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Technical Interest Rate and Risks to the Life Insurer

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Summary

At present, the main, almost exclusive, profit source for insurance companies is the financial income earned on their investment portfolios. Over the past few years there have been wide swings in market interest rates and, since they are so closely linked to financial returns, investment performance has also been extremely uneven, hence the need for proper management of the risk of interest rate movement.

To enjoy a healthy financial position, it is essential for an insurance company to appraise the nature of the risk, its proportions and how to manage it, and these are the basic issues that are addressed in this paper. From this point of view it is vital that insurance companies should be aware of the role played by the technical interest rate.

Recent experience suggests that serious thought should be given to the makeup and the rationale of this financial parameter and that solid actuarial logic should form the basis of calculation since this is important not only from the point of view of the insurance company's liquidity and profitability but also in order to maintain a system that affords overall protection of the insured.

Résumé

Le Taux d'Intérêt Technique et les Risques aux Etablissements d'Assurance Vie

Les rendements financiers du portefeuille d'investissements constituent actuellement la source principale, voire unique, des profits des établissements assureurs. La grande volatilité des taux d'intérêt du marché au cours de ces dernières années et la grande corrélation entre ceux-ci et les rendements financiers ont également entraîné une grande volatilité pour les rendements financiers et, partant, la nécessité de gérer de façon adéquate le risque de variation des taux d'intérêt du marché.

Pour l'économie de l'Entreprise d'Assurances, il est fondamental d'assurer l'analyse des caractéristiques de ce risque, d'en faire l'évaluation et de connaître la façon de le traiter. Ces questions constituent la teneur essentielle de cette communication. De ce point de vue, il est primordial, pour les établissements d'Assurance Vie, de déterminer le rôle que joue le taux d'intérêt technique.

L'expérience récente conseille de réaliser une réflexion approfondie sur la nature et la fonction de ce paramètre financier et d'en fonder la détermination sur une logique d'actuaire solide, vu sa transcendance tant du point de vue de la solvabilité et de la rentabilité de l'entreprise d'assurances qu'en ce qui a trait au maintien d'un système de protection général en faveur de l'assuré.

1. INTRODUCTION

The current level of cross-border economic interdependence explains the fact that whereas in the past a particular decision had a merely local or national effect, nowadays the impact and repercussions are felt worldwide. Such cross-border economic interdependence is the **main reason** behind recent interest rate movements and future projections.

Real interest rates are now at much higher levels than they were at the end of the 70's. In view of the underlying financial consequences, the economic regulators (both public and private) have repeatedly expressed their profound concern over this fact and an explanation is being sought that will account for macro and micro-economic decision taking.

Without going into the subject too deeply, it is appropriate to mention here that the high real rates of interest prevailing in various industrialized countries are, in fact, too high and this has a serious impact on investment, the public deficit and, hence, on employment.

PART ONE of this report seeks to analyze:

a) the recent development of nominal and real interest rates;
b) the causes or factors that explain the prevailing real interest rate levels;
c) how the international shift of real interest rates has come about, if indeed this is the case.

PART TWO addresses the following issues:

a') the main grounds for the insurance companies' concern about the situation that may arise as a result of changes to real interest rates;
b') the need for insurance companies to hedge the risk of interest rate movements.

2.- RECENT DEVELOPMENTS VIS-A-VIS NOMINAL AND REAL INTEREST RATES

Before proceding to analyze interest rate changes, some theoretical presentation may be helpful.

The rate of interest can be defined as the price paid for or earned by borrowing or lending money. Let (c_1, t_1) and (c_2, t_2) be the lending and borrowing side respectively of a loan (1); the rate of interest for the period (t_1, t_2) is calculated as follows:

$$\rho(t_1,t_2)=\frac{c_2-c_1}{c_1(t_2-t_1)}[1]$$

From the definition $\rho(t_1, t_2)$, it can be deduced that this is nought with regard to the amount of principal and (-1) with regard to time; it follows, therefore , that $\rho(t_1, t_2)$ is not contingent upon **the unit of measurement** or **unit of the monetary system under consideration** but depends rather on **the unit of measurement of time.**

The amount $\rho(t_1, t_2)$ contains the following elements:

- Straight rate of interest : ρ_o
- Expected rate of inflation: Θ
- Risk premium: P_r
- Tax on interest income: τ
- Cost of implementing loan: g

It is generally accepted that what follows is:

$$\rho = \rho_o + \Theta + P_r + \tau + g \qquad [2]$$

For the borrower, the rate of interest is the price paid for borrowing funds and for the lender it is the remuneration for lending funds as opposed to putting them to another use, consumer spending inter alia.

[2] explains why there are different interest rates. We reiterate that there is not one single rate of interest; for this reason, our mention of short and long term interest rates (TABLES I and II), requires that we be more explicit and that we show the exact term and the type of loan to which reference is made (2).

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(1) (c,t) represents **financial capital** in the amount of **c** and with a maturity **t**. This is a very useful notation in developing financial theory since it illustrates the fact that financial capital is a two dimensional magnitude.

The distinction between the nominal and the real rate of interest signifies **evaluating 0**, i.e. evaluating the effect of inflation on the interest rate. More than one criterion may be applied to evaluating 0, viz.: at times 0 is **the historical rate of inflation** (conventional real interest rate) whilst at other times it is **the expected rate of inflation** (ex-ante real interest rate). In the latter case, there is no unanimously accepted way of measuring the expected rate and economists limit their estimates to a two year horizon. Lastly, the ex-post real interest rate is considered as the real rate of return on the loan once it has expired.

Whichever definition is chosen, an analysis of recent changes to real interest rates in the industrialized countries leads us to conclude that real interest rates in the 80's were significantly higher than in previous decades. This finding is applicable to both **short and long term rates and, generally speaking, short term rates were higher than long term ones.**

TABLE I . CHANGES TO SHORT TERM NOMINAL RATES OF INTEREST

COUNTRY	1978	1980	1982	1984	1986	1987	1988	198
USA	8.2	13.2	12.3	10.4	6.0	5.9	6.9	8.4
Japan	5.1	11.5	7.1	6.3	5.0	3.9	4.0	4.8
Germany	3.7	9.6	8.8	6.0	4.6	4.0	4.3	6.7
France	8.1	12.1	14.6	11.7	7.7	8.3	7.9	8.5
United Kingdom	9.2	16.2	12.3	17.1	10.9	9.7	10.3	13.7
Italy	11.4	17.5	20.0	9.9	12.8	11.4	13.3	13.2
Spain	17.5	16.5	16.3	14.8	11.7	15.8	11.6	14.8

Source: European Economy, #42

(2) With regard to TABLES I and II, please see bibliographical reference for explicit specifications.

TABLE II . CHANGES TO LONG TERM NOMINAL RATES OF INTEREST

COUNTRY	1978	1980	1982	1984	1986	1987	1988	1989
USA	8.5	11.4	12.9	12.5	8.1	8.7	9.0	8.5
Japan	6.1	8.9	8.3	7.3	5.2	4.7	4.7	5.2
Germany	5.7	8.5	9.0	7.8	5.9	5.8	6.1	7.0
France	9.0	13.0	15.6	12.4	8.4	9.4	9.0	8.8
United Kingdom	12.5	13.8	12.9	10.7	9.8	9.5	9.3	9.6
Italy	13.7	16.1	20.9	14.9	11.7	13.3	12.1	12.9
Spain	13.8	15.1	17.6	17.7	11.4	12.8	11.8	13.8

Source: European Economy, March 1990

3.- FACTORS THAT EXPLAIN THE PREVAILING REAL INTEREST RATE LEVELS

There has been growing scientific and practical interest over the past few years to find a satisfactory explanation for the changes in real interest rates in developed countries. All the studies undertaken coincide in pointing out the following most significant factors:

- Public deficit;
- Changes in investment performance;
- Taxation on capital revenues;
- Monetary policy.

Of all these factors, **there is no doubt that public deficit is the main reason behind higher real rates of interest.** This is explained as follows:

The real rate of interest is determined by the demand for, and the supply of, loanable funds. Due to the public deficit, the growth in demand for loanable funds has outpaced the growth in supply and the real interest rate has tended to rise. Financing recurring public deficit by non-inflationary means, i.e. issuing bonds for internal subscription, results in higher national debt and, needless to say, more interest paid on the paper (3). Having said that, the effects of public deficit are short term; whether or not they become long term depends on the impact that a higher real interest rate has on savings and on the progression of the deficit itself. An inquiry into the events of the past few years reveals climbing government debt and the failure of the monetary authorities in not a few countries to take corrective measures aimed to restrict public spending.

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(3) Growth of Spanish national debt (in millions of Pesetas):

Year	1980	1982	1984	1986	1988	1989
National Debt	0.287	0.710	4.468	8.905	12.975	14.528

This has given rise to expectations of growing national debt and the passage of time has confirmed that these expectations seem to have played and do still play an important role in determining real interest rates.

Another factor regarded as significant in explaining this past decade's high real interest rates is **enhanced returns on investment stemming from technological advancements and better tax treatment** of capital revenues. These two novelties have been responsible for a rise in demand for funds earmarked for investment and this, in turn, has led to higher real interest rates. **The introduction of this factor explains the fact that when real interest rates rise sharply there is a concomitant rise in the price of listed securities** since the prospects of higher profits and dividend pay-outs become brighter.

However, improved investment performance means that investors are more likely to fund operations from their own resources and so there is a drop in the demand for loanable funds. This reasoning is correct even when, such as now, depending on the characteristics of technological innovation, real interest rates may continue to be higher than they were before the technological change took place. What has been seen over the past three years is that **investment has risen sharply and so, also in relation to the factor under review, the expectations of high investment growth during the past few years, has served to offset the public deficit's downward trend.**

Finally, monetary policy is also a factor that explains growing real interest rates. The **struggle against inflation has motivated the introduction of tight monetary policies designed to cut total spending and, obviously, this leads to higher rates of real and nominal interest.** In anti-inflationary times this is an undeniable fact although it ceases to be an attributable cause once inflation reaches a lower level and, epecially, when inflation is expected to decrease.

The conclusion is obvious: **current real interest rates stem from the interaction of several factors,** the most important of which are: public deficit, changes in investment performance, and monetary policy. It therefore follows that any attempt to manipulate real interest rates is unlikely to succeed.

The decidedly anti-inflationary bearing of monetary policy in industrialized countries will, in the short term, continue to exert pressure on real interest rates seeking to lessen the effects of the rise in oil prices following the Gulf crisis. Generally speaking, the monetary policy factor is of particular relevance when analyzing short term movements of real interest rates. **To the extent that the economic authorities sense that inflationary controls are effective, the in-built risk premium will decrease.**

In a given country, or at a given point in time, other significant factors may play a part in pushing up the level of real interest rates, e.g. fiscal modifications and banking deregulation. However, the force exerted by these factors is usually less than it is by the factors we have analyzed above.

In years to come, real interest rates will reamin higher than they were in the 70's despite success in controlling inflation and in gradually reducing the public deficit in many countries. This is because of the scarce supply of capital in international markets and the fierce competition to secure funds, especially in the case of East European nations, and the impact of the Gulf crisis.

4.- INTERNATIONAL CORRELATION OF REAL INTEREST RATES

As from 1981, the United States' public deficit has called for raising interest rates; this has attracted capital from other countries, causing their own interest rates to go up. Thanks to the **expectations that the United States' Balance of Trade will continue to be negative over the next few years, real interest rates over there will remain high while there is no sign of any significant narrowing of the gap.**

Indeed, world economy, now much more interdependent, is responsible for the fact that in many countries, **interest rates** have an in-built external factor. As long as the U.S. public deficit remains at its present level and the dollar at its present exchange rate, it seems that there is little scope for a significant and generalized lowering of real interest rates.

One of the problems facing the Spanish economy is the high level of real interest rates. The question is exacerbated by Spain's membership of the EMS, since, because the mechanism requires that exchange rates remain stable, **high real interest rates attract foreign capital in the knowledge that returns will be high and that there is no risk of currency devaluation.** Consequently, exports suffer from the strong peseta and high real interest rates hinder investment spending.

From the foregoing it is clear that co-ordination of the industrialized countries' monetary policy must be achieved, particularly in the case of the U.S.A., Japan and Germany.

PART TWO : INTEREST RATE MOVEMENT RISK AND THE INSURANCE COMPANY

5.- BASIC REASONS FOR INSURERS' CONCERN OVER MARKET INTEREST RATE MOVEMENTS

Insurance companies' profits rely increasingly on the financial returns on their investment portfolios. These returns are earned on the investment of Technical Reseves. Investment is risk related, i.e. there is always a downside risk, that is that **the rate of return will be lower than expected.** The overall investment portfolio risk comprises several components, the most important of which are, inter alia:

- the risk of tightened liquidity;
- the risk of insolvency;
- the risk of market interest rate movements.

For the purpose of this paper we shall be looking at just the last of these risks.

The risk of interest rate movement is defined as **the risk of incurring a loss as a result of interest rate movements in money markets, either because the movement prompts investment underperformance or because it affects the value of assets.**

At present, the insurers' main profit source is the financial return they are able to earn, in other words, the opportunity to secure a satisfactory return on equity and at the same time to access a major source of funding increases to the Solvency Margin. The measure of the financial return is contingent upon other variables, particularly market rates of interest and the amounts and structure of the investments involved. Therefore, any active investment management must take into account the three main risk elements described above and must comprehend that **it is essential to appraise the nature of market interest rate risk, judge its proportions and decide how to manage it**. This approach essentially entails:

analyzing the economic and financial climate for the purpose of identifying the factors that are behind market interest rate movements. This analysis has, to a large extent, been made in Part One of this paper;

- identifying and measuring the risk of market interest rate movements as it affects the structure of the insurance company's investments;

- recognizing the problems **inherent to market interest rate management, the securities to be invested in, the decisions to be taken, etc.**

Management of an insurance company's investment portfolio should take into account:

a) The **level of acceptable risk**, bearing in mind all the risk elements involved, especially the risk of market interest rate movements.

b) The **desired yield.**

Nor should the fact that **funds available for investment are conditional on the discharge of one-off liabilities related to the insurer's policies portfolio** be overlooked. This calls for estimating the amount of funds required to meet such liabilities and allowing for this contingency when planning investment.

Moreover, it is vital that life assurers also realize that the expected net return on investment must be higher than the technical rate of interest used by them in calculating premiums and mathematical reserves.

Another basic restriction to be considered is the **need for insurance companies to cover their minimum solvency margin in order to continue operating in the future.**

Until relatively recent times, it was impossible to think of managing insurance companies' investments so thoroughly in view of **the strict regulation of this area of their activities**. Furthermore, the past two decades have seen a number of changes in the financial world which have left their mark on financial assets, financial theory and banks and finance companies. The new economic and financial framework **made insurers more demanding and price sensitive (the price of insurance), leading them to work with narrow technical margins** and, in some instances, with technical losses, that were, in any case, insufficient to provide an acceptable return on equity and to fund the minimum solvency margin. This gave birth to immediate concern over financial management.

Very volatile market interest rates over the past 15 years have resulted in matching volatile rates of return for the insurance companies and hence the need for proper risk management of market interest rate movements. **In a scenario of downwards moving interest rates, the decline of the insurance companies' financial returns could be greater than expected since the issuers of financial assets are tending more and more to make use of prepayment or conversion clauses.**

This process is further intensified by one last contributing factor - **deregulation of the financial system and the resulting gradual dismantlement of erstwhile barriers between financial intermediaries (particularly the banks and insurers), forcing the insurance companies to adopt measures to assure optimum management of financial resources since banks have introduced innovative products in competition with insurers.** In an attempt to gain a competitive edge, insurance prices were slashed, in many cases to below tariff; and so, as stated earlier in this paper, the insurance companies now have virtually just one source of profits, i.e. financial returns on investments. This explains the enormous interest shown by the insurance sector in mastering investment management techniques and putting them into practice.

All of this has served to transform the insurance companies' scenario, and this more unstable climate is affecting both balance and risk. The conditions surrounding the insurer have changed as a result of new players joining the game, new markets, more discerning customers and, in general, heightened uncertainty over the macro-economic climate. What this really means is that profits are more likely to fluctuate and the company is at greater risk. Of course there are new opportunities to be grasped, new financial engineering, and a chance to go to more developed and effective money markets, together with better data handling and communication systems that support higher levels of productivity and provide much more information in either real or deferred time. Another advantage is the more flexible legislation in place with regard to 1) **investments**, meaning that they can make a switch to short term, and 2) **products**, meaning that innovative and increasingly complex insurance schemes and services can be designed and launched immediately on the market **since a priori controls have given way to a posteriori controls based on the solvency margin.**

6.- MEASURING THE RISK OF MARKET INTEREST RATE MOVEMENTS

After analyzing the external and internal circumstances that dictate the need for the insurance companies to actively manage the risk of interest rate movements, we should now give some thought to the questions of measuring this risk and of management techniques.

In this sense it is essential to test the sensitivity of financial returns and the value of the investment portfolio to changes in market interest rates. A rise in interest rates will **usually lead to a rise in returns but will decrease the value of the investment portfolio, and vice versa. However, when the reverse occurs, although it would be desirable, there is no set-off from the point of view of eliminating the risk under discussion.**

An initial approach for measuring the risk of interest rate movement is to quantify the sensitivity of financial returns and the value of the investment portfolio, both together and by themselves, to interest rate changes over a given period of time. Certain assets will be insensitive to interest rate movements during the period whereas others will evidence different degrees of sensitivity.

Short term securities, sweep accounts with revisable interest, CD's, bonds and shares are all especially sensitive to interest rate movements.

Analysis of the sensitivity of financial returns and the value of the securities portfolio will usually give us a fairly accurate view of the extent of the insurance company's exposure to the risk of interest rate movements.

In the case of insurance companies, risk management may rely on differing criteria; however, to be effective, certain basic standards should be observed, viz:

- The insurance company's position in the face of risk should be consistent. This principle establishes, for example, that it would be senseless for insurance companies to embrace a circumspect policy vis-à-vis acceptable insurance risks, and to align their reinsurance policy with balance sheet strength and level of solvency and at the same time to adpot an investment policy that relies exclusively on the expected return on planned investment and either overlooks the underlying risks or accepts a level of risk that would be totally out of the question if it were an insurance proposal.

Investment management should be founded on interest rate forecasts made by experts and should strive to adapt the portfolio to these projections whilst taking into account the costs involved.

The insurance company should, therefore, be in a position to decide the percentage of investment risk it is willing to take in a given period of time and then, with due regard to legal restrictions, establish the composition of its investment portfolio on the grounds of interest rate forecasts.

7.- TECHNICAL INTEREST RATE AND THE IRREGULARITY OF THE LIFE ASSURER'S PROFIT FROM ONE FINANCIAL YEAR TO THE NEXT

It is important, in the case of Life Assurers, to consider the extent to which results for the year are affected by the technical rate of interest and how the limit of acceptable risk is established by the insurance company **in a scenario characterized by the very erratic behaviour of interest rates.**

Like charts of mortality and disablement, with a similar function, the technical rate of interest is a central factor as it determines the price of Life Assurance. **In the context of this paper, the technical rate of interest is not as volatile as market interest rates simply because of its different nature. Recent experience shows that it is increasingly necessary to cogitate on the nature and function of the technical interest rate; one should also consider it in quantitative terms, although this requires a complex analysis that is too lengthy to go into here.**

The application of the technical interest rate to life assurance operations enables the insurance company to:

1) set the financial balance between premiums and cover on a case-by-case basis and establish the financial balance or mathematical reserve requirement at a given moment during the lifetime of the operation, and

2) express the minimum interest rate that the company guarantees the insured party on payments made as part of the arrangement and the rate assigned to payments under the contractual terms where the credit balance is in the insured party's favour throughout the operation.

To calculate the financial balance between premiums and cover, and also the mathematical reserves, any rate whatever may be used; from the technical point of view, the rate used to calculate mathematical reserves can even be different from that used to calculate premiums. Obviously, the outcome will vary depending on the rate chosen. Consequently, **the question of establishing the technical rate of interest in Life Assurance depends basically on:**

- the underlying technical implications, and

- the insured parties' requirements in the matter of minimum guaranteed yield.

Among the various technical implications, there are four which warrant special mention, viz:

a) The vast majority of Life Assurance operations are medium and long term. It is essential to make a distinction between short and medium term operations.

b) The technical rate of interest used to determine the technical balance between premiums and cover is not monetary and, unless agreed otherwise, **it cannot be changed during the lifetime of the operation.** In this sense, **it is not a market interest rate.**

c) The legally prevailing minimum percentages for the Solvency Margin (we shall take the EEC's minimum Solvency Margin as a reference) are fixed and are suitable for measuring the company's risk on the assumption that the technical interest rates are between 3 and 5 percent.

The fact that, with a greater or smaller degree of flexibility, the economic regulators fix the technical rate of interest on Life Assurance operations, does not mean an attack on free competition since all that is at stake is a technical ruling that it essential from the point of view of the insurance company's solvency. This is perfectly akin to the Central Bank's establishment of interest rates although, in this case, the technical decisions are made on different grounds and are linked to the country's macro-economic bearing but, in any event, this is considered to be quite compatible with a free market economy. Free competition between Life Assurers is achieved via profit sharing schemes. This way, the insured party is protected by a more solid system whilst at the same time the case for favourable tax treatment of Life Assurance is strengthened.

d) The determination of the technical interest rate should be based on sound actuarial logic.

Every single investment project carries a risk and will only be feasible from the point of view of a going concern when the expected net income from the project is sufficient to enable the investor to recover the investment whilst also providing a return (IRR) that compensates the project's underlying risk and the risk of purchasing power. Where:

i_e = internal rate of return on investment.

i_o = interest rate not adjusted for risk or inflation.

P_r = risk premium.

θ = rate of inflation.

the going concern principle will require that:

$$i_e \geq i_o + P_r + \theta \qquad [1]$$

To the insured party, Life Assurance is not just the simple act of covering an insurance need, but it is also a matter of placing capital. On the other hand, the insurance company has to invest that part of the funds raised from Life Assurance contracts that exceeds payment liabilities at a given moment and, therefore, the investment logic mentioned earlier is applicable to the investments made, although the resulting investment portfolio is subject to the restrictions laid down by insurance legislation. Let us assume that the expected rate of return on the insurance company's overall investment portfolio is i_e: clearly the correlation [1] must be fulfilled.

Part of the expected rate of return cannot revert to the insured party, i.e.

P_r, because the investment risk is carried by the insurance company,

e, if inflation is allowed for via profit sharing in accordance with the DOBSON model, used by Life Assurers since the middle of the 19th century. The only exception would be **in the absence of an agreement in the foregoing terms and in this case it should be remembered that inflation forecasts are only technically valid in the short term (one or two years).**

The parameter i_o appearing in [1] is basically determined by productivity and scarce supply of capital.

It would be hard to justify a technical interest rate fixed at more than 5 percent in medium and long term Life Assurance contracts if the contract envisages profit sharing, since in practice that is roughly the real rate of return on investment in safe or low risk financial assets.

With regard to short term contracts (one or two years' duration) that do not envisage profit sharing, a higher interest rate may be fixed. **It would be a serious technical error to extend this practice to all of the company's operations and it would furthemore mean embracing a high risk investment policy that would be a direct attack on the systems in place to protect the insured parties.** Indeed, the value of a financial asset and, generally speaking, of any source of income, is assessed at a valuation rate written as:

$$i = i_o + P_r + e$$

in which particular recognition is given to the asset's risk (P_r) and to expected inflation (e). Thus, any insurance company that uses a technical interest rate that is higher than i_o will only be able to offset the difference by investing in riskier business. Generally speaking, this affords an opportunity to earn higher returns but the company also takes on more risk or, in other words, financial returns become more erratic. Moreover, as the technical interest rate rises the mathematical reserves diminish, meaning that the insurance company's core solvency becomes less.

In summary, **the use of technical rates of interest that are higher than those considered acceptable means lower fixed solvency and a narrower minimum Solvency Margin while the company's level of risk becomes such that the level of insured parties' protection is lower than the acceptable degree.** It is basically for this reason that insurance legislation all over the world includes, almost without exception, rules for establishing technical interest rates and demands prudence and limits freedom of action in this area.

At a time when inflation is starting to be brought under control and governments of the industrialized nations are beginning to tackle the problems linked to public deficit, insurance companies that do not manage the risk of market interest rate movements may face serious problems caused by the expectation that technical interest rates will move closer to money market interest rates as these come down.

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SUMMARY

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To enjoy a healthy financial position, it is essential for an insurance company to appraise the nature of this risk, its proportions and how to manage it, and these are the basic issues that are addressed in this paper. From this point of view it is vital that insurance companies should be aware of the role played by the technical interest rate.

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