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The Market of Dynamic Hybrid Products in Germany: Concept, Risk-Return Profiles, and Market Overview

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ABSTRACT

This article provides an overview of dynamic hybrid products along with their diverse characteristics and contract variations that are available in the German market at present. Dynamic hybrid products are innovative life insurance contracts combining features of traditional participating life insurance with those of unit-linked policies. This approach is thereby implemented by a mathematical algorithm based on a constant proportion portfolio insurance strategy that periodically reallocates funds (e.g. once per month or day) between the policy reserve stock (with an interest rate guarantee), a guarantee fund and / or equity fund. In this paper, we contribute to the literature by gathering and summarizing available product and market data about dynamic hybrid products. In addition, risk-return profiles are presented and compared. This offers insights into the spectrum of product concepts along with embedded guarantees and options and is intended to identify key characteristics and unique features in the market.

Keywords: Life insurance, innovative life insurance products, dynamic hybrid, unit-linked policies with guarantees, constant proportion portfolio insurance

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1. INTRODUCTION

Against the background of the demographic development and changing consumer needs, innovations in life insurance and pension products have become of central relevance in the insurance industry.[1] In Germany, such innovations are represented by dynamic hybrid products, which are typically offered as deferred annuity contracts. Dynamic hybrid products combine merits of traditional participating life insurance and unit-linked products by periodically shifting funds between the policy reserve stock of an insurer (with an interest rate guarantee), a guarantee fund and / or an equity fund. Since their market launch in 2007,[2] dynamic hybrid products are offered by several life insurance companies by now and become increasingly important.[3] In this paper, we contribute to the literature by providing a comprehensive study of the market of dynamic hybrid products in Germany. We identify key contract characteristics of available dynamic hybrid products and examine the concepts, concrete products offered by insurers, and present risk-return profiles associated with this product design.

In the literature, dynamic hybrid products are mainly addressed by the non-academic literature, such as discussed in Menzel (2008), Siebert (2008), and Bettels, Grosner, and Leitschkis (2011). Apart from the non-academic literature, dynamic hybrid products are studied quantitatively by Kochanski and Karnarski (2011) and Bohnert and Gatzert (2012). Menzel (2008) and Siebert (2008) provide qualitative discussions of dynamic hybrid products, which are offered by an insurance company along with traditional contracts. While Menzel (2008) pinpoints the risk for an insurance company that is associated with dynamic hybrid products, Siebert (2008) counters that there are also merits of dynamic hybrid products in addition to detriments from an insurer's perspective. Bettels, Grosner, and Leitschkis (2011) point out that there are interaction effects between the portfolios of dynamic hybrid products and traditional life insurance contracts, which have to be taken into account by an insurer when offering dynamic hybrid products. While they conduct a case study, they do not provide a model framework or details of their calculations. In contrast to this, Kochanski and Karnarski (2011) provide a partial internal model for static as well as dynamic hybrid contracts and thereby illustrate a shifting mechanism for a 3-fund dynamic hybrid product. They focus on calculating the solvency capital requirements for dynamic hybrid products under Solvency II and show that their approach is superior to the standard formula for innovative life insurance contracts. Bohnert and Gatzert (2012) study the impact of dynamic hybrid products on the fair valuation and risk assessment of an insurer with a portfolio consisting of traditional participating life insurance contracts and dynamic hybrid products. Toward this end, they provide a

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1 See Gatzert and Schmeiser (2013).

2 See, e.g., Ortmann and Pfeifer (2010), and Figure 1 in the subsequent section.

3 See, e.g., Daalmann (2012), and Salzgeber and Steurer (2012).

model framework with which they analyze the interaction effects within a portfolio of dynamic hybrid products and traditional contracts. Even though dynamic hybrid products have recently been attracting attention in the literature and the number of insurers offering these products steadily increase in the German market, a study that holistically examines the current market of dynamic hybrid products is still due.

In this paper, we thus provide an overview of the market of dynamic hybrid products in Germany. In doing so, we focus on assessing the occurrence of dynamic hybrid products in the market along with key characteristics and options of the available contracts. In a theoretical part, we first introduce and specify the methods of portfolio insurance strategies, to which the method of dynamic hybrid products can be ascribed. While we thereby show the idea of static hybrid products as an early version of this product class, we focus on illustrating the concept of the dynamic versions. In the market overview, we characterize and discuss the available products based on their product design (2-fund or 3-fund concept), the availability in form of different contract types and embedded contract options. Furthermore, we address the comparability of products by means of risk-return profiles. Thus, this comprehensive assessment of the market of dynamic hybrid products is intended to offer insights into their functioning, key contract factors, and their performance along with their risk.

The remainder of the paper is structured as follows. Section 2 presents the concepts of dynamic hybrid products in a theoretical part. Section 3 provides the market overview with comprehensive information about the available contracts and embedded options. Section 4 addresses the comparability of products and Section 5 concludes.

2. The Concept of Dynamic Hybrid Products

Portfolio insurance strategies have long been used by banks and have by now become important for the product design in life insurance. The concepts of portfolio insurance can generally be divided into two categories (see, e.g., Basak, 2002).[4] The first group comprises approaches where risky assets are hedged by financial derivates, such as protective put options, and it is referred to as option-based portfolio insurance (OBPI).[5] Second, guarantees can be ensured by periodically allocating assets to risk-free and risky investments, such as implemented in a constant proportion portfolio insurance (CPPI) strategy.[6] Based on this idea, dynamic hybrid products invest and periodically reallocate the savings part of a contract in an

[4] See Grossman and Vila (1989) for the formal definition of a portfolio insurance strategy.

[5] This was first discussed in 1976, see Leland and Rubinstein (1988) and Zagst and Kraus (2011).

[6] The concept of a CPPI for fixed income securities was first addressed by Perold (1986) and it is introduced by Black and Jones (1987) for equity investments.

insurer's policy reserve stock as a risk-free asset (with a minimum interest rate guarantee),[7] a guarantee fund and / or an equity fund. This is done with the aim to combine the stability of traditional life insurance policies along with benefiting from positive capital market returns. In this section, we concentrate on the functioning of dynamic hybrid products, while we briefly address the concepts of a CPPI and a static hybrid product first, since dynamic hybrid products are based on those.

Constant proportion portfolio insurance strategies control for each period the percentage of total assets that is invested risk-free and risky, respectively. The partitioning of an account value AV_t at time t with a guaranteed value $G_{t+\Delta t}$ in $t+\Delta t$ is given by (see, e.g., Gatzert and Schmeiser, 2009; Balder and Mahayni, 2010)

$$B_t = (1-\alpha_t) \cdot AV_t,$$
$$S_t = \alpha_t \cdot AV_t = AV_t - B_t,$$

where B_t denotes the risk-free or low-risk part of bonds and S_t provides the portion to invest risky, i.e. in stocks. The percentage α_t is calculated as follows,

$$\alpha_t = \min\left(\max\left(m \cdot \frac{AV_t - (1+r_f)^{-\Delta t} \cdot G_{t+\Delta t}}{AV_t}, 0 \right), \alpha_{\max} \right), \tag{1}$$

with $m \geq 0$ indicating a multiplier to control for risk aversion. The numerator in Equation (1) is referred to as cushion, since it specifies the fraction that is not required to meet the guarantee and that can be invested in the risky asset.[8]

Using this idea, static hybrid products combine a traditional life insurance policy with a fund investment.[9] In doing so, static hybrid products split the premium into two investment parts.[10] One part is invested in the premium reserve stock (PRS) of a life insurer that resembles an

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[7] The guaranteed interest rate represents a fixed rate, which is at least paid on funds in the policy reserves.

[8] A CPPI strategy invests funds in a pro-cyclical way and might lead to a cash-lock, i.e. all funds have to be invested risk-free in order to achieve the guarantee. In contrast to this, there are modifications of a standard CPPI that adjust the parameters according to the current market environment (see Salzgeber and Steurer, 2012).

[9] Static hybrid products were introduced in 1999 as the first hybrid products in Germany (see, e.g., Kochanski and Karnarski, 2011) and they are referred to as hybrid products of the first generation (see Witte, 2010).

[10] To be precise, the premium is split into four parts, namely investments in the traditional policy and an equity fund as stated above and in addition to this costs have to be covered as well as a premium snippet has to be paid for a term life insurance to cover the case of death. In further explanations, we will ignore the latter two premium snippets and focus on the two investment parts.

investment in a traditional policy with a guaranteed rate of return r_G and the right to receive surplus, whereas the second part is invested into an equity fund EF_t. The initial partitioning of the premiums is maintained throughout the contract term and is given by (see, e.g., Kochanski and Karnarski, 2011)[11]

$$PRS_t = \frac{G_{t+\Delta t}}{(1+r_G)^{\Delta t}},$$
$$EF_t = AV_t - PRS_t.$$

At a certain time during the contract term, the investment in the policy reserves might be higher than required to meet the set guarantee level, i.e. a part of the investment in the policy reserve stock could theoretically be transferred to the risky investment with a higher return on average. This leads to the dynamic version of hybrid products.

Dynamic hybrid products merge the concepts of CPPI and the static hybrid product. In contrast to splitting the premiums in case of a static hybrid product, a contract's total account value is split and invested in the policy reserve stock of an insurer and an equity fund (and / or guarantee fund), and it is periodically (e.g. monthly or daily) reallocated between these pots. A 2-fund shifting mechanism that invests the maximum proportion of the account value in an equity fund or guarantee fund along with ensuring the guarantee, is given by[12]

$$PRS_t = \begin{cases} \dfrac{G_{t+\Delta t} - (1-\lambda)\cdot AV_t}{(1+r)^{\Delta t} - 1 + \lambda}, & if \ \dfrac{G_{t+\Delta t}}{(1-\lambda)\cdot AV_t} > 1 \\ 0, & otherwise \end{cases}$$
$$F_t = \begin{cases} AV_t - PRS_t, & if \ \dfrac{G_{t+\Delta t}}{(1-\lambda)\cdot AV_t} > 1 \\ AV_t, & otherwise \end{cases} \qquad (2)$$

where F_t can be a guarantee fund (GF_t) or an equity fund (EF_t).[13] In case of the guarantee fund, the guarantee promise that the fund value cannot lose more that λ percent per period is provided by a different company. When using the equity fund, the insurer provides the guarantee to the policyholder and thus faces a gap risk that the equity fund value drops below $1-\lambda$ percent of the value at the beginning of the period. This gap risk has to be hedged by the

[11] Here, the guarantee is ensured by the policy reserve stock only, i.e. the equity investments' value could drop to zero in the worst case.

[12] It is based on Kochanski and Karnarski (2011).

[13] Here, the guarantee is provided by the policy reserve stock and the fund investment, which is assumed to fall in the worst case by λ percent in one period. Furthermore, a 2-fund dynamic hybrid product with an investment in the policy reserve stock and an equity fund resembles an individual CPPI strategy.

insurer itself. A 3-fund dynamic hybrid product's mechanism with the aim to invest as much as possible in risky funds results to (see, e.g., Bohnert and Gatzert, 2012; Kochanski and Karnarski, 2011)[14]

$$
\begin{aligned}
PRS_t &= \begin{cases} \dfrac{G_{t+\Delta t} - (1-\lambda)\cdot AV_t}{(1+r)^{\Delta t} - 1 + \lambda}, & \text{if } \dfrac{G_{t+\Delta t}}{(1-\lambda)\cdot AV_t} > 1 \\ 0, & \text{otherwise} \end{cases} \\
GF_t &= \begin{cases} AV_t - PRS_t, & \text{if } \dfrac{G_{t+\Delta t}}{(1-\lambda)\cdot AV_t} > 1 \\ \dfrac{G_{t+\Delta t}}{1-\lambda}, & \text{otherwise} \end{cases} \\
EF_t &= AV_t - PRS_t - GF_t.
\end{aligned}
\tag{3}
$$

The mechanisms in Equations (2) and (3) allow for shiftings between all considered funds, which is often referred to as dynamic hybrid products of the third generation (see Witte, 2010). In contrast to this, dynamic hybrid products of the second generation or partial dynamic hybrid products allow for shiftings in one direction only, i.e. from the policy reserve stock to the guarantee fund, and from the guarantee fund to the equity fund (in case of a 3-fund version), but not vice versa (see Witte, 2010).

In addition to using these shifting mechanisms in the accumulation phase, this concept can analogously be continued in the payout phase, which is then referred to as a dynamic hybrid annuity. Here, the guarantee at the end of each period has to be set equal to the present value of the guaranteed annuity payments. Furthermore, a mechanism that increases the annuity in case the funds' returns are positive has to be included (see Kling, 2009).

[14] One the one hand, a high upside potential is enabled through a maximum investment of the account value in risky funds, while still ensuring the guarantees, but on the other hand this implies numerous shiftings, and thus transaction costs, and this strategy acts pro-cyclical. There are different mechanisms that aim to balance this tradeoff, which are referred to dynamic hybrid products of the fourth generation (see Witte, 2010).

3. Market Development, Product Designs, and Embedded Options

In what follows, we give a comprehensive market overview and study dynamic hybrid products that are available in the German life insurance market. Dynamic hybrid products are generally pension contracts designed as deferred annuity policies and they are provided for all three levels of retirement arrangements in Germany.[15] Currently, about 20 life insurance companies provide dynamic hybrid products and the first contracts in Germany were offered in 2007[16] as outlined in Figure 1.[17]

Even though there is no comprehensive information available with respect to the market share of dynamic hybrid products in life insurance, at least to the best of our knowledge, the available market data for life insurance is still insightful. While the market share of unit-linked policies decreased since 2008 (share of 15.1% of life insurance premiums in 2008), it is still on a comparable level in 2011 (14.5%) and considerably higher than ten years ago (e.g. 5.7% in 2000, and 7.3% in 2001) (see GDV, 2012, Table 34). With respect to new unit-linked business, about 87% of the new contracts are unit-linked annuity policies in 2011 (see GDV, 2012, Table 35). Furthermore, this trend towards annuity contracts with guarantees can also be confirmed for the category of traditional policies. Here, the market share of traditional participating life insurance contracts has decreased in favor of an increase in traditional annuity contracts (e.g. market share of participating life insurance contracts of 52.7% in 2001, and 32.2% in 2011; market share of annuities of 22.4% in 2001, and 32.7% in 2011) (see GDV, 2012, Table 34). According to the market data by GDV (2012), dynamic hybrid products are classified as traditional annuity policies or unit-linked annuity contracts depending on the product's investment structure. This shows that traditional as well as unit-linked annuity contracts become increasingly important and indicate an increasing potential for dynamic hybrid contracts, which also becomes evident in the increasing number of insurance companies offering dynamic hybrids.

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[15] Here, contracts are available as a so-called basic pension or "Rürup" pension, as a government-subsidized contract called "Riester", and as private pension plans.

[16] See also Ortmann and Pfeifer (2010).

[17] In 2011, there are a total number 94 life insurance companies in Germany and their share in the total premium income in the sector of primary insurance amounts to 48.7% (see GDV, 2012, Table 1).

Figure 1: Estimated year of introduction of dynamic hybrid products by German insurers[18]

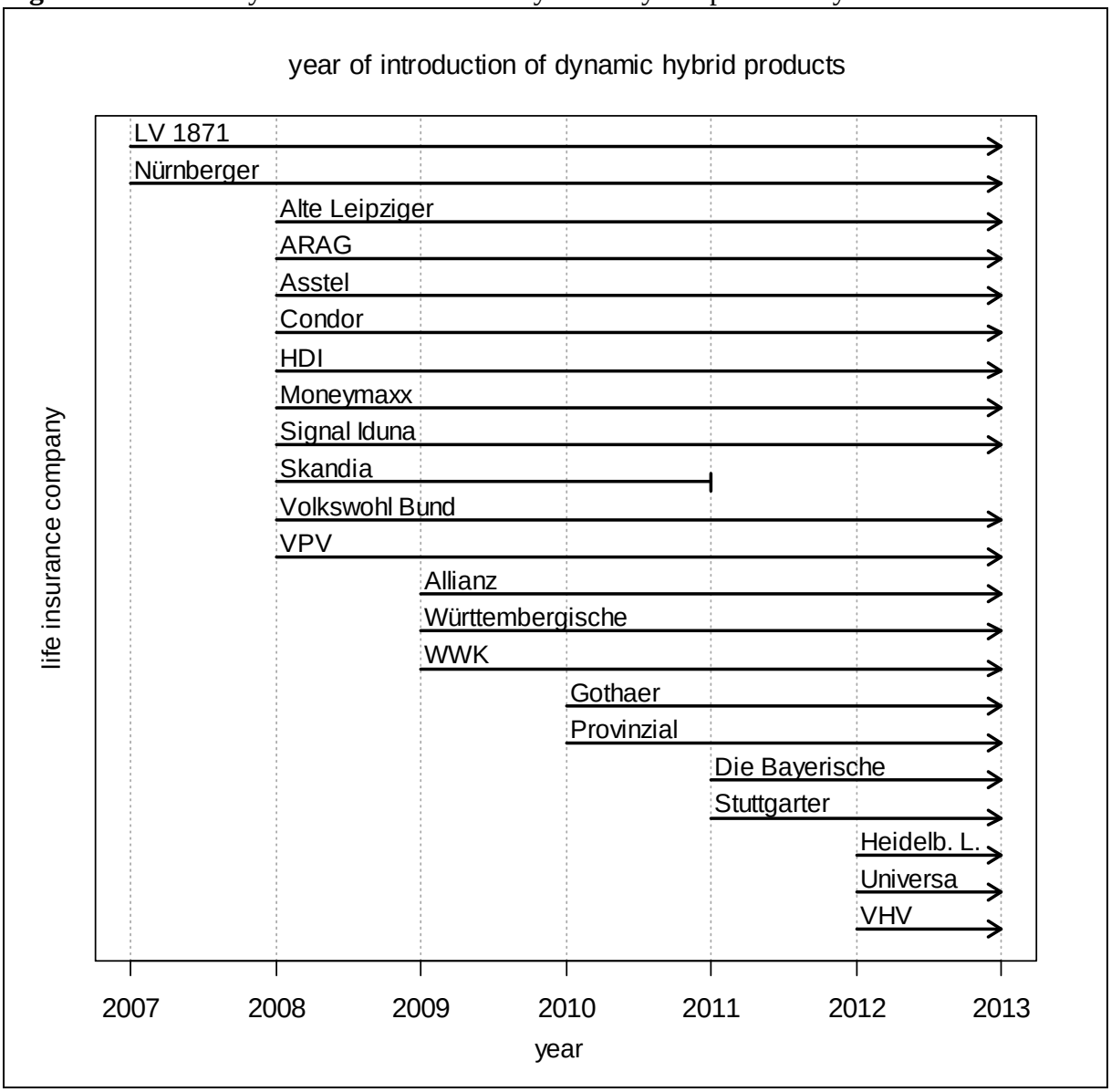

Table 1 gives an overview of dynamic hybrid products offered as deferred annuity contracts that are currently available in the German life insurance market.[19] The first column shows insurance companies offering dynamic hybrids, whereas the second column lists either concrete products that are offered by the corresponding company or the name of a product line, if available. The third and fourth column provide information about the availability of different contract versions with respect to taxation and government-subsidization and the basic design of the dynamic hybrid products' shifting system, respectively.

[18] This information is based on inquiries made by telephone. Skandia offered partial dynamic hybrid products, but discontinued new business with unit-linked and other insurance products in 2012, due to strategic decisions of the globally acting parent company Old Mutual (see www.skandia.de).

[19] The list is mainly based on information that is available through the insurers' websites and it is assembled with the aim to provide a comprehensive market overview, as to our knowledge, it covers most of the market.

The results in Table 1 show that about 70% of the product lines (15 out of 21 considered product lines) are available in all three levels of the German retirement arrangements, i.e. (1) the products are offered as a so-called basic pension or "Rürup" pension with deferred taxation ("basic"),[20] (2) as a government-subsidized version called "Riester" ("subsidized"),[21] and (3) as a private pension plan ("private"), for which premiums have to be paid out of taxed income. Only two insurers offer dynamic hybrid products solely in a government-subsidized version (see Asstel, 2013; Heidelberger Leben, 2013), whereas four insurers offer in addition to private pension plan versions, either subsidized versions (see Die Bayerische, 2013; Gothaer, 2013; Universa, 2013) or a basic pension (see VHV, 2013).

Dynamic hybrid products that are available in the German insurance market can further be distinguished in 2-fund and 3-fund concepts. The prevailing design is the 3-fund approach that is used by 19 (out of 21 considered) insurers, whereas a 2-fund system is used by two insurers only (see Allianz, 2013; WWK, 2013). While the two available 2-fund concepts invest in the insurer's policy reserve stock and an equity fund(s) (see Allianz, 2013; WWK, 2013), the 3-fund dynamic hybrids additionally use a guarantee fund as a third fund.

As outlined above, all dynamic hybrid systems apply a periodical rebalancing process between the used funds. However, the time intervals between these shifts differ for considered concepts. On the one hand, short intervals are necessary to be able to immediately react to market movements and to reallocate capital to less risky investments, such as the insurer's policy reserve stock or a guarantee fund, for falling markets or vice versa in case of an upward trend of the investments. On the other hand, costs incur for every reallocation of funds, which thus constitute a tradeoff between minimizing transaction costs and keeping the capacity to act as quickly as possible. Here, we can observe two different implementations, i.e. the considered concepts either conduct shifts (if necessary) every day or once per month. In our study, the concepts of 18 insurers control and shift once per month, while it is done daily by 3 insurers, which are denoted by an asterisk in Table 1 (see Allianz, 2013; VPV, 2013; WWK, 2013). It can be noticed that the 2-fund concepts coincide with the daily shifting, while virtually all 3-fund approaches use the monthly shifting, except for one 3-fund mechanism that conducts shifts every day (see VPV, 2013). This is due to the fact that the 3-fund products use

[20] A "Rürup" pension plan is subject to tax deferral, i.e. in the accumulation phase, premiums are paid prior to taxation and annuity payments are taxed in the payout phase (currently, premiums as well as annuity payments are partly taxed in the transition period until 2040). Contracts have to fulfill certain criteria to be eligible as a "Rürup" pension, *inter alia*, annuitization in the payout phase is mandatory. These kinds of products are mainly intended for self-employed persons to cover the gap between state-run and private pensions.

[21] A "Riester" pension plan is subsidized by the government, which contributes to the contract by additional payments and tax benefits. To qualify as such a contract, policies must have, *inter alia*, a money-back guarantee. At the end of the accumulation phase, 30% of the contract value is allowed to be paid out as a lump-sum payment, while the remainder has to be annuitized.

a guarantee fund in addition to the policy reserve stock to provide the guarantee. In contrast to this, the 2-fund systems have to be more flexible, as they make use of the policy reserve stock only in order to ensure the guarantee promised to the policyholders.

Table 1: Offered 2- and 3-fund dynamic hybrid products in Germany[22]

Insurance company	Product line / product	Product type	Design
Allianz	Invest alpha-Balance	basic / subsidized / private	2-fund*
Alte Leipziger	ALfonds	basic / subsidized / private	3-fund
ARAG	FoRte 3D	basic / subsidized / private	3-fund
Asstel	Riester-Rente ReFlex	subsidized	3-fund
Condor	Congenial	basic / subsidized / private	3-fund
Die Bayerische	Garantierente ZUKUNFT	subsidized / private	3-fund
Gothaer	ReFlex	subsidized / private	3-fund
Heidelberger Leben	SafePerformer Riester Rente	subsidized	3-fund
HDI	TwoTrust	basic / subsidized / private	3-fund
LV 1871	Performer	basic / subsidized / private	3-fund
Moneymaxx	Basisrente / Riesterrente / Betriebsrente / Privatrente	basic / subsidized / private	3-fund
Nürnberger	Doppel-Invest	basic / subsidized / private	3-fund
Provinzial	GarantRente Vario	basic / subsidized / private	3-fund
Signal Iduna	SIGGI	basic / subsidized / private	3-fund
Stuttgarter	performance-safe	basic / subsidized / private	3-fund
Universa	topinvest	subsidized / private	3-fund
VHV	Variorente-Invest	basic / private	3-fund
Volkswohl Bund	Basis- / Riester-Rente	basic / subsidized / private	3-fund
VPV	ISS	basic / subsidized / private	3-fund*
Württembergische	Genius	basic / subsidized / private	3-fund
WWK	IntelliProtect	basic / subsidized / private	2-fund*

*Notes: *reallocation of funds is conducted daily; it is conducted monthly in the other cases; basic refers to a basic pension "Basisrente" or "Rürup" with deferred taxation and mandatory annuitization; subsidized means government-subsidized ("Riester"); private denotes a private pension plan with "prior" taxation, i.e. premium(s) are paid out of taxed income, while a portion (currently 50%) of earnings are tax-deferred.*

[22] See the contract brochures available at the insurers' websites, i.e. see, www.allianz.de, www.alte-leipziger.de, www.arag.de, www.asstel.de, www.condor-versicherungsgruppe.de, www.diebayerische.de, www.gothaer.de, www.heidelberger-leben.de, www.hdi.de, www.lv1871.de, www.moneymaxx.de, www.nuernberger.de, www.provinzial.de, www.signal-iduna.de, www.stuttgarter.de, www.universa.de, www.vhv.de, www.volkswohl-bund.de, www.vpv.de, www.wuerttembergische.de, www.wwk.de; furthermore see product investigations by ITA (www.ita-online.info) for contracts of Condor, Nürnberger, Stuttgarter, VPV, Württembergische, and WWK.

Even though the insurers' product descriptions are typically less informative with respect to details about their shifting mechanisms of the dynamic hybrids, some specifications can be addressed in what follows. In many cases, brochures and contract documents of 3-fund systems state solely that the underlying investment strategy uses the life insurer's policy reserve stock (identical to the one for traditional contracts), a guarantee fund, and an equity fund. The equity fund investment can generally be selected by the policyholder as illustrated. Even though, insurers do not reveal details, many descriptions indicate that the systems in principle resemble Equation (3) (see, e.g., Condor, 2013; Gothaer, 2013). In case of Condor,[23] an explanation of the investment mechanism shows an analogy to Equation (3) with $\Delta t = 1$ month, $r = 0\%$ and $\lambda = 0.2$, i.e. they use a guarantee fund that cannot lose more than 20% of its value per month. Condor pays an interest rate of at least 1.75% on funds in the policy reserve stock, but this is not taken into account for the shifting algorithm as explained in the documents (otherwise, r would have to be set to 1.75% in Equation (3)). In addition to this, several other 3-fund products seem to be similar, but no further information is provided though.

However, some insurers offering 3-fund systems state modifications from the general approach given in Equation (3) and further characteristics. To begin with, not all systems that are fully dynamic, i.e. that allow for a reallocation of capital between all considered funds (third generation), allow these shiftings without any limitations. Siebert (2008) mentions such limitations with regard to risk management. Here, Provinzial, for instance, restricts shifts from the policy reserve stock to the other funds to 4% of the account value (see Provinzial, 2013). Furthermore, insurers introduce unique features of their investments' rebalancing processes in order to meet different customers' needs. In contrast to Equation (3), where capital is allocated to a maximum of two funds at a time, Stuttgarter operates a system that simultaneously uses all three funds (see also Ortmann and Riskow, 2011). In doing so, they target a different risk-return profile, which is further addressed below. Next, Württembergische uses a 3-fund system with a policy reserve stock, a guarantee fund, and an equity fund that is not further specified and different from other approaches at first sight. In particular, in contrast to a CPPI-based guarantee fund, which is quite common, an OBPI approach is used for the guarantee fund (see Ortmann, 2009). Here, a so-called zero-cost collar strategy is applied, i.e. long put options protect against falling prices, while the option premiums are paid by selling short calls (limiting the upside potential). This idea is used to avoid pro-cyclical trading in case of a CPPI strategy in the guarantee fund. In contrast to the other 3-fund systems that reallocate a contract's capital once per month, VPV uses a system that shifts the capital daily.[24] In addition to this difference, the three funds consist of the policy reserve stock and two guarantee

[23] See downloads.condor-versicherungsgruppe.de/video/hybridmotor2/Condor_Der_dynamische_Hybrid.wmv.

[24] This system is called "ISS" or "Intelligent Shift-System" (see VPV, 2013).

funds,[25] instead of an equity fund and one guarantee fund only (see VPV, 2013; Ortmann, 2010).

Apart from the daily shifting approach, the two considered 2-fund concepts also show differences. WWK's dynamic hybrid product resembles an individual CPPI system that uses the insurer's policy reserve stock as the risk-free asset and an equity fund investment as the second pot.[26] It is stated that the system aims at a high portion of the equity fund (see WWK, 2013). As is typical for CPPI systems, the reallocation of funds is done in a pro-cyclical way (see Ortmann and Pfeifer, 2010). Analogous to WWK, the dynamic hybrid product by Allianz also invests in the policy reserve stock and an equity fund. However, the shifting mechanism differs and it represents a special type of a dynamic hybrid product, which is occasionally referred to as a dynamic hybrid product of the fourth generation (see Witte, 2010). Allianz states that the allocation of the account value between policy reserve stock and equity fund is optimized with the aim to avoid numerous pro-cyclical shiftings, especially in a volatile capital market environment. Here, capital is only reallocated if necessary to protect the guarantee. It is denominated as an anticipatory investment strategy with the idea to buy and hold investments, but no further details are available (see Allianz, 2013).

Next, we focus on an overview of the market with respect to embedded options as well as contract components. Products are typically designed according to the idea of modularity, where each contract can be customized. We thereby consider eight categories, namely investment decisions, minimum guaranteed payoff, lock-in guarantees, payoff options, expiry management, case of death, additional insurance, and premium payment options. At first, a summary is provided in Table 2, while explanations follow thereafter.

[25] One guarantee fund focuses on more risky investments and allows a 20% loss within one month at most, and the other guarantee fund invests less risky and ensures 90% of its value at the end of the month, i.e. it allows a drop of 10% in value per month at most. The guarantees are ensured via a CPPI strategy and the two guarantee funds are funds of funds, which are composed of investments selected by the insurer (see VPV, 2013; Ortmann, 2010).

[26] This system is called "WWK IntelliProtect" (see WWK, 2013).

Table 2: Market analysis of product features embedded in dynamic hybrid contracts[27]

Category	Product feature	Availability[28]
Investment decision	Fund investment can be chosen by policyholder and changed during the contract term (shift and switch)	Provided by 20 insurers (all except VPV)
Minimum guaranteed payoff	Full money-back guarantee (as required for a Riester pension plan)	12 insurers
	Choice of the guarantee level[29]	9 insurers
Lock-in guarantees	Individual lock-in option of the full account value	8 insurers
	Automatic lock-in	5 insurers full lock-in, 3 partial lock-in, 1 both
	No lock-in	5 insurers
	Lock-out option	2 insurers
Payoff options	Lump-sum, annuity, and combination thereof	All insurers (depending on product type)
Expiry management	Option for the last 3-5 years of the accumulation phase	All insurers
	Offered within a life cycle model	3 insurers
Case of death	Death benefit: Account value or maximum of account value and paid-in premiums	All insurers
	"No death benefit" option[30]	3 insurers
Additional insurance	Options typically include disability insurance, term life insurance and long-term care insurance	Available by most insurers
	Additional contribution	All insurers
Options for premium payments	Single premium vs. periodic premiums; increase and decrease premiums; dynamic premium option; pause and resume premium payments; stop premium payments (paid-up option)	Available by most insurers

[27] Based on the product brochures stated at Table 1.

[28] Out of 21 considered insurers; the investigation is based on the product lines and products, respectively, considered and shown in Table 1.

[29] Option that allows the customer to set the guarantee level in percentage points of a money-back guarantee, e.g. a 50% money-back guarantee.

[30] Customer can choose whether the contract includes a death benefit or not.

Investment decisions. Generally, the policyholder can choose the funds to invest in and is also allowed to change this decision during the contract term. In our investigation, only one insurer's investment mechanism does not allow the customer to choose its preference. Here, funds are automatically selected by an investment system called ISS (see VPV, 2013).[31] In all other considered cases (20 insurers out of 21), the choice of funds ranges from 6 (see, e.g., Asstel, 2013) to more than 100 funds (see, e.g., Condor, 2013), i.e. the customer can compose its risky portfolio by selecting from this range of funds that is often referred to as a fund universe (see, e.g., Condor, 2013; Moneymaxx, 2013). This fund universe typically comprises various investment alternatives, such as individual funds, funds of funds, funds with guarantees (money-back or look-back guarantee), or portfolios that are actively managed according to a certain risk preference (see, e.g., Allianz, 2013; Universa, 2013). To facilitate the investment decisions, the various alternatives are categorized based on different degrees of risk aversion, e.g., into three categories such as conservative/stability, balanced/growth, and risky (as done by Allianz and Universa).

To complete the investment choice, the customer does not have to restrict its decision to a single fund, but typically can select more than one fund up to a maximum number of funds that can be hold in a customer's fund portfolio at the same time. This maximum number ranges for the considered contracts from 5 (see, e.g., Gothaer, 2013; LV 1871, 2013; VHV, 2013) to 20 funds (see, e.g., HDI, 2013; Heidelberger Leben, 2013; Stuttgarter, 2013). In doing so, the customer can typically specify the portion for each fund in percent, while usually there is a minimum holding per fund, which can be a proportion of the total fund investment, e.g. 5% (see Heidelberger Leben, 2013) or 10% (see Universa, 2013). Throughout the duration of the contract, this partitioning might differ from its initial allocation due to changes in the funds' market values. Therefore, policyholders can often choose a so-called rebalancing option (for a fee), which reallocates the fund investments regularly (e.g. yearly) according to the initial chosen partitioning (see, e.g., Stuttgarter, 2013; LV 1871, 2013; Württembergische, 2013).[32]

In addition to choosing the initial investments, the policyholders can also change their investment decisions during the contract term. First, the current account value of the funds can be shifted to different funds (out of the insurer's range of funds), which is called the shift option. This does not change the decision where new capital is invested in; it solely changes the current fund allocation.[33] Second, the so-called switch option changes the investment decision

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[31] This system called "ISS" or "Intelligent Shift-System" thereby selects index funds out of a fund universe with more than 100 funds (see VPV, 2013).

[32] Hence, investments that performed well in the last period are sold, i.e. gains are realized, whereas assets that have underperformed are bought again leading to a counter-cyclical strategy (see Ortmann, 2009).

[33] New capital refers to future premium payments as well as money from the policy reserve stock (and guarantee fund in case of a 3-fund dynamic hybrid system), which is allocated to the fund investments in the future.

for new capital that is invested in funds. Third, in order to change the current and future investment allocation, the shift and switch option can be applied both.[34] The shift and switch options are provided by all insurers that allow their policyholders to choose the fund investments (20 out of 21). Generally, shifts and switches are without a charge or at least a certain number is for free once a year (see, e.g., ARAG, 2013, Volksbund Wohl, 2013; WWK, 2013).

Minimum guaranteed payoff. While government-subsidized Riester pension plans require a money-back guarantee (100% payback of the paid-in premiums at maturity) by law,[35] private contracts can provide a choice of the guarantee level. At inception of a private contract, the policyholder can often set the minimum guaranteed payoff at maturity (within boundaries) in percent of the paid-in premiums,[36] i.e. the contracts are designed based on the idea of modularity where one product can be individualized to fit different customers' needs.[37] This possibility to freely choose the contract's minimum guaranteed payoff at maturity within a given range is provided by 9 (out of 21) considered insurers. This range to choose from varies from insurer to insurer. The widest range (of the considered contracts) is given by the LV 1871, where the policyholder can choose the minimum guaranteed payoff between 0%, i.e. no guaranteed payoff at maturity, to a 100% guarantee (money-back guarantee) plus an annual interest rate guarantee of 1.75% on the paid-in premiums (see LV 1871, 2013).[38] A more typical range is from 0% to 100% (see, e.g., Signal Iduna, 2013; Württembergische, 2013), while ranges from 10%, 50%, and 60%, respectively, to 100% are also offered (see, Stuttgarter, 2013; Provinzial, 2013; Gothaer, 2013).[39] The remaining 12 insurers provide a fixed 100% money-back guarantee (see, e.g., Die Bayerische, 2013; Universa, 2013), whereof 2 insurers solely provide Riester pension plans requiring a money-back guarantee by law (see, Asstel, 2013; Heidelberger Leben, 2013).

Lock-in guarantees. In addition to the minimum guaranteed payoff, many contracts include an option to lock-in the current account value, which in the sequel is guaranteed at maturity. Two approaches can be distinguished. First, the policyholder can individually choose the time for a

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[34] Note that there is a maximum number of funds that can be kept in a policyholder's portfolio at the same time.

[35] To qualify for a government-subsidized Riester pension plan, the paid-in premiums have to be available at the end of the accumulation phase (money-back guarantee) (see German Federal Ministry of Justice, 2001).

[36] This guarantee also accounts for additional payments minus payoffs (possible in most contracts) during the contract term.

[37] The choice of the minimum payoff guarantee influences the investment strategy's riskiness.

[38] Note that *in extremis*, i.e. without any guarantee or with a money-back guarantee plus an annual interest rate equal to the minimum interest rate guarantee of the policy reserve stock, the contract leads to a pure unit-linked policy and a traditional contract, respectively. In the first case, funds would solely be invested in the equity fund class, whereas for the latter, funds would fully be put in the policy reserve stock as done in a traditional life insurance.

[39] In addition to a money-back guarantee, VPV offers a 110% guarantee on the paid-in premiums, for which the contract term has to be 17 years at least (see VPV, 2013).

lock-in at specific dates, e.g. at the beginning of a month or a year (see, e.g., Alte Leipziger, 2013), and second, a mechanism can automatically conduct this lock-in (see, e.g., VHV, 2013). The automatic lock-in options available in the market differ with respect to the guarantee level of the lock-in, i.e. some systems do not guarantee 100% of the current account value, but only a certain percentage thereof with the aim to keep a higher portion of the funds in risky investments (see, e.g., Gothaer, 2013; Signal Iduna, 2013). The individual lock-in option of the full account value is provided by 8 (out of 21) insurers and the automatic version is provided by 9 insurers (5 full lock-in, 3 partial lock-in, 1 both), while one of these insurers offers the individual as well as the automatic version (see Condor, 2013). None of both options is offered by 5 insurers. In addition to the lock-in option, 2 insurers mention the possibility for a lock-out, which sets the current guarantee level back to a previous lock-in level (see Provinzial, 2013; Stuttgarter, 2013). This can be done to increase the yield opportunities by increasing the portion of risky investments.[40]

Payoff options. At the end of the accumulation phase and the beginning of the payout phase, the policyholder's account value can be paid out as an annuity, a lump-sum payment,[41] or a combination thereof (see, e.g., Allianz, 2013; Heidelberger Leben, 2013). All considered contracts offer these three possibilities, but for a Riester pension plan, a lump-sum payment of 30% at most is allowed, the rest of the account value has to be paid out as an annuity (see German Federal Ministry of Justice, 2001). For the considered contracts, there are different versions for annuitizing the available capital at the end of the accumulation phase. In addition to a standard annuity (lifelong), capital could be paid out as a temporary annuity (see, e.g., Moneymaxx, 2013), an annuity with annuity payments that increase every year by a certain percentage (see, e.g., Heidelberger Leben, 2013; LV 1871, 2013), or an annuity with annuity payments that are increased by surplus and that are constant unless surplus is decreased (see, e.g., Heidelberger Leben, 2013; LV 1871, 2013). Furthermore, the dynamic hybrid investment mechanism of the accumulation phase can be maintained throughout the payout phase, which is called a dynamic hybrid annuity (see, e.g., Württembergische, 2013). Apart from deciding the type of the payoff, the policyholders can also choose individually the beginning of the payout phase. Each insurance company offers a range of ages to choose from. For the considered contracts, ranges from 62 to 70 (see Heidelberger Leben, 2013) up to 55 to 85 (see Allianz, 2013) are provided.[42]

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[40] For a contract with a single premium, this might be a possibility to escape from a situation comparable to a cash-lock position.

[41] This depends on the type of contract. In case of a basic contract ("Rürup"), the annuitization is mandatory, whereas for a government-subsidized "Riester" contract, 30% of the contract value can be paid out as a lump-sum payment.

[42] Note that the payout phase cannot begin before the age of 60 for a Riester contract (see German Federal Ministry of Justice, 2001).

Expiry management. The idea of expiry management is to protect the available and achieved account value in the last years of the accumulation phase against sudden drops at the capital market (preparation for the payout phase) by shifting capital that is invested in equity funds to safer assets, i.e. the guarantee fund or the policy reserve stock.[43] An expiry management (see, e.g., Asstel, 2013; WWK, 2013) is typically an option that a customer can choose (and typically at no charge) or it is offered in the context of a life cycle model that controls investment decisions depending on the contract's time to maturity, not only for the final contract years. A life cycle model's aim is to keep a relatively high portion of risky assets in the early contract years with an upside potential and decrease this portion until maturity of the contract to achieve a stable payoff at the end of the accumulation phase. All considered contracts in this study offer an expiry management. It is typically offered for the last 3-5 years of the accumulation phase (before payout phase). An expiry management within a life cycle model is offered by 3 out of 21 considered life insurers (see HDI, 2013; Nürnberger, 2013; Stuttgarter, 2013).

Case of death. In case of death during the accumulation phase, most commonly either the current account value is paid out to the heirs (see, e.g., Allianz, 2013; Heidelberger Leben, 2013), or the maximum of the current account value and the premiums paid until then (see, e.g., Condor, 2013; Nürnberger, 2013). Alternatively, 3 insurers mention that the policyholder can also choose the "no death benefit" option (see Condor, 2013; Volkswohl Bund, 2013; Württembergische, 2013). In addition to this, different death benefits can be insured in the context of an additional term life insurance.

Additional insurance. Additional insurance options typically include disability insurance, term life insurance and long-term care insurance (see, e.g., Gothaer, 2013; Signal Iduna, 2013). Provinzial (2013), for instance, mentions that their contracts already include an insurance against dread disease. Furthermore, additional contributions to the contracts are possible in all considered policies.

Premium payment options. At inception of the contract, the customer has to decide whether to choose a single premium contract or a contract with periodic premium payments, i.e. annual or monthly premiums (see, e.g., Württembergische, 2013). In many contracts, periodic premium payments can be decreased as well as increased (that resembles an additional insurance) during the contract term (see, e.g., Allianz, 2013; Alte Leipziger, 2013). But not all insurers allow an increase of the premiums (see VPV, 2013). Apart from a single increase of the future

[43] To apply an expiry management might not be beneficial per se and policyholders should choose the option depending on the market situation, since the expiry managements do typically not consider current market conditions (bear/bull market) and shift funds from risky assets to low-risk assets according to a fixed mechanism that generates a loss at a disadvantageous point in time (see, e.g., Witte, 2009).

premiums, a dynamic premium option increases periodic premiums by a fixed percentage every year (see, e.g., HDI, 2013; WWK, 2013). In case of difficulties with the premium payments, policyholders can typically pause (e.g. up to 3 years) as well as subsequently resume their premium payments (see, e.g., Signal Iduna, 2013). In addition to this, policyholders can choose to stop paying premiums at any time (paid-up option), which leads to an abbreviated contribution period (see, e.g., Heidelberger Leben, 2013).

4. Comparability of Products: Risk-Return Profiles

When aiming to assess the attractiveness of innovative insurance products from a policyholder's perspective, risk-return profiles are of high relevance, which are thus studied in detail in the following section. In traditional life insurance, it has been common in the past to compare contracts on the basis of deterministic projections of the contract values that include, to an appropriate degree, surplus.[44] In contrast to the traditional policies, dynamic hybrid products' payoff at maturity fundamentally depends on the rebalancing process along with the development of the individual funds. Hence, projections have to include the monthly or daily reallocations of funds, i.e. it is vital to account for the products' path-dependency to obtain reliable results. Toward this end, stochastic simulations are used that model the path-dependent development of an insurance contract based on capital market scenarios, i.e. risk-return profiles are generated for the products (see, e.g., Gatzert and Schmeiser, 2009).[45] In order to be able to compare different contracts, the simulations' underlying assumptions with respect to the capital market have to be identical. While there is no standard in the market so far, different approaches that provide comparable risk-return profiles of innovative life insurance products exist (see, e.g., Tremmel, 2011).[46] For instance, such risk-return profiles are provided by ITA Select, which use the software "ifa-SARA" to generate results, as well as by Morgen & Morgen through "Volatium".[47]

Figure 2 exhibits risk-return profiles for dynamic hybrid products as provided by Morgen & Morgen's Volatium. Here, all insurers are considered that offer a dynamic hybrid product as a private pension plan and provide a Volatium profile.[48] The graphs show the probabilities that the actual rate of return p.a. on the paid gross premiums per contract fall in certain ranges.

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[44] Assumptions have to be specified based on an evidence of financial viability ("Finanzierbarkeitsnachweis").

[45] See Gatzert (2013) for a study of the impact of different premium payment schemes on the performance of unit-linked contracts, which can vary considerably depending on the premium type already despite the same present values and keeping all other contract parameters unchanged.

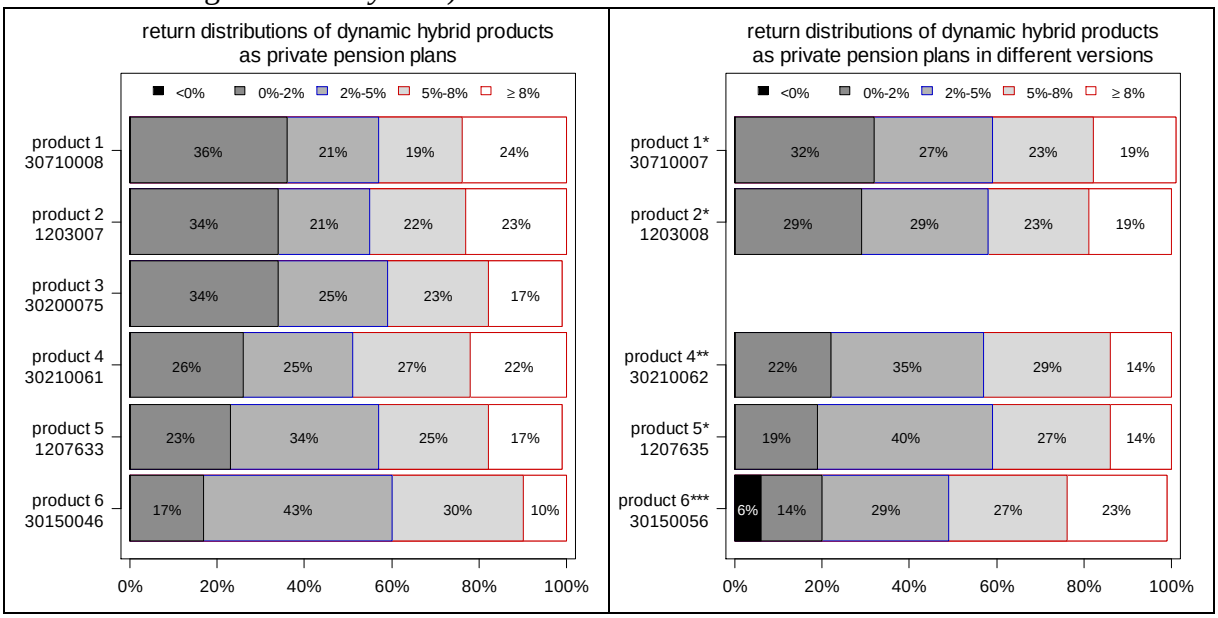
[46] While risk-return profiles allow a comparison of various dynamic hybrid products, it also enables a comparison to different unit-linked policies or other innovative life insurance contracts such as equity-indexed annuities (e.g. the "PrivatRente IndexInvest" by R+V, see www.ruv.de).

[47] See, www.itaselect.de, www.ifa-ulm.de, and www.volatium.de.

[48] Volatium profiles are available for about one third of the considered insurers in Table 1.

Here, private contracts with durations of 30 years are listed.[49] While the left graph in Figure 2 illustrates profiles for the contracts with standard tariffs with a 100% money-back guarantee, the right graph shows the corresponding products with different contract options as explained in the notes of Figure 2. For instance, while an 80% money-back guarantee is applied for product 6 (right graph), in case of product 4 (right graph), the impact of an expiry management is illustrated. Products marked with one asterisk are equipped with an additional lock-in guarantee. Note that all other contract features are identical to the ones in the left graphs.

Figure 2: Probabilities that the actual rate of returns p.a. on the paid gross premiums lie in the given ranges for dynamic hybrid products with a contract term of 30 years (the contracts' Volatium ID is given on the *y*-axis) [50]



*Notes: *with lock-in guarantee; **includes an expriy management; ***80% money-back guarantee; due to rounding, the percentages can deviate from 100% in total.*

[49] Profiles of the corresponding government-subsidized versions of the contracts ("Riester") are virtually identical to those shown here.

[50] Morgen & Morgen state that their profiles are based on Monte Carlo simulations with 10,000 capital market scenarios, for which the development of stocks and bonds is modeled via the Heston model and the Cox–Ingersoll–Ross (CIR) model, respectively. While the equity fund is modeled identically for every contract and insurance company, differences and specific characteristics in the guarantee funds and policy reserve stocks of different insurers are taken into account. The calculations are conducted for male policyholder with the age of 67 at maturity and monthly premium payments of €100. Further specifications are provided at www.volatium.de. However, the provided information does not suffice to mathematically reproduce the results. According to Tremmel (2011), a complete and publicly available documentation of the method is indispensible in order to become a standard in the market.

As Figure 2 (left graph) shows, the products' risk and return profiles can differ considerably. Apart from variations in the companys' average interest rates for the policy reserve stocks,[51] these substantial differences stem from the diverse shifting mechanisms of the insurers. Thus, even though the company-specific algorithms are not released by the insurers, policyholders can choose a product according to their risk-return preferences. Here, product 1 and product 6 differ substantially, for instance. A comparatively high probability of a return of more than 8% p.a. in case of product 1 (left graph in Figure 2) comes along with a also relatively high probability of a moderate return of 0%-2%, while this is different in case of product 6, for which an annual return of 2%-5% is most likely. While many systems aim to invest a high proportion of the account value in equity funds (highest upside potential of the three fund types) and also specified in Equation (3),[52] a different approach is applied for product 6 (see Stuttgarter, 2013). As indicated before, this mechanism uses the three fund types simultaneously, i.e. capital is always distributed to all three funds at a time. As can be seen in the left graph of Figure 2 (product 6), this procedure cuts upside potential, but also considerably increases the chance for returns in the third and fourth category, i.e. for returns between 2%-8%. Moreover, a different shifting algorithm does not implicate a different risk-return profile per se. While almost all listed products in Figure 2 are 3-fund concepts, product 2 is the 2-fund system by WWK. As the left graph demonstrates, the profile of product 2 does not differ substantially from the products 1 and 3, although these products are 3-fund concepts.

The impact of different contract options can be observed when considering the right graph of Figure 2.[53] First, the profiles of the corresponding standard contracts with added periodical lock-in guarantees are provided in case of the products 1, 2, and 5 (marked with an asterisk). Here, it can be observed that the probabilities for the returns to fall into the upper category (more than 8% p.a.) and the lower category (0%-2%) decrease, whereas the probability for a return of 2%-5% increases considerably (and also for a return of 5%-8% p.a., but less pronounced). While the impact of an expiry management in case of product 4 basically exhibits a similar effect as compared to lock-in guarantees, i.e. probability for low and high returns decreases along with an increase of the probability for returns in the medium range, the decrease of the upside potential is stronger. In case of product 6, the effect of an 80% money-back guarantee can be seen, as compared to a 100% money-back guarantee in all other cases. Here,

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[51] Company-specific information is used to derive estimates for the interest rates (including surplus participation) that are paid on funds in the policy reserve stocks of the corresponding companies. A recent comparison of the interest rates for the policy reserve stocks generated by German life insurers can be found in Hinterberger (2013).

[52] In case of a mechanism according to Equation (3), the maximum proportion of the account value is invested in the equity fund (and guarantee fund), while still ensuring the guarantee. This implies that only two out of the three funds are filled at the same time.

[53] In case of product 3, there is no risk-return profile for another contract version available besides the standard contract.

it can be observed that a relaxation of the guaranteed minimum payoff has a positive impact on the upside potential of the product and increases the probability for higher returns considerably.

5. SUMMARY

This paper studies the market of the relatively young product class of dynamic hybrid products in Germany. We thereby focus on identifying key characteristics and contract options of the dynamic hybrids offered in the market with the aim to assess the current market situation. In a first step, we outline the different concepts of dynamic hybrid products and provide algorithms for the shifting mechanisms, wherever possible. In a second step, we present a broad market overview and analysis of contract components, including estimates that tentatively assess the market entrance of insurers, a summary of product types and embedded options along with central characteristics and features. We further address the issue of comparability of dynamic hybrid concepts and products.

The analysis presented in this paper shows that by now a considerable number of German life insurance companies provide dynamic hybrid products and that this number is steadily increasing. Insurers offer multiple contract versions that are modular and cover all types of retirement arrangements in Germany with respect to taxation and government-subsidization. The findings reveal that various shifting mechanisms for dynamic hybrid products are applied, which can be subdivided in 2-fund and 3-fund approaches in a first step. Even though, 3-fund systems are the prevailing approach, these dynamic hybrids also differ substantially in their detailed implementation and their product specifications are manifold. Some systems invest the maximum proportion of the policy's funds in the equity fund investments (along with ensuring that the guarantee can still be met). In contrast to this, other approaches aim to balance transaction costs, pro-cyclical trading and upside potential. Typically, the contract's account value is reallocated to the different funds on a monthly basis, whereas only few insurance companies conduct shiftings every day. The market analysis further shows that the shifting algorithms or details are in general not publicly available. This, in turn, makes it difficult for policyholders to compare the products per se, while risk-return profiles aim to create a comparability and transparency of products. These risk-return profiles are calculated on the basis of Monte Carlo simulations. Currently, this issue is discussed in the context of possible product sheets, which are intended to contain standardized and comparable key information about an insurance policy (see, e.g., Deutscher Bundestag, 2012; Gatzert and Schmeiser, 2013). The comparison of innovative life insurance products from a policyholder's perspective has not undergone a comprehensive analysis to date and might be a worthwhile starting point for further research.

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