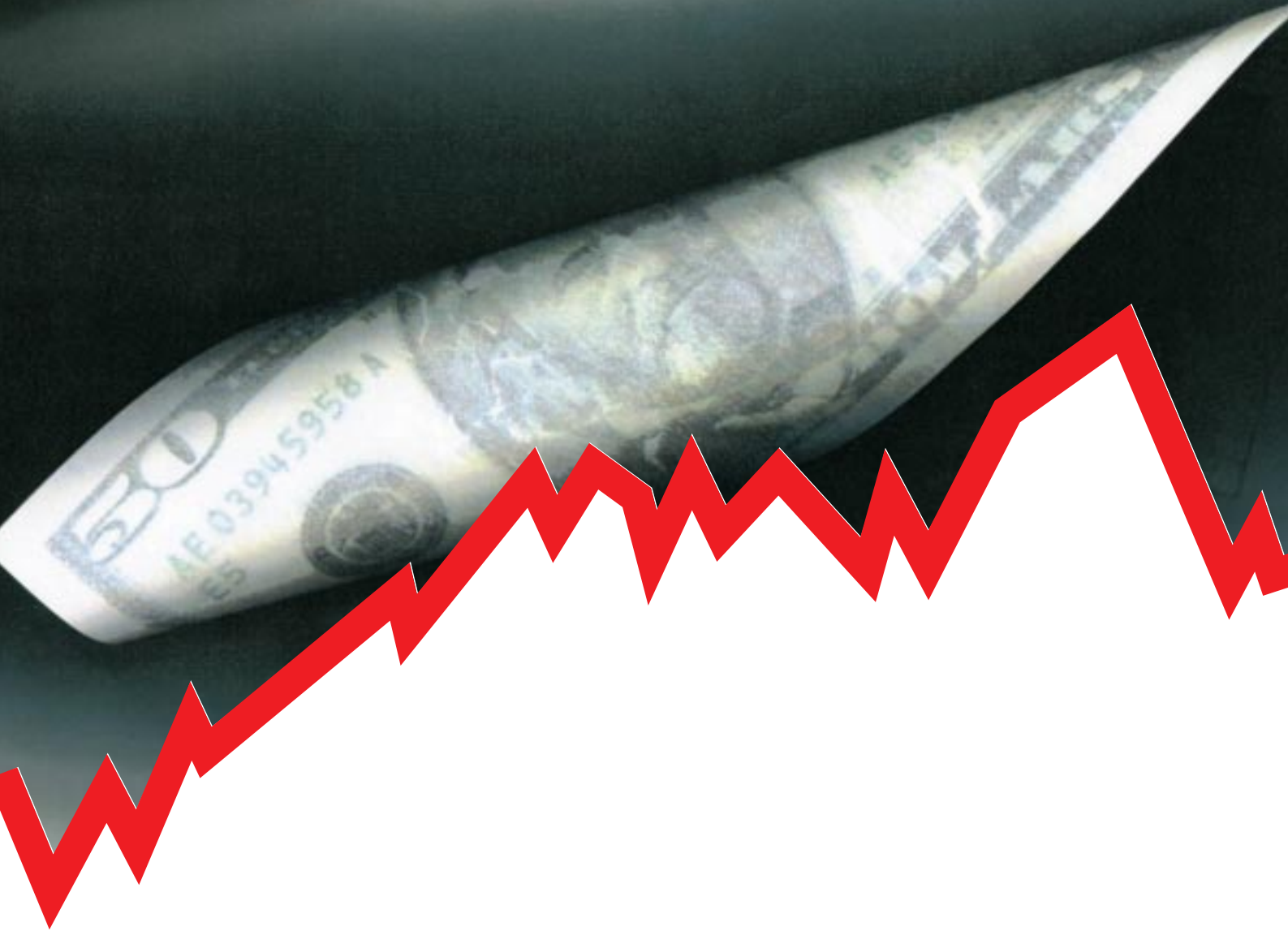


**Equity-Indexed  
Annuities  
in the United States**



**Münchener Rück  
Munich Re**

---

## Equity-Indexed Annuities in the United States

This brochure is based on a research paper written by Manfred Bodmayr, Munich Re Munich, during his participation in the 1998 H. K. Jannott International Visiting Fellows Program at Georgia State University (GSU), Atlanta, in March and April 1998.

© 1998  
Münchener Rückversicherungs-Gesellschaft  
Address for letters:  
D-80791 München  
Germany

<http://www.munichre.com>  
E-mail: [info@munichre.com](mailto:info@munichre.com)

Order number: 2770-E-e

The paper used for the inside pages of this brochure  
was produced without chlorine bleaching.

# Contents

<b>1</b>	<b>Abstract</b>	<b>4</b>
<b>2</b>	<b>Purpose of the paper</b>	<b>5</b>
<b>3</b>	<b>Product description</b>	<b>6</b>
3.1	Introduction and historical background	6
3.2	Description of product design	6
3.2.1	Type of annuity	6
3.2.2	What is an EIA?	7
3.2.3	Evaluation of product features	7
3.2.3.1	Index	7
3.2.3.2	Downside protection	9
3.2.3.3	Indexing or interest calculation methods	10
3.2.3.4	Methods of adjusting the index increase percentage	13
3.2.3.5	Surrender, withdrawal	14
3.2.3.6	Annuitization options and death benefit designs	15
<b>4</b>	<b>Pricing and investment issues</b>	<b>16</b>
4.1	Derivative basics	16
4.2	Product design issues	16
4.2.1	Comparison of product designs	19
4.2.1.1	Impact of index growth pattern	19
4.2.1.2	Impact of participation rate	20
4.2.1.3	Impact of a cap	21
4.2.1.4	Hedging	21
4.3	Pricing for an EIA product	22
4.3.1	The basic concept	22
4.3.2	Regulatory prerequisites	24
4.3.3	Investment risks run by the insurance company	24
4.3.3.1	Surrender / Disintermediation risk	24
4.3.3.2	Hedge mismatch risk	25
4.3.3.3	Enhanced benefit risk	26
4.3.3.4	Renewal risk	26
4.3.3.5	Market liquidity risk	27
4.3.3.6	Counterparty risk	27
4.3.3.7	Market timing risk with flexible premium policies	27
<b>5</b>	<b>Marketing issues</b>	<b>28</b>
5.1	General remarks	28
5.2	Target market	28
5.2.1	Target market for annuities	28
5.2.2	Target market for EIAs	28
5.3	Risks run by the policyholder?	29
	<b>List of references</b>	<b>32</b>

# 1 Abstract

Equity-indexed annuities (EIAs) have been the fastest growing annuity product in the last few years (since 1995). The EIA is an annuity in which the customer's rate of return is determined as a defined share in the appreciation of an outside index, with a guaranteed minimum return, i.e. EIAs allow policyholder participation in the stock market with a limited downside risk.

Socio-demographic as well as economic factors were crucial for the success of this product line:

- Growing demand for attractive retirement saving opportunities
- Development of the equity market, in particular S&P 500 Index

EIAs have produced a number of new concepts and product design features. They involve particular risks for the insurer as well as for the policyholder:

The insurer has to deal with the question of how he can protect himself against unexpected developments of the equity index, a complex question involving product design, pricing and, in particular, investment issues (derivatives). The question is whether there will be continued success if the economic environment changes (high interest rate environment, weak performance of the stock market).

The customer, however, while running no downside risk, may complain about having foregone better yields as compared with alternative annuity products. This leads to the discussion of market conduct issues. The question is, does the customer understand what he or she buys?

## 2 Purpose of the paper

The paper describes the product design in the US and its main features. The paper should help life insurance professionals from countries where there does not yet exist any form of an EIA product to familiarize themselves with the concept of this product line. The reader should get a basic understanding of the product so that he or she can start thinking about the question of whether such a concept would be a feasible product alternative for his/her market. The paper deals with issues like

- why is there a need for EIAs
- what market factors influence demand for EIAs
- insurers' risks
- policyholders' risks

It will not deal with accounting and reserving issues as these are considered to be very market specific so that they cannot necessarily be translated to the conditions and standards in markets outside the US.

## 3 Product description

### 3.1 Introduction and historical background

The equity-indexed annuity (EIA) concept has its origins outside the US, mainly in the United Kingdom. Guaranteed equity life and annuity products account for approximately 25% of all products sold in the UK. In the US, equity-indexed certificates of deposit (CDs) have been available from several banks. In the 1980s, Fidelity Benefit offered an EIA design similar to that of current products. This product, however, was not successful due to Fidelity Benefit's subsequent insolvency.

The first successful EIA in the US was introduced by Keyport Life Insurance Company in 1995. During 1995 and 1996 an estimated 35 carriers entered the market and various premium surveys have indicated a production in 1996 of about \$ 2 billion and estimated roughly \$ 6 billion for 1997. In 1998, over 50 companies are expected to offer an EIA, writing premiums in excess of \$ 10 billion.

### 3.2 Description of product design

#### 3.2.1 Type of annuity

- **Deferred vs. immediate**

An annuity contract is an insurance policy that promises to make a series of payments for a fixed period or over someone's lifetime. Annuities may be divided into two broader categories: deferred annuities, which accumulate wealth with pay-outs deferred to a later date and immediate annuities providing systematic pay-outs to the annuitant immediately.

- **Modes of premium payment**

Traditional annuities provide for three different modes of premium payment: single premium payment (one-time lump sum payment) or flexible premium payment (permits flexible contributions to be made as and when the annuitant desires) or a new mode, the "flingle" (permits a series of non-recurring larger deposits).

- **Fixed vs. variable**

Moreover, annuities can be classified according to the method by which interest earnings are calculated and the degree of risk to principal and earnings that the annuitant bears. In other words, we are talking about fixed versus variable annuities:

In a fixed annuity, the insurance company declares a current rate of interest, guarantees a minimum rate of return and guarantees the principal. A variable annuity provides benefits that vary directly with the investment experience of assets that back the contract. Those assets are maintained in a separate account. The insurer provides no

guarantee of a minimum interest rate credited to this account. Hence, the policyholder bears the whole investment risk and receives the return actually earned on invested assets, less charges assessed by the insurance company.

### **3.2.2 What is an EIA?**

An EIA is an annuity in which the policyholder's rate of return is determined as a defined share in the appreciation of an outside index, with a guaranteed minimum return. The holders of an EIA policy have the potential to participate in equity-linked interest rates while avoiding downside market risk.

Though a few EIAs are offered as immediate annuities, the largest number are deferred annuities which this paper will focus on. EIAs are offered in all premium payment modes as described above. EIAs can be characterized as fixed annuities since they provide the features typically associated with traditional fixed annuities. The unique added benefit of the EIA is its provision of equity-linked returns without losing the guarantee of principal.

### **3.2.3 Evaluation of product features**

The following description of product features will be limited to a large extent to particular features associated with EIAs only. A description of common features of fixed annuity products would not fit into the scope of this paper.

#### **3.2.3.1 Index**

An equity or a stock index tracks the changes in the value of a hypothetical portfolio of stocks. The weight of a stock in the portfolio equals the proportion of the portfolio invested in the stock. A stock index is usually not adjusted for cash dividends, i.e. any cash dividends received on the portfolio are ignored when percentage changes in most indices are being calculated.

There are a number of indices available but today most EIAs use the Standard & Poor's 500 Composite Stock Price Index (in the following abbreviated by S&P 500).

Why has the S&P 500 become the predominant equity index for EIAs in the US?

- The S&P 500 is based on a portfolio of 500 different stocks: 400 industrials, 40 utilities, 20 transportation companies, and 40 financial

institutions. These 500 companies are those that are determined to be representative of their respective industry groups.

- The S&P 500 accounts for 80% of the market capitalization of all the stocks listed on the New York Stock Exchange. The S&P 500 has been a US Department of Commerce leading economic indicator since 1968. Hence, it is widely regarded as the benchmark of broad US stock market performance.
- From around the world companies have licensed the S&P indices and trademarks to issue index-linked products such as EIAs, CDs, bonds, life products, notes, options, swaps, warrants and more. Index funds, i.e. a stock portfolio which replicates the index, now hold assets in excess of \$ 400 billion.
- A crucial factor for the EIA market is the S&P 500's role as a viable hedging instrument since there is a large, active and highly liquid market in S&P 500 index-related derivatives (futures and options).

Figure 1 shows the favourable development of the S&P 500 over the last ten years. The pattern you see in Figure 1 can be characterized as a bull market. In the period from 1/1/88 to 31/12/97, the S&P 500 value steadily grew from 247 to 975 at an annual average growth rate of 14%. The values have been particularly soaring since 1995 (1996: + 25%, 1997: + 29%) and economists have predicted continued growth.

### S&P 500: 1988–1997

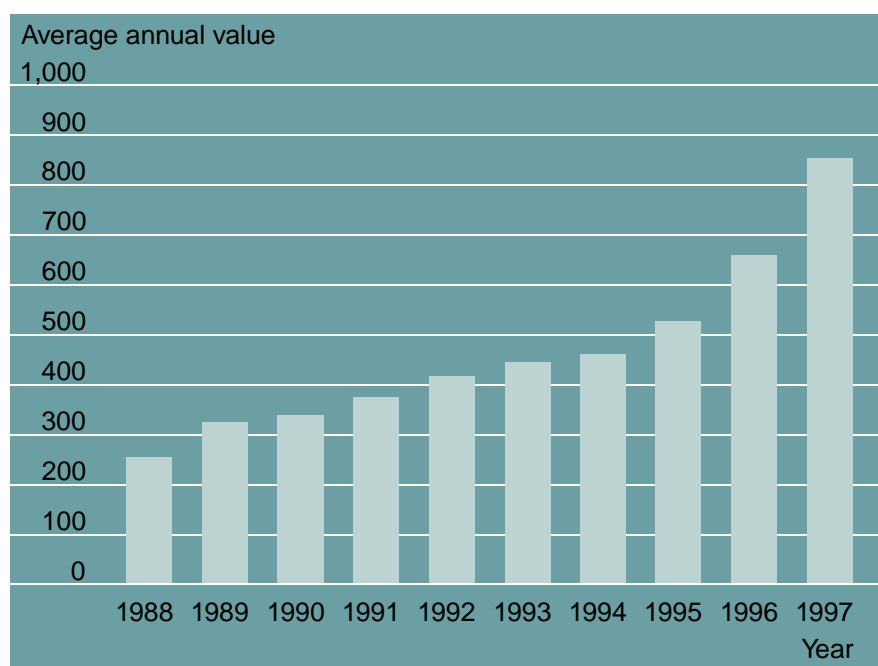


Figure 1

For the further discussion of the EIA products, it is important to emphasize that the S&P 500 does not include dividends which is, as already mentioned above, a common feature of the majority of price indices. The index value is listed, e.g. in the Wall Street Journal, just as a certain index number rather than as a percentage. However, the S&P 500 performance is also discussed in terms of total return. The total return would typically be expressed as a percentage figure, and it would include the dividends that are paid by the stocks underlying the S&P 500 over and above the movement of the index itself. Dividends might account for a significant part of the total return.

As we will see below, the participation of the holder of an EIA policy will also be some percentage of the movement of the index, however, ignoring any dividends paid.

### **3.2.3.2 Downside protection**

- **Minimum contract value**

EIA policies provide for a minimum contract value which is a guaranteed benefit regardless of how the index performs. If the policyholder's contract is terminated for whatever reason or partial benefits are taken out (surrender, death, withdrawal, annuitization), the policyholder receives the greater of the accumulation value or this minimum contract value. This value must comply with the minimum Non-Forfeiture Regulations, which for single premium contracts equals 90% of the premium at 3% interest compounded annually. For flexible premium contracts, the minimum is 65% at 3%, respectively.

For the sake of exactness, it must be mentioned that the Non-Forfeiture Regulations do only apply to the so-called non-registered EIAs, i.e. products which are not registered as securities under the 1933 Securities Act. Registering is not necessary since the performance of the EIA contract does not vary directly with assets underlying the product and the insurer bears the investment risk. Until recently, most EIAs were non-registered products. Some insurers have recently launched registered products, too. Contrary to all non-registered plans, registered products include surrender values which are adjustable according to current market conditions. These adjustments could have a negative impact on the principal of the contract, thus shifting investment risk from the insurer to the policyholder. Hence, those EIAs cannot be considered as fixed annuities, which is the focus of this paper.

At present, most of the contracts are single premium deferred annuities (SPDAs) providing for a minimum contract value of 90% of premium at 3% interest. Some contracts top up the minimum contract value at the end of the term (e.g. after 7 years, when the principal is about 110% of the initial value) to equal the current accumulation value as of the

term just ended. As a consequence, the policyholder enjoys an increased minimum contract value to reflect previously earned index credits.

The minimum contract value is not particularly important for the competitiveness of the EIA products provided that there is an ongoing positive development of the underlying index. However, if the index is flat or declines over the entire term, the minimum contract value could be the crucial provision for EIAs outperforming e.g. variable annuities. Furthermore, if the policyholder wishes or is forced to consider an early surrender of his or her EIA policy, the minimum contract value is of importance.

- **Protection against declining index values**

Perhaps the most compelling feature of the EIA products, however, is their protection against declining movements of the index. The accumulated value stays level when the index declines, and when the index is moving up again, the policyholder never has to recover or catch up from down years of the index, since the accumulated value is locked in as soon as there is some declining movement of the index. Hence, regardless of the indexing methods yet to be discussed in the following, the policyholder enjoys full downside protection of his or her principal.

### **3.2.3.3 Indexing or interest calculation methods**

There are a couple of different indexing or interest calculation methods. Most of these methods refer to the term of the contract, which is commonly in the range of five to ten years. Contracts with terms of one or ten years are also offered. The indexing methods generally fall into several families of designs (cf. Figs. 2–6):

- **Point-to-point designs**

- **Pure point-to-point**

This method credits interest as a portion of the percentage growth in the underlying index from the beginning of the term to the end of the term.

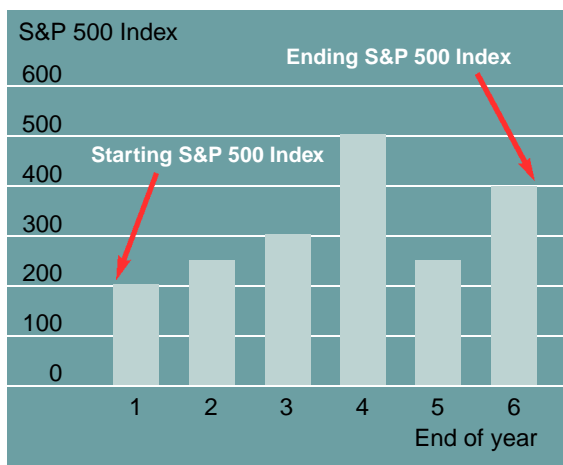


Figure 2

- **Point-to-point with a discrete look-back**

This method credits interest as a portion of the percentage growth in the underlying index from the beginning of the term to the highest value the index has achieved at specified measurement points up to the end of the term. It is also called "High Water", as it figures out the highest anniversary value of the index over the term.

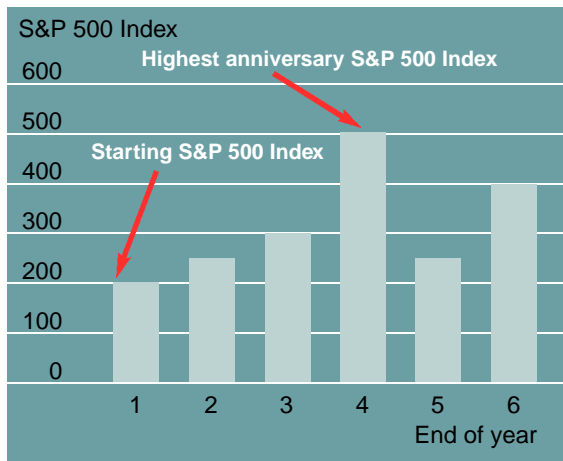


Figure 3

### Point-to-point with a discrete look-forward

This design credits interest as a portion of the percentage growth in the underlying index from the lowest value the index has achieved at specified measurement points during the term to the index value at the end of the term. It is also called “Low Water”.

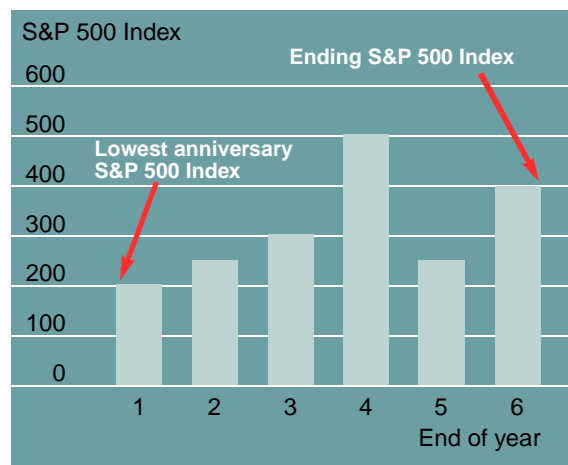


Figure 4

- **Ratchet design**

This design is also known as the annual reset method. It credits index-based interest to the current contract value periodically throughout the term, i.e. it resets the starting index point periodically (mostly annually), thus providing the ability to profit during periods in which the index is recovering from a preceding down year.

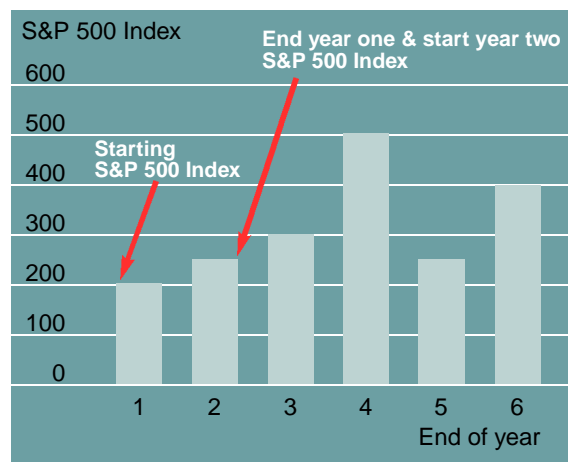


Figure 5

- **Enhanced point-to-point or ladder**

This indexing method is a combination of the point-to-point and the ratchet design. It introduces the concept of an “index interval”, i.e. a period over which the index growth is measured. This interval may differ from the whole term of the contract.

At which time is the index-based interest credited to the contract value? Point-to-point contracts credit interest at the end of the term since it is unknown until then. Annual reset designs, however, credit interest at the time it is determined (in most cases annually).

**Six year term with three year index intervals**

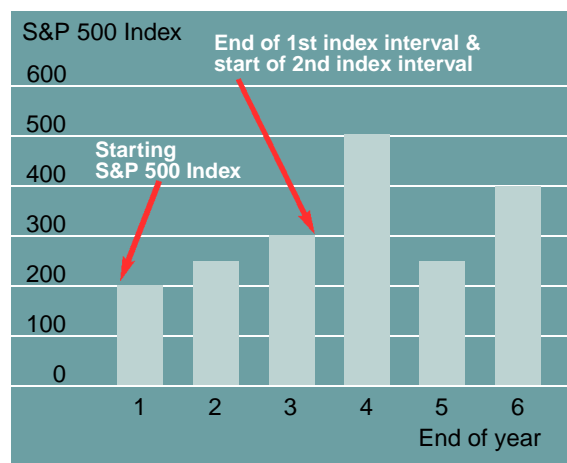


Figure 6

**3.2.3.4 Methods of adjusting the index increase percentage**

The index-based interest crediting rate is, as mentioned above, some portion of the increase in the index. This adjustment is accomplished through the use of a participation rate, a spread deduction, a cap, or a combination of the methods.

In the current contract designs, these adjustment factors are generally guaranteed at their current level either annually or for each index term period. If the current guarantee is for less than the full term, there often is a lower guarantee for the balance of the term and for subsequent terms.

**Participation rate**

This is a multiplier applied to the percentage increase in the index in order to determine the index-based interest rate.

### **Spread deduction**

This is a deduction from the percentage increase in the index in the calculation of index-based interest. The spread deduction can be justified as an administrative fee. The impact of such deduction on the benefit is equivalent to lowering the participation rate accordingly.

### **Benefit cap**

This is a maximum applied to either the annual or the cumulative index-based interest rate.

Further to these adjustments, the index growth itself can be manipulated by using

### **Index-averaging methods**

Averaging measures the index growth from some starting date to some averaged end value. The purpose of averaging is to reduce the volatility of the index increase measurement or to moderate the value credited to the policyholder. It smooths the effect of market lows and highs. It may be used as a modifier with any one of the interest calculation methods described above.

For designing a contract, averaging methods are an alternative to benefit caps with a view to suppressing the measure of index growth. Averaging further allows higher participation rates, *ceteris paribus*.

## **3.2.3.5 Surrender, withdrawal**

### **Surrender**

Generally speaking, for the majority of product designs there is no need for imposing a traditional surrender charge schedule, since the guaranteed value equals the minimum contract value as outlined in item 3.2.3.2.

If the guaranteed value is larger than the minimum contract value as stipulated by the Non-Forfeiture Regulations, the cash surrender value might be the guaranteed value minus a percentage surrender charge, applied either to the current contract value or the premium.

Except for point-to-point designs, the surrender charge can also be based upon the index-based interest. This feature is called vesting. Vesting is the percentage of the interest which can be credited for the calculation of cash surrender values. The surrender charge is reduced annually (i.e. the vesting percentage increases) and is zero (i.e. the cash surrender value equals the full contract value) at the end of the term.

## **Withdrawal**

Most of the current policy designs allow free withdrawal of the full contract value at the end of each index term period. In addition to that, many plans provide for annual partial free withdrawals of a specified percentage, say 10%, of the contract value or the premium as from the second policy year.

Many plans also include nursing home waivers permitting free withdrawals in the event of confinement in a nursing home and terminal illness waivers which permit free withdrawals in the event of a diagnosis of imminent death.

### **3.2.3.6 Annuitization options and death benefit designs**

#### **Annuitization**

As a long-term retirement planning and accumulation financial product, EIA policies offer at least the standard annuitization options available with fixed annuities (e.g. instalments for life, instalments for life with guaranteed period, joint and survivor annuity). However, some product designs include equity-indexed based annuitization options.

#### **Death**

The most common death benefit design provides for payment of the full contract value.

## 4 Pricing and investment issues

### 4.1 Derivative basics

For those readers who have not been dealing with derivative products, the following explanations are offered.

- Options are sometimes also called plain vanilla or standard derivatives. A call option gives the holder the right to buy an underlying asset by a certain date at a certain price. A put option gives the holder the right to sell the asset. Options differ from other derivatives, such as futures and forwards, in that its holder has got the right to do something without being obliged to do so.
- The price of the underlying asset is called strike or exercise price. In other words, the company can trade with derivatives in order to reduce its risk of an unexpected growth rate of the index. The hedging cost is a function of the expectancy of a development, i.e. the option price rises with increasing growth expectancy of the index.
- Options can be classified according to their payoff to the investor which – among other things – depends upon the date at which the option can be exercised. An option which can be exercised at any time up to its expiration date is called an American option. If the investor can exercise his or her option only at its expiration date, it is a European option. These standard derivatives are available for the most common indices. In the US, the Chicago Board Options Exchange (CBOE) was formed in 1973 to actively trade in call options for individual stocks.
- Options with more complicated payoffs, e.g. “path-dependent” derivatives which hedge discrete look-back or look-forward designs or those which hedge designs that include averaging techniques, are called non-standard or exotic. There is, for instance, the so-called Asian option where the payoff depends on the average price of the underlying asset during at least some part of the life of the option. The exotic options are not offered at the CBOE. They are, however, traded “over the counter” and therefore also called OTC options. In OTC markets, financial institutions and corporations trade directly with each other. The main advantage of this market is that options can be tailored to exactly meet the needs of a client. This market is indispensable for insurers who design products with more complex features and rather long terms.

### 4.2 Product design issues

The preceding item 4.1 serves as a basis for the discussion of various product design issues. The following paragraphs will compare the various methods of indexing and analyse the impact of applying adjustments of the index growth to the policyholder's return. This analysis is based upon sample calculations which illustrate various fictitious policy designs. In order to illustrate a realistic equity scenario, true historical S&P 500 values of the preceding ten years were chosen (cf. Fig. 1, p. 8).

**Assumptions:**

<b>Factor</b>	<b>Abbreviation</b>	<b>Value</b>
Index term	Index term	7 years
Premium	Premium in \$	10,000
Participation rate	PR	50%
Index value on issue (January 1991)	Index <sub>0</sub>	330.2
Average index value over last year of index term (1997)	Index <sub>7</sub>	861.2
Max. index value over index term (monthly average)	Index <sub>max</sub>	974.8
Min. index value over index term (monthly average)	Index <sub>min</sub>	330.2
Final index value (December 1997)	Index <sub>f</sub>	974.8
Annuitization value declared over index term	Anv credited rate	4%
Annuitization value at beginning of index term	Anv <sub>0</sub>	10,000
Annuitization value at end of index term	Anv <sub>7</sub>	13,159.32

### 1) Point-to-point

(A) = Index appreciation for index term	$Anv_0 * Index_7 / Index_0$	26,081.16
(B) = Excess appreciation	$(A) - Anv_7$	12,921.85
(C) = Equity index benefit credited to annuitization value	$(B) * PR$	6,460.92
(D) = Total annuitization value credited to policyholder	$Anv_7 + (C)$	<b>19,620.24</b>
(E) = Rol (annual)		<b>10.11%</b>

### 2) High water

(A) = Index appreciation for index term	$Anv_0 * Index_{max} / Index_0$	29,521.50
(B) = Excess appreciation	$(A) - Anv_7$	16,362.18
(C) = Equity index benefit credited to annuitization value	$(B) * PR$	8,181.09
(D) = Total annuitization value credited to policyholder	$Anv_7 + (C)$	<b>21,340.41</b>
(E) = Rol (annual)		<b>11.44%</b>

### 3) Low water

(A) = Index appreciation for index term	$Anv_0 * Index_f / Index_{min}$	29,521.50
(B) = Excess appreciation	$(A) - Anv_7$	16,362.18
(C) = Equity index benefit credited to annuitization value	$(B) * PR$	8,181.09
(D) = Total annuitization value credited to policyholder	$Anv_7 + (C)$	<b>21,340.41</b>
(E) = Rol (annual)		<b>11.44%</b>

### 4) Annual reset

(D) = Total annuitization value credited to policyholder in year 7	$Anv_7 + (C)$	<b>19,474.40</b>
(E) = Rol (annual)		<b>9.99%</b>

#### **4.2.1 Comparison of product designs**

Four individuals may have taken out an EIA plan in 1991 on a lump sum payment of \$ 10,000. The insurance company promised an annual compound interest rate of 4% on the principal and a participation rate of 50% in the equity index growth. The insurance company further stipulated that – except for the High Water design – the last year of the 7-year policy term be averaged. All other index values are averaged monthly.

The illustration shows the best results for the High Water and the Low Water product, closely followed by the point-to-point plan and the annual reset plan.

The policyholder who had chosen the point-to-point plan would have been entitled to take out \$ 19,620 at the end of 1997, while the other one who had decided to buy an annual reset plan would receive \$ 19,474. In terms of annual RoI, the point-to-point design would have marginally outperformed the annual reset plan. The two remaining policyholders who may have taken out either the High Water or the Low Water plan would have received \$ 21,340 or a return of more than 11% per year.

##### **4.2.1.1 Impact of index growth pattern**

It is, however, intuitive that you cannot generalize from this example that the returns do not vary significantly with the policy design, nor do, as a rule, High and Low Water designs always outperform point-to-point products and point-to-point outperforms annual reset. The reason for the marginal variance in returns is the pure bull market pattern of the development of the S&P 500 between 1991 and 1997 (cf. Fig. 1, p. 8). In each and any year, the average index value was higher than the one of the preceding year.

The greatest advantage of the point-to-point design is that it offers the highest returns in uninterrupted bull markets. Given this growth pattern, the High/Low Water and pure point-to-point results would be identical if the last year of the term were not averaged in the point-to-point illustration. Both the High Water and the Low Water designs provide a distinct improvement over pure point-to-point plans in the case of fluctuating index values.

The High Water design will outperform Low Water and point-to-point if the peak of the index value is somewhere in the middle of the term, e.g. you exchange the values of years 4 and 7. The return of both point-to-point and Low Water drop to roughly 4% while the High Water policyholder would continue to enjoy a return of some 11%. Intuitively, a perfect Low Water pattern would be a “U-shaped” development of the index over the term.

The possible comparative advantage of an annual reset plan over a point-to-point plan can be shown by “interrupting” the bull market in one year.

Instead of taking the actual year-end index value of 1996, which was 756.6, we may reduce it to 600 (equals – 21%). While this has no impact on the point-to-point design, the return of the annual reset plan rises from 10% to 10.5%, which is an increase in return of 5%.

This example shows the primary benefit of an annual reset plan. It provides the ability to profit during years in which the index is recovering from a preceding down year. Any increase of the index during a year within the term will generate a higher return regardless of the original starting point of the index at the beginning of the term.

Consequently, the most prudent choice as considered from the policyholder's ex-ante view would be to take out an enhanced point-to-point (or ladder) plan as it combines the features of the pure point-to-point and the annual reset design. The adverse effects of some externalities (unexpected volatility of index values) might thus be best mitigated.

#### 4.2.1.2 Impact of participation rate

Besides the indexing method, the participation rate is the most visible feature of any EIA product.

The following table shows in two scenarios that the impact of the participation rate on the policyholder's return is a function of the index growth within the term and, to some extent, also the policy design. The higher the index increases within a given term, the greater an increase of the participation rate affects the return. In scenario 2, the impact was more significant with point-to-point than with annual reset. A discussion of High and Low Water is omitted since, on principle, those designs work like a point-to-point designed plan.

Scenario 1 describes the actual figures used: The index increases from 330.2 to 861.2.

Scenario 2 illustrates a considerably smaller growth pattern. The index was chosen to start at 400 and grow to 600.

RoI		Participation rate		Change 20%
		50%	60%	
<b>Scenario 1</b>	Point-to-point	10.1%	11.1%	10%
	Reset	10.0%	11.0%	10%
<b>Scenario 2</b>	Point-to-point	5.0%	5.2%	4%
	Reset	4.6%	4.7%	2%

Taking scenario 2, the yield of a point-to-point plan with a 50% participation rate would roughly equal the result of a reset plan with a

100% participation rate. This simple illustration shows the complexity of comparing various policy designs in terms of return expectations.

#### **4.2.1.3 Impact of a cap**

Let's assume scenario 1 and compare the impact of imposing a cap on the index growth rate on a point-to-point product using an annual reset plan.

The growth rate of  $\text{Index}_7/\text{Index}_0$  is 2.61 which equals an average annual growth rate of 15%. If we take this rate as our cap rate, this is the "break-even" cap rate for the point-to-point plan. While for this plan, a 15% cap would have had no effect, it would have reduced the return of the annual reset plan from 10% to 8%, *ceteris paribus*. The return of 10%, however, could have been maintained if the participation rate had been raised from 50% to 125%.

This example shows that the impact of a cap varies with the policy design. While caps can only be imposed for the whole term, for both point-to-point and for High/Low Water, an annual reset design allows for inclusion of annual cap rates.

Further, a cap enables the insurance company to offer a higher participation rate. The insurance company will not bear the risk of the index growth rate exceeding a certain limit. Hence, the company can reduce its hedging costs. However, if the insurer decides to offer uncapped plans only, the determination of participation rates and the use of averaging methods gain importance for mitigating the increased hedging cost of uncapped designs.

#### **4.2.1.4 Hedging**

The hedging cost depends on the length of the term and the indexing method. The point-to-point products can be hedged by European call options. The longer the term, the cheaper is the per-year option cost. From the hedging point of view, the point-to-point design is the easiest one and involves the lowest option cost. Hence, generally higher participation rates can be offered as compared with other policy designs. However, this hedging pattern constitutes one basic disadvantage of the point-to-point design as compared with other designs. The insurer cannot offer generous withdrawal conditions within the term.

The hedging cost can be reduced by using averaging methods. Asian call options mimic the index averaging. In our illustration, the last year of the term was averaged. This partial Asian strategy slightly reduces the option cost relative to a strict European call hedging.

The annual reset products involve the highest hedging cost because the insurer has to hedge for a series of short terms (annual roll-up option).

As discussed above, the cost of hedging can be reduced by setting a cap, thus mitigating the competitive disadvantage as compared with other designs. On the other hand, the highest level of liquidity can be offered (free withdrawals).

The High (Low) Water products are – as mentioned above – also called discrete look-back (discrete look-forward) products in recognition of the type of call option which fits to this hedging pattern. The cost of these options usually lies between the cost of European and annual roll-up options.

### **4.3 Pricing for an EIA product**

#### **4.3.1 The basic concept**

In order to discuss the basic concept of pricing EIA products, the premium can be broken down into three components.

- **Spread**

The insurance company deducts a certain percentage of the premium to cover its expenses, to secure risk and capital charges and a profit margin.

- **Minimum contract value**

In order to provide the minimum contract value (cf. item 3.2.3.2), the insurer buys a zero coupon bond or another fixed income security, at a par value which is equivalent to the minimum contract value at the end of the contract term.

- **Index return**

The third component of the premium is to be invested in order to provide the equity index participation as stipulated in the contract. The insurer will hedge future index growth by purchasing index call options with a strike price equal to the minimum contract value.

A numerical example of a 7-year point-to-point design will illustrate how this principally works.

– Premium received	\$ 10,000
– Commissions plus present value of expenses plus profits	\$ 900
– Zero coupon bond:	
Par value =	
= $10,000 * 90% * (1.04)^7 = 11,843$	
Discount rate = 7%	
Price of bond	\$ 7,375
– Amount available for purchase of options	\$ 1,725
– Cost of 7-year European option	\$ 2,450
– Participation level = $1,725 / 2,450 =$	70%

This illustration demonstrates that the level of the participation rate is largely determined by the cost of the underlying index option, followed by the minimum contract value and the expenses.

As pointed out in the previous item, option cost is a function of volatility of the stock index (dependent on indexing method) and the term. It further depends on interest rates, the dividend yield (cf. item 5.3 below) and customization costs.

The cost of securing the minimum contract value depends on the cost of the bond and the level of the minimum guarantee. Zero coupon bonds might be inappropriate although, in theory, they are the perfect investment vehicle for the minimum guarantee. Corporate zeros are rare and treasury zeros tend to have low yields. Moreover, if the policy design provides generous withdrawal terms, investments in mortgage-backed securities and asset-backed securities might be of advantage since the investor gets periodical coupons.

The insurance company might offer a higher level of minimum guarantee than required:

For instance, in our illustration, the guaranteed compound interest rate for the term was 4% instead of the minimum of 3%. This increases the price of the zero coupon by 7%, and the participation rate drops from 90% to 70%, other things being equal. It goes without saying that the participation rate will not have to be lowered if caps or appropriate averaging methods are used.

A crucial factor of the expenses are commissions. They generally vary with the length of the term (e.g. 0.5% to 1% for 1 year, 5% to 7% for 5 years).

### **4.3.2 Regulatory prerequisites**

The investment strategy, of course, has to comply with the regulatory environment. The most appropriate strategy might fail because of regulatory constraints.

In the US, investment matters are regulated by state laws. The laws of some states, including most of the larger ones, have been amended in recent years to permit derivatives for hedging purposes. The laws of many other states are silent on this issue: they neither permit nor prohibit the use of derivatives. The NAIC (National Association of Insurance Commissioners) issued a Model Act which recommends specifically that derivatives for hedging purposes be permitted, subject to certain maximums. This Model Act is yet to be adopted by various states.

On principle, there would be an alternative to the approach described above:

The investment managers of an insurance company could purchase each of the 500 stocks of which the S&P 500 index is composed, in proportions that match this index. Thus, they would replicate the performance of the index and they could purchase a put option to secure the minimum guarantee. This might be a viable approach for countries other than the US. US companies would not pursue this strategy due to their minimum capital & surplus requirements (risk-based capital). These requirements are substantially higher for common stock than for bonds.

### **4.3.3 Investment risks run by the insurance company**

The following risks should be considered by the companies which issue EIAs:

#### **4.3.3.1 Surrender / Disintermediation risk**

This is the risk of higher-than-assumed early terminations of contracts, particularly in a period when market interest rates are rather high. As a consequence, the market value of bonds is low, which could result in losses if the sum of the available assets (e.g. zero bond plus equity call) is less than the net surrender value.

The disintermediation risk varies by the mix of hedge to fixed income assets (zero bonds). A 7-year point-to-point product as illustrated may have about 80% of the premium (minus expenses, etc.) invested in bonds and 20% in derivatives while an annual reset product may have a 95%/5% initial split.

Since the EIA market is very young, it is difficult to determine the appropriate lapse assumptions. Will policyholders be more inclined to lapse if interest rates increase and the market value of the fixed income assets decrease? Actually, in the past five years, there has been a strong

negative correlation between interest rates and the performance of the S&P 500. However, a rising interest rate environment does not inevitably go along with a declining stock market. The correlation has only been about 30% to 40% over the past 50 years (cf. Panko, R. "Insurers Face Hidden Risks in Equity-Indexed Products").

Moreover, the EIA product design is most appropriate for risk-averse policyholders. Ideally, they deliberately prefer an EIA plan to a variable annuity because of its downside protection. They may correctly consider soaring interest rates as a temporary development, and might therefore refrain from early surrendering their contracts.

The disintermediation risk can be lessened ex-ante by carefully designing the conditions for early withdrawal. The more consumer-friendly they are (e.g. partial free withdrawals, surrenders without forfeiture of all or part of the accrued but not yet credited index-related interest), the higher the propensity of policyholders may be to exercise this option if market conditions trigger such consumer behaviour.

#### **4.3.3.2 Hedge mismatch risk**

If an EIA product is not fully hedged and the index development is not in line with the company's expectations, there is a hedge mismatch risk. This risk has two features:

- coverage risk: the derivatives do not cover the full amount
- basis risk: there is no 100% correlation of the hedge to the index

Generally, the hedge mismatch risk depends, among other things, on the underlying indexing method. An annual reset product would likely have less market price volatility than a point-to-point product.

The insurer could run an enhanced basis risk if he used another index instead of the S&P 500. The use of alternative indices might face the insurer with a liquidity problem regarding the appropriate derivatives.

As discussed in item 4.2, the insurer can manage this risk ex-ante by a prudent policy design. The modifiers such as participation rates, caps and averaging methods are described above.

A crucial factor is the possibility of adjusting these modifiers. These are generally guaranteed for the whole term. The enhanced point-to-point design, however, could allow for adjustable participation rates and caps from one index crediting interval to the next.

Another possibility of mitigating this risk would be to use an option replication strategy instead of buying only one long-term option in order to lower volatility. For example, instead of buying a 7-year call option to hedge a point-to-point plan, the insurance company could buy a combination of several short-term options (terms usually are between

six and twelve months) and buy new short-term options when the first ones have matured. However, the expenses for this strategy might be higher than for the long-term approach because of the higher transaction cost. In a period of increasing expectancy of volatility, the renewal cost will rise with subsequent replications. Moreover, there is a higher basis risk involved since there are more transactions with different kinds of derivatives.

#### **4.3.3.3 Enhanced benefit risk**

A typical product specification is that within a period following the expiration of a term (window period of, e.g., 60 days), the policyholder can select one of various annuitization options. For instance, the policyholder can decide whether he or she surrenders the policy for cash or annuitizes it over a certain period of time. Alternatively, he or she may decide to leave the policy in deferral status and start a new term.

In case of the policyholder's death before the end of a term, the beneficiary may have the right to choose between a lump sum death benefit and its annuitization.

The insurer has to make assumptions as to the policyholders' selection behaviour because he or she does not select the option up-front, but only at the end of the term. Those assumptions are particularly crucial if the actuarial values of the various options differ.

#### **4.3.3.4 Renewal risk**

The renewal risk has various features:

- **Guarantees**

If the hedging period is shorter than the term for which conditions are guaranteed, the insurer bears a renewal risk. In order to properly manage the investment risk the insurer generally guarantees the participation rate only for the period of the term. In case of an enhanced point-to-point design, the guarantee would only apply to the index interval. This also applies to the annuitization value and the minimum contract value if it is higher than the one according to the Non-Forfeiture Regulations (cf. our illustration).

- Reinvestment risk

If the policyholder decides to start a new index term, the contract value accrued at the beginning of the second term is locked in, i.e. he or she does not bear the risk of a decreasing annuitization value in case of an adverse equity development during the second term. Moreover, the contract value in the second term (which is at the beginning equal to the annuitization value at the end of the first term) is guaranteed to grow at least according to the Non-Forfeiture Regulations.

- Covering a long-term index guarantee with short-term hedges

This risk applies if the company chooses the replication strategy as discussed above.

#### **4.3.3.5 Market liquidity risk**

As discussed above, liquidity is considered a minor risk provided that the insurer chooses the S&P 500 as the index basis. This risk might be more considerable if less common indices were used.

#### **4.3.3.6 Counterparty risk**

S&P 500 European short-term options with maturities of up to two years are traded by the CBOE. Hence, no counterparty risk exists for these options.

However, if longer terms are needed, e.g. for hedging a 7-year point-to-point plan or if averaging methods or alternative indexing methods require more exotic options, the insurer has to revert to the OTC option market (cf. item 4.1). These transactions constitute a counterparty risk.

#### **4.3.3.7 Market timing risk with flexible premium policies**

It is intuitive that investments for flexible premium policies are more complex than for single premium plans. Premium volumes to be invested at a certain time are relatively smaller and transaction costs of the investments are higher. There is a higher hedge mismatch risk involved, and the insurer has to cope with a lot more complicated accounting issues. Consequently, the minimum contract value according to the Non-Forfeiture Regulations is lower than for single premium contracts (cf. item 3.2.3.2).

## 5 Marketing issues

### 5.1 General remarks

The following and final chapter will deal with some background information which might be useful for marketing EIA products in countries outside the US. It will not consider issues which are very market specific such as distribution channels and commission structures. However, it discusses the target market for EIA products in general and potential risks for buyers of EIAs. The latter issue is of particular importance in the US since it involves the issue of market conduct.

### 5.2 Target market

#### 5.2.1 Target market for annuities

EIA plans can be considered like any other annuity plan as retirement products. In the US, about 80 million baby boomers are preparing for their post-retirement period. Life expectancy is increasing, retirement age tends to become younger and younger, and people become more and more aware of the need to accumulate savings for this period since they cannot rely on pensions and social security alone. This is a typical feature not only of the US but – to a larger or smaller extent – of all highly industrialized countries. In the US life insurers collect more annuity considerations than life insurance premiums (according to ACLI Life Insurance Fact Book 1997, annuity considerations in 1996 amounted to \$ 176 billion while life insurance premiums were \$ 105 billion).

#### 5.2.2 Target market for EIAs

Since EIA products are rather new, they still make up a tiny part of the retirement product market. Anyone of the potential buyers of retirement products who strives for better than fixed rate returns as provided by certificates of deposit or fixed annuities, but on the other hand also prefers guarantees of principal and a lock-in of prior earnings over the potentially higher returns of variable annuities, is an EIA prospect. In other words, EIAs are targeted toward very conservative, risk-averse retirement accumulators.

EIA sales are driven by three patterns of buying behaviour:

- **Emotional behaviour**

The current economic situation (rather low interest rates combined with a bull market) may trigger EIA sales since many individuals are willing to benefit from these conditions. However, many individuals may also fear the loss of principal if the stock market declines. Therefore they may like the EIA concept as it provides no direct equity participation and moreover offers downside protection.

The current successful sales figures themselves may support a further boost in sales. Investors tend to follow a herd instinct. They decide to behave as many others do. If the investment decision turns out to be wrong, they will not be alone.

- **Behaviour of an educated consumer**

The educated consumer prefers to make decisions based upon empirical evidence rather than emotion. Historical data and the current bull market situation support an educated consumer's interest in EIAs. Such a consumer, however, will also take into account the likelihood of equity market fluctuations and bear market situations.

Hence, he or she might prefer EIAs to variable annuities depending on his or her level of risk aversion: the educated consumer will weigh the pros and cons of EIAs as compared to variable annuities. Since the index growth for EIAs excludes dividends, variable annuities might provide higher returns. However, the latter products provide no downside protection. The difference in performance, i.e. the dividend, can be considered as the price of the downside protection or opportunity cost. The higher the risk aversion of an investor, the higher the marginal price the investor is willing to pay for this protection.

- **Mental accounting behaviour**

A theory says that people handle their money in different ways. They set up mental accounts for their money. Their propensity to save money which is earned by hard work tends to be higher than for money that is raised by chance, e.g. unexpected gambling winnings. They may break down their total account into "safe money" and "easy come easy go money". They would not like to expose their safe money to downside risk. Investors whose "easy come easy go" budget is rather small and who tend to behave according to this pattern, are also a target for EIAs. Actually, many EIA buyers are middle income, an industry sector which the US life insurers have widely overlooked for many years.

### **5.3 Risks run by the policyholder?**

The issue of downside protection was widely dealt with. Hence, the question as to whether the holder of an EIA policy runs certain risks is legitimate. The risk of a life insurance company's insolvency must be mentioned, but this risk should not be dealt with in detail as it is not unique to EIA products. This item discusses features which can be considered as misperception risks. An individual buys an EIA product without fully understanding the product. Expectations might therefore differ from the actual development.

- **EIAs vs. variable annuities in a bull market period**

The assumption is a bull market. An individual who considers buying annuities and has recently heard a lot about the skyrocketing S&P 500 decides to buy an EIA, being convinced of participating in the full index return. Let's further assume that this individual knows of EIAs providing downside protection but does not take into consideration the exclusion of dividends. If this policyholder's risk aversion tends to be rather low, he or she might sooner or later complain about having foregone the chances of higher returns provided by variable annuities.

Would the right strategy for this policyholder be to surrender the EIA contract and take out a variable annuity? The answer is, perhaps not. The reason why he or she might better continue his or her EIA policy is a possible indirect influence of the dividend on its return although dividends are explicitly excluded.

The price of the call option depends – among other things – on the dividend yield of the underlying asset, i.e. the S&P 500 stocks. A higher dividend yield decreases the price of this option, ceteris paribus. The reason for this trade-off is the declining potential appreciation in the stock price if companies have paid a larger percentage of their earnings to their shareholders. Lower prices of call options could virtually increase profitability of the insurers' EIA lines. However, competition will squeeze conditions. The insurance companies will increase participation rates for new issues or for the next term of existing policies (participation rates are generally guaranteed for one term only).

If this trade-off materializes, the policyholder might be better off if he or she maintained the contract, in particular if he or she takes the surrender charges into consideration.

- **EIAs in a bear market period**

EIA products are the perfect annuities in bear market periods because of their unique downside protection. Nevertheless, many consumers might not be fully aware of the mechanisms of the EIAs and withdraw their policies when interest rates are high. If they owned a traditional fixed annuity, surrendering it to pursue the "buy term and invest the difference" strategy would make sense. In the case of an EIA product, however, the policyholder would not only benefit from the guaranteed principal according to the Non-Forfeiture Regulations. As discussed in the previous items, the policyholder can even be credited interest earnings in the midst of a bear market period. The annual reset design would be most advantageous in this scenario.

These two scenarios show that the main policyholder's risk is his or her uncertainty of the stock market performance. We have seen that a discrete look-back or a point-to-point plan might outperform an annual reset plan in a bull market while the contrary might occur in a bear market. The question as to whether a variable annuity will considerably

outperform an EIA largely depends on the dividend ratio of the total index return and the sensitivity of the stock market to dividend payments. The buyer of an EIA actually has to make a decision based upon uncertainty, which constitutes a risk.

However, the decision to buy an EIA might have been based upon misperception of the product risks. The products are more or less complex, and agents might have done a bad job in explaining their features to the customers. First of all, this is a customer's risk. In the US, however, such a risk can eventually turn out to be more detrimental to the insurance company because it can become a market conduct issue. Concerns about the adequacy of disclosure of product design and performance during changing market conditions have been increasingly raised in the US since the EIA sales have soared. Insurers face the risk of litigation and, consequently, the risk of loss of reputation.

## List of references

- American Academy of Actuaries – “Interim Report of the Equity Indexed Products Task Force”, June 1997.
- American Council of Life Insurance – “Life Insurance Fact Book”, 1997.
- Black, K., Skipper, H. D. “Life Insurance”. Prentice Hall, 12th edition, 1994.
- Clark, B. J. “Is Excluding Dividend Yields From EIAs a Bad Deal?” In: National Underwriter, 12th January 1998.
- Connolly, J. “Equity Index Annuities Sales Soar, But Concern Also Rises” In: National Underwriter, 20th January 1997.
- Farrell, R. D. “Nightmare on EIA Street” In: The Financial Reporter, March 1997.
- Financial Distributors, Inc. “Understanding, Evaluating & Marketing Equity Index Annuities”, 1997.
- Harrington, I. “Derivatives, a Big Headache in EIA Market” In: National Underwriter, 21st July 1997.
- Hull, J. C. “Options, Futures, and other Derivatives”. Prentice Hall International, Inc., 3rd edition, 1997.
- Mitchell, G. T., Slater, J. “Equity-Indexed Annuities – New Territory on the Efficient Frontier” In: Product Development News, SoA Issue 39, January 1996.
- Panko, R. “Insurers Face Hidden Risks in Equity Indexed Products” In: BestWeek L/H, 5th May 1997.
- Panko, R. “This Selling Season’s Hit: Equity-Indexed Annuities” In: Best’s Review L/H, April 1997.
- Review Preview January 1998 – A Special Supplement to Best’s Review and BestWeek L/H.
- Sham, L. M. “Bridging the Annuity Gap” In: Emphasis 1996/3.
- Smith, J. B. Jr. “Survey Shows Strong Interest in Offering EIAs” In: National Underwriter, 20th January 1997.