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Surprises in a Growing Market Niche

An Evaluation of the German Private Annuities Market

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Abstract

High replacement rates from public old age insurance might lead to the belief that little room is left for private sector annuities in Germany. Taking a closer look, we find a small market with a surprisingly large variety of products. Due to the recent pension reform and future ones to come the market is projected to grow substantially in the upcoming years. This paper describes the available annuity contracts and determines their money's worth for different subgroups of the population.

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1. Introduction

Annuities generate a life-long income stream in return for a premium paid to an insurance company. In their simplest form they provide protection against the risk of outliving one's resources by pooling the assets of persons with similar life expectancies when longevity is uncertain. They are viewed as the most important decumulation device in private defined contribution schemes. In Germany, tax relief for third pillar savings introduced by the 2001 pension reform is only granted if a specified fraction is annuitized no later than at the age of 85.

Markets for annuities all over the world are smaller than predictions from economic theory suggest.[1] The literature proposes several explanations for this phenomenon. Wherever applicable, crowding out due to public defined benefit systems is probably the most important reason. In a sense, payments from these schemes can be viewed as annuities. Other possibilities include adverse selection if consumers are better informed about their survival probabilities than insurers; loss of liquidity; unwillingness to surrender one's capital to an insurance company due to psychological reasons or stemming from a bequest motive; and administrative loads or possible mark-ups from providers.[2] Some of these may lead to the assertion that annuities include high load factors from the perspective of the consumer. A load factor is any difference between the premium charged by an insurer and the premium that would have to be paid for a hypothetical actuarial fair annuity. In our later discussion, we define it to be one minus the money's worth Ratio.

The most popular approach to estimate these load factors has been pioneered by Warshawsky (1998). He defines the Money's worth ratio (MWR) as the expected discounted present value of all future payments from the annuity contract, divided by the premium payment and calculates its values for the US market. The difference between the MWR and one is the proportional loading charge as perceived by the consumer. Mitchell et al. (1999) refine this concept and use more recent data for the US. They also extend the analysis into several directions, for example they incorporate taxes and calculate the insurance value of annuities for a class of CRRA utility functions. James and Vittas (2001) apply the money's worth methodology to several countries and discuss policy implications which emerge from international experiences. Mitchell and McCarthy (2002) review this literature in the light of

[1] See Mitchell and McCarthy (2002) for an overview.
[2] See for example James and Vittas (2001)

world-wide demographic change and supply discussions of various annuities-related topics, such as differential mortality and regulatory issues.

To our knowledge, such an analysis has not yet been carried out for Germany. Public old age benefits have traditionally been very high, but they are projected to decline and the need for private provision of old age security will rise. This paper addresses the question of whether the German annuities market is prepared to provide reasonable substitutes for public payments in terms of product types and load factors. Our findings are encouraging. Despite its small size, a wide variety of annuity products exists. The MWR ranges between 0.65 and 1.1 depending on the assumptions one is ready to make. Our preferred assumptions yield an approximate value of 0.95, which fits in well with international comparisons. Furthermore, specifically elaborated mortality tables are an important prerequisite for the functioning of annuities markets. These exist for Germany but they will need to be improved in the future.

The paper is organized as follows. Section two tries to sketch the current size of the German annuities market and describes the expectations regarding its future development. Section three characterizes the products available in the market and points out the ones which are analyzed later on. Section four contains a description of the mortality tables commonly used by insurance companies. In the fifth section we determine the money's worth of commonly available annuities and present some comparative statics as well as a comparison with international findings. Conclusions are drawn in the last section.

2. Market Overview

This section tries to outline the size of the German annuities market. Data are scarce due to its relatively small size compared to other insurance markets. We use publications from the Association of German Insurance Companies (Gesamtverband der deutschen Versicherungswirtschaft, GDV), which comprise virtually all commercial insurers in the period from 1998 to 2001. The data are aggregated at a level which includes some minor figures that do not fit in well with our definition of annuities, for example invalidity insurance and long term care insurance. The figures shown thus are higher than true values but they should be reasonably close to them.

Table 1 shows the payouts from annuities as compared to payments made from the public old age insurance system, which are the major source of income during retirement in Germany.

Their importance is still small, rising from a level of 1% in 1998 to 1.5% in 2001. Total payouts ranged at 2,735 Mio Euro in 2001, this is a rise of about 58% in a three year period. Future increases are projected to be even higher. First, reductions of public pension payments are likely to generate a new demand for private pension plans. Second, the 2001 pension reform has created tax incentives to invest in private pension plans which include mandatory annuitization no later than at the age of 85.[3]

Unfortunately, no figures on the accumulation side of private old age provision by means of annuity contracts are available. The reason for this is the aggregation level of the data: most products of German life insurers serve different purposes and we are not able to isolate the ones of interest to us. Consider for example an endowment policy which facilitates both annuitization and lump sum withdrawal of the accumulated stock. In order to analyze these figures we would need the share of policies being annuitized which is not available.

3. Product Overview

Despite its relatively small size a wide variety of contracts is offered in the German annuities market. Sections 3 and 5 draw upon the data base "LV-Win" from Morgen & Morgen GmbH, Hofheim am Taunus. It is a standard product used by brokers to make offers to their clientele. Thus insurance companies have a strong interest in the correct representation of their products and fees. The sample contains 80 companies and covers about 95% of the market. It does not include any group insurance ("Kollektivversicherungen"), e.g. through employer-sponsored pension plans.

For the contracts under consideration, we are not able to link offers with sales. This would be most interesting because we find large differences in both product design and prices, which might be inconsistent with rational informed consumer behavior. Exploring their actual purchasing patterns could provide some important insights. However, the data are sufficient to evaluate the money's worth of individual annuities. Extending the typology of Poterba (1997), we first organize the products along the following lines.

Method of paying premiums: The two predominant forms in this category are fixed annual and single premiums ("Rentenversicherung gegen laufende Beiträge" / "RV gegen Einmalzahlung"). We do not have information on the availability of more flexible

[3] Quoted from Schnabel (2002), where a detailed analysis of future prospects of the German annuities market can be found.

contribution schemes. Our focus in the analysis below is on single premium annuities, the motivation will be given in the next paragraph.

Waiting period: Contracts with zero and positive waiting periods should be distinguished in an analysis. Nonetheless our focus on single premium immediate annuities (SPIAs, "sofortbeginnende RV gegen Einmalzahlung") is quite general because most deferred annuities ("aufgeschobene RV") contain a refund option during accumulation.[4] In this case, a person approaching retirement age faces exactly the same choice regarding annuitization as someone who accumulated stock in a different investment object. Consequently, such a contract can be divided into two different components, the first one being an accumulation vehicle, the second one being a SPIA. For our purposes only the latter part is of interest.

Number of lives insured: An individual life annuity pays benefits to the recipient until the time of death. In case of a joint annuity, payments continue as long as any of the insured persons is alive. With very few exceptions only individual contracts are offered on the German market. However, depending on the above contract characteristics some 65-78% of the companies offer supplementary survivorship insurance ("Hinterbliebenenzusatz-versicherung") which has the same implications as a joint annuity. We only consider individual contracts as neither data on prices for survivor policies nor joint mortality tables are available.

Nature of payouts: We consider period certain annuities ("RV mit Garantiezeit") and life annuities without refund ("RV ohne Beitragsrückgewähr"). In the first case benefits are paid during a fixed number of years regardless of the death of the annuitant. If he dies, the payment is made to his beneficiaries. Period certain annuities are more popular than regular ones. The longest possible guaranteed payment period depends on the entry age, with no guaranteed payment possible beyond the age of 80. We include periods of 0, 5, 10, 15, and 20 years, although we report only results on the 0 and the 10 year period certain contracts.

Roughly a third of the companies offer contracts with a refund option during the decumulation phase. We do not consider these products for clarity reasons.

Allocation of investment and inflation risk: Three combinations are possible in this case. Real annuities assign both risks to the insurer. He bears the investment risk only if the annuity is

[4] This is true for 96% of the contracts offered on the market with fixed annual premiums and 86% of single premium deferred annuities.

paid on a nominal basis and none of the two if a variable annuity is considered.[5] We could not detect any real annuities offered on the German market. There exists a small but growing market of pure variable annuities ("fondsgebundene RV"). Their money's worth will depend in large parts on the future returns on the underlying investment vehicle.[6] Although we will face a similar problem when evaluating standard German annuity contracts, it is less important there. We do not consider variable annuities in our analysis.

The standard product in Germany is a participating annuity. It contains a nominal guaranteed annuity and a variable part which depends on the surplus of the company.[7] Law restricts the maximum interest rate insurers can use to calculate the guaranteed part of the annuity to 3.25%. It further requires firms to apply mortality tables and costs valid on the date when the contract was signed. The nominal guaranteed annuity is calculated on this basis. Capital gains or losses on the annuitants' assets relative to this rate as well as deviations of realized from expected mortality and administrative costs enter the surplus of the company. If positive, at least 90% of the capital gains have to be paid out to the insured within 5 years according to tax law.[8] On the basis of their surplus, companies calculate the profit sharing rate ("Überschussbeteiligung"). Subtracting the guaranteed rate of generally 3.25% and multiplying this by the initial premium payment yields the variable, or participating, component of the annuity.

Type of participation: The two polar forms of participation are constant and escalating schemes ("Konstante Rente" and "Dynamische Rente"). Most companies also offer mixed forms ("Teildynamische Rente"). If participation of the constant type is chosen, each year an amount depending on the premium payment and the profit sharing rate is added to the guaranteed part. If this rate does not change over time, the annuity will be constant, however it can either rise or fall over time. With the escalating annuity option the participation component is annuitized, yielding a yearly rise of the guaranteed pension payment. This annual growth rate ("Dynamisierungsfaktor") equals approximately the profit sharing rate less the guaranteed interest rate of usually 3.25%.

Throughout the last 25 years variations of the profit sharing rate have been very low compared to capital market fluctuations: German insurance companies follow a strategy of

[5] One might argue that a variable annuity provides a hedge against inflation. In our case the validity of the Fisher effect is not required, as we do not include inflation in the analysis.
[6] For a description of the mechanics of variable annuities, see Poterba (1997).
[7] The following description of the German participation scheme is a gross simplification. For details on the system, see for example Schierenbeck and Hölscher (1998).
[8] See Schierenbeck and Hölscher (1998), p. 734.

smoothing surplus over time. Tax law facilitates this by allowing hidden reserves in the balance sheet. Additionally, high periodic surpluses can be used to build up reserves which have to be distributed in the course of up to five years. Albrecht and Maurer (2002) consider the net investment returns of insurers on a book value basis. Since this is the predominant and most volatile position in the surplus (minor ones being gains or losses from actual over expected mortality and costs) this is a reasonable proxy for profit sharing rates. Average net investment returns ranged between 6.85% and 7.5% during the period from 1980 to 1998 for the thirty largest insurers.[9] More recently, profit sharing rates already declined slightly to a 2002 average of 6.17%. In 2003 they experienced another drop to currently 4.8%[10] which represents an all time low. These figures contain the guaranteed interest rate of 3.25%.

4. Mortality tables

This section illustrates some rather technical details regarding the mortality tables available in Germany. It contains additional information which is not essential for understanding the money's worth concept in the succeeding section and might be skipped. We follow the calculation of tables provided by the German Actuaries' Society (Deutsche Aktuarvereinigung, DAV), labeled DAV 1994 R. To our knowledge these provide the calculation base for most insurance companies when dealing with annuities. Some large insurers are known to construct their own tables while small companies lack the sufficient database to do so. In the following we try to outline the method of construction as done in Schmithals and Schütz (1995). The last part of this section compares the different tables and comments on their validity for our purposes.

Schmithals and Schütz (1995) consider four basic steps to construct the annuitant mortality tables which we use for estimating the money's worth ratios of annuities: first, a trend function is estimated which approximates future mortality changes. In a next step, period tables are constructed for each year. Cohort mortality can be derived directly from these tables.[11] Fourth, mortality differences between the general population and insured persons are calculated, yielding two different tables. In order to reflect actuarial conservativeness, the final DAV 1994R tables contain an arbitrary further reduction of mortality in a fifth step. This one is irrelevant for us because it has nothing to do with actual mortality.

[9] Albrecht and Maurer (2002).
[10] Average profit sharing rates refer to all firms in the market and were provided by Morgen & Morgen GmbH.
[11] For a nice introduction on this matter, see McCarthy and Mitchell (2002)

Estimation of the trend function: For this purpose, census data from 1870 to 1987 are used to obtain a log-linear regression function. In the recent past sharper declines in old age mortality than before are detected. In order to take this into account, a multiplicative bonus in old age mortality improvements is incorporated into the trend function. This results in a constant mortality decline over time for each age group. Trend functions differ by sex but are assumed to be identical for annuitants and members of the general population.

Construction of period tables: Using the trend function, a period table obtained from census data is projected into each future year under consideration. Additionally, a smoothing algorithm is applied and the tables are extrapolated to cover mortality until age 110 because census tables end at age 89.

Construction of cohort tables: In order to obtain cohort mortality, a generation is "followed" through the period tables. The resulting tables are often referred to as two-dimensional tables.

Mortality tables for the insured population: With data from six life insurance companies ranging from 1967 to 1992 the relative mortality of insured persons to the general population is calculated, depending on sex and age. Consistent with adverse selection a lower mortality of annuitants is detected.

Comparison of the different tables: McCarthy and Mitchell (2000) provide some metrics for comparing mortality tables, out of which we only report small parts. Figure 1 shows annual probabilities of death, conditional on reaching the respective year of life. It clearly reveals higher mortality for men relative to women. Of course, rates for the insured population are lower than for the general population. Table 2 shows the expected remaining lifetime at age 65. The calculations from period tables can be interpreted as the expected remaining lifetime of a contemporary 65-year-old if there were no mortality improvement for his cohort in the future. The difference between two row entries thus yields the effect of the trend function for his cohort. Differences between column entries show the effect of switching from the general to the insured population.

Comment on the tables: A few critical notes seem necessary regarding these mortality tables. First, one can always dispute the validity of past time trends for predicting future mortality improvements. Another approach would be to model expected medical change and simulate

its impact on expected future mortality.[12] We stick with the standard approach of the DAV because it seems reasonable in an international perspective.[13] The way mortality differences between the general population and annuitants are constructed does not make sense for our purposes. This issue arises because the sample size of insured persons is very small, having a minimum for females aged 60 to 65 with about 20 observed deaths. The resulting relative mortality of insured women aged 60 is 110% compared to 47% at the age of 62. Clearly, this does not make sense. Schmithals and Schütz (1995) help themselves by assuming the relative mortality of this group to be 40% lower for insured persons relative to the general population. While being sufficiently conservative in order to calculate premiums, this approach does not consistently estimate the relative mortality of insured persons. Lacking better data we use these tables anyways. Collecting adequate data on annuitant mortality will be necessary. Therefore, our results for the annuitant population thus should be seen as an orientation only regarding the magnitude of the selection effects. A more serious problem stems from the lack of data on mortality beyond age 89. As explained above, the 2001 pension reform incorporates the possibility of programmed withdrawals and deferred annuitization at the age of 85. Current data clearly are not sufficient for calculating fairly priced annuities in this group.

5. The Money's Worth of Individual Annuities

In this section we apply the methodology developed by Mitchell et al. (1999) to determine the load factors in the German market, looking at single premium immediate annuities as described in section three. To get an idea of the magnitude of the monthly payouts, we first present their averages, maxima, and minima per € 1,000 premium in tables 3 and 4.[14] Reported results are from samples of 17 to 61 firms, because not every firm offers the whole range of contract specifications.[15] Consistent with international findings,[16] we discover considerable price heterogeneity among firms. Correlations between profit sharing rates and guaranteed payouts are positive in a range from 0.25 to 0.3. This means that on average there is no trade-off between the two, which might have been a reason for payout heterogeneity, if risk aversion varies across consumers. If there had been a trade-off, a highly risk averse

[12] For example, GE Frankona Re bases its reinsurance products for annuities on an approach like this. See GE Frankona Re (2000).
[13] See McCarthy and Mitchell (2000).
[14] All our calculations are based on an initial premium of € 100,000. Contrary to our expectations based on administration loads, increasing this value produces a slight *decrease* in the payout ratio and vice versa.
[15] For our purposes sample size does not matter since we are only interested in the availability of products.
[16] See Mitchell and McCarthy (2002) for the US, James and Vittas (2001) for the UK, Australia, and Canada.

consumer might have chosen a contract with high guaranteed payments and less important participating components, the opposite being true for consumers with lower risk aversion. Examining the link between annuity payouts and the rating of providers, we also detect some positive correlation. Thus, there is no risk premium implicit in the contracts but pricing seems to depend on factors unobservable for us.

Due to differential mortality, average payouts increase with the entry age and payouts for men are considerably higher than for women at each age. Surplus payouts are almost equal across age and sex groups on an individual contract level, suggesting that they only depend on the initial premium. Thus the variable part of the annuity is more important for women than for men as they face a lower guaranteed payout. This is also true for younger persons compared to older ones. Findings on period certain annuities are not surprising either. We only report values for the 10-year period, which yields lower payouts than a contract without such an attribute. The difference in payouts between regular and period certain annuities increases with the entry age because of increasing mortality.

The Money's Worth Methodology: To illustrate loading charges we calculate the Money's worth ratio (MWR) which is defined as the expected discounted value of future payouts from the insurance company per Euro of premium. All monthly benefit payments are multiplied by the probability of reaching the corresponding month of life (i.e. the probability of receiving this payment), discounted, summed up and divided by the initial premium:

$$\mathrm{MWR} = \frac{1}{\mathrm{Premium}} \cdot \sum_{t=1}^{T} \frac{p_t \cdot A_t}{(1+i_t)^t}$$

At this point three parameters are to be determined: the interest rate for a t-month investment i_t, the survival probability up to period t p_t, and monthly payouts A_t. Regarding the mortality assumptions, we use the tables discussed in the preceding section[17]. To obtain monthly survival probabilities, we calculate the geometric mean of annual values. This amounts to assuming constant probabilities within years of life. Second, to discount future benefits, we use short-term Euro-money-market rates and the yields of German government bonds ("Staatsanleihen") for maturities of one to thirty years. The latest maturity on the German treasury market is 26.8 years. After this period we update this interest rate into the future. Last

[17] For readers who have skipped this section, there is one table for the general population and another one for insured persons with lower mortality rates. This is due to adverse selection: people with short remaining life expectancies do much less frequently buy immediate annuities.

and most important are the insurance payouts. We calculate MWRs for the guaranteed nominal annuity only and for the two polar participation schemes. The corresponding assumptions are described in detail in the following paragraphs, a comparative static analysis follows at the end of this section. Finally, we incorporate guaranteed payment periods in the analysis. This amounts to assuming a survival probability of one during the period of guaranteed payouts, afterwards the same formulas apply as in the simple case. We only report results for 10-year period certain annuities, as MWRs do not vary substantially across different periods.

Discussion of the discount rate: A major determinant of the MWR is the discount rate which has to reflect an alternative investment with similar risks attached to it. In the case of pure nominal annuities, this risk is restricted to the insolvency risk of the annuity provider. This led researchers in other countries to using the corporate bond yields as discount rates.[18] We neglect this risk because of the strong regulatory framework in Germany. There has not been any reported insolvency of an insurance company for decades. Even without default risk, German annuities bear some investment risk for the participating part. Using government yields will overstate the MWR if there is no risk adjustment. However, applying yields of the Markovitz market portfolio will overestimate the attached risk. As the product profile is unique, an adequate rate simply does not exist. A look at the low historical volatility of net investment returns on a book value basis of life insurers favors the use of government yields.[19] This procedure is disputable and the reader not comfortable with it is referred to the comparative static analysis.

Results for Germany: Consider the first column in Panel I of table 6. It contains MWRs only for the guaranteed nominal annuity assuming zero participation in all periods. This is clearly a drastic assumption, but it provides some insight because the insurer bears investment and mortality risk only up to this point. The first entry shows the MWR for 60-year-old males, assuming population mortality. Its value of 0.76 appears to be rather low, but apart from the interest rate, assumptions are as conservative as possible. Results for ages 60 and 70 are similar. Looking at the outcomes for annuitants, we find a selection effect which raises the MWR by 0.07 to 0.09 points. This is about the magnitude encountered in international

[18] See Mitchell and McCarthy (2002) for a good discussion.
[19] This implies using portfolio volatility as perceived by the consumer as risk measure.

comparisons[20]. Nevertheless it should be interpreted with caution due to the problems associated with the corresponding mortality table.

For the second column we use 2003 payouts of contracts with the constant participation scheme and simply update them into all future periods. We will return to the plausibility of this assumption later. Ratios rise to 0.89 and more. The increase is most pronounced for 60-year-olds, because as noted earlier the absolute value of the participation payment only depends on initial premiums. This group has the highest remaining life expectancy. The selection effect rises proportionally compared to the first column. For annuitants the MWR approaches unity.

In order to obtain MWRs for the escalating participation scheme we use the same growth rates of the annuities for all periods as reported in our data base for 2003 for each insurer. MWRs are slightly lower than for the constant participation scheme. In this case the selection effect becomes more pronounced because high benefits in late periods are weighted stronger due to lower mortality among annuitants.

With regard to Panel II, we do not expect notable changes of the MWR for the annuitants. Turning the life annuity into a certain payment during ten year period should be reflected in a reduction of payouts which is based on annuitant mortality. Our results confirm this expectation. Correspondingly, MWRs for the general population rise slightly by 0.01 to 0.04 points because setting mortality to zero during ten years results in a larger difference for this group. Hence, the selection effect can be attenuated by including a guaranteed payment period.

Results for women are reported in Table 7. MWRs are higher in most cases, around 0.78 for the guaranteed annuity in the general population. The selection effect seems to be less important than for males, ranging form 0.05 to 0.075 in the first column. Incorporating any participation component produces stronger increases in the MWR than in the case of males which is due to lower female mortality. Again, the participation component only depends on the initial premium, not on sex or age. Nearly all values including participation payments exceed unity. Conclusions regarding period certain annuities are the same as for males.

Comparative Statics: Our results depend heavily on the assumptions on interest and profit sharing rates. Up to now we assumed values given today which need not be valid in the

[20] An overview is given in Mitchell and McCarthy (2002).

future. In this section we explore alternative scenarios and relate them to past experiences. We consider increases in either one or both rates. Similar results are obtained for corresponding decreases, thus we do not report them.

Tables 8 and 9 show some results if 100 or 200 basis points are added to either the annual interest or the profit sharing rate, or both. Raising the interest rate by 100 basis points produces drops in MWR of the guaranteed part of 0.05 to 0.07 (see the first column in Panels II). The effect gets weaker when increasing the entry age. This last statement is also true for relative changes, which is nearly equal in all three columns. An increase in the interest rate of 100 basis points causes the money's worth to fall by 6.3% to 8.3%. The effect is strongest for women aged 60 and least pronounced for 70-year-old males. It declines in the magnitude of the basis points added to the interest rate, see Panel V. These figures show how important interest rate assumptions are for the MWR.

When varying the profit sharing rates, we only consider changes in the annuities' growth rates in the escalating scheme. We did not find a reasonable way to model the impact of changes in profit sharing rates on benefits in the constant participation scheme. The relative changes are slightly larger in absolute value than in the case of the interest rate. Adding 100 basis points to the profit sharing rate in each period yields a rise of the MWR of 7.8% to 13.5%. The large range stems from mortality differences and the calculation of the participation component. As expected, it is highest for the group with the lowest mortality rate which are female annuitants aged 60. A 70-year-old man belonging to the general population profits the least from such a rise.[21]

Increasing both rates by 100 basis points at the same time yields MWRs similar to the ones resulting from our original assumptions (see Panels IV). If they are increased by 200 basis points each, the profit sharing rate effect predominates and causes higher MWRs.

The assumptions which lead to our original results under either the constant or the escalating participation scheme seem most plausible to us. The profit sharing rates we use are historically low and they appear sufficiently conservative even in the current capital market situation, although they certainly do not represent a lower bound. During the last 20 years, insurers have been more successful than this. Another assumption one may want to criticize is the interest rate level, which is also low in a historical perspective. This might yield too high

[21] The gains would be closer together in the case of constant participation. See the above discussion of the selection effect in the different participation schemes.

MWRs. However, if they were to increase we would suspect a positive correlation of interest and profit sharing rates.[22] In this case, either scenario IV or VI might apply and results do not change substantially.

International comparisons: Our results fit in well with international findings as compiled in Mitchell and McCarthy (2002) from different sources. We report them in Table 10. MWRs based on our preferred assumptions for both annuitant and general populations are comparable to those estimated in the UK, Australia and Italy, while being slightly lower than in Canada and higher than in the US. Nevertheless, it should be noted that these values are estimates for guaranteed nominal annuities, while our analysis is based on participating annuities. This does not imply direct utility consequences if consumers are willing to bear some risk. After all, there is the possibility to gain more through the participation component, which is not present in pure guaranteed annuities. Estimates for the MWR of participating annuities are available for Switzerland. They are remarkably high, exceeding unity for almost all subgroups of the population. In our understanding of the original paper by James and Vittas (2001), these are based on rather optimistic assumptions on the participation component. Results are comparable to those reported in the third Panels of Tables 8 and 9, which reflect the scenario present a few years ago.

The insurance value of annuities: We use the results from Mitchell et. al. (1999) to illustrate the utility value for a CRRA utility function with a unity risk aversion parameter. This reflects a relatively low risk aversion. They assume stochastic inflation with a mean of 3.2% and a preexisting real annuity amounting to 50% of total wealth at the age of 65, e.g. claims from public old age insurance. For different values of the interest rate and the individual time discount rate, they obtain critical MWR values of about 0.75. This is to be interpreted as follows: an individual with this utility function who already owns a real annuity will attach a positive utility value to an additional nominal annuity if the loading charges do not exceed 25%. Comparing this result to tables 8 and 9, we find that he will buy an additional annuity in nearly all of the scenarios, even if only considering the guaranteed part of the annuity.

[22] Bonds are the predominant capital investment of insurance companies. As future coupon payments go up because of rising interest rates, so should profit sharing rates.

6. Summary and Outlook

Our findings thus far came as a positive surprise to us. Money's worth ratios in Germany are comparable to international ones despite the small market size. Consumers can choose among many different contract specifications, although we are missing offers of real annuities and offers for people older than 70. The decline of benefits from the public old age insurance scheme and tax benefits for private retirement saving will lead to an increase in volume. It is not clear, however, what will happen to money's worth ratios if annuities account for a significant part of insurance companies' revenue in the future. They might increase because of fiercer competition. On the contrary, if companies have some market power, MWRs could decrease because annuities have to account for a larger revenue share.

Mortality tables will need improvement in order to facilitate sensible pricing of annuities with an entry age of 85 years which are projected to be a popular withdrawal option for third pillar saving. From our perspective, a better estimation of the selection effect is desirable.

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Table 1

	1	2	3			
	Annuities paid by insurers	**Main insurance benefits paid by insurers**	**Payments from Public Old Age Insurance**	**Growth Rate Annuities**	**Ratio**	**Ratio**
Year	**Mio Euro**	**Mio Euro**	**Mio Euro**		**1 / 2**	**1 / 3**
1998	1,732	25,841	171,512		6.7%	1.0%
1999	2,053	29,402	167,782	18.5%	7.0%	1.2%
2000	2,457	32,804	177,758	19.7%	7.5%	1.4%
2001	2,735	35,429	183,393	11.3%	7.7%	1.5%
Increase 1998-2001	57.9%	37.1%	6.9%			
Average annual Increase	12.1%	8.2%	1.7%			

Note: Main Insurance Contracts denote life insurance contracts, private old age insurance, and some minor positions. They are called this way because they may include additional options such as invalidity insurance, which are not included in these figures. Source: GDV, Statistical Yearbooks of German Insurance 2002, 2001, 2000.

Table 2

Expected remaining lifetime

	Male Population	**Male Insured**	**Female Population**	**Female Insured**
Period table for 2003, beginning at age 65	16.0	18.6	19.9	22.3
Cohort aged 65 in 2003	16.9	19.6	21.3	24.1

Note: Own calculation based on tables provided in Schmithals and Schütz (1995).

Table 3

Payouts per € 1.000 Premium – Men

No Period Certain Annuity

		Guaranteed Part	Constant Participation Scheme
	Average	**4.84**	**5.72**
60	Lowest	4.72	4.73
	Highest	4.99	6.33
	Average	**5.51**	**6.43**
65	Lowest	5.38	5.45
	Highest	5.71	7.00
	Average	**6.68**	**7.59**
70	Lowest	6.47	6.47
	Highest	6.90	8.18

10 Years Period Certain Annuity

		Guaranteed Part	Constant Participation Scheme
	Average	**4.73**	**5.55**
60	Lowest	4.50	4.64
	Highest	4.90	6.19
	Average	**5.30**	**6.07**
65	Lowest	5.04	5.25
	Highest	5.50	6.75
	Average	**6.17**	**6.96**
70	Lowest	5.86	6.02
	Highest	6.39	7.54

Note: Annuity payouts as provided in LV-Win by Morgen & Morgen GmbH. Calculations are based on an initial premium of Euro 100,000 on a single premium immediate life annuity.

Table 4

Payouts per € 1.000 Premium – Women

No Period Certain Annuity

		Guaranteed Part	Constant Participation Scheme
	Average	**4.27**	**5.18**
60	Lowest	4.17	4.19
	Highest	4.42	5.75
	Average	**4.91**	**5.79**
65	Lowest	4.74	4.74
	Highest	5.08	6.35
	Average	**5.69**	**6.57**
70	Lowest	5.54	5.54
	Highest	5.89	7.12

10 Years Period Certain Annuity

		Guaranteed Part	Constant Participation Scheme
	Average	**4.23**	**5.06**
60	Lowest	4.04	4.16
	Highest	4.39	5.70
	Average	**4.82**	**5.62**
65	Lowest	4.59	4.67
	Highest	5.00	6.25
	Average	**5.49**	**6.31**
70	Lowest	5.22	5.36
	Highest	5.70	6.88

Note: Annuity payouts as provided in LV-Win by Morgen & Morgen GmbH. Calculations are based on an initial premium of Euro 100,000 on a single premium immediate life annuity.

Table 5

Term	Interest Rate
1 Month	2.65%
3 Months	2.53%
6 Months	2.46%
1 year	2.41%
2 years	2.33%
3 years	2.49%
5 years	3.06%
7 years	3.61%
10 years	4.00%
15 years	4.36%
20 years	4.55%
25 years	4.75%
30 years	4.76%

Source: European Central Bank, Monthly Bulletin March 2003, and http://www.bondboard.de/.

Table 6

Panel I - No Guaranteed Payment Period, Men

Age	Mortality Table	Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme *)
60	Population	0.763	0.902	0.886
	Annuitants	0.833	0.985	0.981
65	Population	0.760	0.886	0.864
	Annuitants	0.840	0.980	0.968
70	Population	0.780	0.887	0.868
	Annuitants	0.872	0.990	0.982

*) Average Growth Rate: 1.55%

Panel II - 10 Years Guaranteed Payment Period, Men

Age	Mortality Table	Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme *)
60	Population	0.780	0.915	0.894
	Annuitants	0.835	0.980	0.971
65	Population	0.788	0.902	0.885
	Annuitants	0.846	0.969	0.963
70	Population	0.817	0.921	0.900
	Annuitants	0.876	0.988	0.976

**) Average Growth Rate: 1.45%

Note: Each entry shows the Money's worth ratio. All calculations use the all-company sample average annuity payouts. Samples differ by type of contract, this is why average growth rates may differ, too.

Table 7

Panel I - No Guaranteed Payment Period, Women

Age	Mortality Table	Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme *)
60	Population	0.776	0.942	0.922
	Annuitants	0.826	1.003	0.995
65	Population	0.795	0.938	0.921
	Annuitants	0.857	1.012	1.008
70	Population	0.795	0.918	0.900
	Annuitants	0.870	1.005	0.999

*) Average Growth Rate: 1.55%

Panel II - 10 Years Guaranteed Payment Period, Women

Age	Mortality Table	Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme *)
60	Population	0.782	0.935	0.917
	Annuitants	0.827	0.988	0.982
65	Population	0.805	0.940	0.923
	Annuitants	0.858	1.001	0.997
70	Population	0.814	0.936	0.912
	Annuitants	0.873	1.004	0.992

**) Average Growth Rate: 1.45%

Note: Each entry shows the Money's worth ratio. All calculations use the all-company sample average annuity payouts. Samples differ by type of contract, this is why average growth rates may differ, too.

Table 8

Comparative Statics - Men, No Guaranteed Payment Period

Panel I

Age		Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme
60	Population	0.763	0.902	0.886
	Annuitants	0.833	0.985	0.981
65	Population	0.760	0.886	0.864
	Annuitants	0.840	0.980	0.968
70	Population	0.780	0.887	0.868
	Annuitants	0.872	0.990	0.982
	Basis points added to interest rate:			0
	Basis points added to profit sharing rates:			0

Panel II

Age		Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme
60	Population	0.705	0.834	0.815
	Annuitants	0.769	0.909	0.901
65	Population	0.706	0.823	0.798
	Annuitants	0.778	0.907	0.891
70	Population	0.731	0.830	0.809
	Annuitants	0.812	0.923	0.911
	Basis points added to interest rate:			100
	Basis points added to profit sharing rates:			0

Panel III

Age		Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme
60	Population	-	-	0.980
	Annuitants	-	-	1.096
65	Population	-	-	0.941
	Annuitants	-	-	1.064
70	Population	-	-	0.931
	Annuitants	-	-	1.063
	Basis points added to interest rate:			0
	Basis points added to profit sharing rates:			100

Panel IV

Age		Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme
60	Population	-	-	0.899
	Annuitants	-	-	1.005
65	Population	-	-	0.867
	Annuitants	-	-	0.977
70	Population	-	-	0.866
	Annuitants	-	-	0.983
	Basis points added to interest rate:			100
	Basis points added to profit sharing rates:			100

Panel V

Age		Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme
60	Population	0.654	0.774	0.753
	Annuitants	0.712	0.842	0.832
65	Population	0.658	0.768	0.741
	Annuitants	0.723	0.843	0.825
70	Population	0.687	0.780	0.758
	Annuitants	0.760	0.863	0.848
	Basis points added to interest rate:			200
	Basis points added to profit sharing rates:			0

Panel VI

Age		Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme
60	Population	-	-	0.917
	Annuitants	-	-	1.037
65	Population	-	-	0.872
	Annuitants	-	-	0.991
70	Population	-	-	0.865
	Annuitants	-	-	0.986
	Basis points added to interest rate:			200
	Basis points added to profit sharing rates:			200

Note: Each entry shows the Money's worth ratio using the same samples as before. Either a parallel shift is applied to the interest rate for each period and / or the profit sharing rate is increased in the same fashion.

Table 9

Comparative Statics - Women, No Guaranteed Payment Period

Panel I

Age		Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme
60	Population	0.776	0.942	0.922
	Annuitants	0.826	1.003	0.995
65	Population	0.795	0.938	0.921
	Annuitants	0.857	1.012	1.008
70	Population	0.795	0.918	0.900
	Annuitants	0.870	1.005	0.999
	Basis points added to interest rate:			0
	Basis points added to profit sharing rates:			0

Panel II

Age		Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme
60	Population	0.715	0.868	0.846
	Annuitants	0.761	0.924	0.914
65	Population	0.733	0.866	0.846
	Annuitants	0.790	0.933	0.925
70	Population	0.738	0.853	0.832
	Annuitants	0.805	0.930	0.920
	Basis points added to interest rate:			100
	Basis points added to profit sharing rates:			0

Panel III

Age		Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme
60	Population	-	-	1.036
	Annuitants	-	-	1.130
65	Population	-	-	1.018
	Annuitants	-	-	1.125
70	Population	-	-	0.978
	Annuitants	-	-	1.096
	Basis points added to interest rate:			0
	Basis points added to profit sharing rates:			100

Panel IV

Age		Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme
60	Population	-	-	0.948
	Annuitants	-	-	1.036
65	Population	-	-	0.932
	Annuitants	-	-	1.030
70	Population	-	-	0.901
	Annuitants	-	-	1.006
	Basis points added to interest rate:			100
	Basis points added to profit sharing rates:			100

Panel V

Age		Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme
60	Population	0.662	0.803	0.780
	Annuitants	0.705	0.855	0.844
65	Population	0.679	0.803	0.780
	Annuitants	0.731	0.864	0.853
70	Population	0.688	0.795	0.772
	Annuitants	0.748	0.864	0.851
	Basis points added to interest rate:			200
	Basis points added to profit sharing rates:			0

Panel VI

Age		Only Guaranteed Part	Constant Participation Scheme	Escalating Participation Scheme
60	Population	-	-	0.984
	Annuitants	-	-	1.093
65	Population	-	-	0.946
	Annuitants	-	-	1.060
70	Population	-	-	0.903
	Annuitants	-	-	1.017
	Basis points added to interest rate:			200
	Basis points added to profit sharing rates:			200

Note: Each entry shows the Money's worth ratio using the same samples as before. Either a parallel shift is applied to the interest rate for each period and / or the profit sharing rate is increased in the same fashion.

Table 10

International MWRs - 65-year-old Men

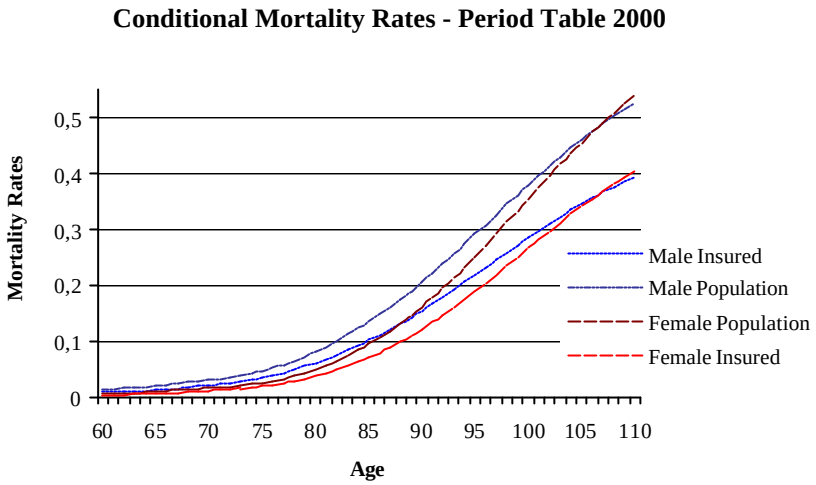
	Germany	UK	Australia	Canada	Switzerland	US	Italy
Population	0.887	0.897	0.914	0.925	0.965	0.814	not available
Annuitants	0.980	0.966	0.986	1.014	1.169	0.927	0.958

International MWRs - 65-year-old Women

	Germany	UK	Australia	Canada	Switzerland	US	Italy
Population	0.939	0.910	0.910	0.937	1.029	0.852	not available
Annuitants	1.013	0.957	0.970	1.015	1.152	0.927	0.965

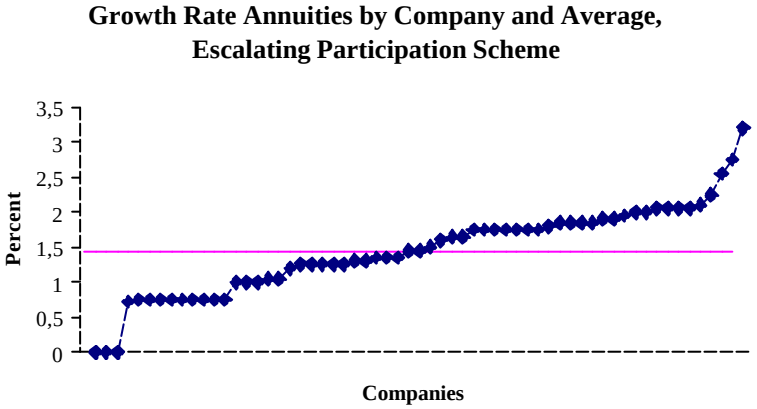
Note: Results for Germany are taken from our own calculations. MWRs for other countries stem from the compilation given in Mitchell and McCarthy (2002) and from James and Vittas (2001)

Figure 1



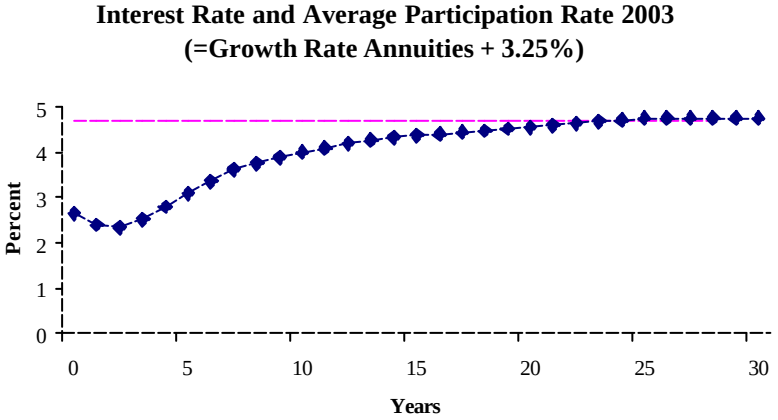
Note: The conditional mortality rate is the probability of dying at age t+1 conditional on reaching age t. Based on tables provided in Schmithals and Schütz (1995).

Figure 2



Note: Growth Rates by company as provided in LV-Win by Morgen & Morgen GmbH.

Figure 2



Note: Average profit sharing rates calculated from growth rates as provided in LV-Win by Morgen & Morgen GmbH. Interest rates are taken from ECB monthly bulletin, March 2003 and http://www.bondboard.de/.