deals with the implementation of the principle of equal treatment between men and women in the access to and supply of goods. Under all this legislation it is no longer legal to use an individual's gender as a risk-differentiating factor in calculating insurance premiums.

Application of this Directive will bring in a set of far-reaching changes in the insurance sector. Not all of them are negative, however; this change can in fact be seen as a splendid chance for innovation and revamping the biometric methodology used to date, grafting on new forecasting models of an individual's survival probability over and above the factors of gender and age.

This article will set forth the main features of a new methodology to replace the current biometric models.

DUAL IMPACT:

PREMIUM PRICING AND
CALCULATION OF CAPITAL NEEDS

1. Impact on insurance premium rating

On 7 December 2011 CEA (now Insurance Europe) presented a study[1] commissioned by the German Insurance Association (GDV in its German initials) detailing the unintended negative consequences for consumers, insurers and society arising from the ban on using gender for calculating premiums and

THE APPLICATION OF THE GENDER DIRECTIVE WILL BRING IN A SET OF FAR-REACHING CHANGES IN THE INSURANCE SECTOR, NOT ALL OF THEM NEGATIVE

benefits in the EU as from December 2012.

The study draws from a sufficiently large sample of insurers from diverse European countries to ensure that its findings are representative and conclusive. The most important of these findings are outlined below:

■ Insurance companies have to price their products on the basis of the insured risk. If insurers do not differentiate between different groups of individuals who perceive that they have different risk levels, economic efficiency may be lost for two reasons:

● Adverse selection. This occurs if a uniform premium deters the low-risk group from buying insurance while attracting more of the high-risk group. Settling premiums separately for the two groups leads to insurance adoption that is closer to an economically optimal level.

● Moral hazard. This arises when insurance results in customers changing their risk behaviour, eschewing the precautions they would otherwise have taken to protect the insured good, thereby increasing the insurance company's loss potential.

■ Insurance prices may increase as a result of the redistribution of premiums from the high-risk group to the low-risk group.

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[1] OXERA (2011).

A CEA STUDY DETAILED IN 2011 THE NEGATIVE CONSEQUENCES OF THE GENDER DIRECTIVE FOR CONSUMERS, INSURERS AND SOCIETY

■ Demand for insurance products may be affected, giving rise to various social implications such as a reduction in households' incentive to save for their retirement.

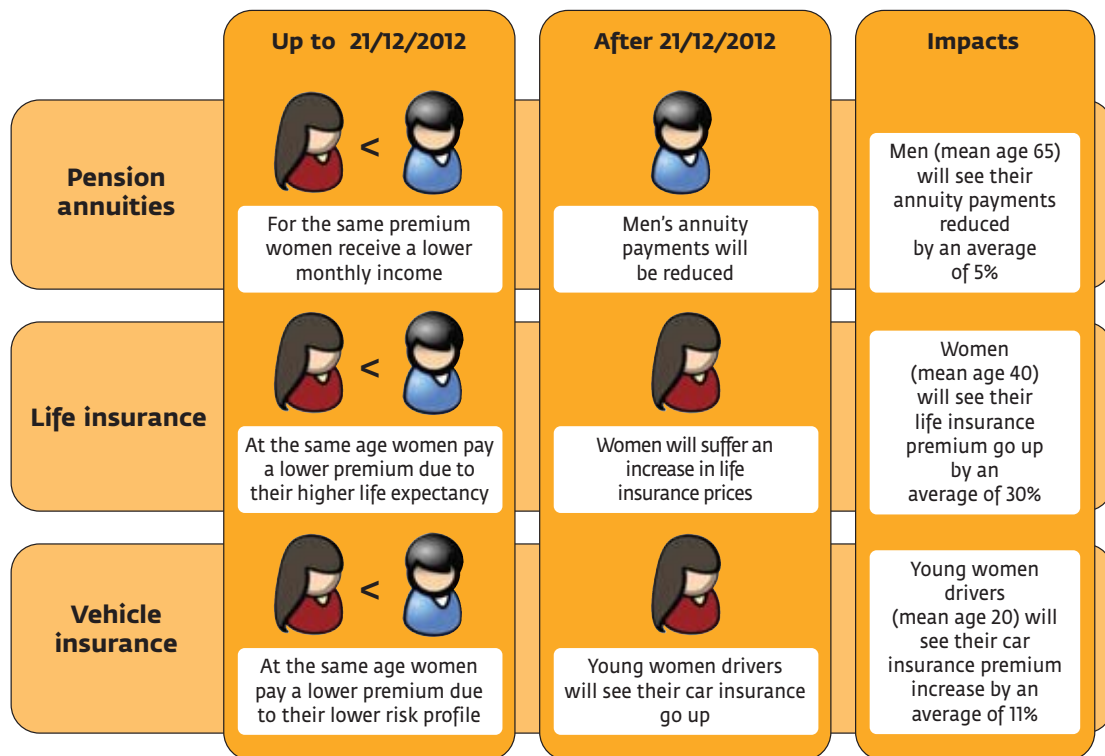■ Gender is a useful long-term and stable risk indicator for insurance companies; as such it cannot easily be replaced.

■ From an economic perspective the use of gender-based pricing does produce fair treatment since the net present value of future benefits in gender-differentiated pricing is very similar for men and women.

■ Banning gender pricing means that men, on average, will receive different lifetime benefits from women (for the same price and insurance product).

Gender is a determining factor in the classification of at least three product categories (Figure 1): vehicle insurance, life insurance and private health insurance.

Figure 1. Main impact per product

	Up to 21/12/2012	After 21/12/2012	Impacts
Pension annuities	For the same premium women receive a lower monthly income	Men's annuity payments will be reduced	Men (mean age 65) will see their annuity payments reduced by an average of 5%
Life insurance	At the same age women pay a lower premium due to their higher life expectancy	Women will suffer an increase in life insurance prices	Women (mean age 40) will see their life insurance premium go up by an average of 30%
Vehicle insurance	At the same age women pay a lower premium due to their lower risk profile	Young women drivers will see their car insurance go up	Young women drivers (mean age 20) will see their car insurance premium increase by an average of 11%

Source: drawn up by the author.

2. Impact on the calculation of capital needs for underwriting risk

Solvency II[2] has been designed in terms of three pillars: the first is to establish a process for analysing reserves, assets and liabilities for covering obligations taken on in the policies; the second is to define rules for supervision, internal control and corporate governance; the third lays down the insurers' disclosure and transparency requirements.

Capital requirements aim to guarantee the insurance company's financial stability against unforeseen claim fluctuations, thereby protecting the insured too, doing so by establishing economic volumes called Minimum Solvency Capital Requirement (MSCR) and Solvency Capital Requirement (SCR).

How can the SCR be quantified? One possible answer to this question would be to calculate approximately how much equity would be needed to rule out, practically, the chances of an insurance company's ruin within the next year, with a given level of confidence. Two alternatives are put forward for the practical determination thereof: standard formula and internal models.

The standard formula is not yet a done deal; there are various different approaches such as the formula based on factors or scenario simulation. The main advantages of the standard formula are simplicity of use and economy of means.

Internal models call for an increase in the sophistication and complexity of calculation models but provide greater precision and capital sensitivity in terms of

THE NEW METHODOLOGY PUT FORWARD IN THIS ARTICLE WOULD FORM PART OF A POSSIBLE INTERNAL MODEL, AS A DYNAMIC RISK MANAGEMENT MODEL PROVIDING CONTINUAL CALIBRATION ON THE BASIS OF THE PORTFOLIO'S OWN EXPERIENCE

quantifying a company's risk exposure. This is conducive to a better prediction of capital needs. These models, which have to be vetted beforehand by the supervisor, stand out for the following features:

■ They gauge risks according to own experience
■ They pave the way for effective risk management
■ They enable the efficiency of risk mitigators to be evaluated
■ They adjust capital requirements

The new methodology put forward in this article would form part of a possible internal model, as a dynamic risk management model providing continual calibration on the basis of the portfolio's own experience (experience relevant for drawing up the hypotheses). This model would impinge on all those SCR calculation submodels that contain portfolio mortality –and longevity– estimates with a greater impact, as might be expected from the life insurance underwriting risk submodule, improving prediction accuracy and tailoring results to the company's own experience.

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2 Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II).

INSURANCE PRACTICE

The use of gender-based actuarial factors is widespread in the insurance sector and other related financial services. The legislation proposed by the Directive in 2004 in terms of using gender for risk-differentiation purposes therefore affected the financial sector as a whole and the insurance sector in particular.

Are Spanish insurance companies ready for this change? A survey conducted by the company RGA international Reinsurance Company showed that in mid 2012 40% of Spanish life insurers considered themselves to be ill-prepared for analysing the problem of non gender-discrimination. This problem means eschewing the current life and survival

SPANISH INSURANCE COMPANIES CONSIDER THEMSELVES TO BE ILL-PREPARED FOR ANALYSING THE PROBLEM OF NON GENDER-DISCRIMINATION

tables and seeking another system with the same predictive power but without using gender as a differentiating factor.

The only observable move by the insurance sector towards a new methodology to date boils down to the transformation of the current PASEM 2010 life tables, one for men and one for women, into a single table obtained as a weighted average of the former.

The weights assigned to obtain the weighted average depend on the decision adopted by each company, which could be taken on two different grounds:

- On the basis of the makeup of the company's own portfolio, allocating equal weights to the proportion of men and women therein.

Let x be the age of an individual. The following weighted average is then calculated to determine that individual's probability of death:

$$q_x = q_{x \text{ en PASEM 2010 MALE}} * \alpha_1 + q_{x \text{ en PASEM 2010 FEMALE}} * \alpha_2$$

- On the basis of the risk profile the company is to be subjected to, applying in each case the scenario most favourable to the insured or insurer. Should it be decided, for example, to benefit the insured (a higher risk profile for the company), the women's life tables would be applied to all automobile insurance contracts formalised as from 21 December 2012. Should it be decided, conversely, to opt for a lower risk profile for the insurance company, the men's

table would be applied for all life insurance contracts taken out after that date.

The latter practice has been the market's most common recourse up to the judgment handed down by the European Court of Justice.

Should an insurance company decide to apply a weight of 50% to each gender, the new life table obtained would present the differences shown in Figure 2, when comparing the probabilities of insurance practice (weighted average) with the PASEM 2010 tables. It follows logically from this result that rating with the new probabilities will impinge heavily on the premiums to be met by the two genders, each premium being more or less economically beneficial for

WHICHEVER OPTION IS CHOSEN BY INSURER, WEIGHED AVERAGE OR RISK PROFILE, EITHER WILL THROW THE DEATH PROBABILITY MEASUREMENT OUT OF SYNCH, WITH THE CONCOMITANT ERROR IN THE PREMIUM PRICING OF THE INSURANCE PRODUCT AND IN THE CALCULATION OF THE CORRESPONDING ECONOMIC CAPITAL

Figure 2. Mixed PASEM rating tables

Legend:
- Qx MEN PASEM 2010
- Qx WOMEN PASEM 2010
- Qx MIXED RATING
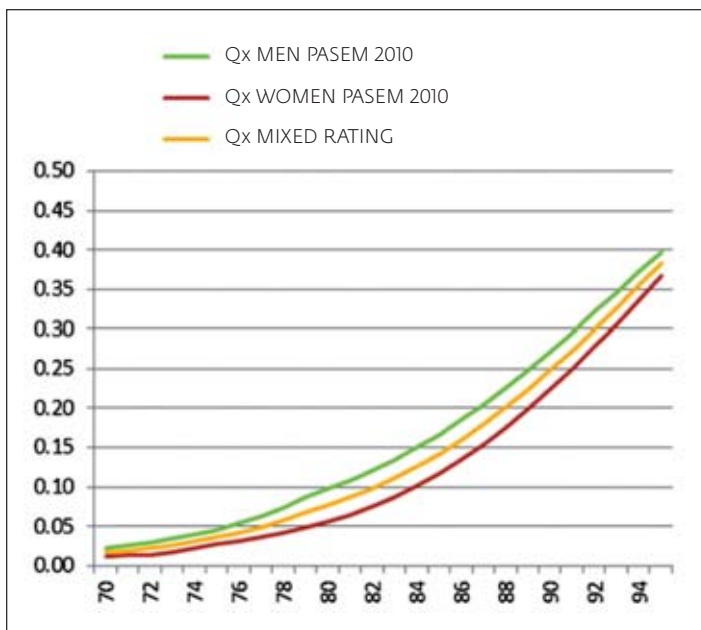
Source: drawn up by author from PASEM 2010 tables.

the insured depending on the insurance type and class.

Whichever option is chosen by insurers, weighted average or risk profile, either will throw the death probability measurement out of synch, with the concomitant error in the premium pricing of the insurance product and in the calculation of the corresponding economic capital.

Can we come up with any other methodology that abides by the Gender Directive and internal legislation without forfeiting or even improving the predictive capacity of the methodology used to date? Answering that question is one of the main aims of this article.

PROPOSAL OF A NEW PREDICTIVE MODEL

In the case of life tables, the uniformity hypothesis has always been considered to be inapplicable to the gender of each individual, since an individual's age of death variable is known to be gender dependant. The probabilistic study of the age of death of men and women has therefore always been tackled separately up to now. Why not therefore accept this working hypothesis since there are many other factors besides age and gender that determine a person's age of death?

Up to now it has been taken for granted that the various life expectancies of the insured parties, the different readiness to assume driving risks and the varying recourse to health insurance are mainly gender dependant. But in fact there is another series of factors that play an important part in the evaluation of these differences. For example, the life expectancy of insureds might be heavily influenced by economic and social circumstances and also by the personal lifestyle, family setting, occupation, eating habits, leisure or risk activities, smoking, etc.

It could therefore be argued that, in light of the population trend and changes in society, traditional roles have lost some of their meaning. A person's life expectancy, therefore, and also the

A NEW METHODOLOGY CAN BE DETERMINED WITH THE STRATEGIC OBJECTIVE OF ELIMINATING GENDER DIFFERENTIATION WITHOUT THEREBY FORFEITING PREDICTIVE CAPACITY, SEEKING ADDITIONAL FACTORS TO STAND IN FOR THE GENDER FACTOR

effects of behavioural factors on health, may no longer bear any direct gender relationship.

True it is that it is easier in insurance products to establish gender-dependant differences of the insured than his or her economic and social circumstances and also lifestyle habits, especially when these factors might change with time. Nonetheless these practical difficulties are those we have to try to solve, since they do not in themselves justify ruling out these factors as differentiation criteria.

A new methodology can therefore be determined with the strategic objective of eliminating gender differentiation without thereby forfeiting predictive capacity, seeking additional factors to stand in for the gender factor. From this main objective the following specific objectives can be derived:

■ Replace (without elimination) the insured's gender variable by others of a significant character that abide by the Gender Directive but maintain the representativeness of gender in insurance pricing.
■ Offer greater precision in predicting the probability of death, working from the current life tables using only the variables of age and gender.
■ Better fit in the rating of pure premiums of insurance products thanks to the improvement in the forecasting of death and survival probability.
■ Better fit in calculating the necessary capital for gauging the

underwriting risk, as laid down in Solvency II

■ Input a new perspective in terms of choosing the data sources for predicting an individual's survival. Knowing which are the most representative variables of the model, insurance companies will be able to ascertain which data have to be sought from each insured to achieve better prediction of survival probability.

■ Increase the number of mortality-prediction variables; although age is the most revealing variable of an individual's probability of death, the model cannot afford to ignore other factors that might increase this probability appreciably, barring the gender of the insured.

■ Finally, determine the bases of a new methodology to replace the biometric model used to date in life tables, after having defined the significant variables that will predict the probability of death.

THE MAIN AIM OF THE FIRST PHASE IS TO DEVELOP A MODEL TO LESSEN THE GENDER DIRECTIVE'S IMPACT FROM DECEMBER 2012 ON THE INSURANCE SECTOR
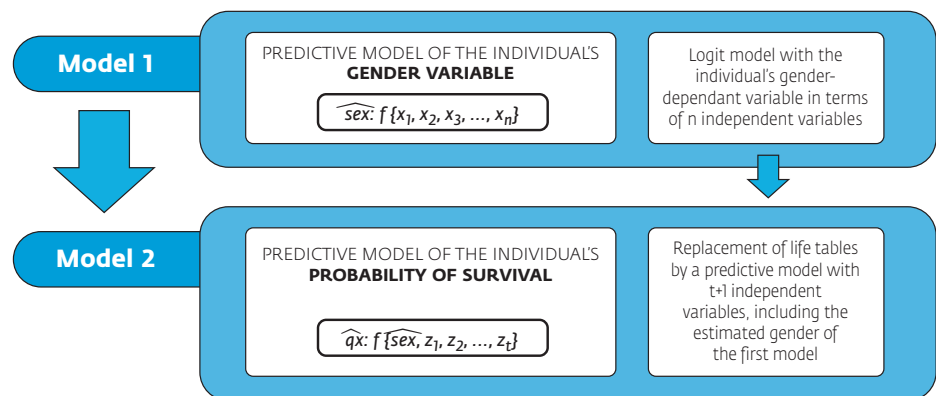
MODEL PHASES

As shown in Figure 3 the proposed model is two-phased:

■ The first phase involves creation of a first model that, according to a given probability, classifies an insured into a given gender, man or woman, depending on a number n of independent variables.

■ An estimate is then made of the individual's survival probability in terms of the estimated gender of the former model, of the age and some variables that are additional to those currently being used (only gender and age).

Figure 3. Phases of the proposed methodology

| Model 1 | PREDICTIVE MODEL OF THE INDIVIDUAL'S **GENDER VARIABLE** $\widehat{sex}: f\{x_1, x_2, x_3, …, x_n\}$ | Logit model with the individual's gender-dependant variable in terms of n independent variables |
| Model 2 | PREDICTIVE MODEL OF THE INDIVIDUAL'S **PROBABILITY OF SURVIVAL** $\widehat{qx}: f\{\widehat{sex}, z_1, z_2, …, z_t\}$ | Replacement of life tables by a predictive model with t+1 independent variables, including the estimated gender of the first model |

Source: drawn up by author.

The main aim of the first phase is to develop a model to lessen the Gender Directive's impact as from December 2012 on the insurance sector and provide insurance companies with a better-fit solution than the one currently used today. The main objective of the second phase, working from the variables obtained from the first model, is to obtain the particular probabilities of death and survival for each specific individual, on the basis of personal, economic and social characteristics.

This article deals with the first phase, the predictive model of the individual's gender, leaving aside for a later occasion the second phase of the model.

PROPOSAL OF THE
FIRST MODEL

Classification is a task that involves assigning a category or class to each element of a set. A particular example of this technique is binary classification, considered to be the simplest classification system; a classic example of binary classification is determination of an individual's gender.

There are several techniques of binary classification that might be used for building up the gender prediction model: decision trees, Bayesian networks, artificial neural networks, genetic programming,

THE MAIN OBJECTIVE OF THE SECOND PHASE IS TO OBTAIN THE PARTICULAR PROBABILITIES OF DEATH AND SURVIVAL FOR EACH SPECIFIC INDIVIDUAL, ON THE BASIS OF PERSONAL, ECONOMIC AND SOCIAL CHARACTERISTICS

binary logit, clustering and evolutionary algorithms.

All the abovementioned techniques set out to estimate the probability of belonging or not to a given class (qualitative variable) by applying «1» to the event consisting in belonging to the class or category under study and «0» to the event of not belonging to this category. In the problem of estimating the gender of an individual, this variable will take the value «1» if the sex is feminine (woman) and «0» if the sex is masculine (man).

The chosen classification technique for the first model is binary logistic regression or logit, since it is simpler to use, more intuitive and best meets the needs posed by the current insurance framework.
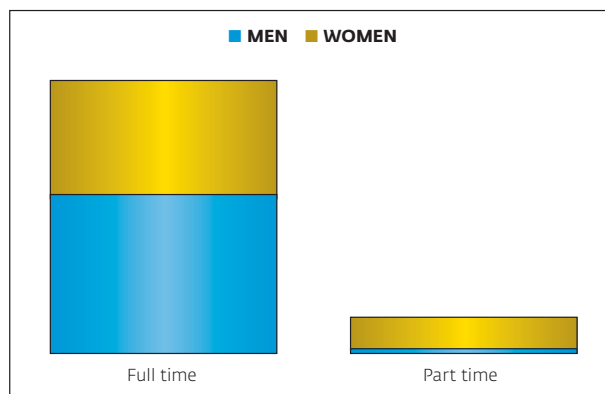
The working database contains 171,344 individuals, 48.09% men and 51.91% women, for whom the information has been collected in 93 variables. A bivariate analysis is then carried out to see how the gender variable behaves in relation to the rest of the variables. The objective of this analysis is to discriminate from among
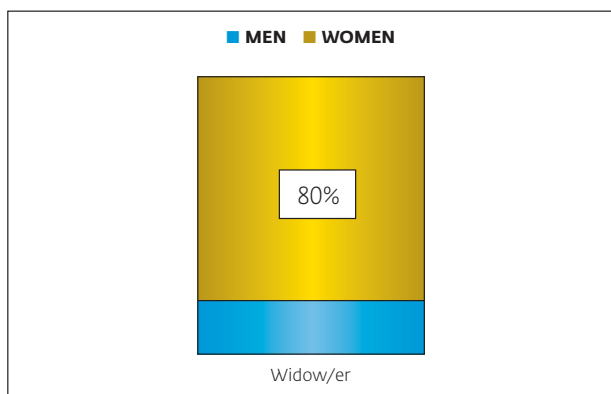
Figure 4. Gender breakdown by spouse age

Source: drawn up by author.

Figure 5. Gender breakdown by marital status
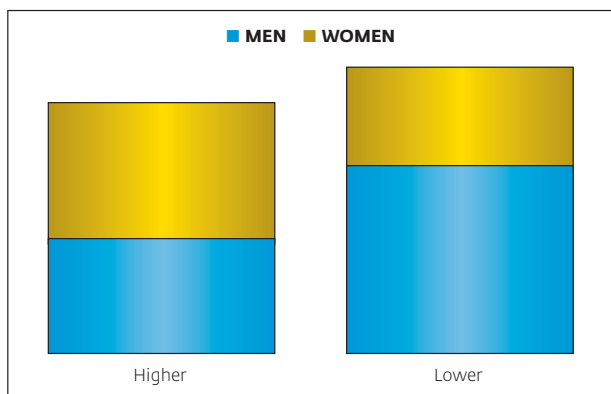
Source: drawn up by author.

Figure 6. Gender breakdown by type of working day

Source: drawn up by author.

possible and least discriminating in terms of the Gender Directive.

The resulting model would be the following:

$$P(Y = 1) = \frac{e^z}{1 + e^z}$$

where $z = constant + \beta_1 \, marital \; status + \beta_2 \, age \; of \; spouse + \beta_3 \, occupation + \beta_4 \, activity \; and + \beta_5 \, working \; day$

the base variables those that are most discriminating in terms of the individual's gender, obtaining the following: marital status, age of spouse, main occupation, main activity and type of working day.

The abovementioned variables are grouped into categories that best discriminate the gender and are then recoded into a dichotomous variable. The recoding process aims to make the question with a dichotomous answer as general as

Marital status. Is defined as the independent categorical variable that reflects whether an individual's marital status is widow/er, taking the value 1 if yes and 0 if no.

Age of spouse. Is defined as the independent categorical variable that reflects whether the spouse of the respondent, if any, is older than the latter, taking the value 1 if yes and 0 if no.

Occupation. Is defined as the independent categorical variable that

reflects whether the individual's main occupation corresponds to any of the following categories: military, armed forces, management, farming and fishery sector, manufacturing industry, machinery operator, taking the value 1 if yes and 0 if no.

Activity. Is defined as the independent categorical variable that reflects whether the main activity of the company in which the individual works corresponds to crop- or animal-farming, fishery, mining, construction, machinery, transport, storage and food, taking the value 1 if yes and 0 if no.

Type of working day. Is defined as the independent categorical variable that reflects the individual's type of working day, taking the value 1 in the case of part-time working and 0 in the case of full-time working.

If the obtained model is applied to the initial database, this gives a classification rate of 70.27% with a sensitivity[3] of 82.71%, a result that can be considered satisfactory.

BUSINESS APPLICATION
OF THE MODEL

THE MOST NOTEWORTHY CONCLUSION TO BE DRAWN FROM THIS WORK IS THE NEED FOR CONSTRUCTING A GENDER-PREDICTION MODEL

If the modelling proposed in this study were to be implemented in the business world, the dichotomous variables would throw up the following questions to be posed in the insurance application:

■ What is your marital status?
■ What is the age of your spouse?
■ What is your main occupation?
■ What is your main activity?
■ Do you work full- or part-time?

On the basis of the answer obtained, the logit model would throw up a classification percentage $(P(Y=1))$ representing the probability that an individual is a woman, according to which we can estimate if the individual is a man $(P(Y=1) <$ cut-off point) or woman $(P(Y=1) \leq$ cut-off point). Working with the result of the model, various alternatives could be adopted for implementing the predictive model in an insurance company, representing very attractive alternatives to those used in today's insurance practice.

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[3] The sensitivity indicates the model's capacity to signal as positive (women) cases that really are: i.e., the proportion of women correctly identified. In other words, the sensitivity characterises the test's capacity of detecting the gender in the database subjects.

Some of the alternatives could be the following:

● Instead of using a weighted average whose weights are a portfolio's % of men and women, a weighted average can be made of the life tables of men and women for each individual, whose weighting factors will be the percentage of probability obtained in the model, and its complement, thus working with a weighted average but adjusted to each individual.

If P(y=1) = p ➜ PASEM female★p + PASEM male★ (1-p)

● Set a probability cut-off point below which the table to be used will be PASEM 2010 male. If the probability obtained is higher than this cut-off point, the table to be used will be PASEM 2010 female.

If P(y=1) ≥ 50% ➜ PASEM Female

If P(y=1) < 50% ➜ PASEM Male

● Set intervals for applying each option: for example, if the probability lies between 40% and 60%, the weighted average is applied with weights equal to the probability. If the probability is less than 40%, the men's table can be used directly (PASEM 2010). If the probability is higher than 60%, the women's table can be used directly.

If P(y=1) < 40% ➜ PASEM Male

If P(y=1) > 60% ➜ PASEM Female

If 40% ≤ P(y=1) ≥ 60% ➜ PASEM Female★ P(y=1) + PASEM Male★ (1-P(y=1))

● The last alternative would involve an amalgam of the above options.

CONCLUSIONS

Up to now life tables have generally been accepted by national insurance companies, likewise assuming the working hypotheses of stationarity, uniformity and independence to build them up.

The current problem posed by the coming into force of the Gender Directive, especially in the insurance sector, provides an opportunity for revising and improving the calculation of an individual's probability of death and survival.

A new two-phase methodology is proposed herein for gauging the probability of survival and death. The first phase, the predictive model of the gender variable, is proposed as an efficient and useful tool, firstly for insurance companies, allowing them to eschew the gender variable without thereby forfeiting insurance-premium prediction capacity, and secondly for individuals, who will not suffer any reduction in the efficiency of their insurance premium calculations even though gender disappears as a risk differentiation factor.

The most noteworthy conclusion to be drawn from this work is the need for constructing a gender-prediction model. Although the results of this model are highly satisfactory and could provide a solution to the stipulations of the Gender Directive, the non-gender-discrimination ruling of the European Court of Justice can still be regarded as overkill. In actuarial calculations the gender of the insured has always been a naturally differentiating variable used for calculating premiums and benefits. Even if models are eventually drawn up, based on both theoretical and empirical analyses, for predicting an individual's gender with a high success rate, the precision will never be the same as when using the gender variable directly. ▮

THE DEVELOPED MODEL IS A PRACTICAL SOLUTION FOR THE INSURANCE SECTOR, AND ITS IMPLEMENTATION IN INSURANCE COMPANIES IS EASY AND EFFICIENT

BIBLIOGRAPHIC REFERENCES

BETZUEN, A. (2010). *«Análisis sobre las posibilidades de predicción de la mortalidad futura aplicando el modelo Lee-Carter».* Anales del Instituto de Actuarios 2010. Pp. 111-140.

FELIPE, A., GUILLÉN, M., y PÉREZ-MARÍN, A. (2002). *«Recent mortality trends in the Spanish population».* British Actuarial Journal, 8(4):757–786.

GIL FANA, J.A., HERAS MARTÍNEZ, A., VILAR ZONÓN, J.L. (1999). *«Matemáticas de los seguros de vida».* Editorial MAPFRE. Madrid.

LÓPEZ CACHERO, M.; LÓPEZ DE LA MANZANARA BARBERO, J. (1996). *«Estadística para actuarios».* Madrid: Editorial MAPFRE.

SANCHEZ DELGADO, E. (2008). *«Impacto de la Ley de Igualdad de Género en los seguros de Salud».* MAPFRE RE, 1996-Trébol nº 47 Pp.9-16.

VEGAS ASENSIO, J. (1982). *«Estadística, aplicaciones económicas y actuariales».* Madrid, Pirámide.

VICENTE MERINO, A.; HERNÁNDEZ MARCH, J.; ALBARRÁN LOZANO, I.; RAMÍREZ PÉREZ, C. (2002). *«Proyección y estudio de una población. El papel de la mortalidad».* Documento de Trabajo nº. 2002-03. Universidad Complutense de Madrid.

The *«cartels»*[1] of Barcelona's *nineteenth-century maritime*

MARIO SALA
Actuary

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[1] The term «cartel», used here to refer to the agreements signed by the companies, does not tally exactly with today's concept of inter-company agreements designed to corner a particular market. In the case in hand they were agreements to rationalise a market over which they already wielded control, as we will see later.

After the becalming of the corsair-infested seas at the end of the American colony-liberation wars, Barcelona merchants once more began to send ships to the old trading colonies. This resurgence of maritime activities spawned new insurance companies specialising in maritime trade. Between 1838 and 1857
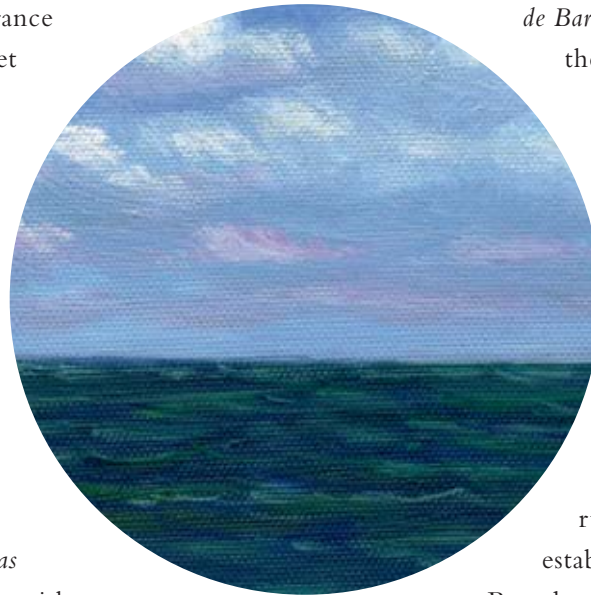
insurance companies

16 maritime insurance companies were set up in Barcelona. These companies were created under the aegis of the 1829 *Código de Comercio* (Commercial Code) and the 1848 *Ley de Sociedades Anónimas* (Corporation Act), with a high capital input and many shareholders who paid out only a small part of the share capital (about 10%). This number of companies was more than enough to cover all local maritime insurance needs. The 1857 stockmarket crash hit the Catalan economy pretty hard. Insurance companies suspended dividend payments; the frantic search for more income fuelled fierce competition between them, forcing premiums and even guarantees down to dangerously low levels, even though they all used the same type of policy. Covering losses by capital calls became increasingly difficult as shareholders rushed to ditch their shares and were loathe to fork out new payments. Witness the number of press announcements asking for capital calls at this time.

The despondency of insurers was perfectly reflected in two articles by Juan Mañé y Flaquer published in the *Diario de Barcelona* in 1859. In the first[2] he commented on the state of Barcelona's insurance market. After running through the maritime-insurance premium-setting rules, partly established by Barcelona's own practice and partly imported from elsewhere, he wondered: *«Do our insurance companies meet all these terms and conditions when insuring a vessel?»* In answer to his own question he reproduced a letter sent by a small group of company directors to other directors, enclosing a draft convention for study purposes. This group was led by the director of *Compañía Ibérica,* Jerónimo Ferrer, who had previously set up a commission to seek a solution to the problems of insurers suffering from the fierce market competition. The draft convention advocated an inter-company agreement to ensure that insurance policies always abided by the conditions imposed by past experience and insurance theory. The letter, dated 20 February 1859, gave a description of the woeful state of the insurance market; it ran as follows[3]: *«The premiums currently charged cannot cover the risks run; not only are these premiums*

continually being squeezed but also the previous surcharges for winter voyages, for rounding Cape Horn and Cape of Good Hope, for quarantine, equinox risks and stopover risk have all fallen by the wayside. No less serious are the habitual suppressions and modifications in the policy terms and conditions, with blithe removal of articles that exclude certain risks at certain times of year; excesses are also often suppressed; batch insurance policies are accepted without any premium increase and, finally, no distinction is made between ships of the 1st, 2nd and 3rd class; all are insured alike at the same premium and under the same terms and conditions. Worse still are the many crippling consequences of the open-handed claim payment policy, as yet another effect of the ruinous competition reigning in this business at the present time». The article author,

Juan Mañé y Flaquer, did not actually comment on the draft convention but expressed his very favourable attitude towards it. He ended up his article by saying *«The undertaking is by no means easy, let us make no mistake about that, but the long-term rewards are enormous».*

This letter conjures up an atmosphere of cut-throat competition and a critical market condition. It strikes us as strange that, neither in this letter nor in other previous articles by the same author, is any mention made of another important problem of Barcelona's insurance market: the glut of companies competing for the meagre business in those years. Other documents, on the other hand, do bring out this problem. For example, the *Unión Comercial*, a credit society which

WITH THE 1857 STOCKMARKET CRASH, THE SEARCH FOR MORE INCOME FUELLED FIERCE COMPETITION BETWEEN INSURANCE COMPANIES, FORCING PREMIUMS AND GUARANTEES DOWN TO DANGEROUS LEVELS

[2] Published in March 1859, page 2726.

[3] *Diario de Barcelona* of 1859, page. 2727.

[4] *Diario de Barcelona* of march 1859, page. 2468.

[5] *The last two companies, founded in 1857, shortly before the stockmarket crash, never actually started trading.*

[6] *Diario de Barcelona*, august 1859, page. 8186.

[7] Ibid, august 1859, page. 8150.

THE TALKS
BETWEEN
COMPANY
DIRECTORS
TURNED OUT TO
BE SUCCESSFUL
AND TWO
CONVENTIONS
WERE APPROVED
BETWEEN 1859
AND 1860

already held most of the capital of *La Garantía* (2,500 of the 4,000 shares), said the following in its annual report of 1858: «*So that, in response to the universal call for a reduction in the huge number of insurance companies set up here so heedlessly, we are continuing with the previous management's proposal of preparing for the winding-up of La Garantía, accumulating if possible the total number of shares issued*»[4]. This winding-up came to fruition in a Royal Decree of 28 April 1860. In its annual report of 1858-1859, the insurance company also said: «*Please note that there are currently fourteen maritime-insurance companies in Barcelona[5]; this number greatly exceeds business needs and is a natural result of competition, which is forcing premiums down to such a low level that they no longer match the risks run*»[6].

Another article by the same author, dating from August 1859[7], advocated the merger of insurance companies as a

solution to their problems. A sine qua non of such mergers would be a convention or confederation of interests since «nobody will want to bring it about (the merger) at any cost and in any fashion».

The talks between company directors, as proposed in the former letter, were finally held and turned out to be successful. Two conventions were signed between two groups of companies; the first (which we will call convention A) was drawn up in late 1859 and was signed and came into force in mid 1860, with a scheduled term until 31 December 1861, extendible thereafter. The companies included were *La Aseguradora*, *Naviera Catalana*, *Comercio Marítimo*, *El Cabotaje* and *La Salvadora*. The second convention (convention B) was notarised on 30 July 1860[8] and came into force on 1 August 1860, with a scheduled term until 31 December 1861, extendible thereafter. No company, unless it was actually wound up, was entitled to leave the convention. This convention included the companies *La Barcelonesa*, *Catalana General de seguros*, *Ibérica de seguros* and *El Ancora*. The convention was also entered in the *Registro de Comercio* (Commercial Register) on 8 August 1860.

Both conventions were approved in extraordinary general shareholders' assemblies of the companies concerned. These conventions did not include *La Masnouense*, *La Esperanza* and *La Garantía* (which had all already taken winding-up agreements in their general shareholders'

assemblies) or *Lloyd Barcelonés* and *Lloyd Catalán*, which continued to trade as independent companies. This latter company had also initiated winding-up proceedings due to irregularities but these proceedings were stayed by the Civil Governor on 29 May 1861. All the companies, in their annual reports, commented on the harmony, cordiality, frankness and fair-minded reciprocity that prevailed during these preliminary talks.

The reason why two different conventions were drawn up was the conceptual differences existing between the two groups of companies. The five companies comprising convention A

retained their independence and continued to trade in their own right, each issuing its own policies (with identical texts) and applying a common rate. The policy-issuing company retained 40% of the risk and premium, while the remaining 60% was shared out equally between the other four companies, which also figured in the policy, each taking on part of the risk but maintaining their autonomy. The policy clearly indicated this: «*The subscribing company hereby insures Mr. N.N. for the sum of… holding itself accountable for 40% hereof, the remaining being taken on in equal shares by the companies noted in the margin, by proxy of which the leading company hereby signs this policy*». Article 7 of the convention laid it down that «*The companies do not hold themselves jointly and severally accountable but rather each one in the proportion noted in the policy. Although the companies do not hold themselves jointly*
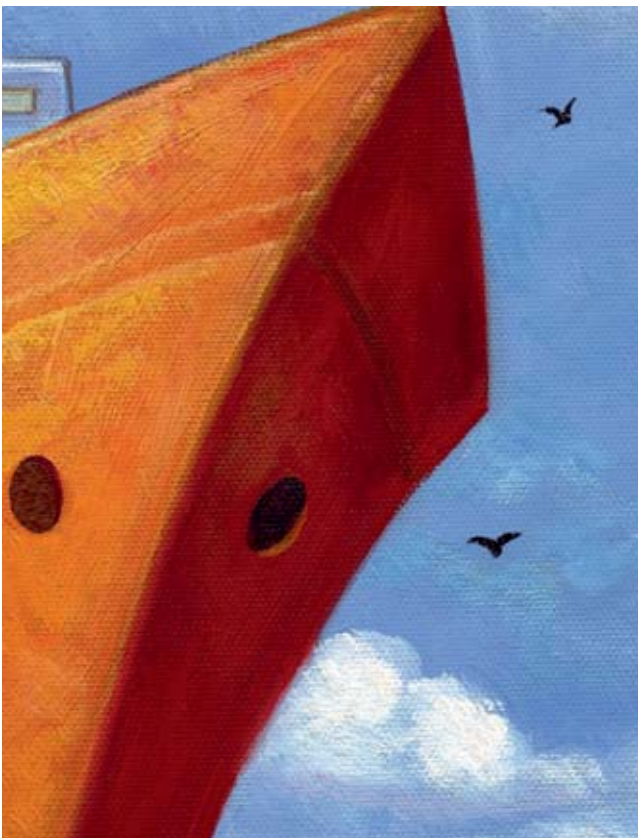
liable, the fact that the leading company does not begin to pass on the premiums to the other companies until six months after receiving them acts as a further guarantee for the insured». The intention of this clause was to make it clear that the policy-issuing company kept the premiums in its power for six months, thereby being able to cover any payment default by another company in the event of any loss or average.

The companies making up convention B sought eventual merger of the four companies, as laid down in article 1 of the convention: *«For the purposes of working towards a merger, the subscribing companies, as from a date to be established later, will verify all operations jointly and equally between them all».* Article 2 laid down the companies' modus operandi: «S*uch insurance policies*

as are verified will be issued in a single policy in the name of all of them, expressing the fact that they hold themselves jointly accountable vis-à-vis the insured for the sum subscribed in the policy or in other words the insurance risk». They therefore began to act in the market as though they were already a single company, using a single policy and charging the same rate, assuming the risks in common, with a 25% risk- and premium-shareout for each one. Monetary settlements between the four companies were made quarterly. The convention preamble pointed out that «*Said convention has established that the four companies will hold themselves jointly liable for the sums insured by any single one».* Should one of the companies fail to pay its part of any loss, the other three would make up the difference. In terms of insurance techniques, convention A worked as a grouping of independent companies that co-insured between them the risks taken on by each one, while convention B worked as a form of obligatory co-insurance. The insureds would be entitled to apply to any of the four companies. We will flesh out these concepts in the next section.

Convention A was prolonged for a further year on 31 December 1861 («*all the united companies having deemed this to be in their interests»*)[9] and was wound up by mutual agreement on 31 December 1862 «d*espite this, the insurance business has settled down into some semblance of regularity, uniform rates now being charged*

market once again began to trade separately.

Both conventions took identical market-rationalisation measures:

a) Establish a general ship registry to enable insurers to adapt premiums to the characteristics of each type of vessel, which were divided into seven classes. This measure was the most important of all, allowing as it did the premiums to be tailored to the risks taken on with each particular type of ship.

b) Formulate the policies and rates that should govern the insurance of each class of ship, navigation and effects. This documentation had to be presented within 30 days of signing the convention for the policies and rates of Barcelona, 60 days for the rest of Spain and as soon as possible for business abroad. This second measure was very important in terms of bringing premiums into line with the risks underwritten, although it

for all insurers, and there are reasonable grounds for hoping that, having now learnt the lessons of a painful past, there will be no return of the fierce competition that erstwhile proved so crippling for all concerned» [10].

Convention B was renewed for a further yearly term on 31 December 1861. Upon running this new term, on 31 December 1862, *La Catalana General* opted out of the convention despite not itself being in winding-up proceedings. The remaining companies renewed the convention for a further year, whereupon it was then cancelled. In January 1864, therefore, all companies of the Barcelona

COMPANIES BEGAN TO ACT IN THE MARKET AS IF THEY WERE A SINGLE COMPANY, USING A SINGLE POLICY AND CHARGING THE SAME RATE, ASSUMING THE RISKS IN COMMON

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[8] AHPB, Notary public Fernando Moragas y Ubach, notary's record of 1860, volume III, page 236 ff.

[9] Annual report of *La Aseguradora* of 6.8.1862. *Diario de Barcelona* 1862, page 7036.

[10] Annual report of *La Aseguradora* of 5.8.1863. *Diario de Barcelona* 1863, page 7112.

did not achieve an increase in the mean premium charged for reasons commented on in the next point on company accounts.

c) Examine documents on the losses and averages that were common to all, establishing the corresponding arrangements and settlements accordingly.

They also decided to set up a maritime insurers committee, made up by a director from each company, whose main remit was to meet the objectives indicated in the former paragraph, solve doubtful cases (ships not included in the register, insurance policies taken out when the ship was already at sea, and others) and, above all, jointly process average adjustments and loss settlements. The pressing need for market rationalisation measures was obvious. Convention A catered only for

Commissioners (representatives-agents) in Spain and all the companies gradually closed their agencies abroad and then concentrated on the Spanish business. Conversely, convention B allowed for representatives-agents in the Spanish Antilles and South America.

The conventions also differed in some aspects of daily activity: insurable capital in a single policy was capped at only 25,000 *pesos fuertes* (1 *peso fuerte* = c. 8 *reales*) in convention A and 60,000 in B. Representatives-agents could accept risks only up to 15,000 *pesos fuertes* in A while convention B set no general limits; management would set them according to the importance of the port.

This policy sale system, rather than trying to stem excessive competition between the companies, wiped it out completely, since all companies granted the same coverage using the same policies and applying the same premiums. Despite the market rationalisation brought about by these conventions there were some circumstances that disheartened both directors and shareholders. Take the following examples: the obligation of assigning a sizeable part of a risk that a company had underwritten and considered to be a «good risk», or the opposite situation, whereby a company was forced to assume part of what it considered to be a «bad risk»; with time this proved to be irksome for good insurers. The established acceptance rules prevented directors from favouring their own shareholders (lower premiums or less

merchants had always preened themselves on probably also had some bearing on the non renewal of the contracts. Barcelona's regulations, so strict in terms of premiums and risk underwriting conditions, were certainly a mistake, since they hemmed in the company's commercial activity with too many constraints. ▌

red tape in dealing with a loss). We should not forget here that a good number of shareholders were also merchants or shipowners with maritime transport interests. These might be some of the reasons for the short duration of these experiments. In the annual reports of the companies we have found no mention of problems in the financial relations between the grouped companies (such as delays in paying the accounts of assigned premiums or paid averages), though this does not necessarily mean there were no problems of this kind at all. Finally, the independent spirit that Barcelona

RANKING

of insurance groups in
Latin America in
2011

For the 10th straight year, FUNDACIÓN MAPFRE hereby presents its ranking of the 25 largest insurance groups in Latin America by premium volume, this time for 2011. Three rankings have been compiled —Overall, Life and Non-Life— and separate information is included on local and multinational insurers.

CENTRO DE ESTUDIOS
FUNDACIÓN MAPFRE

RANKING OF INSURANCE GROUPS IN LATIN AMERICA IN 2011
OVERALL

RANKING 2011	GROUP	COUNTRY	Premiums (millions of €)		% ▲	Market share 2011 %	RANKING 2010
			2010	2011			
1	BRADESCO SEGUROS	BRAZIL	8.014	9.619	20,0	9,3	1
2	MAPFRE	SPAIN	6.705	7.333	9,4	7,1	2
3	ITAÚ/UNIBANCO HOLDING	BRAZIL	5.351	6.964	30,1	6,7	3
4	ZURICH	SWITZERLAND	1.500	4.675	211,7	4,5	16
5	BRASILPREV	BRAZIL	3.258	4.018	23,3	3,9	5
6	METLIFE	UNITED STATES	3.575	3.429	-4,1	3,3	4
7	PORTO SEGURO	BRAZIL	3.090	3.300	6,8	3,2	7
8	LIBERTY MUTUAL	UNITED STATES	2.351	2.691	14,5	2,6	8
9	CNP	FRANCE	2.085	2.399	15,0	2,3	9
10	ALLIANZ	GERMANY	1.712	1.986	16,0	1,9	10
11	GRUPO NACL. PROVINCIAL	MEXICO	1.657	1.820	9,8	1,8	11
12	HSBC	UNITED KINGDOM	1.504	1.794	19,3	1,7	15
13	SURAMERICANA	COLOMBIA	1.116	1.761	57,8	1,7	20
14	MCS	UNITED STATES	1.541	1.682	9,2	1,6	13
15	GENERALI	ITALY	1.309	1.640	25,3	1,6	18
16	AXA	FRANCE	1.589	1.621	2,0	1,6	12
17	TRIPLE-S	PUERTO RICO	1.513	1.579	4,3	1,5	14
18	BBVA	SPAIN	1.188	1.455	22,5	1,4	19
19	SULAMÉRICA	BRAZIL	1.338	1.427	6,6	1,4	17
20	INBURSA	MEXICO	781	1.180	51,0	1,1	25
21	MMM HEALTHCARE	UNITED STATES	1.007	1.096	8,8	1,1	21
22	ACE	UNITED STATES	882	1.012	14,7	1,0	23
23	RSA	UNITED KINGDOM	830	979	18,0	0,9	24
24	TALANX	GERMANY	762	969	27,2	0,9	–
25	AIG	UNITED STATES	994	964	-3,0	0,9	22

|	2010	2011	%	Market share
Total for top 10	37.641	46.414	23,3	45,0
Total for top 25	55.654	67.392	21,1	65,3
Total for sector	90.316	103.181	14,2	100

IN 2011, CONCENTRATION INCREASED 0.9% IN THE RANKING OF THE 25 LARGEST INSURANCE GROUPS IN LATIN AMERICA, WHICH TOGETHER ACCOUNTED FOR 65.3% OF THE MARKET. PREMIUM REVENUE TOTALED 67,392 MILLION EUROS, UP 21.1% FROM 2010

RANKING OF INSURANCE GROUPS IN LATIN AMERICA IN 2011
NON-LIFE

RANKING 2011	GROUP	COUNTRY	Premiums (millions of €)		%▲	Market share 2011 %	RANKING 2010
			2010	2011			
1	MAPFRE	SPAIN	4.969	5.535	11,4	10,1	1
2	PORTO SEGUROS	BRAZIL	2.944	3.147	6,9	5,7	2
3	LIBERTY MUTUAL	UNITED STATES	2.252	2.579	14,5	4,7	3
4	BRADESCO	BRAZIL	1.972	2.174	10,2	4,0	4
5	ITAÚ/UNIBANCO HOLDING	BRAZIL	1.611	1.972	22,4	3,6	5
6	ZURICH	SWITZERLAND	1.031	1.905	84,7	3,5	10
7	ALLIANZ	GERMANY	1.454	1.681	15,7	3,1	6
8	AXA	FRANCE	1.215	1.334	9,8	2,4	7
9	GENERALI	ITALY	979	1.265	29,3	2,3	11
10	SULAMÉRICA	BRAZIL	1.127	1.205	6,9	2,2	8
11	GRUPO NACL. PROVINCIAL	MEXICO	1.050	1.046	-0,4	1,9	9
12	RSA	UNITED KINGDOM	803	951	18,5	1,7	13
13	TALANX	GERMANY	740	940	27,1	1,7	15
14	INBURSA	MEXICO	534	927	73,7	1,7	20
15	AIG	UNITED STATES	942	924	-1,9	1,7	12
16	MERCANTIL	VENEZUELA	692	857	23,9	1,6	16
17	ACE	UNITED STATES	746	856	14,8	1,6	14
18	SANCOR	ARGENTINA	495	708	43,2	1,3	22
19	CNP ASSURANCES	FRANCE	563	661	17,4	1,2	19
20	TOKIO MARINE	JAPAN	589	654	11,0	1,2	17
21	QUÁLITAS	MEXICO	589	649	10,3	1,2	18
22	HORIZONTE	VENEZUELA	418	618	47,6	1,1	–
23	MARÍTIMA/YASUDA	BRAZIL/JAPAN	509	600	18,0	1,1	–
24	SURAMERICANA	COLOMBIA	423	552	30,7	1,0	25
25	BBVA	SPAIN	450	549	22,1	1,0	23

	2010	2011			
Total for top 10	19.553	22.797	16,6	41,5	
Total for top 25	29.094	34.291	17,9	62,4	
Total for sector	47.460	54.941	15,8	100	
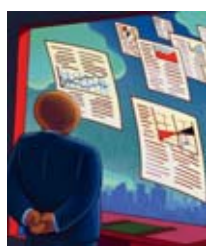
MAPFRE REMAINED AS LEADER OF THE NON-LIFE RANKING, WITH 10.1% SHARE OF THE PREMIUMS IN THIS LINE. ITS REVENUE LAST YEAR ROSE 11.4% TO 5,335 MILLION EUROS. THE SPANISH GROUP REMAINS QUITE A WAY OUT IN FRONT OF ITS CLOSEST COMPETITOR

RANKING OF INSURANCE GROUPS IN LATIN AMERICA IN 2011
LIFE

RANKING 2011	GROUP	COUNTRY	Premiums (millions of €) 2010	2011	% ▲	Market share 2011 %	RANKING 2010
1	BRADESCO	BRAZIL	6.042	7.445	23,2	15,4	1
2	ITAÚ/UNIBANCO HOLDING	BRAZIL	3.741	4.992	33,4	10,3	2
3	BRASILPREV	BRAZIL	3.258	4.018	23,3	8,3	3
4	METLIFE	UNITED STATES	3.147	3.010	-4,3	6,2	4
5	ZURICH	SWITZERLAND	469	2.770	491,2	5,7	18
6	MAPFRE	SPAIN	1.736	1.798	3,6	3,7	6
7	CNP	FRANCE	1.523	1.738	14,2	3,6	8
8	MCS	UNITED STATES	1.541	1.682	9,2	3,5	7
9	TRIPLE-S	PUERTO RICO	1.392	1.469	5,6	3,0	9
10	HSBC	UNITED KINGDOM	1.083	1.270	17,2	2,6	10
11	SURAMERICANA	COLOMBIA	693	1.179	70,1	2,4	13
12	MMM HEALTHCARE	UNITED STATES	1.007	1.096	8,8	2,3	11
13	BBVA	SPAIN	738	906	22,8	1,9	12
14	GRUPO NACL. PROVINCIAL	MEXICO	607	774	27,4	1,6	14
15	HUMANA	UNITED STATES	591	719	21,8	1,5	15
16	BANAMEX	MEXICO	531	628	18,2	1,3	17
17	NEW YORK LIFE	UNITED STATES	549	566	3,2	1,2	16
18	CARDIF	FRANCE	318	479	50,5	1,0	24
19	CONSORCIO	CHILE	340	450	32,5	0,9	22
20	F. MEDICAL HEALTH PLAN	UNITED STATES	427	419	-1,9	0,9	19
21	ICATÚ	BRAZIL	269	418	55,2	0,9	–
22	GENERALI	ITALY	330	374	13,3	0,8	23
23	PMC MEDICARE CHOICE	PUERTO RICO	387	331	-14,4	0,7	20
24	BOLÍVAR	COLOMBIA	296	310	4,8	0,6	–
25	ALLIANZ	GERMANY	258	305	18,2	0,6	–

	2010	2011	% ▲	Market share
Total for top 10	23.931	30.193	26,2	62,6
Total for top 25	31.272	39.147	25,2	81,1
Total for sector	42.856	48.240	12,6	100

WITH GROWTH OF 25.2%, THE 25 LARGEST LIFE INSURANCE GROUPS IN LATIN AMERICA SHOWED A MORE ROBUST PERFORMANCE THAN THOSE LISTED ON THE NON-LIFE RANKING, WHOSE PREMIUM REVENUE EXPANDED 17.9%

RANKING OF LOCAL INSURANCE GROUPS IN LATIN AMERICA IN 2011
OVERALL

RANKING 2011	GROUP	COUNTRY	Premiums (millions of €) 2010	Premiums (millions of €) 2011	%▲	Market share 2011 %	RANKING 2010
1	BRADESCO	BRAZIL	8.014	9.619	20,0	9,3	1
2	ITAÚ/UNIBANCO HOLDING	BRAZIL	5.351	6.964	30,1	6,7	2
3	BRASILPREV	BRAZIL	3.258	4.018	23,3	3,9	3
4	PORTOSEGURO	BRAZIL	3.090	3.300	6,8	3,2	4
5	GRUPO NACL. PROVINCIAL	MEXICO	1.657	1.820	9,8	1,8	5
6	SURAMERICANA	COLOMBIA	1.116	1.761	57,8	1,7	8
8	TRIPLE-S	PUERTO RICO	1.513	1.579	4,3	1,5	6
7	SULAMÉRICA	BRAZIL	1.338	1.427	6,6	1,4	7
9	INBURSA	MEXICO	781	1.180	51,0	1,1	9
10	MERCANTIL	VENEZUELA	708	872	23,2	0,8	10

Total for top 10	26.827	32.539	21,3	31,5
Total for sector	90.316	103.181	14,2	100

RANKING OF MULTINATIONAL INSURANCE GROUPS IN LATIN AMERICA IN 2011
OVERALL

RANKING 2011	GROUP	COUNTRY	Premiums (millions of €) 2010	Premiums (millions of €) 2011	%▲	Market share 2011 %	RANKING 2010
1	MAPFRE	SPAIN	6.705	7.333	9,4	7,1	1
2	ZURICH	SWITZERLAND	1.500	4.675	211,7	4,5	10
3	METLIFE	UNITED STATES	3.575	3.429	-4,1	3,3	2
4	LIBERTY MUTUAL	UNITED STATES	2.351	2.691	14,5	2,6	4
5	CNP	FRANCE	2.085	2.399	15,0	2,3	5
6	ALLIANZ	GERMANY	1.712	1.986	16,0	1,9	6
7	HSBC	UNITED KINGDOM	1.504	1.794	19,3	1,7	8
8	MCS	UNITED STATES	1.541	1.682	9,2	1,6	9
9	GENERALI	ITALY	1.309	1.640	25,3	1,6	–
10	AXA	FRANCE	1.589	1.621	2,0	1,6	7

Total for top 10	23.871	29.251	22,5	28,3
Total for sector	90.316	103.181	14,2	100

Observations on the ranking

The economy of Latin America and the Caribbean remained strong in 2011, with output growing 4.3%, according to ECLAC. Still, a slowing of the rate of growth in the region was detected. The insurance sector continued to expand at a good pace and reached premium volume of 103,181 million euros[1], an increase of 14.2% with respect to 2010. Growth was slower than the 19.2 percent rate posted in 2010, as a result of the smaller economic expansion but also because of the appreciation of the euro against major local currencies. Nonetheless, all the countries of the region posted increases in premium volume as measured in local currency, both in Life and Non-Life insurance.

For yet another year, the strong performance by the Life insurance branch was driven by the Brazilian product known as *Vida Gerador de Beneficio Libre* but also by a robust showing by Life insurance in Argentina.

Non-Life insurance was favored by the economic expansion, with rises in employment and sales of goods and automobiles, and by an increase in insurance rates in the main markets. In Brazil, another factor was the increase in investment in infrastructure due to all the big projects under way (the 2014 World Cup, the Olympic Games of 2016 and exploration of deep water, so-called pre-salt oil deposits).

The expansion of the Brazilian insurance market, which is also the region's largest, again had a considerable effect on the ranking of the region's insurance groups. Also contributing to this was the

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[1] Does not include Health insurance in Brazil, Life Annuities and Retirement Insurance in Argentina, or Pensions in Mexico.

fact that the real depreciated less against the euro than did other Latin American currencies.

Overall ranking

In 2011, concentration increased 0.9 percentage point in the ranking of the 25 largest insurance groups of Latin America, which together accounted for 65.3% of the market. This was a result of acquisitions and business agreements they reached over the course of the year. Premium revenue totaled 67,392 million euros, up 21.1% from 2010.

The most important corporate news of 2011 included the following:

● In July 2011, Banco Santander reached an agreement with the Zurich group under which the latter acquired 51% of the holding made up of Santander's insurance units in Latin America (in Argentina, Brazil, Chile, Mexico and Uruguay). Under this deal, Zurich will manage the companies and the bank will sell insurance products in each of the five aforementioned markets, for 25 years, through its network of branches.

● Grupo de Inversiones Suramericana (Grupo Sura) bought out the pension and life insurance business of ING in Latin America. The deal does not include the Dutch group's 36% stake

in the Brazilian insurer SulAmérica. The Colombian group also acquired in 2011 the Dominican insurer Proseguros and one of the largest insurance companies in El Salvador, Aseguradora Suiza Salvadoreña (Asesuisa).

● In April 2011, the German group Talanx announced it was acquiring the Argentine and Uruguayan units of L'Union de Paris, and in July it disclosed that it is buying the Mexican company Metropolitana.

● In order to maintain growth in Medicare Advantage, the top-performing health care product in recent years in the Puerto Rican market, Triple-S announced in January 2011 that it was buying the operations of American Health in Puerto Rico.

● In December 2011, the ACE Group announced it was acquiring the Ecuadorean company Río Guayas, owned by Banco de Guayaquil. It is the fourth-ranked insurance company in Ecuador.

● The Brazilian company Marítima Seguros struck a deal with Yasuda Seguros, part of the Japanese group Sompo, to sell it 50% of the Brazilian firm's capital.

The participation of major European and U.S. insurers in these transactions is the result of the stiff competition that exists in these markets. These groups, hard hit by the international economic crisis, are looking for growth in emerging markets that have suffered less of an impact than more developed markets and which have a higher level of growth.

For yet another year, the ranking was led by Brazilian insurer Bradesco, with premium volume of 9,619 million euros and a market share of 9.3%. Next came the MAPFRE group and Itaú/Unibanco, which held the same spot as the previous year and have a market share of 7.1% and 6.7%, respectively. Thanks to the deal struck with the Santander group, which held sixth place in the 2010 ranking, Zurich climbed 12 places to take over fourth, with revenue of 4,675 million euros. It is important to keep in mind that the data used in this study does not come from consolidated accounting procedures. Therefore, the premium volume of groups which have reached agreements with other companies is the sum of the total revenue of both groups.

Brasilprev, in which Banco do Brasil and the Principal group hold stakes, remained in fifth place, although its market share rose three-tenths of a point thanks to major premium growth of 23.3%. MetLife dropped from fourth to sixth place after selling to the U.S. concern Pan-American Life Insurance Group (PALIC) the units that Metlife bought from ALICO

IN 2011, THE LATIN AMERICAN INSURANCE SECTOR CONTINUED TO EXPAND AT A GOOD PACE AND REACHED PREMIUM VOLUME OF 103,181 EUROS, AN INCREASE OF 14.2% WITH RESPECT TO 2010

in Panama and Costa Rica. This caused Metlife's premium revenue to go down by 4.1%.

Another important change in the ranking was the big jump posted by the Colombian group Suramericana, which took over 13th place thanks to the acquisitions it carried out in 2011 and which were discussed earlier in this report. Also worth pointing out is the extraordinary revenue growth seen by the Inbursa Group – 51.0% – which placed it in 25th place in this latest ranking. This rise stems from the renewal in August 2011 of the two-year Property Damage policy held by Petróleos Mexicanos.

Finally, we should mention that Talanx has risen to 24th in the ranking, thanks to robust premium growth of 27.2%, as a result of acquisitions carried out in 2011.

Non-Life ranking

The market share held by the top 25 groups in the Non-Life line was 62.4%, compared to 60.8% in 2010. As discussed earlier, the main reason for this increase was the merger and acquisition activity that took place in 2011.

MAPFRE remained as leader of the Non-Life ranking, with a 10.1% share of the premiums in this line. Its revenue last year rose 11.4% to 5,535 million euros. The Spanish group remains quite a way out in front of its closest competitor, Porto Seguros (5.7% market share), even though MAPFRE's market share slipped four-tenths of a point. Liberty, Bradesco and

Itaú/Unibanco hold third, fourth and fifth place, respectively. One highlight is the latter's 22.4% jump in premium revenue.

The factors driving the growth and higher ranking positions of Zurich, Talanx and Inbursa are the same as those discussed in the section on the overall ranking. Besides these increases one should mention the expansion reported by the Argentine group Sancor –its premium revenue rose 43.2% and its place on the ranking climbed four spots– and that of the Italian group Generali. With strong growth in its Argentine and Mexican markets, it expanded 29.3% and went up two rungs in the ranking.

Companies joining the ranking for the first time were Venezuela's Horizonte Group, whose Health insurance premiums rose 56%, and Brazil's Marítima Seguros, thanks to the agreement reached with Yasuda of Japan.

Life ranking

With growth of 25.2%, the 25 largest Life insurance groups in Latin America showed a more robust performance than those listed on the Non-

THE PARTICIPATION OF MAJOR EUROPEAN AND U.S. INSURERS IN THESE TRANSACTIONS IS THE RESULT OF THE STIFF COMPETITION THAT EXISTS IN THESE MARKETS. THESE GROUPS ARE LOOKING FOR GROWTH IN EMERGING MARKETS

Life ranking, whose premium revenue expanded 17.9%. The revenue of these groups – 39,147 million euros – also surpassed that of Non-Life companies, which totaled 34,291 million euros. Concentration increased 1.5 percentage points to 81.1%. The top five groups, led by the Brazilian groups, accounted for nearly half of all premium revenue in the region.

Bradesco remained the undisputed leader, with 7,445 million euros in premiums and a market share of 15.4%. In second place was Itaú/Unibanco, which in 2011 posted major growth of 33.4%, with revenue reaching 4,992 million euros. Brasilprev and MetLife held onto third and fourth place, respectively.

The biggest changes in the 2011 ranking were the rise of Zurich, which went from 18th to 5th place, and Cardif, which jumped six spots thanks to growth by its units in Brazil and Chile. Newcomers to the ranking were Icatú, Bolívar and Allianz.

Rankings of local and multinational groups

In 2011 there was no change in the makeup of the ranking of local groups. Bradesco continued to be the leader, although the distance between it and its immediate rival, Itaú/Unibanco, became narrower.

MAPFRE continued to lead the ranking of multinational companies in Latin America, followed by Zurich, which, thanks to its agreement with Santander, became the second largest multinational company in the region.

Methodology

In the preparation of this study, the same methodology was used as in earlier versions. The data come from information published by the insurance regulatory bodies in the various countries, and the premium volume of each group is the sum of the premiums issued in each country. In calculating data we have taken into account the mergers and acquisitions announced in 2011.

One must note that in carrying out this kind of study, a complication arises because of the different makeup of the Life and Non-Life branches in each country. In general, and wherever possible, Health and Accident insurance have been included in the Non-Life branch. But it was not possible to apply this criterion to Puerto Rico, for instance, where the Disability line (Health) is considered part of Life insurance. In fact, the largest insurers of Life and Health in Puerto Rico are mainly Health insurers. Some of them are among the top 25 Life insurance groups in Latin America.

Also, in Brazil, contributions from *Previdencia Privada*, or private pension plans, were not included, nor were Health insurance premiums because they are not under the control of the *Agência Nacional de Saúde Suplementar* (ANS). In Argentina, life annuities and retirement insurance are not included and in Mexico pensions are excluded[2].

To convert data expressed in other currencies into euros, we used the average exchange rate for the year. Growth rates are calculated using revenue in euros.

The rankings can be obtained from the electronic publications section of the Institute of Insurance Sciences at FUNDACIÓN MAPFRE, at www.fundacionmapfre.com/cienciasdelseguro. ▮

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[2] For this reason, and due to the differences in the makeup of the Life and Non-Life branches, the figure on total Life and Non-Life premiums in this study is different from the one published in the FUNDACIÓN MAPFRE's study "The Latin American Insurance Market."

responds to the sense of social responsibility which is a basic principle behind MAPFRE's business activities. It was founded in 1975.

The Insurance Sciences Institute of FUNDACIÓN MAPFRE was created to promote educational and research activities concerned with the world of insurance and risk management.

Gerencia de Riesgos y Seguros

ENGLISH APPENDIX