Economics & INSURANCE

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Economics

Posts

Introduction

MAPFRE Economics is delighted to publish the first issue of our biannual review, Economics and Insurance, which aims to open a dialog that contributes to the enhanced circulation of its principal works.

This review, which will be brought to you exclusively in digital format, came about from the desire to introduce the reader to pertinent topics of an economic and financial nature that are linked to the workings of the insurance sector and which have been analyzed by our Economic Research team. The goal is to give you a general overview of these works so that you can continue following up in more detail on those of interest to you by accessing the complete version of the relevant study.

The review will also facilitate direct access to the forecasts prepared by the Economic Research team related to the main macroeconomic aggregates – GDP, inflation and interest or exchange rates – of the most relevant economies within MAPFRE's operating footprint and beyond. In addition, the review will also feature special collaborations on insurance-related topics from a global perspective, carried out by authoritative external partners.

This first issue is full of topics that are very much in the news – pensions systems, insurance penetration drivers in Latin America and insurance sector investment allocation. Also included is an analysis of economic and financial perspectives for 2018 and their impact on insurance activity, and a discussion on the usefulness of copula statistical methods in risk measurement.

MAPFRE Economics seeks to promote, contribute to and drive general economic debate, as well as those discussions pertaining to the financial system, the insurance sector and the prudential regulation framework. With all that being said, we do hope that you find our new review interesting and of use to you in both learning more about the work of MAPFRE Economics and following our activity more easily.

MAPFRE Economics

Reassessing Pensions Systems
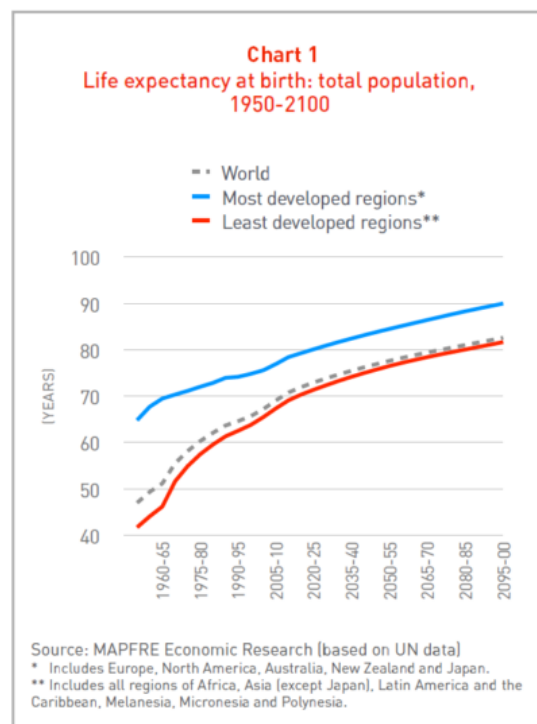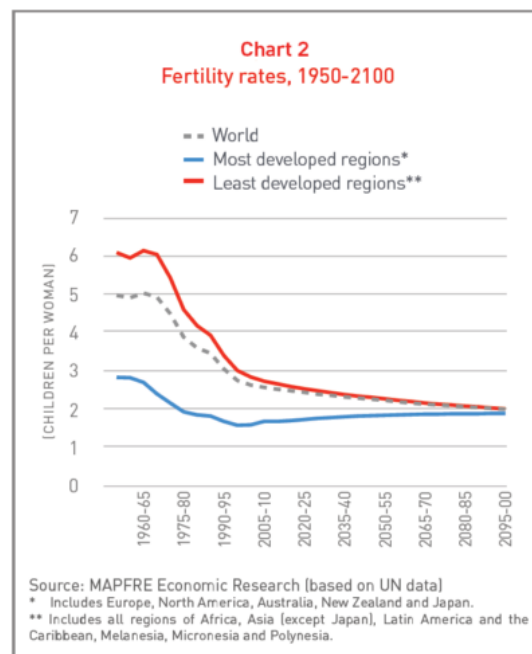
Author: MAPFRE Economics

More than a century after the first pensions systems appeared as part of the infrastructure on which the welfare state was built, and after profound transformations in both population dynamics and economic structure, it appears essential to reassess those systems if they are to continue to form part of the institutional framework that gives cohesion to our societies.

Changes in demographic patterns

Globally, life expectancy at birth has been increasing steadily over recent decades: in 1950 it was 47 years of age, but by 2015 it had risen to almost 71 years of age. This reflects a trend toward greater longevity which, at least in its inertial dynamics, will be maintained in the coming decades both in developed and emerging regions regions of the world (see Chart 1). However, there are scientific investigations in the field of longevity that could result in disruptive changes that would raise the age at death to well above the currently conceivable limits.

Chart 1
Life expectancy at birth: total population, 1950-2100

- - World
— Most developed regions*
— Least developed regions**

(YEARS)

Source: MAPFRE Economic Research (based on UN data)
* Includes Europe, North America, Australia, New Zealand and Japan.
** Includes all regions of Africa, Asia (except Japan), Latin America and the Caribbean, Melanesia, Micronesia and Polynesia.

Meanwhile, the behavior of the fertility rate shows a clear downward trend. In 1950, the global average of this index was five births per woman, but by 2015 this had been reduced by half, and it is estimated that by the end of the century it will be around two births per woman, with a convergence of this trend both in the more developed regions and in relatively less developed regions (see Chart 2). Thus, both of these demographic phenomena (greater life expectancy and lower fertility rates) will underpin a process of progressive aging of the population, with more and more people reaching extreme ages.

Chart 2
Fertility rates, 1950-2100

Source: MAPFRE Economic Research (based on UN data)
* Includes Europe, North America, Australia, New Zealand and Japan.
** Includes all regions of Africa, Asia (except Japan), Latin America and the Caribbean, Melanesia, Micronesia and Polynesia.
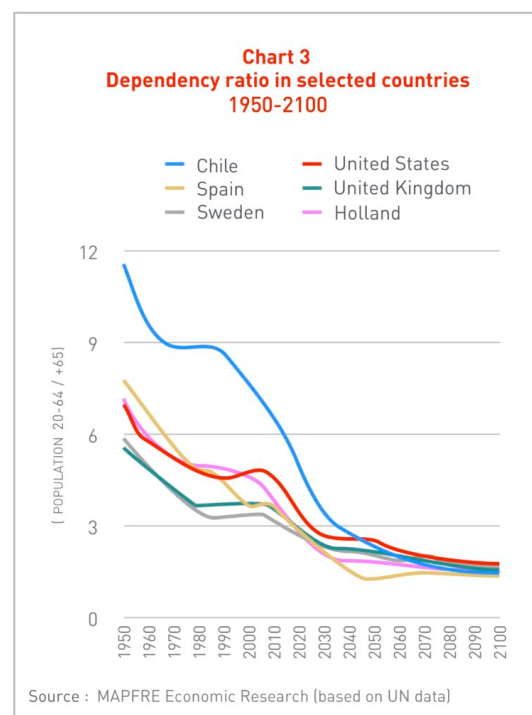
The effect on the pensions systems

One of the main areas on which these demographic trends will have an impact will be the pensions systems. A first way of measuring this impact is the relationship between the population that has reached retirement age and those persons considered to be of working age (dependency ratio), which has been generally increasing in recent decades. This trend is expected to continue markedly in the coming years.

In Spain, for example, while in 2000 there were 3.7 persons of working age (20-64 years of age) for each person of retirement age (over 65 years of age), it is estimated that by 2050 there will be only 1.3. This is a trend that, with varying degrees of intensity, is seen in all societies globally (see Chart 3).
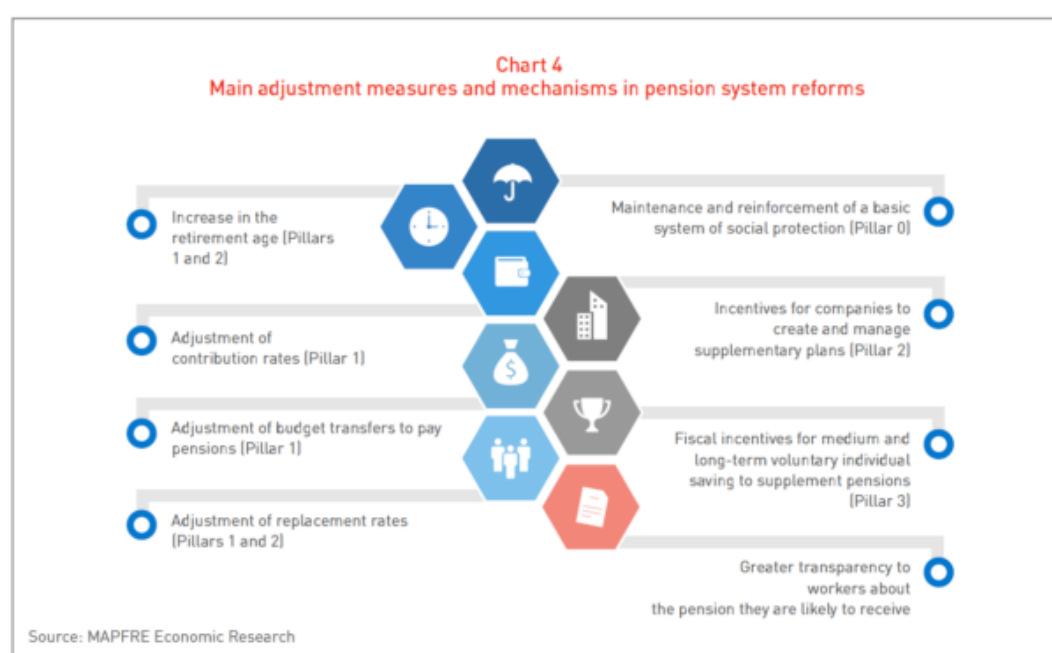
It is important to note that in addition to the effect of the demographic phenomena, there are economic and financial factors that are also impacting the medium- and long-term sustainability of the pensions systems, such as the climate of low interest rates, as well as others related to structural elements that affect economies' employment and productivity levels.

Chart 3
Dependency ratio in selected countries
1950-2100

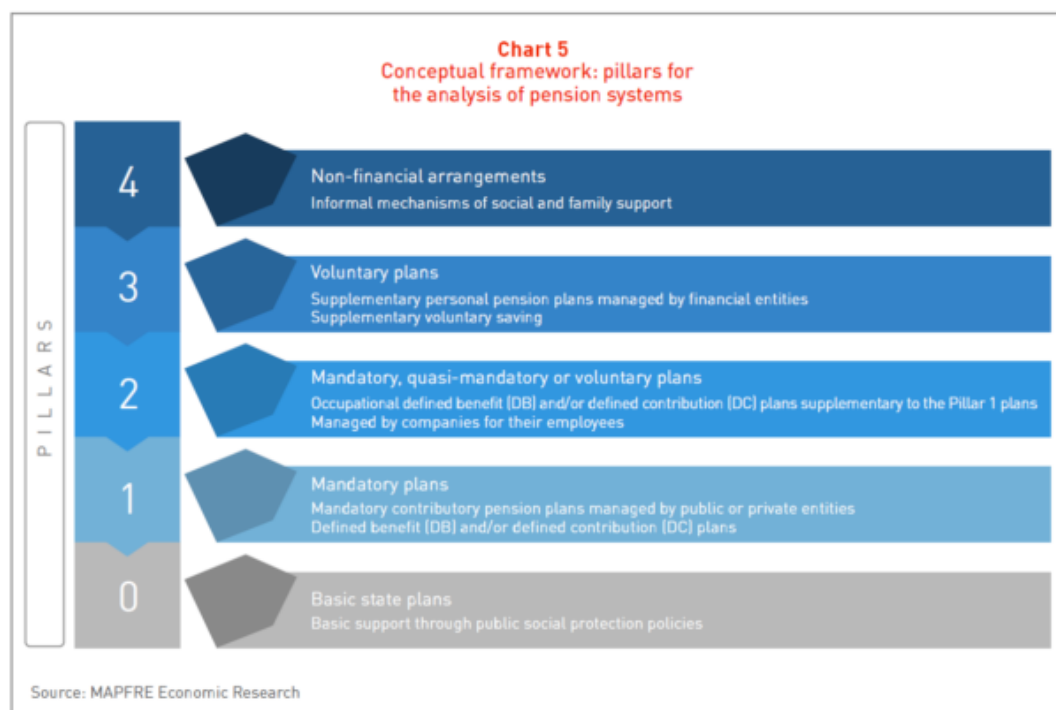Source : MAPFRE Economic Research (based on UN data)

Reassessing pensions systems

The effect of the demographic, economic and financial factors on the pensions systems can be absorbed or corrected through a combination of mechanisms. Analysis of the international experience suggests that the following are the eight most important public policy mechanisms available to provide long-term stability and sustainability to the pensions systems (see Chart 4): (i) maintenance of a basic social support scheme; (ii) increase in the retirement age; (iii) adjustment of contribution rates; (iv) adjustment of budgetary transfers for the payment of pensions; (v) adjustment of replacement rates; (vi) generation of incentives for businesses to create and manage supplementary pension plans; (vii) establishment of tax incentives for voluntary medium- and long-term individual savings to supplement pensions, and (viii) greater transparency for workers regarding the pension that they will be able to receive in the future.

Generally speaking, reforms to systems around the world are based not on the use of any one of these mechanisms in particular, but on a combination of them. However, the use of each of these tools has different effects on the pillars that make up the pensions systems (see Chart 5). For example, the only parametric reform that does not significantly alter the balance between inter-generational solidarity and loss of the level of well-being within "Pillar 1" (compulsory contribution schemes) is the raising of the retirement age. Another important aspect concerns the percentages of contribution to the system. The average for the countries of the Organization for Economic Co-operation and Development (OECD) is around 18%; systems with lower contribution rates can result in replacement rates below that which is desirable. Also worthy of note is the use of targeted tax incentives to stimulate medium- and long-term savings, which have a major influence, particularly when they involve the voluntary individual savings components present in Pillar 2 (occupational schemes) and Pillar 3 (voluntary schemes).

Chart 4
Main adjustment measures and mechanisms in pension system reforms

Increase in the retirement age (Pillars 1 and 2)

Adjustment of contribution rates (Pillar 1)

Adjustment of budget transfers to pay pensions (Pillar 1)

Adjustment of replacement rates (Pillars 1 and 2)

Maintenance and reinforcement of a basic system of social protection (Pillar 0)

Incentives for companies to create and manage supplementary plans (Pillar 2)

Fiscal incentives for medium and long-term voluntary individual saving to supplement pensions (Pillar 3)

Greater transparency to workers about the pension they are likely to receive

Source: MAPFRE Economic Research

Chart 5
Conceptual framework: pillars for
the analysis of pension systems

PILLARS

4 Non-financial arrangements
Informal mechanisms of social and family support

3 Voluntary plans
Supplementary personal pension plans managed by financial entities
Supplementary voluntary saving

2 Mandatory, quasi-mandatory or voluntary plans
Occupational defined benefit (DB) and/or defined contribution (DC) plans supplementary to the Pillar 1 plans
Managed by companies for their employees

1 Mandatory plans
Mandatory contributory pension plans managed by public or private entities
Defined benefit (DB) and/or defined contribution (DC) plans

0 Basic state plans
Basic support through public social protection policies

Source: MAPFRE Economic Research

A look at the international experience

To summarize the international experience, it can be said that the most successful models in terms of counteracting the concrete effects of the demographic, economic and financial risks that affect the pensions systems have been those that have ultimately succeeded in better balancing the relative weight of the different pillars involved in the funding of pensions. In other words, those that have achieved better diversification of the risks to which pensions systems are exposed, by combining the benefits of inter-generational solidarity and stimulus for individual savings (through a restructuring of Pillar 1) and supporting supplementary long-term savings (through a strengthening of Pillars 2 and 3).

Thus, together with the maintenance and rationalization of the Pillar 1 schemes (in both their defined-benefit and defined-contribution variants), a first element of this strategy has consisted of generating stimuli for businesses to create and manage (either directly or indirectly through professional managers) contribution-based supplementary pension plans, and specifically defined-contribution plans. These mechanisms make it possible to stimulate savings by individuals at their place of work, and simultaneously create greater awareness of the importance of medium- and long-term savings, by familiarizing workers with the purpose of the contributions that will fund their pensions.
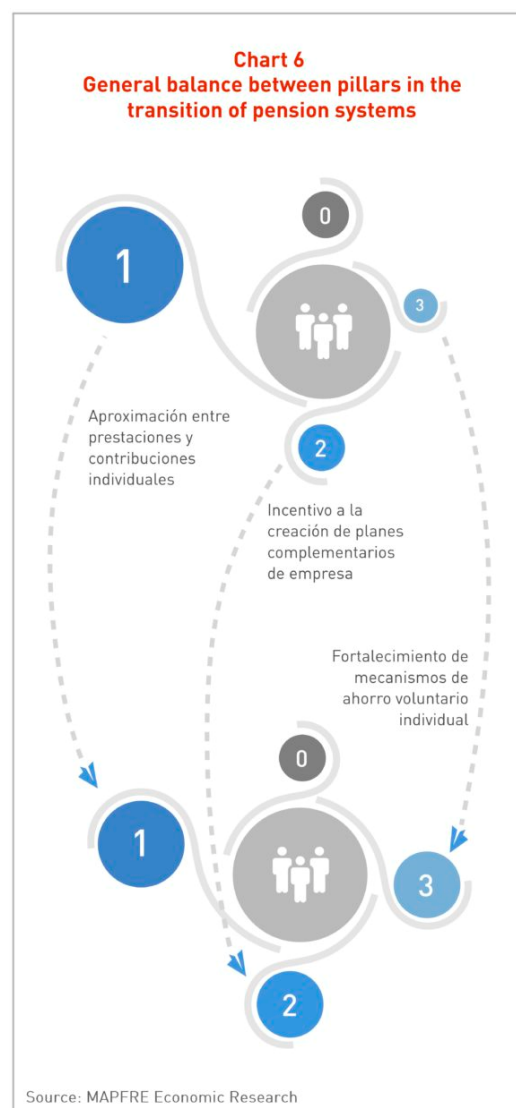
In the same way, supplementing the funds that will be used to finance the payment of pensions by encouraging the voluntary individual savings that people make through professional managers is an element more suitable for achieving a better balance between pillars, a better system for dispersing the risks to which the pensions systems are exposed, and therefore a mechanism that provides better prospects of sustainability and stability in the long term.

As illustrated in Chart 6, from an instrumental point of view, the analysis of the international experience confirms that adapting the pensions systems in order to pursue the objective of giving them long-term sustainability consists of creating a better balance between their pillars (and consequently between their correlative risks). This is a strategy that can only be adopted in a medium- and long-term implementation scenario, and can be summarized in the following general public policy principles:

1. Maintenance and strengthening of a basic social support scheme (Pillar 0), i.e. a non-contributory social minimum benefit aimed at those workers who do not succeed in completing the working career that would have given them access to a contribution-based pension.

2. Rationalization of a first contribution-based pillar that combines inter-generational solidarity with individual savings, thus bringing the benefits of the system into line with the individual contributions to that system. In this process, measures such as adjustment of the retirement age (which has shown itself to be the measure likeliest to achieve the set objective), together with adjustment of contribution rates, represent two essential tools.

3. Generation of stimuli (mainly tax-related) for businesses to create and manage (directly or indirectly through professional managers) contribution-based supplementary pension plans (especially defined-contribution plans) established to supplement the contribution-based pensions of the first pillar.

4. Incentivization, through appropriate taxation, of the voluntary medium- and long-term individual savings that people make through professional managers of financial products intended to generate income during retirement as a supplement to the pensions deriving from the first and second pillars.

In conclusion

Adjustment of the pensions systems is a pressing need. This is the economic and social challenge most widely diagnozed by governments, specialists and society; the

Chart 6
General balance between pillars in the transition of pension systems

Aproximación entre prestaciones y contribuciones individuales

Incentivo a la creación de planes complementarios de empresa

Fortalecimiento de mecanismos de ahorro voluntario individual

Source: MAPFRE Economic Research

collective challenge on which there is a large consensus on the urgent need to take measures, and a challenge to which an adequate solution must be found for the sake of key aspects that concern not only countries' macro-economic fundamentals but also their social stability.

To achieve this end, it is necessary to reassess the pensions systems of the future in structural terms. A focus based on the risks facing the pensions systems leads to the conclusion that the advance toward a reformulation that provides them with long-term sustainability and stability must center around a better balance between pillars that limits and mitigates the risks inherent in their functioning.

Given the uncertainty regarding the levels of longevity that may result from the demographic patterns of the future, societies and governments must open up a space for reflecting on and implementing measures that will mature only in the medium- and long-term and must therefore be taken as soon as possible. In the end, society cannot rest with the idea of a period of retirement that grows ever closer to the working life of its members; this is not only financially unsustainable, but also – and above all – incompatible with nations' aspirations for economic and social advancement.

The complete analysis can be found in the Pension Systems: An International Comparative Survey report, prepared by MAPFRE Economics.
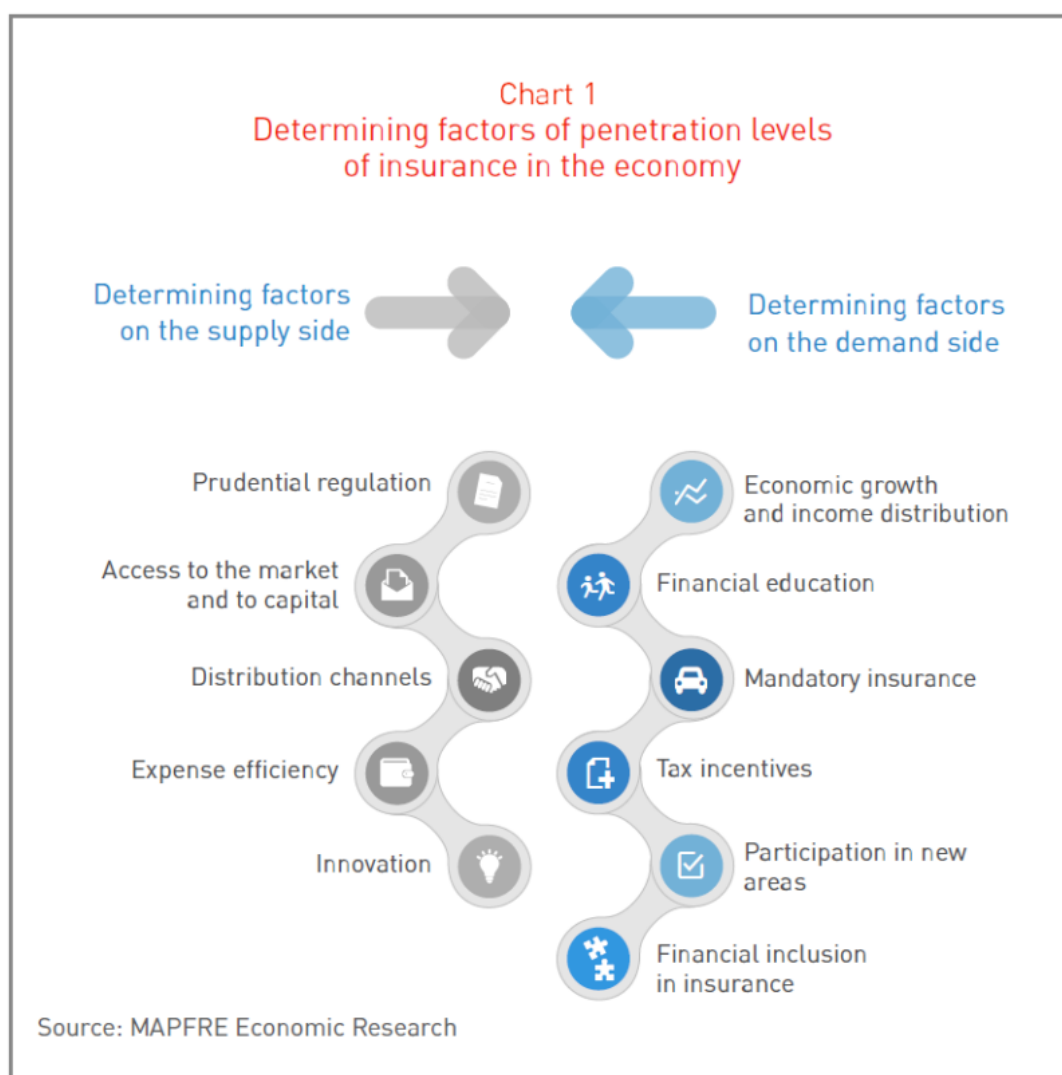
Insurance Expansion in Latin America

Author: MAPFRE Economics

The protection and risk compensation process carried out by the insurance industry supports the functioning of the different sectors of the real economy by providing stability and continuity to the economic process, stimulating and making it possible to perform multiple activities and commercial transactions, providing stability to personal and family income and, in a broader sense, by supporting the generation of capital through the savings-investment process.

The insurance penetration rate (a quantitative ratio that links insurance premiums with a country's gross domestic product) is an indicator of the way a society uses this compensation mechanism to provide stability to economic and social activity. Therefore, government authorities of many emerging countries (mostly in Latin America) have become aware of how their economies benefit from increasing penetration levels until such time as they reach levels similar to those of more-advanced economies.

The main factors on which an emphasis should be placed in order to foster the development of the insurance industry, both from the supply perspective of insurance companies and from the demand perspective of consumers and savers, are shown in Chart 1.

Let us briefly analyze them as far as Latin America is concerned. First off, the advance in design and implementation of *risk-adjusted regulatory frameworks* allows for a more efficient allocation of capital and incentivizes more professional management of insurers. Furthermore, this advance can contribute to a greater extent to the purpose of boosting insurance

Chart 1
Determining factors of penetration levels of insurance in the economy

Determining factors on the supply side → ← **Determining factors on the demand side**

Supply side:
- Prudential regulation
- Access to the market and to capital
- Distribution channels
- Expense efficiency
- Innovation

Demand side:
- Economic growth and income distribution
- Financial education
- Mandatory insurance
- Tax incentives
- Participation in new areas
- Financial inclusion in insurance

Source: MAPFRE Economic Research

penetration in the economy when done gradually, and in parallel with the infrastructure required for its proper implementation.

The casuistry of formulas used to *allow access to the market* to new insurance companies in the region is wide, without there necessarily being a single or better solution. However, considering the concentration and competitive structure in each insurance market, some countries seem to have obtained an adequate balance between the levels of disaggregation by line for new authorizations and the corresponding quantitative minimum capital requirements.

The development of plans that facilitate *multi-channel insurance distribution* may stimulate supply with the creation of means that are more agile and efficient in reaching consumers, such as complementary ways of servicing new segments of the population. Logically, in the Latin American economies, this would translate into increased insurance penetration without hindering the growth of one distribution channel at the expense of another.

There is still much work to be done in Latin American insurance markets to take measures that will help reduce the operating expenses of insurance

companies. The enhanced cost efficiency may widen the relative share of premiums allocated to the payment of benefits, which would aid not only in the fulfillment of the risk-pooling social role of insurance, but also in improving the public's general perception of insurance companies in the region.

This effort implies moving forward from two perspectives. Firstly, it entails an increase in cost efficiency on the part of individual insurers, through organizational improvements and more intensive use of technology as part of risk management. Secondly, it implies also advancing at industry level in each country in order to identify and consolidate the public assets required for insurance operation, as well as the market infrastructure that can allow them to be managed so as to facilitate a more efficient operation for the sake of the companies and of their consumers.

In this last dimension, similar to what happens in the more mature insurance markets, trade and professional associations can advance in forms of collaboration that contribute, among other aspects, to designing information usage mechanisms (which can be useful when enhancing product pricing or for the underwriting of some types of risks), standardizing basic contractual contents that reduce the probability of misinterpreting the scope of coverages (reducing legal costs at market level), collaboration schemes for managing claims (in the case of the automobile sector, for example), as well as the standardization of information technology protocols that insurance companies must exchange as part of the insurance operation within markets.

Furthermore, the experience analyzed in the region indicates that it would be advisable to find *more flexible mechanisms to bring new products to the market*, not only so as to stimulate innovation and broaden the insurance offering, but also to offer the population timely new products that better fit their protection needs.

Regarding the factors that impact the demand side, the analysis carried out confirms that insurance demand is highly dependent on the performance of large structural factors such as *economic growth and income distribution*. Correlation levels between insurance activity and GDP, both in Latin America and in different regions around the world, are very high and indicate that, as long as the economy shows dynamic growth, penetration levels rise. Additionally, the negative effect of income concentration on the growth in demand for insurance services is verified.

Financial education is, also, a structural factor that can stimulate growth of aggregate insurance demand in the medium- and long-term and, with it, the elevation of insurance penetration levels in the economy. In Latin America, however, the initiatives in this matter are still limited and call for the design and implementation of better public policies.

Mandatory insurance, for its part, has several positive effects on society. First, it protects the public interest in various circumstances, mainly those related to third-party liability. Second, by linking to third-party liability deriving from a wide range of activities, it facilitates expanding insurance participation in

economic and social activity. And third, mandatory insurance is an instrument that can be used to raise awareness of prevention, and thus, is a powerful tool in the financial education process, specifically in insurance. Its successful implementation does however require the existence of a solid insurance market and the execution of mechanisms to establish effective controls regarding the use of mandatory insurance by those citizens who are obliged to do so.

The effect of *tax incentives* on insurance demand and, consequently, on the levels of penetration in the region are also crucial. The promotion of greater complementary medium- and long-term savings is, undoubtedly, an element that could support the strengthening of pension benefit plans (under heavy financial pressure in most countries in the region), contributing also to the funding of long-maturing productive activities and thereby stimulating economic growth.

Another element that has proven relevant when increasing the penetration of insurance in the region is the *opening up of participation in new areas* via public-private formulas that take advantage of the technical capacity and experience of the insurance industry in managing long-term savings, and the claims originating from the risks covered through insurance contracts. A notable example is the incorporation of the insurance industry into pension plans linked to social security, or the participation of insurance in the provision of health services, which has allowed some countries to provide access to quality medical care to a larger number of citizens, either by equalizing services provided to lower-income groups with those provided by the private sector, or by enabling citizens to access a wider network of services when universal insurance systems are created.

Lastly, advancing an insurance *financial inclusion* strategy based on broadening micro-insurance in employment can also contribute to the development of insurance markets. This entails three core aspects: (i) identifying the risks that may affect the vulnerable groups; (ii) designing products in accordance with said risks and the groups they address, and (iii) having a regulatory framework in place that allows these products to be effectively brought to those groups within the confines of economic and social efficiency.

A key aspect of meeting this goal is the possibility of reducing transaction costs. This implies using non-traditional distribution channels, as well as technology to reduce costs not only in purchasing the product and paying the associated premium, but also in its management and renewal, and in the payment of the corresponding benefits.

The complete analysis can be found in the Elements for Insurance Expansion in Latin America report, prepared by MAPFRE Economic Research.

Insurance Industry Investment

Author: MAPFRE Economics

The insurance industry is one of the main sources of institutional investment in the world. By exercising this function, it contributes to the consolidation of capital via stable resource inflows for the long-term financing of projects that drive economic growth, bringing stability to the financial system by providing a steady source of financing that reduces pro-cyclicality at times of crisis.

This investment role performed by the insurance industry can be explained by the fact that its business model involves the need to implement liability-driven investment strategies in order to achieve an appropriate match in terms of maturity, interest rates and currencies between recognized liabilities and the investment instruments that back them up.

In this context, MAPFRE Economic Research has carried out an analysis of the composition of insurance companies' investment portfolios in a variety of developed markets (the Eurozone, the United States, the United Kingdom and Spain) and of emerging markets (Brazil and Mexico), tracing the relationship in the case of the European markets with the capital risk weights imposed on each asset type under the new Solvency II regulations. The analysis identifies the major asset categories so as to facilitate comparisons among the selected markets.

A distinction has been made, whenever possible, between the traditional portfolio (in which the insurance company holds the investment risk) and the unit-linked portfolio (in which it is the person taking out the insurance who assumes the investment risk). It is the composition of the traditional portfolio that presents the greater interest for purposes of analysis, since in the latter case, the investment decisions and the risk assumed fall to a great extent on

the person taking out the insurance.

In Table 1, the differing volumes of the markets analyzed can be observed, while Table 2 shows the respective proportions of traditional and unit-linked business. A higher proportion of unit-linked business is an indicator of the degree of sophistication of the various insurance markets, with the United Kingdom holding over 54% of its total portfolio in this type of product.

Table 1
Selected markets: investments managed by the insurance industry, 2016
(billions of euros)

Market	Investment	GDP	% of GDP
Eurozone	7,048,596	10,773,928	65.4%
United States	5,398,483	16,374,987	33.0%
United Kingdom	2,293,934	2,375,897	96.6%
Spain	286.848	1,113,851	25.8%
Brazil	201.347	1,625,346	12.4%
Mexico	49.529	946.066	5.2%

Source: MAPFRE Economic Research (with information from EIOPA, NAIC, SUSEP, CNSF and FMI)

The combined value of the investment portfolios analyzed totals 15.3 trillion euros, representing significant proportions of the GDP of their respective markets, the most notable case being the United Kingdom, with a figure of 97%.

The structure of the investment portfolios in the selected markets

The analysis conducted examines the structure of the portfolios and also assesses how they have changed over the last decade. In the Eurozone, for example, unit-linked business represented 15.2% of the combined investment portfolio at the end of 2016. With regard to the historic evolution of the share of unit-linked business in the total portfolio over the period 2006-2016, the data show that this fell by 3.2 percentage points (pp), remaining at a constant level during the period following the financial crisis, contrary to what might have been imagined in the light of the context of low interest rates experienced in recent years.

Another interesting phenomenon is the trend toward an increase in fixed income investment to 64% (+7.5pp), compared with a decrease in variable income to 18% (-6.9pp). This behavior can be partially explained in terms of an anticipation of the coming into force of the Solvency II regulatory system (in 2016) and the new capital risk weights linked to the different asset types, which may have led to a trend toward the reorientation of investments, reducing the percentage of variable income and increasing the percentage of fixed income investment. The volume of assets classified under the heading "other investments" likewise increased, while this category had been

Table 2
Selected markets: the structure of investment portfolios broken down by type of insurance business, 2016
(%)

Type of business	Eurozone	United Kingdom	Spain
Traditional business portfolio	84.8%	45.8%	94.5%
Unit-linked business portfolio	15.2%	54.2%	5.5%

Source: MAPFRE Economic Research (with information from EIOPA)

Chart 1
Eurozone: the structure of traditional business investment portfolios broken down by asset type, 2006-2016
(%)

Source: MAPFRE Economic Research (with information from EIOPA)

Chart 2
Eurozone: structural breakdown of traditional business investment portfolios by asset type, 2016
(%)

Source: MAPFRE Economic Research (with information from EIOPA)
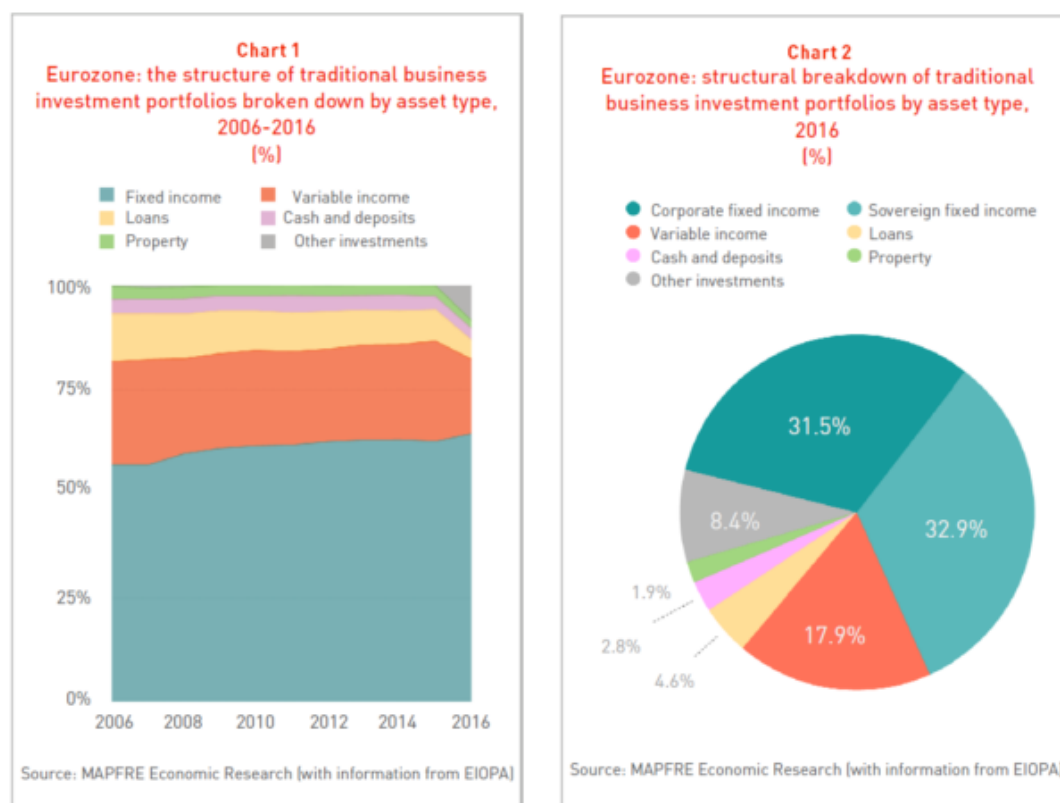
used only marginally prior to then (see Charts 1 and 2).

In the United States during the last decade, unlike the Eurozone, the share of fixed income investment fell over the period 2006-2016 to 66% (-4.7pp), accompanied by growth in the relative proportion of variable income investment to 13% (+2.4pp). Another interesting aspect in the USA is that fixed income investment is primarily concentrated in corporate fixed income, while in the Eurozone there is a greater balance between sovereign and corporate debt. In the US, 76% of fixed income investment is in corporate debt, while 24% of the total represents sovereign debt.

In the United Kingdom, it can be seen that the unit-linked portfolio represents 54% of total investment, with a trend toward growth in recent years, an idiosyncratic feature of this market. During the period 2006-2016, the share of unit-linked business increased by 5.4pp, showing the greatest dynamism in terms of the growth of this type of product among all the markets analyzed.

With regard to the evolution of the structure of the traditional investment portfolio during the period 2006-2016, a highly significant reorientation of investment can be seen to have taken place, with an increase in the percentage of fixed income bonds of 18.5pp and a fall in variable income of -28.7pp. This change coincided during the period 2006-2008 with the global financial crisis, with a 10.5pp fall in the weighting of variable income, and subsequently in 2015-2016 with the coming into force of Solvency II.

In Spain we observe the predominance of fixed income in the traditional portfolio, which represented 75% of the overall portfolio at year-end 2016,

Table 3
Selected markets: overview of the structural breakdown of traditional business investment portfolios by asset type, 2016
(%)

Asset type	Eurozone	United States	United Kingdom	Spain
Corporate fixed income	31.5%	50.3%	35.2%	23.7%
Sovereign fixed income	32.9%	15.6%	20.5%	54.9%
Variable-income	17.9%	13.1%	17.4%	5.3%
Loans	4.6%	9.7%	7.5%	0.7%
Cash and deposits	2.8%	4.0%	8.9%	8.9%
Property	1.9%	0.7%	2.4%	2.7%
Other investments	8.4%	6.6%	8.0%	3.9%

Source: MAPFRE Economic Research (with information from EIOPA and NAIC)

with over two thirds of this invested in sovereign debt. This is accompanied by a lower proportion of unit-linked portfolio business compared with other insurance markets in the Eurozone (and the lowest in the examples analyzed), representing 5.5% of the total portfolio.

Table 3 shows the breakdown of the portfolio in four large markets, and separating the fixed income into its sovereign and corporate components:

The influence of capital risk weights on the composition of portfolios

One of the aspects that seems to influence the trends observed in the composition of investment portfolios in the European Union concerns the capital risk weights applicable under the new Solvency II regulations.

In this respect a comparative study is shown below of the regulatory gross capital risk weights by asset type, as imposed on insurance companies applying the Solvency II standard formula. This shows the capital risk weights applicable to the most representative categories within insurers' investment portfolios.

Table 4
Gross capital charges applicable to bonds per year of duration
(%)

Credit rating**	EEA sovereign bonds	Non-EEA sovereign bonds	Corporate bonds	Admissible infrastructures	Mortgage bonds	Securitizations – type 1	Securitizations – type 2
AAA	0.00%	0.00%	0.90%	0.64%	0.70%	2.10%	12.50%
AA	0.00%	0.00%	1.10%	0.78%	0.90%	3.00%	13.40%
A	0.00%	1.10%	1.40%	1.00%	1.40%	3.00%	16.60%
BBB	0.00%	1.40%	2.50%	1.67%	2.50%	3.00%	19.70%
BB	0.00%	2.50%	4.50%	4.50%	4.50%	82.00%	82.00%
B	0.00%	4.50%	7.50%	7.50%	7.50%	100.00%	100.00%
Lower than B	0.00%	4.50%	7.50%	7.50%	7.50%	100.00%	100.00%

Source: MAPFRE Economic Research (with information from EIOPA)
* European Economic Area (EEA)
** See the link to the Equivalence Table indicated in Reference Point 3 to this report (p. 31).

It can be observed that investment in sovereign bonds of member countries of the European Economic Area (EEA) is not subject to capital risk weights for spread risk, provided that they are denominated and financed in their own currency. It is important to point out that these percentages are applied both to direct investments and to investments implemented through mutual funds, to which the so-called look-through approach is applied.

In the case of variable income investment, the gross capital risk weight applicable to shares listed on regulated markets of the Organization for Economic Cooperation and Development (OECD) is 39% of the value of the shares concerned. This charge is subject to countercyclical symmetrical adjustments that are published every month by EIOPA.

The gross capital risk weight for market risk for property investments is 25% of the value of the property concerned. As in the case of other assets, this percentage is applied both to direct investments and to investments implemented through property mutual funds, to which the look-through approach is applied.

Furthermore, additional capital risk weights are applied if there are concentrated risks over and above specific thresholds and in the event of defective management of the risk of unbundling of cash flows and/or currency provisions between assets and liabilities.

A complete analysis can be found in the report Insurance industry investment. An analysis of the placement of insurance industry investment in selected markets, prepared by MAPFRE Economics.

Global Economic Outlook

Author: MAPFRE Economics

Global vision in the baseline

In 2017, solid growth was seen in virtually all regions across the globe (around 3.6% YoY globally) with developed economies growing by 2% and emerging economies close to 5%. The evolution of inflation was also benign (see Charts 1.1-a and 1.1-b). In developed markets, inflation increased moderately, while inflationist pressure on emerging markets, declined. The normalization of the monetary policy in the United States did not affect the world trade and markets, nor indeed was it more greatly affected by the recent protectionist rhetoric.

In the global vision based on our baseline, we have improved our growth prognosis for developed markets in 2018 by 0.1 percentage points (pp) up to 2%, to a large extent thanks to the strengthening of growth in the United States (as a result of the tax stimulus) and Eurozone prospects are also better, despite the recent soft patch experienced in Q1 2018. Nonetheless, the recovery will be less synchronized than last year, given that commercial tension would appear to head toward a certain level of divergence.

Inflationist pressure on the developed markets will continue to be moderate, thereby eliminating the possibility of a repeated tightening of the global monetary policy. Despite commercial tension, the combination of strong growth and well-controlled inflation on developed markets, will also provide a good basis for solid growth on the emerging markets, where our forecasts have been raised up to around 5%. In regional terms, a somewhat slower business in emerging Europe will be compensated by improvements in the rest of the emerging economies.

**Chart 1.1-a
Global: growth and inflation,
2011-2018**

— Inflation YoY, % (world)　　— Actual GDP p/, % (world)

Source: MAPFRE Economic Research (with Bloomberg data)

**Chart 1.1-b
Global: short- and long-term interest rates, 2000-2020**

— Long-term rates (%)　　— Short-term rates (%)

Source: MAPFRE Economic Research (with Bloomberg data)
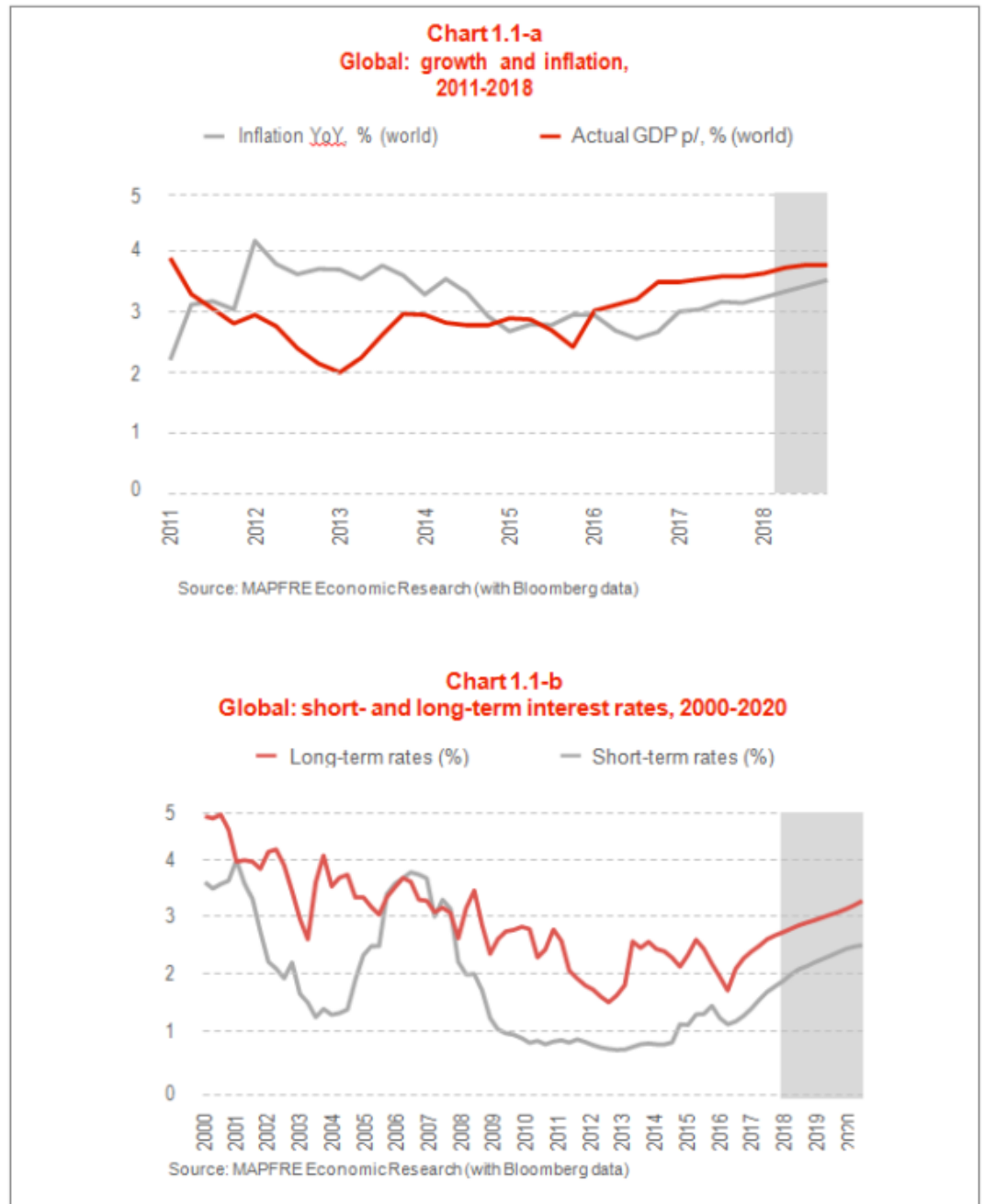
Since early 2018, major changes have been made to United States policies that have caused us to significantly improve our growth forecasts for this country, up to 2.8% in 2018. The December 2017 tax package reduced income tax charged against natural persons and businesses, including the possibility of a complete initial depreciation of capital. Stimuli are considerable, although it is hoped that they will eventually substantially expand upon the tax deficit. Nonetheless, the package must ensure a significant boost to growth, particularly in terms of investment.

Thus, we believe that this stimulus will add between 0.2 and 0.5 pp to 2018 growth with respect to that estimated toward the end of last year.

Nonetheless, the increase in deficit may increase the return on bonds and, ultimately, be transferred to private investment.

In the case of the Eurozone, we hope that growth will establish at around 2.2% in 2018, as the delayed effects of the stimuli of the European Central Bank (ECB) are consolidated, confidence is recovered and the deleveraging cycle draws to a close.

Japan's economy is expected to grow by 1.5% this year, before slowing down in 2019, as the tax consolidation takes hold in this country. It is hoped that the monetary policy will remain without major changes, with the yield curve control (YCC) policy objectives of the Bank of Japan, without changes for this year and the next.

Emerging markets

As mentioned previously, the emerging markets will benefit from greater growth in developed economies and the recovery of prices of commodities, but the uncertainty relating to commercial protectionism may weigh down export-orientated economies. In this context, it is hoped that growth is recovered in all emerging regions. In Latin America, growth in Brazil will continue the route of recovery from the recovery of 2015-16, while uncertainty over NAFTA renegotiation will continue to weigh heavy on Mexico. In Asia, we hope that those responsible for formulating policies in China will achieve growth of 6.3%, as Indonesia and the Philippines maintain the strong domestic demand that guarantees current progress (between 5.5% and 6%), even if certain imbalances are accrued. For its part, prospects are positive in emerging Europe, with the exception of Turkey, where growth will slow after the strong credit boost of 2017 and due to the fact that this year will probably see elections held early, amid the backlash of the correction of the previous year's credit excesses.

Monetary policy

As regards the normalization of monetary policy driven globally by the United States Federal Reserve, the boost to growth in tax stimuli in this country should increase underlying inflation to closer to the objective level, but not excessively so. Therefore, it is hoped that the Federal Reserve may increase interest rates twice more this year and even if there is an acceleration in the rate of rises, uncertainty remains regarding the recovery of the natural interest rate.

Additionally, there are risks of a reduction to the ECB and Bank of Japan inflation forecasts. The Phillips curve in the United States remains flat yet the underlying inflation might recover if disturbances to oil prices that permanently alter inflation expectations remain.

At present, it is expected that portfolio flows will have an impact on emerging currencies, which are expected to depreciate further.

World trade

With regard to world trade, the matters relating to existing world and regional commercial agreements would appear to be the main source of risk. According to preliminary estimates, the tariffs announced between the United States and China affect a small portion of world trade and will have an insignificant impact on growth. Nonetheless, the balance is fragile. If those responsible for formulating policies should fall into a spiral of new tariffs and retaliation measures, world confidence and growth may be significantly more affected.

In more general terms, the discontent over social and economic results worldwide has given rise to a public that is receptive to political platforms based on populist policies. It is difficult to predict the result if radically different policies should be applied, but the associated uncertainty may be negative to global economic growth.

The complete analysis can be found in the 2018 Economic and Industry Outlook: Second Quarter Perspectives report, prepared by MAPFRE Economics.

Industry Outlook
for the Insurance Market

Author: MAPFRE Economics

Summary of the report's conclusions:
MAPFRE Economics
2018 Economic and Industry Outlook: Second Quarter Perspectives
Madrid, Fundación MAPFRE, April 2018

The context of current world economic growth makes it possible to be optimistic with regards to the development of the insurance market at the global level. The forecast for economic growth of around 3.8% (compared with 3.7% in 2017), which is solid and synchronized across all major regions, is estimated at above 2% for developed economies and around 5% for emerging economies.

This strong global growth, combined with moderate inflation, will have a positive influence on the insurance industry, the development of which is very much tied to the trends of the economic cycle. The insurance industry of emerging markets will benefit in particular, where the low level of insurance penetration in the economy also causes the elasticity of growth in insurance demand to be greater than in more developed economies, meaning that weak or moderate GDP growth tends to result in greater growth in insurance policy premiums.

In some developed economies, the persisting context of low interest rates continues to act as a ballast for the Life, Savings and Life Annuity business lines, which may be damaged despite solid economic performance. The lax monetary policies imposed by the central banks of the Eurozone and Japan continue. In the Eurozone, considering the predicted schedule for monetary normalization, there is no expected rise in interest rates until late 2019. Decreases in purchase programs are expected to be very gradual, with the aim of avoiding any undesired consequences, such as sudden increases in the cost of financing debt and possible over-valuations of assets that may occur, which would have a negative impact on the results of the insurance industry, among other sectors. Nonetheless, it is a latent risk (Chart 1).

Chart 1
Eurozone: risk-free yield curve
(%)

Source: MAPFRE Economic Research (with EIOPA data)
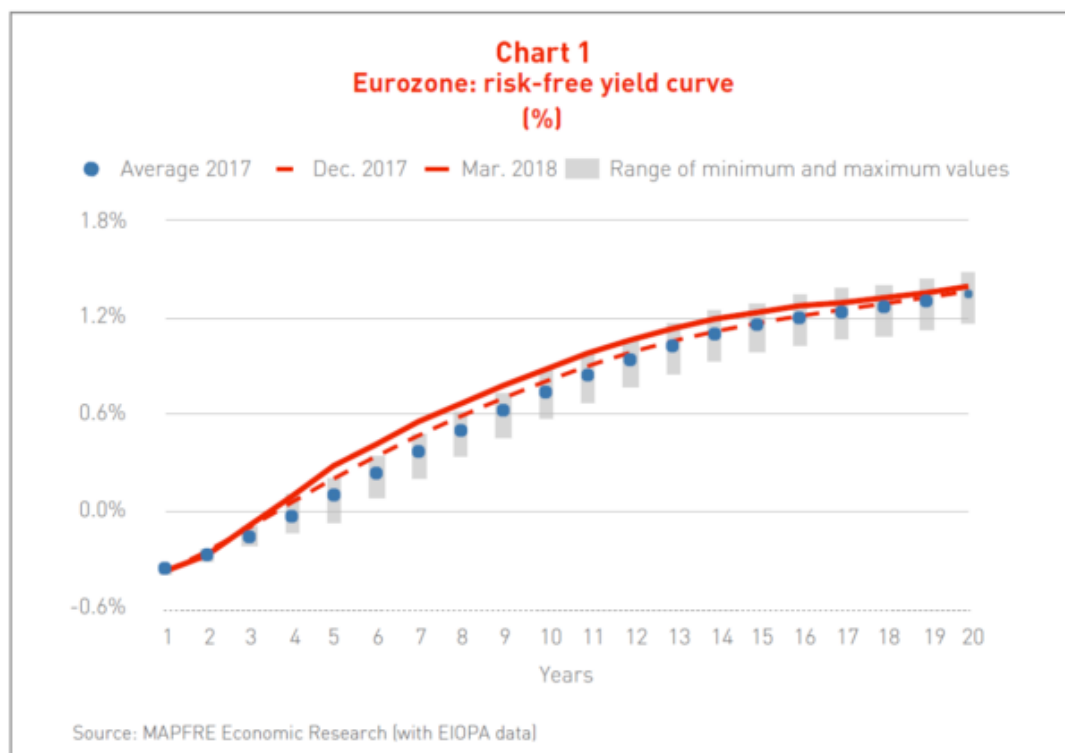
In the United States the normalization of monetary policy has already occurred, but neither the said normalization nor the protectionist measures adopted have significantly affected its economy, the markets or world trade, at least for now. This is good news for Life Savings and Life Annuity insurance in the US, although its impact may not be immediate. The flattening out of the interest rates curve, a sudden rise to such, or expectations of future rises may be damaging in the short-term, given that it takes insurance companies time to adjust the new products and rates guaranteed in their portfolios. In this context, the demand for savings products may slow as rises occur, and this may give rise to the surrendering of policies sold at lower-than-market rates (Chart 2).

A further nuance to single out is that the strength of the dollar, together with twin structural deficits (in both fiscal and current account terms) in some emerging countries, is having a negative influence on their economies, combined with the effect of high oil prices in non-producing countries. The persistence of this situation could result in a loss of the synchronized global growth that we are currently experiencing.

In this context, it is still considered that in developed markets, Life insurance premiums may decline by around -1% in 2018, while Life insurance premiums in emerging markets will grow by more than 9% this year. Nonetheless, as the monetary normalization process advances, the situation for Life insurance premiums of the developed markets may improve, with growth in excess of 1% in 2019.

Chart 2
United States: risk-free yield curve
(%)

● Average 2017 — Dec. 17 — Mar. 18 ▮ Range of minimum and maximum values

Source: MAPFRE Economic Research (with EIOPA data)
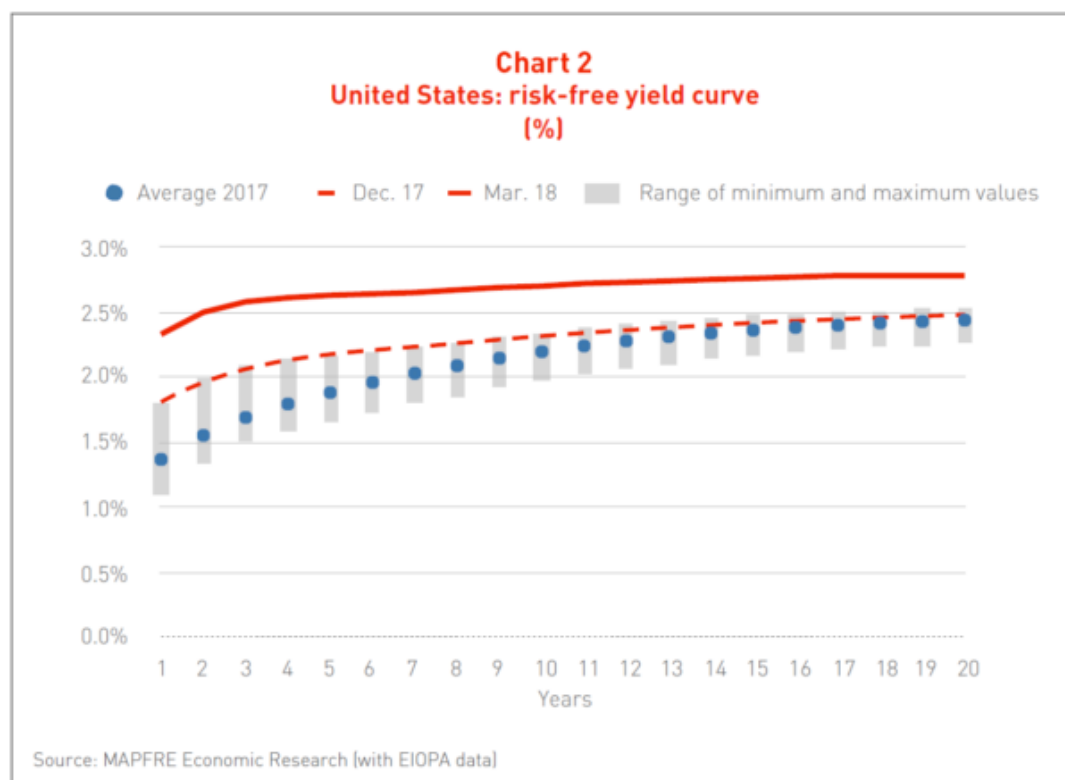
As far as Non-Life insurance premiums go, we maintain our forecasts in the sense that developed markets may experience growth of around 2.7% in 2018, with around 7.5% for emerging markets.

In addition, it is confirmed that the second half of last year was a historic period with respect to the catastrophic losses incurred as a result of disasters caused both by nature and by man. According to the first preliminary estimates, losses should come in at around 337 billion dollars for 2017, of which the total amount insured is 144 billion dollars, the largest figure ever registered. The strong capitalization seen to date in the reinsurance sector has supported the downturn seen in profitability. Nonetheless, the major impact of the latest disasters on its accounts and balance sheets has put reinsurance premiums under pressure, especially in a market that has become excessively competitive on price in the absence of significant disasters in recent years.

With respect to the major regulatory trends, the International Association of Insurance Supervisors (IAIS) has made significant progress in the revision process of the core principles applicable to the supervision of internationally active insurance groups (IAIGs) and global systemically important insurers (GSIIs).

In the European Union for its part, the European Insurance and Occupational Pensions Authority (EIOPA) has submitted the second technical consultation to the European Commission for the revision of the parameters and factors applicable to the calculation of regulatory capital in line with the Solvency II standard formula. The European Commission must now continue with the legislative process and prepare a text that must be submitted to the European Parliament and Council for its consideration.

With regard to the digital environment, EIOPA, together with the national supervisors and the insurance industry, is currently developing a qualitative exercise on cybernetic risk in a bid to increase knowledge of this emerging risk, which it has decided to consider as strategic. This activity is in line with others developed by the European Securities and Markets Authority (ESMA) and the European Banking Authority (EBA) with the objective of not only gaining greater in-depth knowledge of the risk involved, but also of encouraging financial institutions to take action to improve the vulnerable aspects of their systems.

In the insurance distribution field, on March 14, the European Parliament and Council approved a Directive that modifies the term for the transposition of the new insurance distribution Directive, extending it until October 1, 2018. In Spain, on May 11 the Council of Ministers approved the Draft Law for the Distribution of Insurance and Reinsurance Policies, which was published in the Official Gazette of the Spanish Parliament on May 21, thus initiating its passage through the country's parliament.

The full analysis of the sectoral prospects for the insurance market can be found in the report Economic and Industry Outlook 2018: Second Quarter Perspectives prepared by MAPFRE Economics.

Copulas: Concept and Use in Risk Measurement

Author: Luis Latorre Lloréns

What is a copula? An heuristic approach would be to say that copulas are multivariate probability distributions that embody rules determining the dependency between the random variables involved. So, the way in which these variates depend on each other lies inside the copula. If we change the copula, we will also change the way in which the variables depend between them. This suggests that copulas may be useful to model the dependence between random variables or between risks that affect a particular activity.

Before this idea the reader may reply that the correlation coefficient is a measure of statistical dependence and that the role of copulas is performed by the correlation coefficient. But this is true only in some cases. The correlation coefficient only measures dependence when dealing with a special class of distributions, the so-called elliptical distributions, such as normal or t multivariate distributions. Let us imagine a bivariate normal density function with a correlation coefficient of 0.5. If we make an horizontal cut to the surface that represents this 3-dimensional function, we will obtain an ellipse. The point is that there are other multivariate distributions (bivariate, to follow the example) where the figure obtained by this procedure in no way resembles an ellipse. In these, the correlation coefficient cannot be utilized as a measure of dependence.

The correlation coefficient may lead to erroneous conclusions when applied in situations where it is not suitable as a dependence measure. Let's look at an example. Each of the following graphs shows 500 random simulations of the losses from two risks, X and Y (i.e.: claims from two different types of events, compensations to pay for two different causes, etc.)
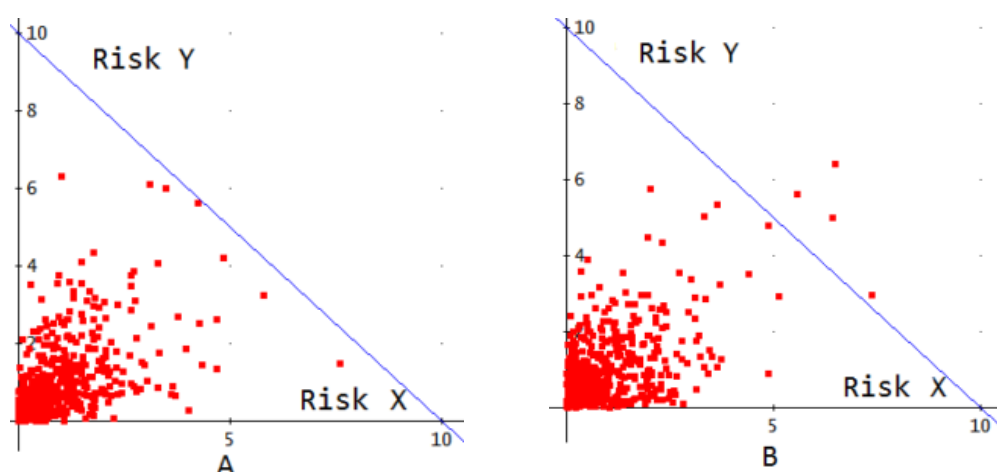
Risk X and risk Y have been simulated from the same distribution function and therefore have the same mean, variance, etc. However, both graphs A and B, differ in something very important: In A there has not been any result where the sum of the amount of risk X plus the amount of Y exceeds 10 units, while in B there are some experiences that do exceed this threshold (represented in A and B by the straight diagonally descending line). Is this difference due to the fact that the correlation coefficient is greater in B than in A? No. In both cases the coefficient is 0.5. The greater severity of the risks (X, Y) in graph B stems from the different way in which these risks depend on each other, severity that is not reflected by the correlation coefficient.

This example leads us to the conclusion that any bivariate (and, in general, multivariate) distribution function involves two aspects defining the statistical behavior of these random variables:

1. The marginal distribution of each one, that is, how it behaves statistically when observed in isolation from the other variable, and

2. The joint behavior of both variables (i.e., the dependence structure). The copula is the function (in our example, function of two variables) that specifically regulates such joint behavior; therefore, the copula does not tell us anything about the marginal behavior of those variates.

To obtain the copula from a distribution function, we must "extract" the marginal distributions from it. What remains after this operation is the copula. If we have a distribution function of two variables F(x,y) with marginal distribution functions u=g(x), v=h(y), we know that these functions g and h determine the function F(x,y) so that in order to "isolate" or leave the copula function alone, we must "undo" the effect that g and h exert on F(x,y). This can be done in two steps:

First, we obtain the inverse functions g-1 and h-1. This is done by solving u=g(x) and v=h(y) for x and y respectively. We thus obtain x= g-1(u), y= h-1(v). We note that u and v represent the probability

corresponding to each value of x and y according to the marginal distribution function g and h. So, the range of u and v is the interval (0 -1).

Next, we insert the expressions x = g-1(u) and y= h-1(v), into F(x,y). It thus follows that F(x, y) = F[g-1(u), h-1(v)] is, in short, a function that depends on u and v that is typically designated by C(u,v), and is called a copula.

The copula is, therefore, "what remains" of a distribution function once the marginal behavior of the random variables is eliminated. Therefore it is the element that regulates and determines the dependence structure between those variables. The copula is a function defined for values between 0 and 1 of its independent variables u, v. Actually, it is the joint distribution function of these uniform variables (0,1) designated by u, v. The following graph shows the density function of the copula corresponding to a t-distribution with 4 degrees of freedom and a correlation coefficient of 0.6.
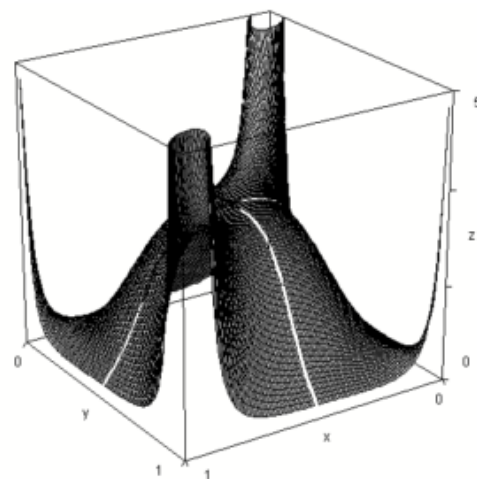
We have obtained the copula from a distribution function. In fact, it is also possible to follow the opposite route: To arrive at the distribution function by "connecting" the marginal distribution functions to the copula. That is, we would symbolically have:

Copula + marginal distributions = Joint distribution function

And also,

Joint distribution function – Marginal distributions = Copula

The possibility of combining a particular copula model with different distribution functions and, likewise, a certain set of copulas with different copula models, opens up a variety of different models for describing the joint statistical behavior of two or more random variables (i.e. of joint distribution models).

We have already seen how a copula can be obtained from a known multinomial distribution (Gauss, t-distribution). However, different copula models can also be obtained if we build functions that meet the essential requirements for the result to be considered a copula. Thus, in addition to the aforementioned Gauss and Student copulas, there are many others such as Clayton, Gumbel, Frank, etc., so that the professional has a remarkable variety of options for modeling the phenomenon of interest.

What is, then, the use of copulas? Wherever there is a diversity of risks that may be dependent on each other, there will be scope for attempting to apply

copulas. Regulations of financial institutions (banks and insurance companies) tend to include a plurality of risks that affect them in their solvency systems. Our interest will be not only on how these risks are distributed individually or separately (marginal distribution) but also on the way in which they depend on one another. It may be the case that, under normal conditions, there is no dependency between them, but when a crisis occurs, things get worse in all of them. In this situation, the correlation coefficient is not a suitable instrument, while the application of copula theory may in fact provide a satisfactory result. In the European Union regulations on insurance company solvency (Solvency II), the coefficient of correlation is in some cases increased so as to allow for the insufficiency of this coefficient. Despite the advantage of its simplicity, this solution seems too crude to us to be satisfactory. Thus, in such cases it is advisable to consider the application of copula theory, that offers models flexible enough to adapt to a wide variety of phenomena.

The interested reader may use my work entitled Teoría de Cópulas. Introducción y Aplicaciones a Solvencia II (Theory of Copulas. Introduction and Applications to Solvency II, only available in Spanish) (Fundación MAPFRE) as an introduction to this topic, and subsequently continue with the study of the extensive literature available, proof of the great interest that it deserves among scholars and professionals of these issues.

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