UNIVERSAL LIFE INSURANCE –

ASPECTS OF THE CASH VALUE

DEVELOPMENT

Martin Birkenheier

141 Pages August 2004

Life Insurance, Cash Value, Cash Surrender Value, Expenses, Premiums, Transparency, Flexibility, Taxation, Reserves, Interest Rates, Valuation, Whole Life

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The Universal Life insurance product was the first product to introduce more flexibility to the life insurance market and, at the same time, also lead to more disclosure of pricing parameters to the policyholder. During the last three years Universal Life insurance experiences a revival, caused by new product features, especially no-lapse guarantee riders.

As Universal Life Insurance is a permanent insurance contract, the accumulation of cash value is a very important feature of it. Compared to whole life policies, it even gains more importance as it is the main source to provide for the flexibility of the product.

This thesis analyzes the development of the cash value and the different factors of influence on thereon, discusses the legal framework given for the valuation of Universal Life policies and also compares Universal Life to whole life insurance contracts in different manners.

The first chapter gives an introduction on Universal Life insurance. I will briefly describe the history of the product, followed by a short summary of the product features. Further I will discuss the present market situation for Universal Life products and clarify some terminology used in this thesis. The second chapter will detail the features of Universal Life insurance. In the third chapter I will describe the regulatory provisions concerning Universal Life insurance. Chapter four will discuss the development of the cash value in detail, deriving a general formula as well as determining and describing the most important factors of influence. Chapter five compares the investment character of Universal Life insurance with the investment character of whole life insurance and term life insurance combined with an alternative investment. Chapter six gives an overview over today's Universal Life insurance market with detailed information about the credited interest rates and cash value development of today's Universal Life products. The cash value development and the internal rate of return are compared to the corresponding values of whole life contracts.

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# ASPECTS OF THE CASH VALUE

# DEVELOPMENT

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A Thesis Submitted in Partial
Fulfillment of the Requirements
for the Degree of

MASTER OF SCIENCE

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# CHAPTER I

# INTRODUCTION

This first chapter shall give an introduction to the Universal Life product. Section 1.1 will describe the history of the product Universal Life from its origins to its present state. Section 1.2 will give a very brief impression of the features of Universal Life insurance. An overview over today's life insurance market will be given in Section 1.3 and Section 1.4 will conclude the chapter with definitions and clarifications of used terminology.

## 1.1 The History of Universal Life Insurance

The idea of Universal Life was not new at its introduction in 1979. An idea describing a "Universal Life Plan" was first mentioned by G.R. Dinney in his address to the Canadian Institute of Actuaries in 1971 (Doll, 1990).

In 1975, C.H. Anderson, the president of Tillinghast & Company, defined "The Universal Life Insurance Policy" further in speeches and articles. He argued that due to the social changes happening at that time traditional whole life insurance was likely to lose much of its importance (Doll, 1990). As the whole life policies in force could not keep up with the high interest rates available in the market, combined with the consumers' fear of inflation, the insurance industry worried a significant decline in its share of the savings. This high interest scenario lead to an increasing use of policy loans which itself lead to cash-flow problems for some insurance companies and to disintermediation threat for the entire industry (Doll, 1990). (For a definition of disintermediation see Section 4.1.4) Many policyholders withdrew money from their contracts to earn a higher yield in the capital market. This was possible as life insurance contracts often offer the policyholder a loan for a predetermined interest rate. Some policyholders even surrendered their policies to get access to their funds (Doll, 1990).

The industry responded to the disintermediation threat in various ways. The key among them was the development of the concept of Universal Life Insurance. The first such policies were issued in 1977 and 1978 but were not successful due to taxation problems for the beneficiary. They were structured as term policies combined with deferred annuities. The proceeds from the annuity contract created the federal income tax problems for the beneficiary (Doll, 1990).

In 1979, the Federal Trade Commission (FTC) published a report in which whole life insurance was portrayed as a "bad investment" through which the policy owners were losing billions of dollars (Dearborn, 2000).

The industry responded with further development of the new Universal Life product.

E.F. Hutton, today First Capital Life, was the first company to introduce this new kind of product successfully in 1979, followed by some smaller companies in 1980. In 1981 major companies followed and by 1983 almost all major insurance companies offered at least one version of Universal Life insurance (Doll, 1990).

With the introduction of Universal Life the industry responded to the major objections of the FTC by crediting near market interest rates to the cash value of the policy. The new product also offered a previously unknown flexibility and transparency for the policyholder. These new benefits had their price: the loss of certain guarantees compared to whole life (Black and Skipper, 2000).

Soon after its introduction, sales for the Universal Life product soared and reached their peak in 1985 with a market share of 38% (compare Figure 1) in new premiums. Since then the market share declined slowly until it hit its minimum of 18% in 2000. This decline was mainly due to the decrease in the market level of interest rates combined with the introduction of Variable Universal Life, which combined the benefits of a variable product with those of a Universal Life contract. Variable Universal Life gives the consumer the chance to invest in the opportunities of the stock market while keeping the flexibility and transparency of Universal Life products (Pinkans, 2002b).

With the stock market downturn in 2000 and the following two years the market share of Universal Life started to increase again as more consumers, disappointed by the decline in the value of their stock investments, were looking for a stable interest income again. This development was supported by the introduction of new guarantees and riders for Universal Life products, of which the no-lapse guarantee riders drew the most attention. These riders provide a guaranteed death benefit for time periods varying between 1 year and the entire lifetime of the insured at a term insurance premium level (Pinkans, 2002b). A closer look at this type of rider is taken in Section 2.5.1. Worth mentioning about these riders is that they might lead to substantial basic and/or deficiency reserves for the corresponding products (see Section 3.1 and Section 3.3).

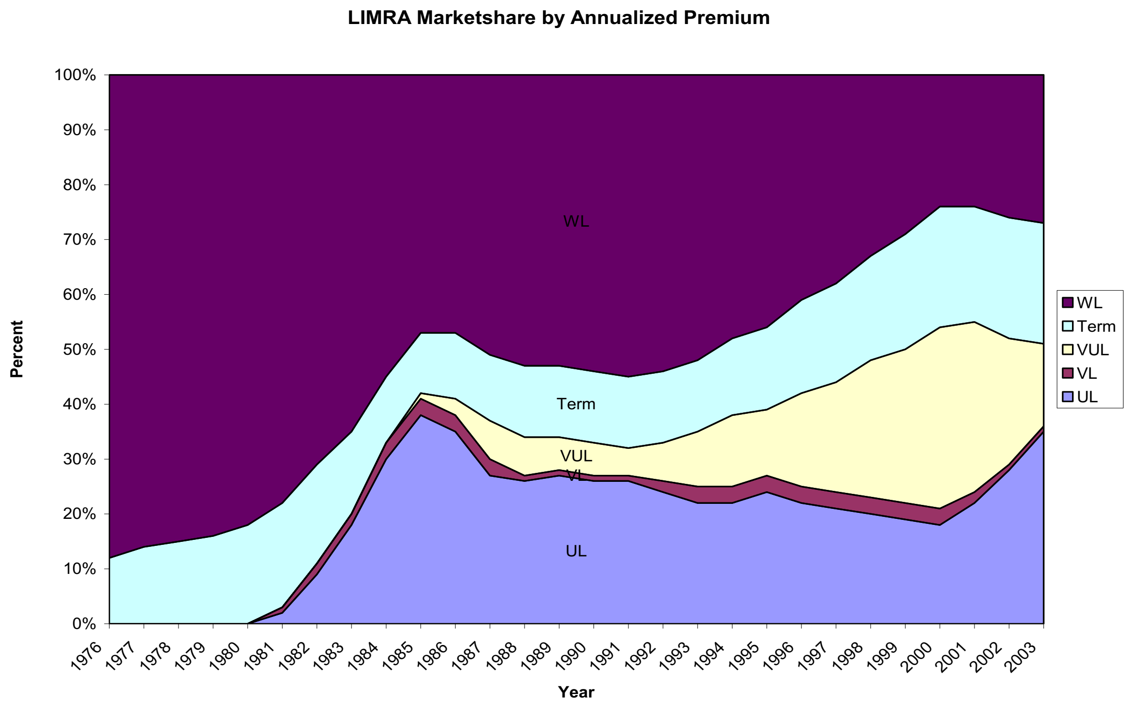


Figure 1: Market Share by Annualized Premium (LIMRA, 2004)

## 1.2 A General Description of Universal Life Insurance

A life insurance policy is a contract between an insurance company and a policyholder. The insurance company promises to pay a contractually specified amount upon the death of the policyholder, who in return pays premiums to the insurer.

Up to the development of Universal Life insurance both death benefits and premiums payment patterns of a typical life insurance policy were rather fixed with no chance to change them during the life of the contract.

With the introduction of Universal Life this inflexibility changed. Universal Life offers the customer flexibility in premium payments as well as the possibility to modify his/her death benefit coverage along with his/her needs (see Section 2.3.2).

Furthermore, this product is also designed to be transparent. This means that the policyholder is not just paying premiums in the “black box” of life insurance but is periodically informed about the development of his policy. In particular he is told about any deductions, e.g. mortality charges or expenses, and credits, e.g. premium payments or interest, to the policy (see Section 2.3.1).

Any surplus of credits over deductions is put into an account in the name if the policyholder in which these extra funds are credited with interest and accumulate over time. These funds are referred to as the cash value of the policy. The policy owner has various ways to access his cash value, even during the life of the policy. (see Chapter 4)

Examples clarifying these properties and definitions of the used expressions will be provided in the corresponding chapters.

## 1.3 A Market Overview for Life Insurance

This section shall give a short overview about the life insurance market in general. A comparison of market shares with regard to premiums, face values and policies issued will be made for universal life, whole life, variable life, variable universal life and term insurance.

We will start by explaining how the life insurance market is divided among different products. Market shares can be compared by premium, face amount or by the number of policies, and then again by in force numbers or newly issued policies.

The first table (Table 1) shows the numbers of ordinary life insurance policies issued and in force in 1998 and their corresponding market shares.

Table 1: Life Insurance Market by Number of Policies (American Council of Life Insurance, 1999)

| | Issued | | In Force | |
|---|---|---|---|---|
| | (in thousands) | (in percent) | (in thousands) | (in percent) |
| Tradtional Whole Life | 4,709 | 40.9% | 79,281 | 58.2% |
| Universal Life | 1,790 | 15.5% | 23,760 | 17.4% |
| Variable Universal Life | 1,031 | 8.9% | 5,139 | 3.8% |
| Variable Life | 67 | 0.6% | 1,035 | 0.8% |
| Total Permanent | 7,597 | 65.9% | 109,215 | 80.1% |
| | | | | |
| Term | | | | |
| Decreasing | 213 | 1.8% | 2,029 | 1.5% |
| Level and other term | 3,560 | 30.9% | 17,557 | 12.9% |
| Term additions | 127 | 1.1% | 277 | 0.2% |
| Extended term | | | 5,855 | 4.3% |
| Total Term | 3,900 | 33.8% | 25,718 | 18.9% |
| | | | | |
| Endowment Insurance | 26 | 0.2% | 1,333 | 1.0% |
| | | | | |
| Total | 11,523 | 100.0% | 136,266 | 100.0% |

As we can see, level term insurance and whole life insurance made up over 70% of the new issued market in 1998 by policies sold with Universal Life having 15.5% of the market.

For the in force consideration one can see that whole life insurance takes almost 60% of the market, mostly due to its dominant position in the past.

If we look at the numbers for face value (see Table 2) we can see that the picture here is slightly different.

Table 2: Life Insurance Market by Face Amount (American Council of Life Insurance, 1999)

| | Issued | | In Force | |
|---|---|---|---|---|
| | (in million US$) | (in percent) | (in million US$) | (in percent |
| Tradtional Whole Life | 205,749 | 15.5% | 2,276,648 | 26.8% |
| Universal Life | 175,785 | 13.3% | 2,128,217 | 25.0% |
| Variable Universal Life | 272,470 | 20.6% | 1,096,193 | 12.9% |
| Variable Life | 14,838 | 1.1% | 87,649 | 1.0% |
| Total Permanent | 668,842 | 50.5% | 5,588,707 | 65.7% |
| | | | | |
| Term | | | | |
| Decreasing | 23,974 | 1.8% | 131,975 | 1.6% |
| Level and other term | 622,960 | 47.0% | 2,649,709 | 31.2% |
| Term additions | 8,665 | 0.7% | 72,088 | 0.8% |
| Extended term | | | 50,096 | 0.6% |
| Total Term | 655,599 | 49.5% | 2,903,868 | 34.1% |
| | | | | |
| Endowment Insurance | 125 | 0.0% | 13,320 | 0.2% |
| | | | | |
| Total | 1,324,566 | 100.0% | 8,505,895 | 100.0% |

One can clearly see that the dominance of whole life is not as obvious as for the policy numbers. Term insurance had almost 50% of the newly issued market whereas whole life only had 15.5%. Universal Life contributed 13.3% while Variable Universal Life had 20.6%.

With regard to in force, the market is nearly equally divided between whole life with 26.8%, Universal Life with 25% and term insurance with 34.1%. Variable Universal Life contributes 12.9% and therefore not as important in this comparison.

Table 3 gives an overview over the distribution of premiums between the different product types.

Table 3: Life Insurance Market by Premium (American Council of Life Insurance, 1999)

| | First year | | Total | |
|---|---|---|---|---|
| | (in million US$) | (in percent) | (in million US$) | (in percent) |
| Tradtional Whole Life | 4,605 | 26.3% | 46,993 | 50.0% |
| Universal Life | 4,017 | 23.0% | 20,706 | 22.0% |
| Variable Universal Life | 7,129 | 40.8% | 14,995 | 16.0% |
| Variable Life | 155 | 0.9% | 635 | 0.7% |
| Total Permanent | 15,906 | 90.9% | 83,329 | 88.7% |
| | | | | |
| Total Term | 1,585 | 9.1% | 10,555 | 11.2% |
| | | | | |
| Endowment Insurance | 1 | 0.0% | 98 | 0.1% |
| | | | | |
| Total | 17,492 | 100.0% | 93,982 | 100.0% |

Comparing market shares by premiums gives a completely different picture with regard to term insurance. Having had about a third of the market by face amount and policies sold, term insurance only reached 11.2% market share compared by premiums. This is not surprising, as term insurance does not have the savings component of the permanent insurance products and thus requires significantly lower premiums. The *permanent products*, i.e. all non-term products (Atkinson and Dallas 2000), shared 88.7% of the market between them. Whole life had 50% of the total premiums but only26.3% of the first year premiums, which shows the decline of its market share. The numbers support the observed increase of the market share of Variable Universal

Life as it accumulated 40.8% of first year premiums compared to 16% of total premiums. Universal Life stayed constant at about 22%.

## 1.4 Clarifications of the Terminology Used

While most of the terminology used in actuarial science is clearly defined, I would like to clarify some expressions used throughout this thesis to avoid ambiguous situations and prevent misunderstanding.

The term *cash value* refers to the accumulated funds inside the policy, i.e. the amount on which interest is credited. The cash value is also referred to as the account value of the policy (Atkinson and Dallas, 2000). In some publications, the term cash value is used for what I will define to be the cash surrender value of the policy. The *cash surrender value* of a policy is the amount available as nonforfeiture benefit to the policyholder. It is most commonly defined as the cash value minus a surrender charge. The *nonforfeiture benefit* of a policy are the benefits which are not lost due to a premature ending of the policy contract, either in from of lapsation or full surrender (Bowers et al., 1997). For more details on cash value and cash surrender value see Section 2.2 and Chapter 4.

The term *whole life insurance* refers to ordinary participating whole life insurance, unless otherwise noted in the text. *Whole life* insurance provides a typically level death benefit for the lifetime of the insured, as long as the required premiums are paid (Atkinson and Dallas, 2000). The pricing is typically based on guaranteed values for expense, mortality and interest rates.

*Participating whole life insurance* includes some non-guaranteed elements. These elements are mostly forms of participation on the excess of real experienced expense, interest and mortality rates over the assumed ones (Black and Skipper, 2000). The most common form of participation is dividend payments. The term *ordinary* life insurance refers to premium payments during the whole life of the policy, meaning that no limited-pay policies are considered (Black and Skipper, 2000).

Further will the term Universal Life Insurance only refer to contracts which allow for flexible premium payments and exclude so called fixed premium Universal Life insurance contracts. These contracts are also referred to as current-assumption whole life contracts (Black and Skipper, 2000) and do not have all the properties which define a typical Universal Life product.

# CHAPTER II

# THE FEATURES OF UNIVERSAL LIFE INSURANCE

The following chapter shall give a deeper understanding about how Universal Life insurance works in detail. First I am going to describe the common life insurance components premiums, expenses, death benefit and lapses in general as well as with regard to Universal Life. Following this I am going to discuss the cash value accumulation of the policy as well as its distinction from the cash surrender value. Afterwards I will discuss the flexibility and transparency of this product. Section 2.4 will deal with the requirements for life insurance contracts and give an overview over the income tax benefits of life insurance. A discussion of the most common riders found in Universal Life products will conclude the chapter.

## 2.1 The Common Life Insurance Components

### 2.1.1 Premiums

The general purpose of premiums is to pay for expenses, the cost of insurance and to for any surplus premiums to accumulate for cash value, when such cash values are applicable. For Universal Life all three of these parts are very important. Especially as there is no fixed premium payment schedule as for traditional life products, i.e. the time and the amount of premium paid by the policyholder may vary, the accumulation of cash value is of even more significance than in traditional whole life insurance (Black and Skipper, 2000).

The benefit premiums for traditional insurance products are typically determined by the equivalence principle (Bowers et al., 1997):

Expected value of future benefits

= Expected value of future premiums

This method works only limited for Universal Life insurance as there often exist no exactly defined future benefits and as premium payments are uncertain, this complicates determining an expected value as well. Premiums for Universal Life policies are set depending on the desired funding level for the policy, under consideration of actuarial principles (Cherry, 2000).

In the case that the policyholder decides to skip a premium payment, the expenses and mortality charges for the period are deducted from the cash value of the policy (Black and Skipper, 2000). As the skipping of premium payments is the right of the policyholder, it would not be reasonable to define lapsing of a policy as in traditional products.

For Universal Life insurance a policy lapses if the cash value is not sufficient to pay for expenses and mortality charges (Country, 2004). How this mechanism works exactly will be explained in Section 4.3.

Inadequate premium payments may cause the cash value to become insufficient. This inadequacy can either be in quantity, which means the policyholder skips many payments, or in quality, meaning that the policyholder does not pay sufficient amounts with each payment. Another possibility is that the policyholder pays too much into the policy and changes it unwanted into a *modified endowment contract* (MEC) (Baldwin, 2001). For an explanation of a MEC and the differences to a life insurance contract see Section 2.4.3.

To keep the policyholder from over- or under-funding the policy, the insurer informs him about the different premium levels.

These premiums levels are (Dearborn, 2000; Baldwin, 2001):

- Minimum Premium

  This premium defines the minimum amount the policy owner has to pay into the policy in order to keep it from lapsing during a contractually specified period.

- Target Premium

  The target premium is set up in a way that it will be sufficient to support the policy until maturity if current interest and mortality assumptions hold and might therefore later show to be insufficient. This premium is usually in the range of regular whole life premiums.

The target premium is also used for the calculation of the agent's commission. The agent receives full first-year commission for the premium paid up to the target premium amount and renewal commission for any higher premium payments.

- 7-pay premium

  This premium is the largest premium allowed by law in order for the contract not to change into a modified endowment contract. This limitation arises from the preferred tax treatment of life insurance because of which the tax legislation wants to limit the savings component of life insurance.

### 2.1.2 Death Benefit

The death benefit in life insurance is the amount paid in the case of the insured's death. In Universal Life insurance there are three different types of death benefit patterns, two of which are offered with every contract available whereas the third one is not very common.

The two common options are called Option A and Option B and will be described in detail, the third option, also called Option C, is not very common and only appears in the context of split-dollar arrangements.

2.1.2.1 Death Benefit Option A

Death benefit option A represents a level death benefit. The net amount at risk, defined as the difference between the specified death benefit and the accumulated cash value (Dearborn, 2000).

Net Amount at Risk = Specified Amount – Cash Value

Under this option the net amount at risk is calculated as death benefit less accumulated cash value in the policy. The net amount at risk is therefore most commonly decreasing with an increasing cash value but for the case of a decreasing cash value the net amount at risk might also be increasing (Black and Skipper, 2000).

The death benefit can increase because in two different cases. First, the policyholder can increase the death benefit, given the insured's insurability. This restriction reduces the effect of adverse selection as the insurance company verifies the health of the insured prior to accepting an increase, i.e. assures his/her insurability. The second possibility is when the cash value increases to such an extent that the net amount at risk in the policy would be too low, meaning that the insurance contract would fail the corridor test (see Section 2.4.1). The death benefit then automatically increases to the required level to keep the contract from loosing its preferred tax treatment (see Section 2.4) (Dearborn, 2000).

An example for a possible development for the death benefit is given in Figure 2.

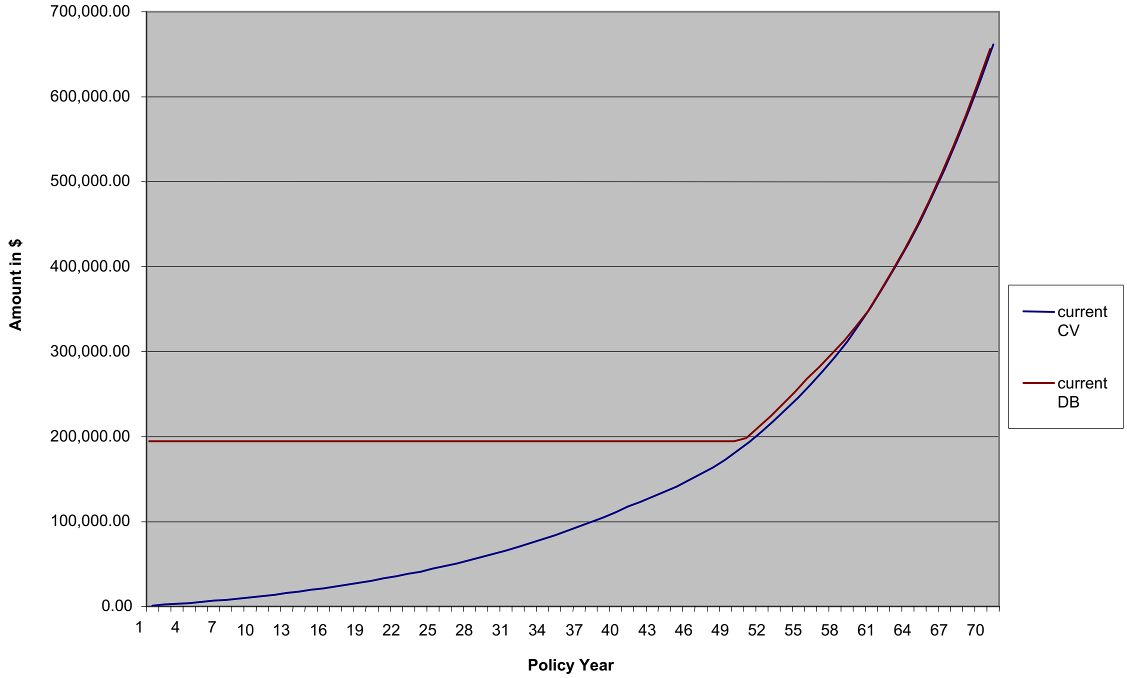


Figure 2: Development of the Cash Value and Death Benefit under Death Benefit Option A (Country, 2004)

### 2.1.2.2 Death Benefit Option B

Death benefit option B is an increasing death benefit option. With option B the net amount at risk is kept at a constant level, whereas the death benefit payable upon death of the insured equals the net amount at risk plus the accumulated cash value of the policy (Dearborn, 2000).

This implies that with the growth of the cash value the death benefit increases as well. On the other hand, if the cash value decreases, e.g. due to skipped premium payments, the death benefit might decrease as well.

Option B is usually the more expensive option to chose as the net amount at risk is kept constant compared to the decreasing one under option A. Therefore the cost of insurance for option A, everything else equal, is lower than the cost of insurance for option B.

The net amount at risk can either be increased by the policyholder as under option A or automatically be increased to conform to the corridor test for life insurance contracts (see Section 2.4.1).

An example for the development of the death benefit under option B is given is Figure 3.

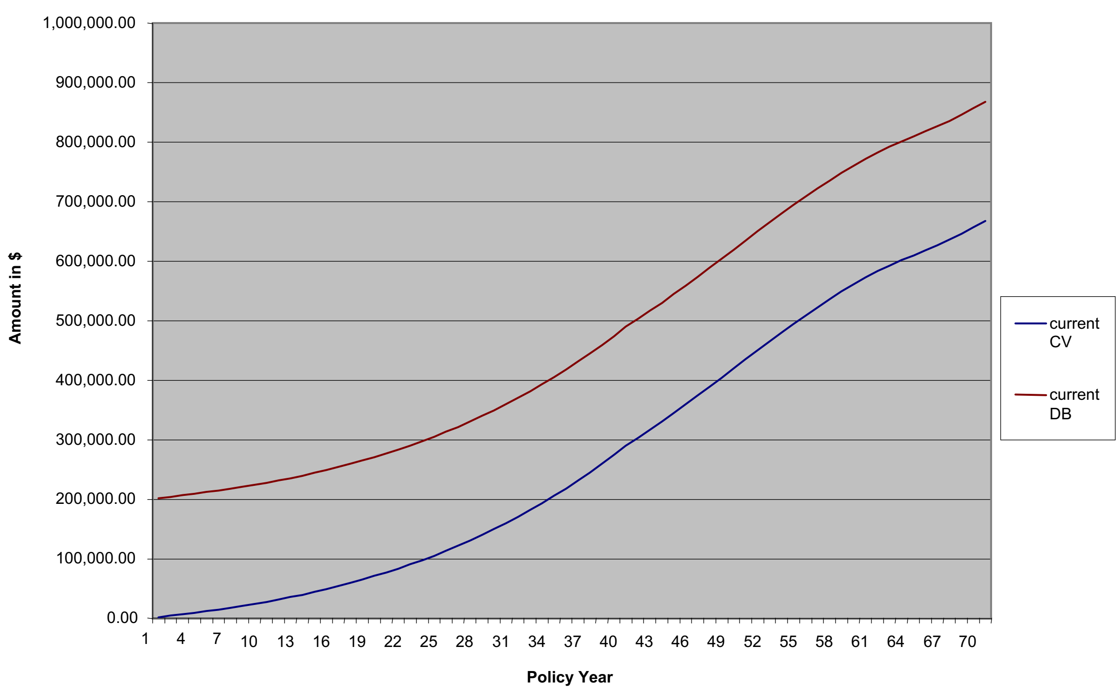


Figure 3: Development of the Cash Value and Death Benefit under Death Benefit Option B (Country, 2004)

#### 2.1.2.3 Death Benefit Option C

Option C is an increasing death benefit option which is mostly used with split-dollar arrangements (Dearborn, 2000). Most commonly an employer and employee share the premium payment for the policy, with the employee being the insured. In the case of a regular contract, the insured would just enjoy a decreasing death benefit as the employer was to receive his paid premiums upon the termination of the policy (Dearborn, 2000).

Option C is designed to avoid this kind of problem. The death benefit under this option equals the face amount plus the cumulative paid premiums. This way the beneficiaries of the insured receive the full face amount, even if the employer paid all premiums (Dearborn, 2000).

This option effectively has increasing benefits as the premiums paid add to the face amount of the policy. The death benefit therefore does not depend on the development of the cash value.

### 2.1.3 Expenses

An insurance company faces the same type of expenses with Universal Life products as with traditional life insurance products.

Because the design of Universal Life is aimed towards transparency for the customer, the insurance company has to disclose any deducted expenses and charges during the life of the policy. This is a significant difference to whole life policies, where the customer is not informed about any deductions from his accumulated funds.

One can divide the expenses an insurance company incurs into two different types, once the ongoing expenses and once the first-year expenses.

### 2.1.3.1 Ongoing Expenses

For ongoing expenses there are three different ways how insurance companies charge money for them (Black and Skipper, 2000).

First there is the possibility for charging a certain percentage of every premium paid. These charges are currently in the range from 2 to 11 percent and often referred to as "percentage of premium expense load" (Blease, 2004).

Second the company can assess charges with respect to the face amount of the policy. These charges are usually given per $1000 face amount and are deducted monthly from the cash value of the policy.

The third way is to charge a flat policy charge per month. These charges are deducted monthly from the cash value of the policy.

An insurer does not always use all three of these possibilities, especially as these expense charges can easily be identified in the policy as well as on every account statement the policyholder receives.

There are also hidden charges included in most policy designs. A company might have a surplus mortality charge, meaning that it charges higher mortality rates than it actually experiences, therefore giving an extra source of earnings. Charging higher mortality rates than necessary is not as easily detected by the customer, but still influences the cash value of the policy negatively. The company might also credit less interest to its customers than it actually earns to achieve an additional source for expense coverage. This method has the disadvantage that customers often look at credited interest rates to compare Universal Life products so crediting lower interest rates make ones product look less competitive (Dearborn, 2000), especially as interest rates have a major impact on the development of the cash value in the long run. (see Section 4.2.2)

#### 2.1.3.2 First-Year Expenses

The acquisition of a new insurance policy is linked with large costs for the issuing insurance company. Most of these costs are first year agent commissions and the costs for the medical examinations of the applicant.

To amortize these acquisition costs two different approaches are incorporated in Universal Life products.

One approach uses front-end loads, the other approach back-end loads. With the front-end load approach the insurer deducts higher charges during the first year/years of the policy to amortize the acquisition costs after which he decreases the charges. Back-end loads are usually incorporated in the form of surrender charges in most policies (Black and Skipper, 2000). These charges are applicable in the case of an early cash surrender of the policy and reduce the payout for the policyholder depending on the age of the policy.

Back-end loads have the advantage that they do not affect any illustrations of future cash values and therefore increases the illustrated amounts. Nevertheless do they influence the cash surrender value of the policy and thus are an important factor in determining the expense load of the policy.

Another advantage of back-end loads is that they make the treatment of early surrenders fairer. If no back-end loads are included, the company might have no chance to recover incurred expenses if a policyholder surrenders his policy very early. With the inclusion of back-end loads, policyholders who surrender before the company could recover the incurred expenses receive a lower surrender value and pay therefore their share of the expenses, as the policyholders who keep their policies do.

### 2.1.4 Lapses

In traditional life insurance a policy lapses if the policyholder does not pay a scheduled premium payment. He/She is then granted a grace period of at least 30 days to make up this payment before his coverage definitely ceases. This is even true for cash value policies like whole life, where the policyholder has various options to access the cash surrender value of the policy. The most common of these options are reduced paid-up insurance, extended term insurance, cash surrender and automatic premium loan (Blease, 2004). Each of these options is explained in Section 2.1.5.

Universal Life treats lapses differently as there exists no fixed premium schedule for this type of product. A Universal Life policy lapses when the cash value plus a possible premium payment are not sufficient to pay for the deductions of that period. This scenario is unlikely if a premium payment is received, but might occur if no sufficient funding leads to an inferior cash value development than originally assumed (Black and Skipper, 2000).

The policyholder is usually granted a 60 day grace period in which he can adjust his premium payments to keep the policy from lapsing. If he/she does not do so, his/her coverage will cease and the contract ends.

### 2.1.5 Nonforfeiture Benefit Options

As mentioned in Section 2.1.4 the policyholder has various options how to access the cash surrender value in the case of a lapse or surrender of the policy.

If the policyholder chooses the option of paid-up insurance, he/she receives a reduced amount of coverage for the remaining lifetime of his/her policy. The reduced amount is determined by the accumulated cash surrender value of his/her policy (Bowers et al., 1997).

Another option the policyholder has is to choose extended term. With this option, the accumulated cash surrender value is used to paid-up term insurance for the full face amount of the original policy. The length of the paid-up contract depends on the cash surrender value available (Bowers et al., 1997).

A third option available is the choice of an automatic premium loan. This provision keeps the policy in full force as long as the cash surrender value is greater than the policy loan, which is generated by the implicit payment of premiums and interest payments. The cash surrender value is thus used to pay the ceased premium payments and the interest payments for the loan amount generated from this (Bowers et al., 1997).

The last option the policyholder has is to decide for a cash payout of the cash surrender value of his/her policy. Under this option he receives the amount he/she is entitled to, possibly subject to income taxation as described in Section 2.4.

## 2.2 Cash Value and Cash Surrender Value

### 2.2.1 The Cash Value

Universal Life is a permanent insurance and therefore one of its most important characteristics is the development of cash value. The cash value is defined as the money accumulated inside the policy (Dearborn, 2000; Black and Skipper, 2000), i.e. the funds the policyholder is credited with interest. The accumulation of cash value has several positive effects for the policyholder.

For once the cash value is credited with tax-deferred interest, serving as an investment account for the policyholder. Another benefit is that the cash value serves as a source for premium payments in the case that the policyholder skips a premium payment, keeping the policy from lapsing. Furthermore the policyholder has the possibility to make a loan towards the cash value of the policy, making use of the usually guaranteed interest rates for the loan while still receiving credit on his cash value. As a last benefit the policyholder can also partially withdraw money from the cash value, given that enough cash value remains in the policy to keep it from lapsing (Black and Skipper, 2000). These partial withdrawals are subject to charges and may also be taxable (see Section

2.4). These benefits of the cash value will be explained in greater detail in Section 4.1.

As the cash value is the core of a Universal Life policy, a positive development of the cash value is mandatory. If the cash value fails do develop as assumed, the policy might either lapse or need considerable extra funds to be kept from lapsing (Baldwin, 2001).

The development of the cash value can shortly be described as the balance of the funds flow of the policy. Premiums payments and credited interest increase the value, deductions for mortality and expenses decrease the value (Dearborn, 2000). The development will be discussed in great detail in Chapter 4.

### 2.2.2 The Cash Surrender Value

The cash surrender value of the policy is the amount of the cash value the policyholder can receive in the case of a full surrender of the policy, i.e. the cash value of the policy less any surrender charges applicable (Black and Skipper, 2000). During the first policy years the insurance company charges the so called surrender charges in the case of a full surrender. The time during which such surrender charges are applicable varies greatly in the market and ranges from zero up to twenty years (Blease, 2004). The reasons for the use of surrender charges are non-amortized acquisition costs and an incentive for the policyholder not to surrender his policy. Due to the nature of the commission system for agents, it is hard if not impossible for an insurance company to meet the incurred first-year expenses with the first-year premium (Dearborn, 2000). The company is therefore required to spread the amortization of these costs over several years. In the case that the policyholder surrenders the policy before the acquisition costs are fully amortized, the insurance company charges him with the surrender charges to balance its account (Black and Skipper, 2000).

Surrender charges can have several varieties. They can either be given as a flat charge, just depending on the age of the policy. Another way is to charge a certain percentage of the cash value, usually decreasing with time (Black and Skipper, 2000).

These charges are subject to limits, given in Section 7702 of the IRC, to protect the policyholder from excessive charges. They decrease with the persistency of the contract, reaching zero between the fifth and $20^{th}$ policy year (Blease, 2004). When the surrender charges approach zero, the cash surrender value approaches the cash value of the policy (Baldwin, 2001).

## 2.3 Universal Life Specific Features

### 2.3.1 Transparency

Universal Life insurance products are designed to be transparent for the customer. Transparency is defined as providing the policyholder with the information necessary to follow the development of the policy, i.e. of the cash value, by disclosing mortality, expense and interest rates to him/her (Black and Skipper, 2000). This information is disclosed in a periodical account statement sent to the policyholder as required by the Universal Life Insurance Model Regulation (American Academy of Actuaries, 1998). The statement contains information about the beginning of the period cash value, paid premiums, deducted expense and mortality charges, credited interest and the end of period cash value (see Table 4). This enables the policyholder to keep track of the development of his contract and adjust his premium payments if necessary.

A basic account statement might look like this:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Policy Value as of: | | | 1/12/2002 | 1/11/2003 | | | | |
| Face Amount: | | | $1,000,000.00 | $1,000,000.00 | | | | |
| Death Benefit: | | | $1,000,000.00 | $1,000,000.00 | | | | |
| Death Benefit Option: | | | A | A | | | | |
| Cash Value Amount: | | | $349,394.00 | $356,216.10 | | | | |
| Less: | | | | | | | | |
| Surrender Charges | | | $0.00 | $0.00 | | | | |
| Outstanding Loans | | | $0.00 | $0.00 | | | | |
| Net Cash Surrender Value: | | | $349,394.00 | $356,216.10 | | | | |
| | | | | | | | | |
| Transactions for Guaranteed Interest Account - Unloaned | | | | | | | | |
| | | | | | | | | |
| | Premium Payments | | | Monthly Deductions | | | Policy Values | |
| Effective Date | Total | Charges | Net Premium | Month/Day | Cost of Insurance | Admin Charge | Interest Credited 5.00% | Policy Amount |
| 1/21/2002 | $64,754.00 | $1,295.08 | $63,458.92 | 12-Jan | $6,506.06 | $10.00 | $0.00 | $342,887.94 |
| | | | | 12-Feb | $6,571.12 | $10.00 | $1,396.97 | $401,172.71 |
| | | | | 12-Mar | $5,988.27 | $10.00 | $1,634.43 | $396,818.86 |
| | | | | 12-Apr | $6,031.81 | $10.00 | $1,616.69 | $392,403.74 |
| | | | | 12-May | $6,075.96 | $10.00 | $1,598.70 | $387,926.48 |
| | | | | 12-Jun | $6,120.74 | $10.00 | $1,580.46 | $383,386.20 |
| | | | | 12-Jul | $6,166.14 | $10.00 | $1,561.96 | $378,782.03 |
| | | | | 12-Aug | $6,212.18 | $10.00 | $1,543.20 | $374,113.05 |
| | | | | 12-Sep | $6,258.87 | $10.00 | $1,524.18 | $369,378.37 |
| | | | | 12-Oct | $6,306.22 | $10.00 | $1,504.89 | $364,577.04 |
| | | | | 12-Nov | $6,354.23 | $10.00 | $1,485.33 | $359,708.15 |
| | | | | 12-Dec | $6,402.92 | $10.00 | $1,465.50 | $354,770.72 |
| | | | | 11-Jan | | | $1,445.38 | $356,216.10 |
| | | | | | | | | |
| Total | $64,754.00 | $1,295.08 | $63,458.92 | | $74,994.51 | $120.00 | $18,357.70 | |

Figure 4: Sample Account Statement (Baldwin, 2001)

### 2.3.2 Flexibility

As traditional life insurance products were rather inflexible, the death benefit and constant premium guaranteed for the life of the policy, Universal Life introduced a new concept of flexibility in the industry.

Universal Life contains two aspects of flexibility, once with regard to premiums and once with regard to the death benefit.

#### 2.3.2.1 Flexibility of Premium Payments

Whole life or term products require a certain premium payment on every contractually arranged date to keep the policy from lapsing. Universal Life products, in contrast, to not rely on scheduled premium payments to keep the policy in force. This therefore gives the policyholder a certain amount of flexibility in his payments. He can adjust as well the timing as the amount of his payments.

Nevertheless these choices are still limited by legal and economic boundaries. From the legal side there is the limit of over-funding the policy and changing it to a modified endowment contract (Baldwin, 2001), from the economical point of view, the policy will lapse if it becomes underfunded, meaning that too few premium payment are received (Baldwin, 2001) (for an explanation of lapses see Section 2.1.4).

Therefore the concept of flexibility is not necessarily positive for the policyholder, but can also have undesirable consequences, as e.g. the just mentioned under-funding and possible early lapsation of the policy.

#### 2.3.2.2 Flexibility of the Death Benefit

Traditional life insurance products require the policyholder to choose the desired level of coverage at the beginning of the contract and after this he has no chance to change this coverage later during the life of the contract. The only choices he has are either to cancel the contract and sign a new one with a different death benefit which meets his/her changed needs or to sign an additional contract to his old one. Both of these alternatives can be expensive as both involve a first-year agent commission and the first one requires a surrender of the contract, which is usually linked with financial penalties (Black and Skipper, 2000).

The Universal Life insurance product offers a way to avoid those financial penalties associated with its death benefit flexibility. This means that the policyholder has the right to increase or decrease the amount of coverage during the life of the policy (Dearborn, 2000). The increases are usually subject to insurability, especially to prevent adverse selection otherwise. The insurer often offers the purchase of a "guaranteed insurability" rider (see Section 2.5.6) with the policy, enabling the policyholder to increase his/her coverage either after a certain number of years or in the case of special events, such as marriage, or the birth of a child (Black and Skipper, 2000). The decreases of the face amount are limits as well as the contract has still to fulfill the requirements for life insurance contracts (see Section 2.4.1).

## 2.4 Taxation of Life Insurance

Life insurance contracts enjoy a preferred income tax treatment. This imposes two important questions:

- Which types of contracts are treated as life insurance contracts?
- What does the preferred income tax treatment look like?

Both of these questions will be answered in the following chapter, as both are of significance dealing with life insurance.

The first question is relevant, as life insurance contracts have a special income tax treatment (see Section 2.4.2) as well as with respect to the reserves of the life insurance company (see Section 3).

### 2.4.1 The Definition of Life Insurance under Section 7702 of the Internal Revenue Code

Section 7702 of the *Internal Revenue Code* (IRC) defines an insurance contract as life insurance if it qualifies as life insurance under applicable state law and satisfies either of two test, defined in parts (a)(1) and (a)(2) of the section. These tests are referred to as the *Cash Value Accumulation Test* and the *Guideline Premium/Cash Value Corridor Test* (Desrochers, 1988).

#### 2.4.1.1 The Cash Value Accumulation Test

The cash value accumulation test is met if, by the terms of the contract, the cash surrender value of the policy does never exceed the single benefit premium for future guaranteed contract benefits

(Desrochers, 1988). These values are subject to limitations imposed in section 7702 regarding allowable interest and death benefit patterns and endowments.

The term cash surrender value is defined in section 7702(b)(1) as the cash value of the contract less any surrender charges, reasonable termination dividends of less than $35 per thousand or policy loans (Desrochers, 1988). Cash surrender value further refers to the amount to which the policyholder is entitled in the case of surrender or against which he may borrow.

The cash value accumulation test is a prospective test intended to let traditional cash value life insurance policies, with cash value accumulating at reasonable interest rates, continue to qualify as life insurance (Desrochers, 1988). An effect thereof is that compliance is required "by the terms of the contract", i.e. the test has to be met at all times. If a contract fails at some future date, the contract will be treated as having failed at issue (Desrochers, 1988).

#### 2.4.1.2 The Guideline Premium/Cash Value Corridor Test

This alternative test to the preceding one is specified in Section 7702(c)(1) of the IRC. In order to comply with the guideline premium test, the total of the premiums paid under the contract at any time may not exceed the guideline premium limitation at that time and additionally the cash value corridor requirement has to be satisfied (Desrochers, 1988). The guideline premium limit is defined as the maximum of the guideline single premium and the sum of the guideline level premiums, i.e. the guideline level premium times years since issue. The guideline single premium is the single premium at issue with respect to future benefits calculated based on guaranteed interest, mortality and expenses, all subject to statutory limits, defined in Section 7702(c)(3) of the IRC. The guideline level premium is the level annual equivalent of the guideline single premium payable over a period at least until the insured attains age 95, except that the minimum interest rate is 4%, instead of 6% minimum used for the guideline single premium (Desrochers, 1988).

The corridor test is passed if at any time the death benefit is not less than the applicable percentage of the cash value, defined in the IRC (see Table 4). The corridor percentages, found in Section 7702(d)(2) of the IRC, are supposed to be lower than the ratio of death benefit to cash value under the cash value accumulation test as there are additional restriction on the level of premium (Desrochers, 1988).

Table 4: Corridor Percentages (Desrochers, 1988)

| Attained Age | Percentage | Attained Age | Percentage |
|---|---|---|---|
| 0-40 | 250% | | |
| 41 | 243 | 61 | 128% |
| 42 | 236 | 62 | 126 |
| 43 | 229 | 63 | 127 |
| 44 | 222 | 64 | 122 |
| 45 | 215 | 65 | 120 |
| | | | |
| 46 | 209 | 66 | 119 |
| 47 | 203 | 67 | 118 |
| 48 | 197 | 68 | 117 |
| 49 | 191 | 69 | 116 |
| 50 | 185 | 70 | 115 |
| | | | |
| 51 | 178 | 71 | 116 |
| 52 | 171 | 72 | 111 |
| 53 | 164 | 73 | 109 |
| 54 | 157 | 74 | 107 |
| 55 | 150 | 75-90 | 105 |
| | | | |
| 56 | 146 | 91 | 104 |
| 57 | 142 | 92 | 103 |
| 58 | 138 | 93 | 102 |
| 59 | 134 | 94 | 101 |
| 60 | 130 | 95+ | 100 |

The guideline premium test is, unlike the cash value accumulation test, a retrospective test under which a contract is assumed to comply until it actually fails. It is therefore possible for a contract to first comply with the test even though it terms assure a failure to a later date as well as bringing a failing contract back to compliance (Desrochers, 1988).

### 2.4.1.3 Application of the Tests

The two tests just mentioned are regarded equal. The cash value accumulation test is assumed to be used for traditional permanent products whereas the guideline premium test is assumed to be used for flexible products like Universal Life insurance (Desrochers, 1988). This assignment is assumed, not required, as the retrospective nature of the guideline premium test fits better the flexible nature of Universal Life, especially as the contract value are not fixed at issue. The cash value accumulation test fits the traditional products with their fixed premium and coverage patterns better.

An important observation is that the development of Universal Life insurance lead to the development of Section 7702. It is thus often the case that Universal Life plans seem to qualify more easily under Section 7702 (Desrochers, 1988).

For further details of Section 7702 of the IRC I refer the interested reader to the paper by Christian J. Desrochers (1988).

## 2.4.2 The Income-Tax Benefits of Life Insurance

The preferred income tax treatment of life insurance can be divided into four different aspects (Baldwin, 2001).

The most know income tax benefit of life insurance is that the death proceeds received by the beneficiary are federal income tax free, as defined in Section 101 of the IRC. This death benefit can include the net amount at risk, any equity accumulated within the contract as well as any positive investment earnings (Black and Skipper, 2000).

Another important tax benefit is the deferred tax interest accumulation in the policy. This means that all earnings on the policy investments are not subject to current income taxation. These earnings are taxed when one takes gains from the policy, e.g. surrenders the policy or withdraws funds from it and experiences a taxable gain from doing so, or they are totally tax exempt if the proceeds are paid as death benefits (Baldwin, 2001).

The last two aspects of the preferred income tax treatment of life insurance refer to the treatment of the investment income.

First, the amount you can recover tax-free when you surrender the policy is determined with the help of a cost basis. The cost basis is determined as the sum of all paid gross premiums less any received dividends. Thus only amounts above the cost basis are subject to income tax, implying that all insurance costs, expenses as well as mortality charges, can be recovered tax-free (Baldwin, 2001).

In the case of a partial withdrawal the same rules are in force. Only amounts exceeding the cost basis, i.e. the sum of gross premiums, are subject to ordinary income tax (Baldwin, 2001).

### 2.4.3 The Modified Endowment Contract

A *modified endowment contract* (MEC) is a life insurance contract, which meets the definition of IRC Section 7702 but fails the seven-pay test (Black and Skipper, 2000). This test defines the maximum cumulative amount which can be paid into a life insurance policy during the first seven years. If the amount is exceeded, the contract becomes a modified endowment contract (MEC) (Baldwin, 2001). In the opinion of the Internal Revenue Service (IRS) it loses part of the preferred income-tax treatment as the inside build-up of the cash value becomes taxable as income for the policyholder (Blease, 2004b). Section 7702 of the IRC also imposes restrictions on the amounts permitted to be paid into a life insurance policy and often these amounts are more restrictive than the seven-pay limits (Baldwin, 2001).

The accumulated value inside modified endowment contracts cannot be accessed without the payment of income taxes. Withdrawals, loans and collateralization result in immediate taxation of the gains. An access of the funds inside the policy by a policyholder of age 59.5 or younger even results in a ten percent penalty on the amount included in the gross income as a result of the above mentioned actions (Baldwin, 2001).

## 2.5 Riders in Universal Life Insurance

A rider is an amendment to an insurance policy which is part of the insurance contract and provides additional benefits or limits them (Atkinson and Dallas, 2000). Riders are mostly used for the customization of a product but can also be used to include multiple policies into one, e.g. a child or spouse term rider attached to a Universal Life policy.

The following sections discuss the most common riders in Universal Life insurance, whereof especially the no-lapse rider deserves special attention as this rider is mostly responsible for the rise of Universal Life sales observed during the last 3 years.

### 2.5.1 No-lapse Guarantee Rider

As the pricing of Universal Life is largely based on assumptions of future mortality, interest rates and expenses, and each of these, especially the future interest rates, are hard to predict, the originally calculated premium might not be sufficient to carry the policy to maturity. Especially if interest rates drop the development of the cash value falls short of primary calculations and might force the policyholder to supply additional funds to keep the policy in force.

The no-lapse guarantee rider supplies a vehicle to avoid this scenario of an unwanted early lapsation. With the no-lapse rider attached, the policyholder is guaranteed a level death benefit until the insured turns 100 or in newer products even until age 120 or for life. In the first products containing this guarantee, the guarantee stayed in effect as long as the policyholder paid the no-lapse minimum premium, no matter how low the account values fell (Scholl and Stern, 2002). This lead to a partial loss of the flexibility inherent in Universal Life products. In newer versions the insurance companies provide the policyholder a "catch-up" provision, which enables him to pay skipped premium payments at a later time, possibly plus missed interest payments, thus keeping the flexibility of Universal Life insurance (Koco, 2003).

The benefits of the no-lapse guarantee are obvious. There is a guarantee of the death benefit regardless of the development of the interest environment and with this the cash value development. This guarantee is of interest for the customers especially in today's volatile and low interest environment (Pinkans, 2002). Furthermore the no-lapse guarantee rider enables the policyholder to buy insurance coverage for lower premiums than with whole life insurance. The usual premium level of Universal Life with a no-lapse rider is about 40 to 50 percent of a comparable whole life premium (Nisbet, 1997).

The disadvantages of these riders cannot be neglected. First of all, the policyholder loses some of the flexibility inherent in Universal Life products. The skipping of premium payments can lead to a loss of the guarantees if the policyholder does not follow the possible catch-up schedule. The access of the cash value via withdrawals or loans might also negate the no-lapse guarantee. The industry developed two tests to determine if the lapse protection for contracts in jeopardy still holds (Scholl and Stern, 2002). The first test, the minimum premium test, checks if the minimum cumulative premium paid was over the life of the policy. If so, the policy stays in force, regardless of the cash value. The second test, called shadow account test, guarantees the policy to stay in force as long as a shadow account has a positive cash value. This shadow account may be calculated with a different set of assumptions, including lapse and mortality rates.

Another negative aspect no-lapse guarantees is, that they limit the upside potential of the policy even with increasing interest rates scenarios as the death benefit will stay level and the cash value inaccessible (Pinkans, 2002).

### 2.5.2 Waiver of Premium Rider

A waiver of premium rider is a supplemental benefit, which pays specified premiums for the policy while the insured is disabled (Black and Skipper, 2000). The specified premium might be the minimum or the target premium or any premium in between, chosen at the time of the contract issue.

The waiver of premium rider is also offered in a weaker form, as a waiver of monthly charges/deductions. This waiver pays only the expense and mortality charges for each month but does not supply any additional money for the cash value growth.

### 2.5.3 Accelerated Death Benefit Riders: Critical Illness Rider and Terminal Illness Rider

Medical advances and increasing life expectancy lead to ever increasing pre deaths expenses. An insured might have an adequate life insurance policy with cash value, but might only be able to access the relatively low cash surrender value, especially compared to the face amount (Black and Skipper, 2000).

The two accelerated death benefit riders under consideration here both offer ways for the insured to access the policy face amount prior to his death.

The critical illness rider, also known as dread disease rider, provides payment of an accelerated benefit for the case that the insured is diagnosed with a specified disease, such as e.g. a heart attack, a stroke or cancer which shortens his life expectancy considerably. If he suffers from any disease or illness not covered in the policy, no benefit is provided (Black and Skipper, 2000).

The terminal illness rider allows a pre-death access of a specified amount, usually between 25 and 50 percent, of the policy's face amount if the insured is diagnosed with a terminal illness. For being considered having a terminal illness, the insured's life expectancy has to be less than a year, with some companies even requiring less than 6 months (Black and Skipper, 2000).

The usage of these pre-death benefits reduces remaining death benefits, premiums and cash values proportionally or, in the case of the critical illness rider, on a one-to-one basis (Black and Skipper, 2000).

### 2.5.4 Family/Spouse/Child rider

These two riders offer term insurance protection for the spouse and/or children of the insured.

The child rider covers all children of the insured, even if they are born or adopted after the issue of the policy. Coverage is provided in the form of term insurance up to an age of 18 until 25, depending on the company, starting from usually 15 days of age (Black and Skipper, 2000).

The spouse rider grants term insurance coverage for the insured's spouse. The face amount is subject to limits, the upper bound usually given by the face amount of the main policy (Black and Skipper, 2000).

A family rider combines the spouse rider and the child rider into one rider, providing term coverage for the whole family (Black and Skipper, 2000).

### 2.5.5 Accidental Death rider

An accidental death rider provides that the double face amount of the policy is payable, given the case that the insured dies as a result of an accident. Newer versions often enable to choose from various multiples of the face amount (two, three or even more times) of the policy (Black and Skipper, 2000).

To be covered, a death must usually occur within 90 days of the accident and be a direct result of it. The time limit is supposed to assure that the death is solely caused by the accident (Black and Skipper, 2000).

### 2.5.6 Guaranteed Insurability rider

As the increases of the death benefit in Universal Life insurance are always subject to insurability to avoid adverse selection, it might not be possible for an insured with bad health to increase his coverage although he has the need to do so. This problem occurs quite frequently as young people often do not have the life insurance need they develop later in their life, e.g. when founding an own family.

The guaranteed insurability rider provides the right to increase the death benefit at specified times, e.g. marriage, birth of child or at certain ages, without any prove of insurability (Black and Skipper, 2000). The amounts of the increases are usually limited. They either have to be decided on at issue of the contract or are limited to multiples of the face amount, whichever option is less (Black and Skipper, 2000).

Most of the time, the insurer sets up a periodic schedule with given intervals at whose end the policyholder can execute his option to increase. The guaranteed increase rider is usually limited to an age of about 40 years (Black and Skipper, 2000).

CHAPTER III

# RESERVING FOR UNIVERSAL LIFE INSURANCE

This chapter shall give an understanding of reserving for Universal Life insurance. First I will give an introduction in reserving for life insurance in general. In the following two subchapters I will describe the specific regulations for Universal Life insurance based on the Universal Life Model Regulation from 1997 (American Academy of Actuaries, 1998) and the Valuation of Life Insurance Policies Model Regulation from 2000 (Kansas Insurance Department, 2000). I will discuss only statutory accounting principles in this thesis.

## 3.1 Reserving in Life Insurance

As the main portion of a life insurers' liabilities are reserves for the policies in force, the subject of reserving is one of the most important ones for an actuary. For the formulas in this chapter I assume the reader to be familiar with the most common actuarial notations. I refer the unfamiliar reader to the book Actuarial Mathematics by Bowers et al.

(Bowers et al., 1997). I will limit myself to the discussion of only discrete formulas and calculations as they are the standard in applications. Similar considerations are valid for the continuous and modal cases.

The liabilities that represent the amount expected to be paid for future benefits for policies in-force today, with interest and premiums earned, are referred to as the *policy reserve* (Black and Skipper, 2000).

There are two definitions for the policy reserve, one in prospective and one in retrospective terms. The prospective definition defines the formula statutory policy reserve as the amount, which, according to today's valuation assumptions, will be sufficient, together with future net premiums and interest, to pay for future claims (Black and Skipper, 2000). The retrospective view defines the reserve as the difference of the paid net premiums, accumulated at interest with benefit of survivorship, and the paid claims, accumulated at interest with benefit of survivorship, each according to today's valuation standards (Black and Skipper, 2000).

As the reserves defined here are calculated according to the valuation standards, they do not reflect any past experience of the insurer.

A problem called surplus strain, the insufficiency of first year premium charges to pay for actual first year expenses and the resulting problem for net level reserves, requires life insurance companies to use modified reserves. There are two important methods to modify net level reserves in the United States are the *full preliminary term* (FPT) and the *commissioners' reserve valuation method* (CRVM) (Black and Skipper, 2000).

Full preliminary term treats the insurance contract, for the purpose of reserving, as term insurance for the first year and assumes the actual contract to start in the second policy year. The first year is treated as covered by a term insurance contract. The consequence of this is that the paid benefit premium is split up in two parts. One is used to cover the first year's cost of insurance, usually a relatively small amount. The rest of the premium is now available to pay for incurred expenses. This amount is typically referred to as the *expense allowance*. The first-year premium, $a$ , is thus determined by the cost of insurance for the first year, $A^{1}_{x:\overline{1}|}$ (Bowers et al., 1997). As the premium payments of the policy still have to fund the same benefits as in the original policy, the benefit premiums for the following years have to be increased. This increased benefit premium, called the *renewal premium*, is denoted by $b$. The reserve for the first year under FTP is therefore zero for all types of contracts (Black and Skipper, 2000).

The effect on the net premiums for policy years two and later is an increase of the net premium as the additional expenses paid in the first year are subtracted from the following years.

Assuming a $h$ pay policy with benefit premium $P$, and let further

denote the actuarial present value for an corresponding insurance issued at age 1. It follows that

$$ \qquad (1)$$

and therefore

$$ \qquad (2)$$

This equation can be interpreted as $\beta$ being the benefit premium for the same contract issued one year later, with premiums paid for one year less (Bowers et al., 1997). The reserves for policy years two and later therefore are the net level reserves for the one year deferred contract.

The net effect of full preliminary term compared to net level reserving thus is a deferred funding of the first-year reserve and an amortization of this amount during the remaining premium payment period of the policy (Bowers et al., 1997).

The commissioner's reserve valuation method makes 20-payment whole life policies the maximum limit for which deferred funding of first year expenses is permitted and therefore splits policies into two groups (Bowers et al., 1997):

- For policies where the renewal premium $b^{FPT}$ does not exceed the corresponding modified net premium of a 20-pay whole life contract $_{19} \quad _{1}$, full preliminary term is used, i.e. the expense allowance for the first year is defined as $EA^{CRVM} \quad {}^{FPT} \quad A^{1}_{x:\overline{1}|}$

- For policies with higher premiums, i.e. policies where $_{19} \quad _{1}$, the first year expense allowance is limited to the amount allowed by the preliminary term method for a 20-pay whole life policy. In this case the renewal premium is defined as

$$^{CRVM} \quad P \quad \frac{{}_{19}P_{x\ 1} \quad A^{1}_{x:\overline{1}|}}{\ddot{a}_{x:\overline{j}|}} \tag{3}$$

where $j$ is the modification period.

The expense allowance, and with it $\alpha$, is defined as

$$EA^{CRVM} \quad {}_{19}P_{x\ 1} \quad A^{1}_{x:\overline{1}|} \tag{4}$$

(Bowers et al. 1997).

Another concept of reserves is worth mentioning here. The minimum reserve requirements for United States life insurance companies are defined to be the present value of future benefits less the present value of future valuation net premiums. These valuation net premiums are calculated with the method used for calculating the reserve, but apply minimum valuation standards for interest and mortality. For the years in which the gross premium charged by the insurer is less than the valuation net premium, the gross premium is substituted for the net valuation premium in the definition above. If the originally required reserve is less than the reserve calculated this way, the new reserve becomes the minimum reserve required for the policy (Black and Skipper, 2000). The differences of the required reserves in these special situations are referred to as *deficiency reserves* (Black and Skipper, 2000).

## 3.2 The Universal Life Model Regulation

Published by the *National Association of Insurance Commissioners* (NAIC) in 1997 (American Academy of Actuaries, 1998), the Universal Life model regulation contains rules and regulations how to valuate the reserves for Universal Life insurance policies.

In the opinion of the developers of the model regulation, Universal Life insurance is just another competing life insurance product and should be treated in the same regulatory approach as other products. The model regulation does therefore only address the areas where former regulations are not sufficient or clear for Universal Life insurance products (American Academy of Actuaries, 1998).

The regulation contains definitions of several important terms, which I would like to state here (American Academy of Actuaries, 1998):

- The net cash surrender value is defined as the maximum amount payable to the policyholder in the case of surrender.

- The cash surrender value is defined as the net cash surrender value plus any outstanding policy loan amounts.
- The policy value is defined as the amount to which identifiable interest credits as well as expense and mortality charges are made. This amount is also referred to as account value or cash value of the policy.

The regulators emphasize not to put too much emphasis on the policy value as it was just an intermediate step to determine values actually available to the policyholder, such as the cash surrender or the death benefit (American Academy of Actuaries, 1998). Despite this warning, the importance of the policy or cash value is obvious as all other values mentioned depend on it.

### 3.2.1 The Statutory Valuation of Universal Life Products

The minimum valuation standard for Universal Life insurance is defined to be the Commissioners Reserve Valuation Method (CRVM) as introduced in Section 3.1.

The terminal reserve for the basic policy and any additional benefits and riders which are paid for collectively at any policy anniversary is defined to be equal to:

(5)

where the parameters are defined as follows:

$A$ is defined as the present value of all future guaranteed benefits at the date of the valuation.

$B$ is defined as $\frac{PVFB}{a_x} a_{x\ t}$ where $PVFB$ is the present value of all future guaranteed benefits at issue of the policy. This present value assumes the payment of guaranteed maturity premiums by the policyholder and also takes all guarantees contained in the policy or declared by the insurer into account (American Academy of Actuaries, 1998). The symbols $\ddot{a}_x$ and $a_{x\ t}$ are the values of annuities due, paying one per year at policy anniversaries beginning at ages x or x+t, respectively and ending at the highest age requiring premium payments as defined in the policy.

The term guaranteed maturity premium is defined as the level gross premium, which, paid over the life of the policy, will mature the policy on the latest permitted maturity date in accordance to the policy structure. The maturity amount required is further defined as the initial death benefit for option A and the specified amount for option B (see Section 2.1.2), both subject to changes caused by the corridor rule (see Section 2.4.1).

$r$ is defined as the ratio of the policy value to the guaranteed maturity fund, where the guaranteed maturity fund is defined as the amount which, together with future guaranteed maturity premiums will mature the policy based on the policy guarantees at issue (American Academy of Actuaries, 1998).

$C$ is defined as where $\beta$ is the applicable renewal premium under CRVM and $\alpha$ is the first-year premium for the plan of insurance given at issue for the guaranteed maturity premiums and all guarantees inlcuded in the policy or given by the insurer (American Academy of Actuaries, 1998). The difference of $\beta$ and $\alpha$ is thus the expense allowance for the policy. $\ddot{a}_x$, $\ddot{a}_{x+t}$ and $r$ are defined as in $B$ above.

$D$ is defined as the sum of any additional quantities correspondent to $C$, which arise from structural changes in the policy. Each such quantity is calculated on a basis consistend with $C$ using the maturity date in effect at the time of the change (American Academy of Actuaries, 1998).

In a case of a change the guaranteed maturity premium, the guaranteed maturity fund as well as $B$ are to be recalculated to reflect the structural changes in the policy. The recalculation has to be consistent with the above described formulas.

The future guaranteed benefits are to be determined by projecting the greater of the guaranteed maturity fund and the policy value with guaranteed values for interest, mortality and expenses while taking future guaranteed maturity premiums into account. They are further determined by accounting for any benefits which do not rely on the policy value (American Academy of Actuaries, 1998).

The use of the minimum requirements for interest and mortality as defined by the Standard Valuation Law for the calculation of the present values are stipulated by the regulation. For the evaluation of structural policy changes a method is suggested in which the proportionality between guaranteed maturity fund, guaranteed maturity premiums and face value are maintained (American Academy of Actuaries, 1998). The fund and premiums amounts are calculated per dollar of face amount and then multiplied with the new face amount.

If for a Universal Life policy the guaranteed maturity fund is less than the valuation net premium the minimum reserve for this contract has to be the greater of the following two (American Academy of Actuaries, 1998):

- The reserve calculated with the actually used method, interest rate and mortality table.
- The reserve calculated with the method actually used but using the minimum valuation standards defined in the Standard Valuation Law. The valuation net premium is also replaced by the guaranteed maturity premium in each policy year for which the second exceeds the first.

The valuation net premium for Universal Life insurance reserves on a net level basis is defined by $\frac{PVFB}{\ddot{a}_x}$ and for reserves using CRVM, the valuation net premium is defined as $\frac{PVFB}{\ddot{a}_x} \quad \frac{b \quad a}{\ddot{a}_x}$ with all variables as defined above. The valuation net premium is calculated with the valuation method actually used for the calculation of the reserve with minimum valuation standards for interest and mortality (American Academy of Actuaries, 1998).

### 3.2.2 Nonforfeiture Regulations

A minimum cash surrender value for Universal Life insurance policies is defined in the model regulation (American Academy of Actuaries, 1998). Minimum cash surrender values are to be determined separately for the basic policy and any riders which are individually paid for.

The minimum cash surrender value before adjustments for outstanding indebtness and dividend credits is defined as (American Academy of Actuaries, 1998):

The accumulation to the evaluation date of premiums paid less the accumulations to that date of

- Benefit charges;

- Averaged administrative expense charges for the first and any insurance-increase policy years;
- Actual administrative expense charges for all other years;
- Initial and additional acquisition expense charges not exceeding the corresponding allowances;
- Any service charges actually made, except charges for cash surrender or election of paid-up nonforfeiture benefits;
- Any deductions made for partial withdrawals.

All accumulations are calculated with the actually credited interest rates less any unamortized initial and additional expense allowances.

The accumulation of interest in above mentioned points has to be consistent with the accumulation of interest in determining the policy value.

The above mentioned benefit charge includes any mortality charges as well as any charges for riders or benefits for which the premiums are not paid individually. If benefit charges develop low or no cash value, higher cash values can be required by the Commissioner unless the insurer shows the justification of the low cash values (American Academy of Actuaries, 1998).

The administrative expense charges cover any periodic or per-premium charges permitted by the policy to be inflicted without the necessity of a policyholder's request for service.

The averaged administrative expense charges for any year are defined by the arithmetic average charge rate stated in the policy for years two to twenty applied to the transactions and periods in that year (American Academy of Actuaries, 1998).

The initial acquisition expense charges are defined as the excess of actually made expense charges in the first year, with the exception of service charges, over the averaged administrative expense charges for that year. The additional acquisition expense charges are the corresponding value for insurance-increase years. An insurance-increase year is defined to start on the date of increase of a policyholder requested insurance increase (American Academy of Actuaries, 1998).

Service charges are charges permitted by the policy resulting from a policyholder's request for service.

The initial expense allowance is the same as defined in Section 5 of the Standard Nonforfeiture Law for Life Insurance (American Academy of Actuaries, 1998) for a fixed premium, fixed benefit endowment policy with a face amount equal to the initial face value of the Universal Life policy. Required are level annual premium payments as well as maturity on the highest allowed age in the policy if any or otherwise the highest age of the valuation mortality table. The unused initial expense allowance is the difference between the initial expense allowance and the initial acquisition expense charge as defined above.

Subsequent increases of the face amount of the policy may result in the determination of an additional expense allowance and an unused additional expense allowance in consistency with the above and Section 5cE of the Standard Nonforfeiture Law for Life Insurance. This calculation uses the face amount and the latest maturity date allowed at that time by the policy (American Academy of Actuaries, 1998).

The unamortized unused initial expense allowance for year t is defined as the unused initial expense allowance multiplied by the factor $\frac{\ddot{a}_{x+t}}{\ddot{a}_x}$ where $\ddot{a}_{x+t}$ and $\ddot{a}_x$ are annuities due paying one per year and starting at age x+t and x, respectively. The unamortized unused additional expense allowance is the unused additional expense allowance time a similar factor as above with $\ddot{a}_x$ replaced by an annuity starting at the year of the determination of the additional expense allowance (American Academy of Actuaries, 1998).

The expense allowance chosen here is intentionally the same as for a whole life insurance contract. It was chosen this way as in the opinion of the commissioners Universal Life insurance serves as a permanent insurance contract, as whole life does (American Academy of Actuaries, 1998).

### 3.2.3 Minimum Paid-Up Nonforfeiture Benefits

In the case that a Universal Life policy offers the option for a paid-up nonforfeiture benefit, its present value shall be no less than the cash surrender value of the policy on the date of the conversion. The calculation of the present value uses no less favorable values of mortality and interest than guaranteed in the policy (American Academy of Actuaries, 1998).

The paid-up benefit may be substituted within 60 days of the due date of the premium in default by an actuarially equivalent paid-up benefit option, which either provides higher benefits or a longer period of death benefits, or, if applicable, higher or earlier endowment benefits (American Academy of Actuaries, 1998).

### 3.2.4 Interpretation of the Universal Life Model Regulation

This chapter will try to transform the functions and definitions from Section 3.2.1 into more familiar functions.

The terminal reserve $V_{x\ t}^{CRVM}$ for policy year t is defined as

$$V_{x+t}^{CRVM} = \left( PVFB_{x+t} - PVFB_x \frac{\ddot{a}_{x+t}}{\ddot{a}_x} \right) r - (\beta - \alpha) \frac{\ddot{a}_{x+t}}{\ddot{a}_x} r \tag{6}$$

$$PVFB_{x\ t} \quad PVFB_x \frac{\ddot{a}_{x\ t}}{\ddot{a}_x}\ r \quad EA^{CRVM} \frac{\ddot{a}_{x\ t}}{\ddot{a}_x}\ r \tag{7}$$

The first parenthesis of equation (first one) equal the value for a net level reserve on guaranteed premium and benefit basis. The value of $r$ can be interpreted as a measure of how well the policy is conforming to a permanent plan (Tullis and Polkinghorn, 1996). The second term is the unamortized expense allowance, again multiplied by the factor $r$. The value of $\beta$ and the expense allowance are as defined in Section 3.1.

I like to illustrate the calculation with an example similar to the one found in the Valuation of Life Insurance Liabilities book by Tullis and Polkinghorn (1996).

Consider a back-end loaded product with a front-end load of 3% per premium and a guaranteed interest rate of 4%. The policy is issued to a 35 year old male with an endowment at age 95. The valuation basis is 4.5% 58 CSO, where the guaranteed mortality rates are based on the 1958 CSO table and the current mortality rates equal the guaranteed ones. The death benefit option chosen is Option A.

We want to determine the terminal reserve for the end of the 10th policy year. For this, we are given the following information:

- $PVFB_{45} = 381.65$
- $CashValue = 195.75 \qquad CashSurrenderValue = 187.99$
- $P^{NL} = 13.16 \qquad P^{CRVM} = 13.80$
- $PVFP_{45} = P^{NL}\ddot{a}_{45:\overline{50|}} = 205.55$

- $r = 1$
- $EA^{CRVM} = \left(P^{CRVM} - P^{NL}\right)\ddot{a}_{35:\overline{60}|}$ and therefore
- Unamortized expense allowance

$$= \left(P^{CRVM} - P^{NL}\right)\ddot{a}_{45:\overline{50}|} = EA^{CRVM}\frac{\ddot{a}_{45:\overline{50}|}}{\ddot{a}_{35:\overline{60}|}} = 10$$

Given these values, it follows that

$$V_{x+t}^{CRVM} = \left(PVFB_{x+t} - PVFB_x \frac{\ddot{a}_{x+t}}{\ddot{a}_x}\right)r - EA^{CRVM}\frac{\ddot{a}_{x+t}}{\ddot{a}_x}r \qquad (8)$$

$$= (381.65 - 205.55)(1) - 10(1) = 166.10$$

A comment one has to make here is that the minimum reserve is with a value of 166.10 lower than the cash value of 195.75. This observation is also valid for actual policies sold in the market. The reason is that the cash value is determined with current interest, mortality and expense rates whereas the minimum reserve is determined with guaranteed values, decreasing its value. This becomes clear, especially when one considers the retrospective approach of reserves. A reasonable approach for determining the total liabilities in this case could be the choice of the cash surrender value of the policy (Tullis and Polkinghorn, 1996), as this is the maximum amount the insurer has to pay in a case of a full surrender of the policy. When the surrender charges approach zero, the cash surrender value approaches the cash value. Hence, for policies where there are no surrender charges anymore, the reserve equals the cash value of the policy.

## 3.3 Valuation for Products with Secondary Guarantees

Universal Life policies sold today typically offer secondary guarantees. Secondary guarantees provide the policyholder with the guarantee to keep the death benefit in force for a certain period of time, even without sufficient cash surrender value to keep the policy in force otherwise (Blease, 2004b).

The Valuation of Life Insurance Policies Model Regulation (Kansas Insurance Department, 2000) gives guidelines for the calculation of minimum reserves as well as defines new select mortality tables to be used for the valuation. The rules defined in this regulation constitute the commissioner reserve method for the valuation of applicable policies.

I will just discuss the parts of the regulation concerning Universal Life policies as the other parts are not relevant for the object of this thesis. The regulation applies to Universal Life policies, which contain provisions resulting in the possibility to keep the policy in force over a secondary guarantee period (Kansas Insurance Department, 2000). Excepted are policies for which all of the following conditions hold:

- The secondary guarantee period is less than five years;

- The secondary guarantee premium is greater or equal to the net level reserve premium for the secondary guarantee period. This net level reserve premium has to be based on the CSO valuation tables defined in this regulation and the applicable valuation interest rate;
- The initial surrender charge greater or equal to 100 percent of the first year annualized specified premium for the secondary guarantee period.

The valuation tables defined in the regulation are the Commissioners' 1980 Standard Ordinary Mortality Table (1980 CSO Table) without ten-year selection factors and variations of the 1980 CSO Table approved by the NAIC (Kansas Insurance Department, 2000).

Policies with secondary guarantees are defined as having at least one of the following properties:

- A guarantee to stay in force at the original benefit schedule if payments of specified premiums are made;
- The minimum premium at any time being less than the corresponding one year valuation premium. The calculation of the valuation premium uses maximum valuation interest rates and the 1980 CSO mortality tables or any other tables adopted and published for this purpose by the NAIC.

Several more terms need to be defined here. The secondary guarantee period is defined as the period for which the policy will remain in force subject only to the secondary guarantee and the specified premiums are defined as the premiums which paid regularly guarantee the policy to stay in force at the original benefit schedule during the guarantee period (Kansas Insurance Department, 2000). These premiums have to be specified in the policy. The application of maximum mortality and expense charges, combined with the crediting of minimum interest rates show these premiums to be insufficient to keep the policy in force in the absence of a guarantee (Kansas Insurance Department, 2000).

The minimum premium is defined as the premium, which paid at the beginning of a year into a policy with a cash value of zero will produce zero cash value at the end of the year. The calculation of this premium uses the guaranteed values for mortality, interest and expenses given in the policy (Kansas Insurance Department, 2000).

The one-year valuation premium equals the net one-year premium based on the original benefit schedule for the corresponding policy year. The one-year valuation premiums are determined at the issue of the policy and do not allow the use of select mortality factors as defined in the regulation (Kansas Insurance Department, 2000). The frequency of fund processing as well as the distribution of death assumption shall be included in the calculation of the one-year valuation premium (Kansas Insurance Department, 2000).

3.3.1 Basic Reserves for Secondary Guarantees

The basic reserves for the secondary guarantees are defined as the segmented reserves for the secondary guarantee period (Kansas Insurance Department, 2000).

The segmented reserves are defined as follows by the contract segmentation method. This method divides the duration from issue to the mandatory termination of the policy into segments. The length of each segment is defined as the difference between the end of the preceding segment to the end of the latest policy year as defined below. The 1980 CSO Table (or any other by the NAIC adopted table) is used for all calculations, and, if chosen, the optional minimum mortality standard for deficiency reserves as defined later (Kansas Insurance Department, 2000). The length of the segments is determined by the minimum value of t for which $G_t$ is greater than $R_t$. For the case that $G_t$ never exceeds $R_t$, the length of the segment is defined as the number of years from the beginning of the segment until the mandatory expiration date of the policy (Kansas Insurance Department, 2000).

$G_t$ and $R_t$ are defined as follows:

$$\frac{\quad}{\quad_1} \tag{9}$$

and $$\frac{\quad}{\quad_1} \tag{10}$$

where

$x$ = original issue age

$k$ = number of years from issue to the beginning of the segment

$t$ = 1, 2, …; t is reset to 1 at the beginning of each segment

$_1$ = guaranteed gross premium per thousand dollar face amount for year t of the segment. Policy fees are ignored only if they are level for the premium paying period of the policy.

$_1$ = valuation mortality rate for deficiency reserves in policy year k+t, using the select mortality tables defined in the regulation (Kansas Insurance Department, 2000) if the use of the X factors (see Section 3.2.3) is chosen for the calculation of the deficiency reserves for durations in the first segment (Kansas Insurance Department, 2000).

The value of $R_t$ is allowed to be changed by one percent in any policy year by opinion of the company, but is not allowed to be less than one. The reason for the one percent tolerance of $R_t$ is to prevent irrational segment lengths. The rounding avoids segments greater than one year, which might otherwise be the case for premiums following the underlying mortality table (Kansas Insurance Department, 2000).

In the case that 0 and $_1$ 0, 100(. If 0 and $GP_{x+k+t-1} = 0$, 0.

The gross premium for these calculations equals the specified premiums, if defined, or otherwise equal the minimum premiums, which keep the policy in force (Kansas Insurance Department, 2000).

### 3.3.2 Deficiency Reserves for Secondary Guarantees

Deficiency reserves for secondary guarantees, if applicable, are to be calculated for the secondary guarantee period as described below, with gross premiums equaling the specified premiums, if defined, or otherwise the minimum premiums, which would keep the policy in force (Kansas Insurance Department, 2000).

The calculation of the deficiency reserves is ruled to be on a segmented basis as the corresponding basic reserve is segmented.

Deficiency reserves have to be calculated for all policies for which at any time during the life of the contract the modified net premium calculated with the method used for the basic reserve while applying minimum valuation standards for interest and mortality is greater than the guaranteed gross premium (Kansas Insurance Department, 2000).

The gross premium is for this calculation substituted as mentioned above.

Deficiency reserves are calculated for each policy as the excess, if greater than zero, of the quantity A (see Section 3.2.3) over the basic reserve as defined in Section 3.2.1. As the deficiency reserve for Universal Life products is determined on a segmented basis, the quantity A is calculated with segments of the same lengths as the ones used for the calculation of the basic reserve (Kansas Insurance Department, 2000).

### 3.3.3 The X Factors and the Quantity A

As mentioned in Section 3.2.2 two newly introduced terms are of importance for the calculation of the deficiency reserves, the so called “X Factors” and a quantity just labeled A (Kansas Insurance Department, 2000), where the later depends on the first.

As mentioned above, the deficiency reserves are calculated for each policy as the difference between A and the basic reserve. If this difference is positive, deficiency reserves have to be set up (Kansas Insurance Department, 2000).

The quantity A is determined by recalculating the basic reserve for each policy by using the guaranteed gross premiums instead of the net premiums for the time periods in which the later is greater than the guaranteed gross premiums (Kansas Insurance Department, 2000). The company can chose for any one or more plans of insurance to calculate quantity A and the corresponding net premiums used for the calculation of A based on the 1980 CSO valuation tables with select mortality factors. These select mortality factors can be:

- The ten-year select mortality factors of the 1980 amendments to the NAIC Standard Valuation Law;
- The selected mortality factors defined in the regulation (Kansas Insurance Department, 2000);
- For the time period of the first segment, X percent of the select mortality factors given in the regulation;
- Any select mortality table adopted and published by the NAIC for the purpose of the calculation of deficiency reserves.

The percentages of the last point are also referred to as the "X Factors" (Kansas Insurance Department, 2000) and are subject to several conditions:

- The percentages X may vary across policy years, policy forms, underwriting classifications, issue age and any other factor affecting mortality experience;
- X is not allowed to be less than twenty percent (20%);
- X is not allowed to decrease in successive policy years;

- X is defined in such a way that (i) is greater or equal to (ii) when using the valuation interest rate for the basic reserves;
    - (i) = actuarial present value of future death benefits calculated applying the mortality rates resulting from the application of X;
    - (ii) = actuarial present value of future death benefits calculated with anticipated mortality experience without including any assumed improvements after the valuation date;
- Mortality rates resulting from the application of X may not be less than the anticipated mortality experience, without inclusion of expected improved in mortality after the valuation date, for the first five years after the valuation date;
- The appointed actuary has to increase X at any valuation date if the given requirements are not met;
- The decrease of X by the appointed actuary is allowed if X is not decreased in successive policy years and as long as it still meets all requirements;
- Adverse effects on mortality and lapsation caused by the increase of the gross premium have to be taken into consideration by the appointed actuary in determining X;

- In the case that X is less than 100 percent at any time during the life of a policy, the following requirements have to be met:
    - An actuarial opinion and memorandum have to be prepared by the appointed actuary;
    - The conformity of X with the given requirements has to be stated by the appointed actuary on a yearly basis. This statement has to be accompanied by an actuarial report which follows the Actuarial Standards of Practice. The X factors are to reflect the anticipated development of future mortality without taking possible mortality improvement after the valuation date into account.

# CHAPTER IV

# THE DEVELOPMENT OF THE CASH VALUE IN UNIVERSAL LIFE POLICIES

The cash value is one of the central aspects of Universal Life insurance, once with regard to the necessity of premium payments and also with regard to the development of the death benefit. This chapter will first explain the importance of the cash value in detail and then analyze the influence of different factors on the development thereof. In the last part of the chapter I will derive a general formula for the development of the cash value and give an example from Country Insurance and Financial Services.

## 4.1 The Cash Value of Universal Life Policies

As briefly described in Section 2.2 the cash value is one of the central components of Universal Life policies. It has such a central role for the policy for various reasons:

- Provide funds for later years of the policy when mortality charges increase.
- It has a high influence on the development of the death benefit of the policy.
- It supplies funds to cover expenses and mortality charges in the case of skipped premium payments.
- It serves as an investment fund and provides the possibility of loans or withdrawals as well as a payment when the policy matures.

Especially the first three points emphasis the significance of the cash value. The first point is of importance for all permanent life insurance policies as they are all based on the same mechanism (see Section 4.1.1). The influences on the death benefit were briefly addressed in Section 2.1.2 and will be discussed here in greater detail in Section 4.1.2. The third point is a specific feature of flexible products and will here be discussed in the context of Universal Life in Section 4.1.3. The last aspect will be explained in Section 4.1.4, especially with respect to loans and withdrawals. The investment character of the cash value will be discussed in Chapter 5.

### 4.1.1 Cash Value Development in Traditional Permanent Insurance

The need for cash value accumulation in permanent insurance is generated by the general increase of mortality rates with the increase of the insured's age and the desire for level premium payments (Bowers et al., 1997).

The increase of mortality rates from a certain age to the next one results typically in an increase of the cost of insurance. This effect is possibly lessened by a decrease in the net amount at risk, which tends to eliminate the effect of increasing cost of insurance in early years but cannot keep up with the increase in mortality for higher ages (Bowers et al., 1997).

One can see the effect of this increase of mortality if one looks at the term insurance rates for different ages. Being very low in young years, one year term insurance rates increase very sharply with increasing age, especially in the years after retirement.

To avoid this sharp increase in premiums and therefore give the policyholder more financial predictability, the high mortality charges of older ages are pre-funded with premiums of younger ages.

The actuary determines a level premium which is guaranteed for the life of the policy and which, regularly paid, is sufficient to fund all benefits of the policy.

With the standard actuarial notation, the basic discrete formulas for benefit premiums and reserves of whole life insurance are (Bowers et al., 1997):

for the premium $P_x = \dfrac{A_x}{\ddot{a}_x}$ (11)

for the reserve ${}_kV_x = A_{x+k} - P_x \ddot{a}_{x+k}$ (12)

The surplus of these paid premiums over the actually incurred expenses in the early policy years lead to an accumulation of funds in the policy, the cash value. These funds are credited with interest and therefore increase with the duration of the policy. When the cost of insurance charges increase over the level of premiums paid, any additional charge is subtracted from the accumulated cash value.

As the pricing of a whole life policy is based on guaranteed values for interest, mortality and expenses, the cash value is guaranteed to increase to the face value by the time of maturity of the policy (Bowers et al., 1997).

### 4.1.2 The Influences of the Cash Value on the Death Benefit

Universal Life insurance is offered with two types of death benefit, one level and one increasing. The level death benefit is usually referred to as Option A and the increasing one as Option B. We will now discuss the influence of the cash value on the death benefit under each option, each time with consideration of Section 7702 of the IRC.

#### 4.1.2.1 Death Benefit Option A

Death benefit option A describes a level death benefit. Under this option the policyholder chooses a specified amount to be his death benefit, which stays level over the life of the contract (Black and Skipper, 2000). The death benefit increases only if the accumulated cash value increases to an ex tend that the corridor rules of Section 7702 apply. The possibility of the policyholder increasing the specified amount will not be discussed here. The corridor rule applies if the corresponding percentage of the cash value is higher than the specified amount, in which case the death benefit is automatically increased to conform to the requirements (Dearborn, 2000).

An example for the development of the death benefit given a certain development of the cash value can be found in Figure 5.

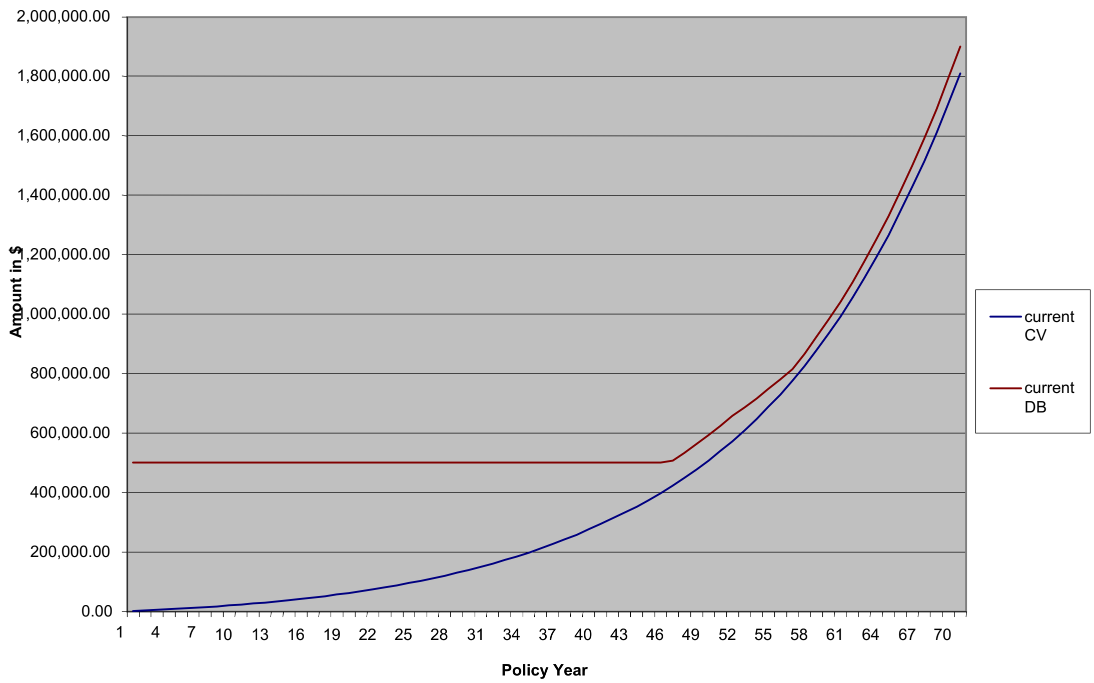


Figure 5: Development of the Death Benefit and the Cash Value under Death Benefit Option A (Country, 2004)

The other influence the cash value has is not directly on the death benefit, but on the net amount at risk of the policy. The net amount at risk is defined as the specified amount less any accumulated value in the policy (Black and Skipper, 2000). An increasing cash value leads therefore to a decreasing net amount at risk, or vice versa. A decreasing net amount at risk benefits the policyholder as it decreases the cost of insurance, being the product of net amount at risk and mortality rate. The net amount at risk can clearly be seen to be decreasing in Figure 5 for policy years one through 55. The increase of the death benefit for policy years 46 and higher is caused by the corridor rule, as described in Section 2.4.1.

#### 4.1.2.2 Death Benefit Option B

Death benefit option B is an increasing death benefit pattern where the policyholder chooses a certain net amount at risk which will stay constant over the life of the policy (Black and Skipper, 2000). The death benefit therefore changes accordingly with any change in the cash value. An increasing cash value will consequently increase the death benefit, as well as a decreasing cash value will decrease the benefit.

As for this option an increase in the cash value does not reduce the net amount at risk, the cost of insurance is higher for this option. This tends to decelerate the increase of the cash value as higher cost of insurance are deducted each period (Dearborn, 2000).

Figures 6 and 7 show an exemplary development of the death benefit under option B, given each a certain development of the cash value and a given specified amount.

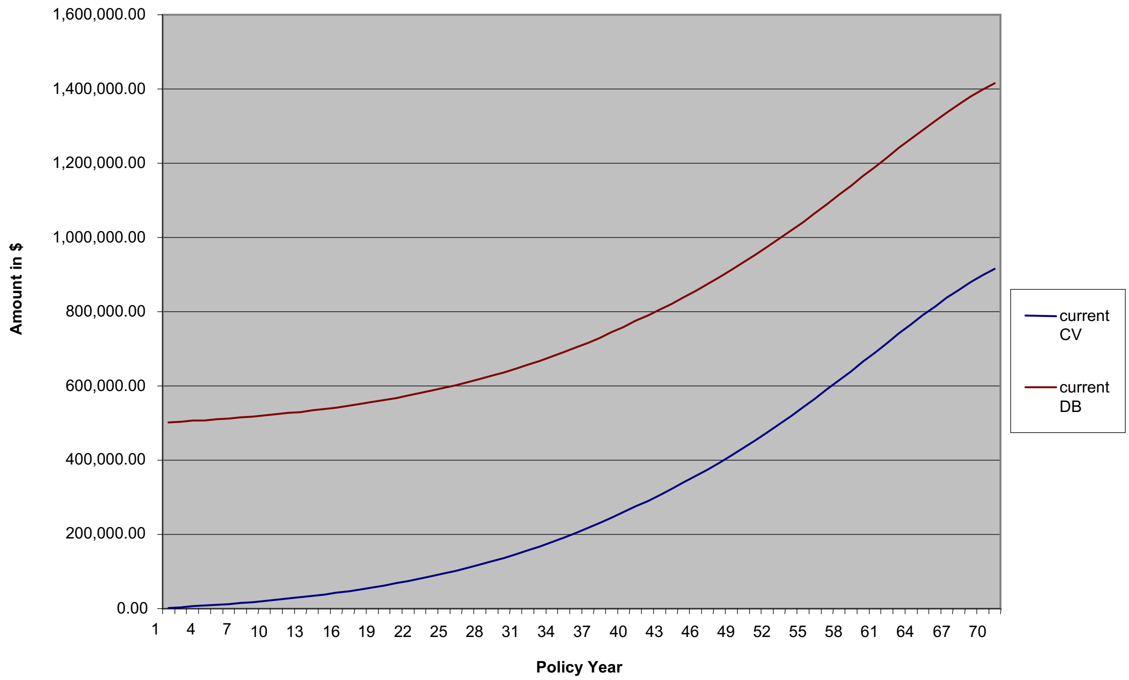


Figure 6: Development of the Death Benefit and Cash Value under Death Benefit Option B (Country, 2004)

Due to the nature of this death benefit pattern, it is very hard for the policy, not to conform to the corridor test of Section 7702 of the IRC, but nevertheless possible. If the chosen net amount at risk level is relatively low to the accumulated cash value of the policy, an increase due to the corridor rule has to be done. This can be seen in Figure 6 for policy years 20 to 37.

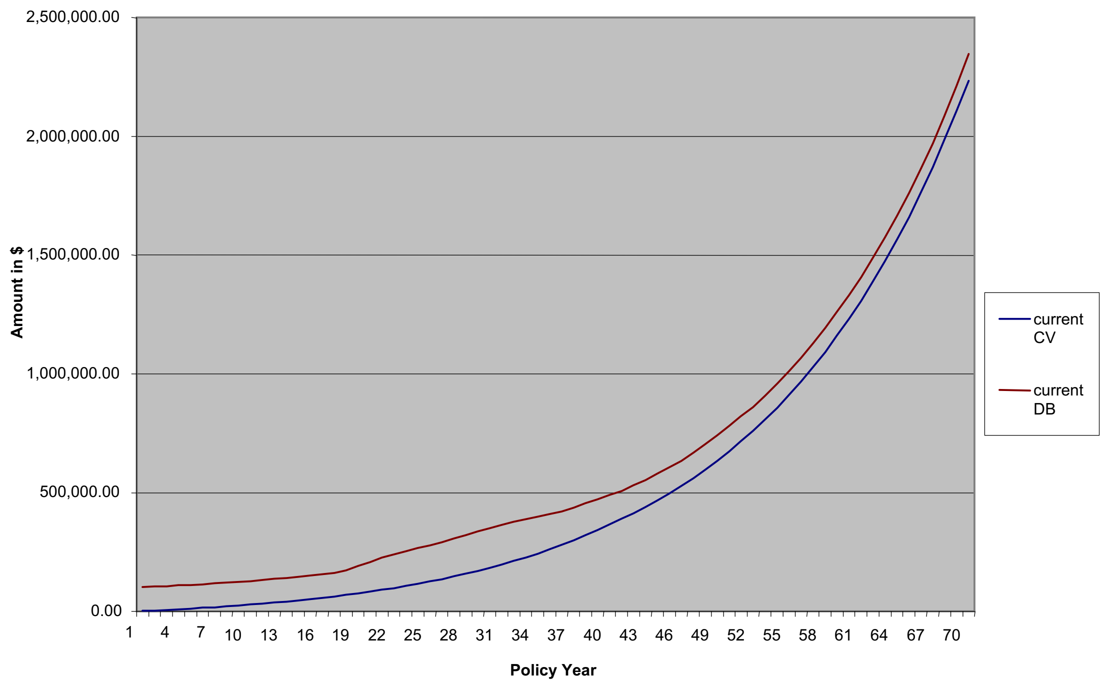


Figure 7: Development of the Death Benefit under Option B with Application of the Corridor Rule (Country 2004)

### 4.1.3 The Cash Value as Provider of Flexibility

Without the accumulation of cash value the insurer had no source for the deduction of expenses and mortality charges in the case of a not sufficient or even skipped premium payment by the policyholder.

As cash value accumulates during the life of the policy, it gives the policyholder the possibility to skip premiums, which, in fact, is a payment of premiums out of the cash value. Thus, if the cash value develops better than assumed, the policyholder might be able to fund all of the policy expenses with the earned interest on the cash value.

An insufficient grow of the cash value in contrast might force the policyholder to supply funds into the policy to keep it from lapsing before maturity (Black and Skipper, 2000).

These two scenarios are not possible under whole life insurance, as there the development of the cash value is guaranteed, whereas it is just assumed under Universal Life. A similar approach is contained in a participating whole life contract where paid dividends might serve to decrease premium payments in order to make the policy self-sustaining (Black and Skipper, 2000).

#### 4.1.4 Possibilities to Access the Cash Value

The easy accessibility of the cash value under Universal Life insurance provides additionally to the flexibility of the product.

The insured has the same right to be granted a policy loan as with whole life insurance. These loans have often a predetermined interest rate, which is today often linked to market values to decrease the risk of disintermediation. The permission to include variable interest rates for policy loans was given by the Model Policy Loan Interest Rate Bill, which was adopted by all states (Black and Skipper, 2000).

Policy loans provide an easy access to the equity in the policy for usually a low cost. The low cost arises from the difference of the interest rate paid on the loan and the interest rate credited on the borrowed on cash value. This difference is the net paid interest, typically referred to as spread, which often is in the range of only one to three percent (Baldwin, 2001). The loan amount is limited by the cash surrender value of the policy less charges to keep the policy in force for several months (Black and Skipper, 2000). This time period is depending on the insurance company and is usually about three month in length (Blease, 2004). In the case of the dead of the insured, the payable amount is decreased by any outstanding loan amounts.

Another way to access the cash value in Universal Life is the partial withdrawal of funds, an approach not available in whole life insurance. With partial withdrawals, the policyholder can access any amount of his available cash value (Black and Skipper, 2000). The available cash value is the accumulated cash value less any surrender charges and less any policy loans (Baldwin, 2001). The available amount is often subject to other restrictions, too. Many companies have additional lower and upper limits for withdrawals. The lower limits are in the range of $100 to $500, whereas the upper limits are regularly defined by the remaining cash or face value, not allowing the face value to drop below $100,000 or the withdrawn amount to exceed the cash surrender value less the monthly deductions of two or three months (Blease, 2004). Partial withdrawals are also often subject to a surrender charge, usually in the range of $25 to $50. The permitted frequency of partial withdrawals ranges from one to unlimited for one year, usually starting after the first policy year (Blease, 2004).

If the policy matures, and for most policies in the market this happens at age 100, the accumulated cash value is usually paid out. Exceptions arise from extended maturity riders which grant death benefits until a later age, mostly 120 years, or even longer. Some policies do not have a maturity date and do not require premium payments after the insured turned 100 while no longer deducting expense and mortality charges (Blease, 2004).

## 4.2 The Factors of Influence for the Cash Value

This section will talk about the different factors which influence the development of the cash value. They will be introduced and briefly explained and conclusive, with the help of research done by James M. Carson, their influence will be discussed.

### 4.2.1 Parameters Influencing the Cash Value

#### 4.2.1.1 The Credited Interest Rate

One would expect the credited interest rate to be the most important factor of influence on the development of the cash value. As we will see in Section 4.2.2 this is true for most policy years, although not necessarily true for the first policy years where expense and mortality charges have a bigger influence on the development of the cash value.

The credited interest rate is not the only interest rate of concern for Universal Life contracts. Another interest rate of importance is the guaranteed interest rate. This rate is the minimum rate guaranteed by the insurer to be credited to the account of the policyholder (Black and Skipper, 2000). Typically interest is credited monthly at the end of each policy period with the interest rates given on an annual basis (Black and Skipper, 2000). Although interest is credited monthly, most companies can provide cash values for every day of the contract, with interest technically credited daily (Country, 2004).

The third item to be considered concerning interest rates is the current crediting basis. With the crediting base the insurer determines how he passes earned interest to his customers. The two most common alternatives are to take either new money rates or portfolio rates. When the insurer decides to choose the portfolio approach, it credits his customers with the earned interest on the overall portfolio held by the insurer. In the case of the new money rates it credits the cash values with interest rates available in the market for investment. The portfolio rates tend to be more stable than the new money rates, decreasing slower in falling interest rate environments whereas new money rates can react more quickly on upward changes in the interest rates. About 64% of the policies use the portfolio approach whereas 31% use the new money approach (Blease, 2004).

Sales illustrations often advertise with the current credited interest rates projected into the future to achieve high yield scenarios for the potential customer. They are also required by the Universal Life Model Regulation (American Academy of Actuaries, 1998) to include an illustration of the guaranteed cash value development, given regular premium payments.

Another interesting feature is the crediting of persistency bonuses, also called illustration enhancements. These long-term bonuses are supposed to enhance illustrations as well as to encourage persistency. These bonuses are typically subject to conditions imposed by the credited interest rate. The bonuses are triggered by various events, as, e.g., a certain amount of policy years, a certain accumulated cash value in the policy or market interest rates. They are either once or on yearly policy anniversaries. These bonuses are in the range of 0.1% up to 1% annually and are granted by 57% of the policies (Blease, 2004).

The guaranteed interest rates in the market are in the range of 2% up to 4%. One policy even grants 6.5% guaranteed for the first year and 3.5% thereafter (Blease, 2004). The current interest rates are between 3% and 6.7%. Some insurance companies distinguish between unloaned and loaned crediting rates, where no trend is observable which rates tend to be higher. For some Universal Life policies, about 13.5%, the credited interest rates also varies by the face amount of the policy, the so called bands, with higher amount receiving higher rates (Blease, 2004).

#### 4.2.1.2 The Expense Charges

The expense charges have, naturally, a negative influence on the cash value. For Universal Life policies there are three main expense charges assessed with most policies. One charge is quoted as a percentage of the paid premium; one other charge is a monthly policy charge, due regardless of a premium payment and the third one is a per $1000 face amount charge, also assessed each month (Black and Skipper, 2000). The charging of expenses with respect to the face amount is not very common in today's policies, only about 23.5% of the policies include this (Blease, 2004).

For all of these charges there are again current and guaranteed values. The guaranteed values define the maximum charges allowed in the policy and are given in the contract at issue. The current rates may change during the life of the policy but are usually only increased, if possible, up to the guaranteed amounts.

The policy fees in the market range from $2.50 per month up to $10 per month. Some companies have a tiered fee system with higher fees in the first years. One extreme example is a policy fee of $996 in the first year and $72 in the following years. Some other companies also charge an explicit contract fee for issuing the policy (Blease, 2004).

The premium charges also differ highly in their extent. They range from 2% up to 10% of each premium. The guaranteed values are in the range of 7% to 11% per premium. Some policies try to recuperate the first year expenses via the premium load. This shows in expense charges of 35% or 50% of the first year's premium (Blease, 2004).

The charges with respect to the face amount were not published. They vary with age, sex and underwriting class and are mostly limited to the first five years of the policy.

#### 4.2.1.3 The Mortality Charges

The mortality charges, often referred to as the cost of insurance, are another very important influence of the development of the cash value. The cost of insurance is the product of net amount at risk and the applicable mortality rates (Black and Skipper, 2000).

The net amount at risk depends on two factors. First the chosen death benefit pattern and second the prior development of the cash value. As mentioned before, death benefit option A usually leads to a lower net amount at risk as death benefit option B, thus leading to lower cost of insurance.

The attainable face amounts of the policies, and therefore maximum net amounts at risk, vary widely between the different companies. The minimum available policy size ranges between $25,000 and $100,000 for most companies. The maximum policy sizes are often subject to reinsurance. Most companies also split the face amounts into different bands for which they often apply different interest rates or mortality rates (Blease, 2004).

The mortality rates depend on various factors. These factors include the age of the insured, his sex and his risk classification.

To determine the age of the insured, insurance companies employ two methods, both of which will be briefly explained here.

The most common method, used with 72.8% of the policies, is the age nearest method (Blease, 2004). This method uses the nearest birthday of the applicant to determine the issue age of the policy. The age last method uses the applicant's age at his last birthday as the issue age.

The mortality rates are determined by mortality tables. They differ by sex and risk classification. Most insurers distinguish between risk classes, usually a preferred tobacco and non-tobacco as well as standard tobacco and non-tobacco. Some companies have an additional preferred plus class for risks they categorize as extremely good. The risk class an applicant is sorted in determines his mortality charges and also might limit the entry ages for the policy, where preferred risk classes do not permit extremely high ages (Blease, 2004).

The mortality rates follow mostly a Select & Ultimate table, with selection times of 15 to 30 years. About 69% of the companies use this approach whereas just 17% use Attained Age, i.e. ultimate, tables (Blease, 2004). For an explanation of mortality tables I refer the interested reader to the book Actuarial Mathematics by Bowers et al. (Bowers et al., 1997).

If the applicant is found to be a substandard risk, additional mortality charges may be applied. This can either be done by taking multiplies of the tabulated mortality rates for each age or by adding flat extra rates into the tabulated rates. These alterations are often used if there is, e.g., a known cancer history in the family of the applicant. They reach from 150% up to 500% of the basic mortality rates (Country, 2004). Another possibility is the addition of only temporary flat extra charges. These temporary extra charges describe a temporary increased risk, as for example a high-risk work environment or sport.

#### 4.2.1.4 The surrender charges

Although the surrender charges have no influence on the cash value of the policy, they do have an influence on the cash surrender value of the policy. This is of importance as the cash surrender value is the deciding measure for partial or full withdrawals as well as policy loans and therefore is the upper limit for the available funds.

Surrender charges have been discussed in Section 4.1.4 and will therefore only be briefly addressed here.

Surrender charges are assessed either as a decreasing flat amount or as a percentage of the cash value (Blease, 2004). Both ways reduce the cash value of the policy and enable the insurer to recuperate his not amortized first year expenses.

### 4.2.2 The Quantitative Influence of the Parameters

To determine the quantitative influence of the just parameters mentioned in Section 4.2.1, Chung and Skipper analyzed the influence of the interest rate on the cash value with help of a single-variable regression (Chung and Skipper, 1987). They examined policies for 45 year old non-smoker males with death benefit option A and projected cash surrender values.

Their results show no significant relation of the cash value to the interest rate for durations of 1 and 5 years whereas there is a significant relation between these two measures for durations of 10, 15 and 20 years. For the cash surrender values they even find a significant negative correlation for the 1 year duration, negative, but not significant, correlation for the 5 year duration and positive significant correlation for durations 10, 15 and 20 (Chung and Skipper, 1987).

They conclude that for short durations the influence of mortality and expense charges have a higher influence on the development of the cash value than the credited interest rate. With increasing duration the significance of the interest rate increases, but on cannot conclude that high yield policies will result in the highest cash value.

Carson extended Skipper's and Chung's research using a multivariate regression to determine influences on the cash value. (Carson, 1996) He used similar data as Skipper and Chung but including expenses, mortality and surrender charges. He also used historical developments of cash values and not projected ones.

The model he used was:

$$\begin{aligned} SURRVAL_{it} &= a + b_1 INTRATE_{it} + b_2 EXPCHG_{it} \\ &\quad + b_3 MORTCHG_{it} + b_4 SURRCHG_{it} + e_{it} \end{aligned} \tag{13}$$

The subscript i corresponds to company i and t refers to the holding period t, where t can take the values 1, 5 and 10. SURRVAL is the end of year surrender value and the dependent variable of the regression. The interest rate variable, INTRATE, is the geometric average of the actually credited interest rates for each holding period. EXPCHG expresses the average annual expense charge for each period, where MORTCHG represents the average annual mortality charges. SURRCHG is the variable expressing the surrender charge, computed as the difference of the accumulated cash value and the surrender value of the policy (Carson, 1996).

The results show that expenses, mortality and surrender charges are significantly negatively correlated to the surrender value. The values of the coefficients of the regression are shown in the following table (Table 5) for holding periods of one, five and ten years.

Table 5: Results of the Multivariate Regression (Carson, 1996)

| | | One-Year Parameter Estimates | | Five-Year Parameter Estimates | | Ten-Year Parameter Estimates | |
|---|---|---|---|---|---|---|---|
| Variable | Expected Sign | Estimate | T-Value | Estimate | T-Value | Estimate | T-Value |
| Dependent Variable: | | SURRVAL (Surrender Value) | | | | | |
| Intercept | | 1397.64(FN*) | 7.5 | 8929.26(FN*) | 13.24 | 18355.00(FN*) | 8.86 |
| INTRATE | + | 16.5 | 1.03 | 84.29 | 1.26 | 517.28(FN**) | 2.27 |
| EXPCHG | - | -0.86(FN*) | 15.08 | -6.36(FN*) | 14.41 | -15.12(FN*) | 8.2 |
| MORTCHG | - | -1.30(FN*) | 6.21 | -6.63(FN*) | 11.28 | -13.89(FN*) | 9.04 |
| SURRCHG | - | -0.89(FN*) | 22.99 | -0.94(FN*) | 23.47 | -0.81(FN*) | 4.83 |
| Adjusted $R^2$ | | 0.88 | | 0.89 | | 0.64 | |
| | | | | | | | |
| Dependent Variable: | | LOGSUVAL (Log of Surrender Value) | | | | | |
| Intercept | | 18.25(FN**) | 1.96 | 11.24(FN*) | 9.73 | 12.12(FN*) | 23.08 |
| LOGINT | + | 0.55 | 0.18 | 0.28 | 0.71 | 0.27 | 1.63 |
| LOGEXPCH | - | -0.29(FN**) | 2.05 | -0.05(FN*) | 2.87 | -0.04(FN*) | 5.42 |
| LOGMORCH | - | -2.66(FN**) | 2.52 | -0.49(FN*) | 3.97 | -0.48(FN*) | 8.15 |
| LOGSURCH | - | -0.50(FN*) | 5.75 | -0.03(FN*) | 4.51 | -0.01(FN*) | 2.88 |
| Adjusted $R^2$ | | 0.52 | | 0.28 | | 0.49 | |

Table 5 shows that expenses, mortality and surrender charges are significant for all holding periods under consideration, where (*) denotes significance at the 0.01 level and (**) significance at the 0.05 level. The interest rate shows to be only significant for the 10 year period. The values have to be interpreted per dollar gain or loss, meaning that, e.g. for each dollar of surrender charge for the five year period, the cash value will decrease 94 cents. The values for expenses and mortality charges for the five and ten year holding periods are approximately the future values of 5 or 10 year annuities of one dollar per year. (Carson, 1996)

The second part of Table 5 shows the results of a log-linear model, giving the elasticity of the variables. The results are similar to the linear model, except that the interest rate is not significant for any duration. The log-linear model shows furthermore that the elasticity of the surrender value with respect to the mortality charges is higher than the sum of the elasticity of the credited interest rate, the expenses and the surrender charges. For the ten-year period, for example, a ten percent increase in the mortality charges would lower the cash surrender value by 4.8% (Carson, 1996).

Carson (1996) also found a significant positive correlation of 0.28 between the credited interest rate and the expense charges for the ten-year period, thus higher interest rates are typically achieved at the cost of higher expense charges. No other variable showed to be significantly correlated with the credited interest rate. Additionally the correlation coefficients of the mortality and surrender charges show direct correlation between the two for the five and ten year periods. As mortality and surrender charges are significantly negatively correlated with the expense charges (-0.32 and -0.37 respectively for the 10 year model), lower mortality charges come at the cost of higher expenses (Carson, 1996).

These results show that one cannot only rely on the credited interest rate to achieve a good development of the cash (surrender) value. Especially for short term horizons the effect of mortality and expense charges outweighs the effect of the credited interest rate as compound interest cannot have a significant effect (Carson, 1996).

In further research, Carson and Dumm (2001) look at the influence of external factors on the development of the cash surrender value. They choose the measure of the correlation coefficient $r$ to compare the different variables. They consider the lapse ratio, the general expenses, the yield on investment, the premium income, the A.M. Best rating, the overall gains to income, the organizational form, i.e. if the insurer is a mutual or a stock company, and the frequency of product changes in this research (Carson and Dumm, 2001).

The results show that the cash surrender value is strongly negatively correlated to the lapse rate with $0.47$ at a significance level of 0.01 (Carson and Dumm, 2001). The other variables, which show a significant correlation with the surrender value, are the yield on investment, positively correlated with $0.23$ and significant at the 0.05 level, and the organizational form, negatively correlated with $0.22$ and significant at the 0.1 level. The negative correlation for the organizational form means here that stock companies tend to offer policies with lower cash surrender value (Carson and Dumm, 2001).

We can observe from these results that a reduction in lapse rates will have a major positive influence on the development of the cash surrender values of Universal Life policies (Carson and Dumm, 2001). Furthermore can we see that mutual companies tend to offer higher surrender value for their policies which might be a result of lower lapse rates. The statement that mutual companies have lower lapse rates than stock companies can also be deferred from the data (Carson and Dumm, 2001).

## 4.3 The Calculation of the Cash Value

In this section I will derive formulas for the calculation of the cash value. The calculations require assumptions about the interest rate, the mortality rates and also the expense charges. The formulas will be on a monthly basis, unless otherwise stated.

4.3.1 Definition of the Variables and Symbols used

$CV_t$ = Cash value at the end of policy month t

$GP_t$ = Gross premium paid for policy month t

$TP_t$ = Target premium for policy month t

$COI_t$ = Cost of insurance for policy month t

$FL_t$ = Flat policy load for policy month t

$PL_t$ = Percent of premium load of policy month t

$RC_t$ = Rider charges for policy month t

$WP_t$ = Waiver of premiums charge for policy month t

$WM_t$ = Waiver of monthly deductions charge for policy month t

$q_t$ = Rate of mortality for policy month t

$SA_t$ = Specified amount of the policy in policy month t

$i_{c,t}$ = current interest rate for policy month t

$i_{g,t}$ = guaranteed interest rate for policy month t

$i_g$ = guaranteed annual interest rate

$i_c$ = current annual interest rate

$v_{g,t}$ = Discount rate for policy month t using the guaranteed rate $i_g$

$C_t$ = Applicable percentage for the corridor test of Section 7702 of the IRC for policy month t

### 4.3.2 Assumptions used for the Calculations

In order to derive any formula one has to clarify certain assumptions (Cherry, 2000).

The premium payments $GP_t$ are assumed to be paid at the beginning of month t, just prior to the deduction of any charges.

The order of deductions is assumed to be as follows. First monthly expenses and rider charges are deducted. Then the cost of insurance for the applicable net amount at risk is subtracted, followed by the charges for the waiver rider.

The charge for the rider of monthly deductions is assumed to be a percentage of the applicable charges, whereas the charge for the rider of premiums is assumed to be a percentage of the target premium.

### 4.3.3 A Monthly Recursion Formula

The cash value describes the surplus funds of inputs over outflows of the policy. As mentioned in Section 4.1, the premium payments and the credited interest have a positive influence on the cash value whereas deductions in the form of expenses, mortality charges and other applicable charges reduce the cash value.

The most basic formula to describe this issue is:

$$CV_t = \left(CV_{t-1} + GP_t - COI_t - \left(FL_t + PL_t GP_t\right)\right)\left(1 + i_t\right) \tag{14}$$

This formula implies that all deductions happen at the beginning of the period t and the remaining funds are credited with the interest rate $i_t$.

A more complicated version of this formula also considers charges for riders, especially the waiver of premium rider as well as others (Cherry, 2000).

$$CV_t = \left(CV_{t-1} + (1 - PL_t)GP_t - (COI_t + RC_t + FL_t)(1 + WM_t)\right)(1 + i_t) \tag{15}$$

Here the waiver rider is assumed just to be a waiver of charges rider. A formula for a waiver of premiums would look like the following.

$$CV_t = \left(CV_{t-1} + (1 - PL_t)GP_t - COI_t - RC_t - FL_t - TP_t WP_t\right)(1 + i_t) \tag{16}$$

Now we have to determine the value of $COI_{t,s}$ to include in the formula (given here for death benefit option A) (Cherry, 2000).

$$COI_t = \left[SA_t \cdot v_g - \left(CV_{t-1} + (1 - PL_t)GP_t - FL_t - RC_t\right)\right] \cdot q_t \tag{17}$$

The formula for death benefit option B is slightly different, due to the different calculation of the death benefit:

$$COI_t = SA_t \cdot v_g \cdot q_t \tag{18}$$

Inserting equation (17) into equation (16) yields

$$CV_t = \begin{pmatrix} CV_{t-1} + (1 - PL_t)GP_t - RC_t - FL_t - TP_t WP_t - \\ \left[SA_t \cdot v_g - \left(CV_{t-1} + (1 - PL_t)GP_t - FL_t - RC_t\right)\right] \cdot q_t \end{pmatrix}(1 + i_t) \tag{19}$$

$$= \begin{pmatrix} (1 + q_t)CV_{t-1} + (1 + q_t)(1 - PL_t)GP_t - (1 - q_t)FL_t - \\ (1 - q_t)RC_t - TP_t WP_t - SA_t v_g q_t \end{pmatrix}(1 + i_t) \tag{20}$$

$$= \begin{pmatrix} (1+q_t)CV_{t-1} + (1+q_t)(1-PL_t)GP_t - (1-q_t)(FL_t + RC_t) \\ - TP_tWP_t - SA_t v_g q_t \end{pmatrix} (1+i_t) \tag{21}$$

$$\begin{aligned} &= (1+q_t)(1+i_t)(CV_{t-1} + (1-PL_t)GP_t) \\ &\qquad - [(1-q_t)(FL_t + RC_t) - TP_tWP_t](1+i_t) - SA_t v_g q_t (1+i_t) \end{aligned} \tag{22}$$

Therefore, the cash value under death benefit option A for month t equals the cash value for month t-1 plus the net premium for month t, credited for interest and mortality. From this amount subtracted are flat policy loads and rider deductions, adjusted for mortality, and credited with interest, as well as the cost of insurance for the total specified amount of the policy, discounted with the guaranteed rate and credited with the current rate.

For death benefit option B, substituting equation (18) into equation (16) yields:

$$CV_t = (CV_{t-1} + (1-PL_t)GP_t - SA_t \cdot v_g \cdot q_t - RC_t - FL_t - TP_tWP_t)(1+i_t) \tag{23}$$

$$= (1+i_t)(CV_{t-1} + (1-PL_t)GP_t - RC_t - FL_t - TP_tWP_t) - SA_t \cdot v_g \cdot q_t(1+i_t) \tag{24}$$

$$= (1+i_t)(CV_{t-1} + (1-PL_t)GP_t) - (RC_t + FL_t + TP_tWP) - SA_t \cdot v_g \cdot q_t(1+i_t) \tag{25}$$

One can see that the cash value under death benefit option B for month t is calculated very analogous to the cash value for option A. The difference being, that under option B, no adjustments for mortality are made to premium payments, expenses and the last month’s cash value.

4.3.4 Example from Country Insurance and Financial Services

I want to present here an example how the formulas which were derived in the last section are applied in real life (Country, 2004).

From the information provided by Country Insurance and Financial Services, one can see that they use the following formula to determine the cash value of their Universal Life policies.

$$CV_t = \left(CV_{t-1} + (1 - PL_t)GP_t - FL_t(1 + WP_t) - (COI_t + RC_t)(1 + WP_t)\right)\left(1 + i_{c,t}\right) \qquad (26)$$

The cost of insurance is defined with the help of the net amount at risk, which is defined as $NAR_t = SA_t v_g - CV_{t-1}$ (27)

and another important quantity, the corridor net amount at risk, defined as $CNAR_t = CV_{t-1}(C_t - 1)v_g$ (28).

The cost of insurance for this policy is then defined as

$$COI_t = \begin{cases} \dfrac{CNAR_t q_t}{1000} & CNAR_t \geq NAR_t \\ \dfrac{NAR_t q_t}{1000} & CNAR_t < NAR_t \end{cases} \qquad (29)$$

These calculations hold for the current as well as the guaranteed values, with the appropriate value entered into the formulas.

# CHAPTER V

# COMPARISON OF THE INVESTMENT CHARACTER OF UNIVERSAL LIFE, WHOLE LIFE AND TERM INSURANCE

In this chapter I will first introduce three methods commonly used to compare life insurance contracts with respect to investment performance and cost efficiency. Following this I will describe the investment character of permanent life insurance in Section 5.2. A financial comparison of Universal Life insurance products with whole life products and term products together with an investment account will conclude the chapter in Section 5.3.

## 5.1 Methods for the Financial Analysis of Life Insurance

Conducting a financial analysis of life insurance policies can be done in various ways. I will follow the work of Carson and Forster (1996) and Baldwin (2001) and first introduce some common methods.

I will discuss the Joseph M. Belth method, the Linton yield method and the rate of return method here. These methods will be explained and clarified with an example each.

### 5.1.1 The Joseph M. Belth Method

Belth developed a method of determining costs and yield of a life insurance product. This method can easily be adopted by an individual who wants to determine the efficiency of his/her life insurance policy (Baldwin, 2001).

Belth came up with the following formula, which determines the yearly price of coverage for a life insurance policy (Carson and Forster, 1996).

$$YP = \frac{(P_t + CSV_{t-1})(1 + i_t) - (CSV_t + d_t)}{0.001 \cdot (SA - CSV_t)} \qquad (30)$$

YP is the yearly price per $1000 of insurance coverage, $P_t$ and $d_t$ are the most recently paid premium and dividend, respectively, $CSV_{t-1}$ and $CSV_t$ stand for last year's and this year's cash surrender value, SA is the specified amount and $i_t$ stands for an after-tax yield available in an alternative investment (Baldwin, 2001).

An interpretation of this formula could be that the premium and last years cash surrender value, the investment in the policy, credited with an interest rate available for an alternative investment. Subtracting this current cash surrender value and possible paid dividends one obtains the difference of the result one should have gotten to the actual amount, the net costs for the year. These net costs are divided by the net amount at risk, resulting in the cost per $ of life insurance coverage (Baldwin, 2001).

The result of this formula is a price, which, compared to a bench mark index developed by Belth, can be used to determine a superior or inferior policy price (Baldwin, 2001).

Baldwin (2001) calls Belth's formula one of the most credible systems to determine the cost of a life insurance policy, but still criticizes some of the input parameters for the method. For example are the benchmarks used for the comparison higher than today's cost (Baldwin, 2001), probably due to improved mortality over the last 20 years. Carson and Forster (1996) criticize Belth's formula for not producing consistent results for the same policy. They argue that the resulting price might be superior for some years and inferior for others, obscuring the information of the policy with the least costs.

Let us assume a 43 year old male policyholder who wants to evaluate his Universal Life policy. The cash surrender value at the beginning of the year is $387.04 and at the end of the year $1,195.45. The premium payment made at the beginning of the year is $1,200 for a level death benefit of $200,000. There are no dividend payments, and we assume an alternative interest rate of 5%.

Substituting these values into equation (the one below) yields:

$$YP = \frac{(P_t + CSV_{t-1})(1+i_t) - (CSV_t + d_t)}{0.001 \cdot (SA - CSV_t)} = \frac{(1200 + 387.04)(1.05) - 1195.45}{0.001 \cdot (200000 - 1195.45)}$$
$$= \frac{470.94}{198.80455} = 2.369 \qquad (31)$$

Comparing the obtained value of 2.369 with the given benchmark value of 4.00 one can see, that the insurance coverage cost of the product is lower than the benchmark price. The example is based on values obtained with the information provided by Country Insurance and Financial Services (Country, 2004).

### 5.1.2 The Linton Yield Method

The Linton Yield method, named after the actuary M. Albert Linton (Baldwin, 2001), treats an insurance contract as a composite of protection and savings element. From each premium a cost of protection is deducted and the remaining premium is treated as an investment (Baldwin, 2001).

The Linton yield equals the average interest rate earned on the investment part over the selected period, i.e. it is based on the internal rate of return methodology (Carson and Forster, 1996).

Linton never published an explicit formula for this method, so yields have been calculated with various methods. The basic concept of the method is that it values the coverage of the policy with the price it would cost to replace the same coverage amount. This value, along with any dividend payment, is then subtracted from the premium payment, resulting in a net savings amount, which is going to the savings part of the contract, or shortly: Annual premium less cost of protection less dividends equals savings (Baldwin, 2001).

One has to pay attention to the level of term insurance selected, as it is positively related to the resulting rate of return. This implies that higher term insurance rates will result in a higher yield as less investment, premium minus term rate, will result in the same projected values (Carson and Forster, 1996).

Baldwin (2001) criticizes this method for using composite numbers which might not be accurate in the individual case. Further he criticizes that the resulting yield is assumed to be constant as well as that the policy is assumed to be terminated at the end of the calculation period. His last point of critique is that illustration values are used for future value assumptions and that these illustrations usually lack accuracy.

An advantage of this method is that it produces an easily understandable result in the form of an average investment yield (Baldwin, 2001). Comparing this investment yield to after-tax returns of other investments can support the validity of the argument that life insurance is a competitive savings vehicle.

Carson and Forster (1996) also evaluate the Linton yield method. They conclude that this method, used with the lowest term rates available, is superior to any other cost comparison methods. It allows across policy comparisons which might lend insight in the competitiveness of life insurance to other saving methods.

Nevertheless they also criticize this method for the assumption of a side fund, which would not resemble the reality of modern cash value policies. They further suggest the use not only of average annual yields but also of marginal annual yields since these would provide further inside in the performance of cash value policies (Carson and Forster, 1996).

An example for a possible formula for the Linton Yield Method is (Carson and Forster, 1996):

$$FE_t = (FB_t - TCHG_t)(1 + i) \tag{32}$$

where

$FE_t$ = fund value at end of policy year t

$FB_t$ = fund value at the beginning of policy year t

$TCHG_t$ = term insurance charge for policy year t

$i$ = trial interest rate used for computing the size of fund at the end of year

The value of $i$ for the given policy equals the Linton Yield for the policy.

### 5.1.3 Rate of Return Method

Baldwin (2001) describes the rate of return method as a systematic process. This process returns a policy specific rate of return based upon various policyholder specific properties as the average equity in the policy or his/her tax-bracket.

In the first step, one determines the amount of pure life insurance coverage by subtracting the total current asset value from the total death benefit, defined as the face amount of the policy plus any potential additional policy provisions. The total current asset value is the capital in the policy which earns interest. In step 2 the total current costs are determined by adding any policy loan costs to the premium paid during the year under consideration. The costs of the policy loan are the sum of interest paid plus any difference in dividends received .Step 3 determines the cash received by the policyholder during the year. The total policyholder credit equals the current year's increase in cash value plus any received dividend payments during the year. One might criticize here, that an only one year consideration might lead to erroneous results for some scenarios, e.g. a variable insurance in a stock market downturn environment, but a recalculation with average values will adjust the impression. The fourth step determines the total investment in the contract as the total asset value less any outstanding policy loans. The total investment amount is an important figure in this concept as the rate of return to be calculated will be in reference to this measure. One can therefore think of various alterations of the given formula, e.g. a monthly average of actual values (Baldwin, 2001).

Step 5 calculates the earned amount in the current year. The policyholder credit from step three is lessened by the policyholder costs from step 2, resulting in the policyholder net gain for the current year. The cash-on-cash return for the policyholder is determined in step 6 by dividing the net gain from step 5 by the investment amount from step 4. From the cash-on-cash return in step 6 one now determines one's equivalent taxable return by dividing the result from step 6 by 1 minus one's tax bracket. This step assumes that alternative investment yields are fully subject to regular income taxation. To adjust this assumption if desired one can either ignore the step or use an expected return on capital rate for alternative investments instead of the tax bracket.

If one cares only about the rate of return for the policy, net of any costs and charges, one does not need to go any further and just compare the result from step 7 with one's alternatives. The life insurance coverage provided by the contract has nevertheless a value. How the individual prices this value depends on factors such as his/her health, age, family situation and others. Baldwin assumes for this method that the value of life insurance protection equals the net amount at risk determined in step 1 times the retail value of term insurance available to the individual.

In step 9 the total received benefit is defined as the policyholder’s net gain from step 5 plus the life insurance value from step 8. The rate of return for the policy is now defined as the total received benefits divided by the amount invested as calculated in step 4. The equivalent taxable return is determined analogue to step 7 in step 11, providing a rate of return comparable to alternative investments if one wants to include the benefits provided by the protection part of the insurance contract (Baldwin, 2001).

Table 7 shows a sample calculation for a policy under this method.

Table 7: Rate-of-Return Method Example (Country, 2004)

| | | | | | | |
|---|---|---|---|---|---|---|
| Data: | | | Step 1: Life Insurance Provided | | | |
| Age | 40 | | $ 236,554.81 | | | |
| Face Amour | $ 250,000.00 | | Step 2: Policyholder Costs | | | |
| Premium | $ 1,500.00 | | $ 1,500.00 | | | |
| DB Option | A | | Step 3: Benefits Received | | | |
| CV beginnin | $ 13,445.19 | | $ 2,084.31 | | | |
| CV end | $ 15,529.50 | | Step4: Investment in Policy | | | |
| increase CV | $ 2,084.31 | | $ 14,487.35 | | | |
| | | | Step 5: Year's Gain/Loss for Policyholder | | | |
| | | | $ 584.31 | | | |
| no policy loan | | | Step 6: Cash-on-Cash Return | | | |
| tax bracket | 28% | | 4.03% | | | |
| | | | Step 7: After-tax Return | | | |
| COI used: | | | 5.60% | | | |
| Current Country rates | | | Step 8: Value of Life Insurance | | | |
| | | | $ 37.80 | | | |
| | | | Step 9: Total Benefits | | | |
| | | | $ 622.11 | | | |
| | | | Step 10: Cash-on-Cash Return of Total Bene | | | |
| | | | 4.29% | | | |
| | | | Step 11: After-tax Total Yield | | | |
| | | | 5.96% | | | |

## 5.2 The Investment Character of Permanent Life Insurance

The main purpose of life insurance is to offset the financial impact of the insured's death for his surviving dependents or whoever else had an insurable interest in his/her life, e.g. with a key employee insurance.

Nevertheless, permanent life insurance does also have an investment or savings character. The accumulation of cash value inside the policy, accessible by the policyholder, can be seen as an investment vehicle. Atkinson and Dallas (Atkinson and Dallas, 2000) provide a list of tax-efficient ways to safe for future needs other than death:

- The establishing of a habit of saving caused by the regular payment of premiums, especially effective is these payments are directly deducted from the policyholder's paycheck.
- In some countries, e.g. Germany, life insurance premium payments are tax-deductible up to a certain amount, encouraging the savings through life insurance.
- The buildup of a policy's cash value is tax-deferred in most countries. The cash value is only taxed in the case of a surrender of the policy, where only the excess of cash surrender value over paid premiums is taxed.
- The death benefit is tax-free in almost all countries.

From this list one can see that savings with life insurance are encouraged in most countries. Especially the tax-deferred accumulation of the cash value emphasizes this encouragement.

The first one to separate a permanent life insurance contract into a protection and a savings component was done by M. Albert Linton in 1919. He was also the first one to try to determine a rate of return on the savings element (Baldwin, 2001). His model is still used today with the Linton yield method (see Section 5.1.2).

The separation of a permanent insurance contract in protection and savings components makes especially sense when comparing the cost of permanent insurance to a “buy term and invest the difference” strategy. Nevertheless does one have to keep in mind that a Universal Life contract offers more guarantees as a “buy term plus investment” strategy and can therefore not exactly be compared.

## 5.3 A Comparison of the ROR of Universal Life versus Whole Life and Term plus Investment Account

The comparison of investment yield of Universal Life insurance with whole life insurance and with the “buy term and invest the difference” approaches have been the subject of various publications.

In Section 5.3.1 I will discuss the papers of Cherin and Hutchins (Cherin and Hutchins, 1987), D’Arcy and Lee (D’Arcy and Lee, 1987) and

Carson, Foster, Russel and Flanigan (Carson, Foster, Russel and Flanigan, 1996) to compare Universal Life to the buy term and invest the difference strategy.

In Section 5.3.2 I will discuss the paper of Carson and Foster (2001) in which they compare the investment yield of whole life insurance with the yield achievable with Universal Life policies.

A conclusion will be drawn in Section 5.3.3, analyzing the results of the discussed papers.

### 5.3.1 Universal Life versus "Buy Term and Invest the Difference"

Cherin and Hutchins (Cherin and Hutchins, 1987) analyze two aspects in their work. First they compare the rate of return calculated for each policy to the quoted rate by the insurer. Further they come up with a technique to assign the discrepancy between the calculated rate of return and the quoted rate to the higher mortality charges of Universal Life compared to term insurance on the one hand, and the expense charges of Universal Life products on the other hand.

To determine the rate of return, Cherin and Hutchins (1987) use the Linton method in comparing the cash value after 20 years with the value of the investment stream from buying term and investing the difference. They define the internal rate of return as the rate, which equates the cash value of the policy at the end of the 20th year with the value of the investment stream created by the alternative strategy.

To determine the factors of influence for the difference between quoted and actual interest rate, they compare the present values of different investment streams, using the quoted interest rate as the discount rate (Cherin and Hutchins, 1987). They calculate the present values for the investment streams defined by (1) the premium payments minus the mortality charges, (2) the premium payments minus the mortality and expense charges and (3) the premium payments minus an open market term insurance rate. The quotient of (3)-(1) over (3)-(2) defines the percentage change in the present value due to the difference in the mortality charges of the Universal Life product where the quotient (1)-(2) over (3)-(1) defines the percentage change in the present value due to the expense charges of the Universal Life product.

Cherin and Hutchins obtain the following results (Cherin and Hutchins, 1987):

- Calculating the internal rate of return with low term insurance premiums results in consistently lower returns than quoted by the insurance companies. Applying average the term insurance rate of the sample yields all rates of return below the quoted interest rates. With high term insurance rates, still 60% of the internal rates of return were lower than the quoted rates.

- Using the guaranteed cash value to determine the internal rate of return results in rates lower than the guaranteed rates, in 21% of the cases even in a negative rate of return.
- The mortality charges for the Universal Life policies where for 32% of the policies lower than the average term insurance rate, nevertheless 98.3% of the policies showed an increasing present value by switching from the Universal Life to the term plus investment strategy.
- The mean increase of the present value is 35.46%, which is caused by the higher mortality charges (9.21%) and the expense loadings (26.25%).

Cherin and Hutchins argue that especially the last result is one of the reasons that Universal Life insurance is not a competitive investment vehicle (Cherin and Hutchins, 1987). They conclude that a "buy term and invest the difference" strategy puts the potential policyholder into a better position.

D'Arcy and Lee compare in their paper (D'Arcy and Lee, 1987) the after-tax rate of return of Universal Life insurance policies with the after-tax rate of return of various alternative investment possibilities. The alternatives under consideration are money market funds, municipal bonds, deferred annuities, discount bonds, IRAs and stocks. Each of these investments is accompanied by the purchase of a term insurance contract to reflect the protection element of the Universal Life contract.

They compare investment results after different holding periods, differentiating between pre- and post-retirement withdrawal. They furthermore differentiate between short term money market accounts, long term bonds and equity funds investments. Later is included as the paper treats Variable Universal Life insurance as well.

D'Arcy and Lee (1987) state that their goal is to determine if Universal Life insurance policies dominate alternative similar investment strategies for the parameters available. For their choice of parameter values I refer the interested reader to their paper "Universal/Variable Life Insurance Versus Similar Unbundled Investment Strategies", published in *The Journal of Risk and* Insurance in 1987 (D'Arcy and Lee, 1987).

D'Arcy and Lee (1987) compare a front loaded Universal/Variable Life policy with no surrender charges and a back loaded Universal/Variable Life policy with no monthly charges, both displaying the extreme possibilities of expense loadings.

The result most applicable for Universal Life policies is the comparison with investments in money market funds. The comparison in this case is between the two Universal Life policies under consideration and investment alternatives of term insurance plus money market funds, an IRA saving with money market funds and a term plus municipal bonds investment. The results show that for a holding period of less than eight years the strategy to buy term and invest in a municipal bond yields the best investment results. For holding periods of eight years and longer the back loaded Universal Life policy shows to be the best alternative. The same statements are true for investments in long term bonds instead of short term money market funds (D'Arcy and Lee, 1987).

Carson, Forster, Russel and Flanigan (1996) also participate in the discussion about the cash value insurance versus "buy term and invest the difference" strategies.

They argue that only parts of a Universal Life contract could be represented by the division into protection and savings components as a Universal Life policy would typically include several options, as for example the surrender option and the option to borrow against the cash surrender value. This prevents a Universal Life policy from being perfectly duplicable and therefore constitutes to the market strength of the product. (Carson, Foster, Russel and Flanigan, 1996)

A major difference of their approach to the previous discussed ones is the use of historical data compared to projected values. The used data included 90 policies and their cash value development from 1985 to 1995. For the buy term strategy they assume two different term insurance rates, one low rate and the other from the then dominating provider of term insurance, Milico. As investment alternatives money market funds and the S&P 500 stock index are chosen (Carson, Foster, Russel and Flanigan, 1996).

The results obtained show that the "buy term and invest the difference" strategy with investments in money market funds and assuming average term insurance rates yields lower pre-tax values than the average Universal Life policy. In contrast yields the use of low term insurance rates with money market investments a better performance as the average Universal Life policy but is still outperformed by the best Universal Life contract. It is important to mention that the cash values of the examined Universal Life policies varied widely from value of $8,748 to $19,707 for the ten year period (Carson, Foster, Russel and Flanigan, 1996).

The final conclusion made by the authors is that neither the buy term nor the Universal Life strategy dominates the other. They conclude that the existing dispersion within and across different life insurance products requires a potential investor in either strategy to inform him-/herself about all important factors related to the performance of the products.

### 5.3.2 Universal Life versus Whole Life

In their 2001 paper Carson and Foster study and compare the (Linton) policy yields of Universal Life and participating whole life insurance.

The hypotheses tested in the paper are for once that a participating whole life insurance contract may have a higher yield because of lower administration costs caused by less flexibility as well as to compensate buyers for the lack of transparency (Carson and Foster, 2001). On the other hand may Universal Life policies have a higher yield than participating whole life contracts as due to the greater transparency market forces might force the insurer to grant higher interest rates to the customer. Furthermore may consumers perceive the risk of the credited interest rate being reduced greater than the risk of lower dividends, therefore requiring a higher interest rate from the insurer (Carson and Foster, 2001).

The analysis uses the Linton yield method introduced in Section 5.1.2. Historical data for the time period between 1988 and 1998 is used and historical yields for five and ten year periods are computed (Carson and Foster, 2001).

The results obtained show that Universal Life policies offer considerably higher yields than participating whole life contracts. Results show that the minimum yield for Universal Life policies was lower than for the participating whole life policies for each time period. The mean and maximum value in contrast where higher for the Universal Life contracts (Carson and Foster, 2001).

Carson and Foster come to the conclusion that a wide dispersion exists within and across the two analyzed insurance products and that Universal Life policies had an average yield 300 basis points higher than the average participating whole life yield (Carson and Forster, 2001). They emphasize the importance of informed purchases of insurance, especially with regard to the different performance possibilities of the various life insurance types.

### 5.3.3 Conclusion

One can see from the discussion above that no general statement about the superiority of any insurance plus investment strategy can be made. Especially Carson emphasized this opinion in both of his papers (Carson and Foster, 2001; Carson, Foster, Russel and Flanigan, 1996). The findings of Cherin und Hutchins (1987) suggest that the “buy term and invest the difference” strategy is superior to buying Universal Life insurance due to the high expense loading of the later. D’Arcy and Lee (1987) find that Universal Life insurance is superior to similar alternatives if the holding period is longer than 7 years. Carson, Foster, Russel and Flanigan come to the result (Carson, Foster, Russel and

Flanigan, 1996) that no general conclusion concerning Universal Life and buy term plus investment can be made. They argue that information is the key for purchasing the best policy and that one has to be aware of the wide dispersion existent within and across different life insurance products (Carson, Foster, Russel and Flanigan, 1996).

For the comparison between Universal Life and participating whole life insurance, Carson and Foster (2001) find that Universal Life insurance policies offer on average a three percent higher yield than participating whole life policies. They again call attention to the dispersion in and across life insurance products and avoid a general conclusion about the superiority of any product (Carson and Foster, 2001).

# CHAPTER VI

# AN OVERVIEW OVER THE UNIVERSAL LIFE INSURANCE MARKET

This chapter shall give an overview over Universal Life insurance policies offered in the market today. The data used was provided by Blease Research (Blease, 2004) and is used with their permission.

Information about current and guaranteed interest rates, as well as current projected and guaranteed cash values, will be provided in Section 6.1. The discussion will be limited to interest rates and not be able to dwell on expense and mortality charges as no sufficient data is available for these parameters. In Section 6.2 I first will introduce additional premium concepts and discuss those. These concepts are then used for a comparison of premium levels of Universal Life and whole life insurance. In Section 6.3 I will conduct comparisons of projected and guaranteed cash values Universal Life and whole life products. Section 6.4 will then cover a comparison of internal rates of return on different cash value and death benefit parameters for both product types.

The data provided by Blease Research comprehends 43 life insurance companies and 80 of their Universal Life insurance policies as sold today. These policies make up about 95% of today's Universal Life insurance market of the United States, in terms of premiums. The whole life policies contained in the sample are all participating whole life policies. The sample contains 19 whole life policies from 16 different insurance companies.

## 6.1 Interest Rates in today's Universal Life Market

As shown in Section 4.2.2, the interest rate credited to the cash value of a Universal Life contract is, for long durations, the most important factor of influence for its development.

However, not only the current credited interest rate but also the minimum guaranteed interest rate is of importance, e.g. for the calculation of the reserve, as described in Section 3.2.

The data provided is split up for several types of contract specifications. Data is available for preferred non-smoker and smoker risks for age 40 and a face amount of $250,000 and for preferred non-smoker also for a face amount of $1,000,000. Additionally policy values are provided for preferred non-smoker age 55 with $250,000 face amount, standard non-smoker age 55 with face amount $250,000 and for standard non-smoker age 65 with a face amount of $1,000,000.

As interest rates do not depend on risk classification nor entry age, but can vary depending on the face amount, I limited the evaluation of the data to the preferred non-smoker age 40 data for both face amounts.

The objects of the analysis were the maximum, minimum and average interest rates as well as the standard deviation for both current and guaranteed interest rates. This analysis was performed for both face amounts and the results were compared.

Table 7: Comparison of Interest Rates (Blease, 2004)

| | current | guaranteed |
|---|---|---|
| Face Amount = 1 Million | | |
| max interest rate | 7.90% | 4.00% |
| min interest rate | 3.00% | 2.00% |
| average | 5.366% | 3.438% |
| standard deviation | 0.889% | 0.592% |
| | | |
| Face Amount = 250,000 | | |
| max interest rate | 7.90% | 4.00% |
| min interest rate | 3.00% | 2.00% |
| average | 5.350% | 3.438% |
| standard deviation | 0.891% | 0.592% |

As one can see in Table 7, the highest credited interest rate available in today's Universal Life market is 7.90% whereas the lowest current credited interest rate is just 3%. The average for the $1Million face amount is 5.366% whereas the average for the $250,000 face amount is slightly less with 5.350%. The difference comes from six policies in which the two face amount lie in differently credited bands. The difference of the interest credited varies between 0.25% and 0.15% for the policies which differentiate between the two face amounts. The standard deviation from the mean is 0.889% for the higher face amount and 0.891% for the lower face amount for the current credited interest rates.

Assuming that the interest rates have a normal distribution with the corresponding means and variances as parameters, one can conduct a test of the hypothesis that both means are equal, i.e. that the face amount of the policy does not influence the credited interest rate.

The used test statistic here is (Schmidt, 2002)

$$T = \frac{\bar{x}_{250k} - \bar{x}_{1000k}}{\sqrt{\frac{\sigma_{250k}^{2}}{81} + \frac{\sigma_{1000k}^{2}}{81}}} \tag{33}$$

where $\bar{x}_{250k}$ and $\bar{x}_{1000k}$ are the averages for the \$250,000 and the \$1,000,000 bands of the analyzed products. $\sigma_{250k}^2$ and $\sigma_{1000k}^2$ are the corresponding variances and 81 the sample size, i.e. the number of policies in the sample.

Using the values from above,

$$T = \frac{0.05366 - 0.0535}{\sqrt{\frac{0.00889^2}{81} + \frac{0.00891^2}{81}}} = 80.895 \tag{34}$$

The test shows the equality of the two means at the 99% significance level, as $80.895 > z_{0.005} = 2.575$.

The maximum for the guaranteed interest rates is 4% whereas the minimum value is 2%. The average value is 3.438% for both face amounts, with a standard deviation of 0.592%. For the guaranteed interest rates there is no differentiation between different face amounts.

## 6.2 Premium Levels in Universal Life and Whole Life

If one wants to compare premium levels for Universal Life and whole life insurance, one first has to find a basis on which these levels can be compared.

Whole life insurance offers a guaranteed death benefit as well as a guaranteed endowment of the policy. Universal Life, in contrast, guarantees neither of these, under the premise that no secondary guarantees are included in the contract. When a secondary guarantee is included in the contract, the death benefit is guaranteed for the period of the guarantee, but still there is no guarantee for the endowment of the policy. The term *endowment* means that the cash value of the policy equals the death benefit of the policy (Blease, 2004b).

For a comparison of the premium levels of these two product types, I want to use the annual gross premium for the whole life products and the *minimum annual premium to endow (MPE)* for the Universal Life policies. The minimum annual premium to endow is defined as the smallest premium which under current assumptions endows the policy (Blease, 2004b).

I also include in the comparison the *minimum premium needed to carry (MPC)*, which is the minimum premium required to maintain the initial death benefit through the life of the contract under current assumptions, and the *premium for the maximum secondary guarantee (PSG)*, which gives the premium charges for a guaranteed death benefit under a Universal Life policy. The later premium will only be considered for companies which offer a guarantee to at least age 100. The reason is a better comparability to the whole life rates. The last premium included in the comparison is the target premium (TP), as described in Section 2.1.1.

The following examples all assume a preferred non-smoker risk class for the Universal Life products.

Table 8: Premium Levels for Face Amount $250,000 and Issue Age 40

(Blease, 2004)

| | WL | UL MPE | UL MPC | UL TP | UL PSG |
|---|---|---|---|---|---|
| Average Premium | 3,796 | 1,709 | 1,580 | 2,082 | 2,003 |
| Max Premium | 4,665 | 2,339 | 2,231 | 11,763 | 4,382 |
| Min Premium | 3,473 | 1,326 | 1,160 | 843 | 818 |
| | | | | | |
| Note: | UL MPE and UL MPC values only for policies with level premiums<br>UL PSG only for policies with guarantees at least until age 100 | | | | |

Table 9: Premium Levels for Face Amount $1,000,000 and Issue Age 40

(Blease, 2004)

| | WL | UL MPE | UL MPC | UL TP | UL PSG |
|---|---|---|---|---|---|
| Average Premium | 14,926 | 6,414 | 5,891 | 8,039 | 7,724 |
| Max Premium | 18,570 | 9,164 | 8,636 | 47,050 | 17,235 |
| Min Premium | 13,665 | 1,728 | 1,531 | 1,805 | 2,150 |
| | | | | | |
| Note: | UL MPE and UL MPC values only for policies with level premiums<br>UL PSG only for policies with guarantees at least until age 100 | | | | |

Table 10: Premium levels for Face Amount $250,000 and Issue Age 55 (Blease, 2004)

| | WL | UL MPE | UL MPC | UL TP | UL PSG |
|---|---|---|---|---|---|
| Average Premium | 7,798 | 3,652 | 3,223 | 4,308 | 3,717 |
| Max Premium | 9,475 | 6,391 | 4,753 | 18,983 | 8,895 |
| Min Premium | 6,977 | 3,008 | 1,260 | 2,466 | 2,017 |
| Note: | UL MPE and UL MPC values only for policies with level premiums<br>UL PSG only for policies with guarantees at least until age 100 | | | | |

One can clearly see from Tables 8 through 10 that the premiums for Universal Life insurance are clearly lower than the corresponding whole life premiums. An exception is the maximum target premiums, which are significantly higher than the maximum premiums for whole life contracts.

All other premiums show to be lower for Universal Life contracts. As the premiums for the Universal Life contracts are calculated on a current assumption basis whereas premiums for whole life insurance policies are calculated with more conservative assumptions.

The following conclusions can be drawn:

- Universal Life offers similar death benefit guarantees to a lower price than whole life;
- Under current assumptions the average premium level to endow a Universal Life policy is about half of that for whole life policies;
- Target premiums for Universal Life products vary widely but are on average lower than whole life premiums

## 6.3 Cash Values in Universal Life and Whole Life

Universal Life and whole life policies are both cash value insurance contracts. Both types of policies use the cash value to prefund mortality charges for later policy years. As mentioned in Section 5.2, cash value policies also have an investment character.

I will here compare the development of the cash value for both types of contracts. The comparison will be conducted on both a guaranteed and projected with current assumptions basis. The assumptions for whole life regard the dividend payments whereas the assumptions for Universal Life affect expense and mortality charges as well as the credited interest rate.

The premiums used for the calculations of the cash values were $3,000 for the Universal Life policies with a face value of $250,000 and

$7,500 for the Universal Life policies with $1,000,000 face amount. The premiums used for the whole life calculations were the contract premiums.

Table 11: Cash Value Development Comparison for Issue Age 40 and Face Amount $250,000 (Blease, 2004)

| Type | UL guar | CV | | | | Type | UL cur | CV | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| policy year | 10 | 20 | 30 | 40 | | policy year | 10 | 20 | 30 | 40 |
| average | 21,065 | 41,672 | 41,399 | 1,553 | | average | 30,295 | 84,786 | 179,535 | 352,368 |
| max | 27,689 | 59,155 | 81207 | 33,269 | | max | 36,361 | 106,309 | 252,853 | 615,680 |
| min | 9,706 | 14,321 | 0 | 0 | | min | 23,782 | 66,996 | 130,966 | 225,147 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Type | WL guar | CSV | | | | Type | WL cur | CSV | | |
| | | | | | | | | | | |
| policy year | 10 | 20 | 30 | 40 | | policy year | 10 | 20 | 30 | 40 |
| average | 32,185 | 78,824 | 129,640 | 175,152 | | average | 36,754 | 116,606 | 258,500 | 487,957 |
| max | 39,155 | 87,992 | 147,840 | 186,738 | | max | 48,331 | 160,438 | 376,417 | 763,427 |
| min | 25,178 | 67,430 | 115,545 | 162,033 | | min | 26,396 | 89,742 | 176,350 | 329,861 |

Table 12: Cash Value Development Comparison for Issue Age 40 and Face Amount $1,000,000 (Blease, 2004)

| Type | UL guar | CV | | | Type | UL cur | CV | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| policy year | 10 | 20 | 30 | 40 | policy year | 10 | 20 | 30 | 40 |
| average | 34,768 | 44,313 | 1,854 | 2,608 | average | 66,742 | 182,181 | 362,497 | 644,290 |
| max | 55,166 | 90,021 | 133,484 | 187,747 | max | 91,504 | 243,318 | 512,818 | 1,012,523 |
| min | 0 | 0 | 0 | 0 | min | 38,981 | 109,752 | 189,405 | 228,575 |

| Type | WL guar | CSV | | | Type | WL cur | CSV | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| policy year | 10 | 20 | 30 | 40 | policy year | 10 | 20 | 30 | 40 |
| average | 128,681 | 315,768 | 518,561 | 700,607 | average | 147,776 | 469,661 | 1,041,712 | 1,967,414 |
| max | 155,530 | 652,007 | 591,360 | 746,950 | max | 196,839 | 652,007 | 1,526,426 | 3,093,034 |
| min | 100,710 | 358,967 | 462,180 | 648,130 | min | 105,585 | 358,967 | 705,401 | 1,319,446 |

Tables 11 and 12 show the comparison of guaranteed and current assumption cash values for Universal Life and whole life policies for a 40 year old male preferred non-smoker for face values of $250,000 (Table 11) and $1,000,000 (Table 12).

A very remarkable observation is that all but one of the Universal Life policies in the sample do not offer any cash value guarantees for policy years beyond 30. Some companies even offer no cash value guarantee at all for policies of that size.

A further comparison of the cash value levels is not possible as the premium levels used for the different products vary too widely. This is especially true for the policies with $1,000,000 face amount as there the average premium for the whole life contracts is $14,926 (see Table 9) whereas the premium used for the Universal Life policies is just $7,500. It is therefore not surprising that the cash values for the whole life policies as much higher than the ones for the Universal Life policies.

## 6.4 The Internal Rate of Return of Universal Life and Whole Life

The *internal rate of return*, defined as the discount rate, at which the present value of future cash flows equals the initial investment (Blease, 2004b), will be used for a comparison between Universal Life and whole life insurance. The internal rate of return can be used as a measure of the efficiency of the production of cash value in a policy.

The data available gave following results:

Table 13: Internal Rates of Return for Issue Age 40 (Blease, 2004)

| | | | | |
|---|---|---|---|---|
| Face Amount | $250,000 | | | |
| | | | | |
| IRR | UL curr CV | WL guar CSV | WL curr CSV | |
| average | 4.59% | 0.83% | 4.78% | |
| max | 6.85% | 1.83% | 6.31% | |
| min | 2.85% | -0.36% | 3.16% | |
| | | | | |
| Face Amount | $1,000,000 | | | |
| | | | | |
| IRR | UL curr CV | WL guar CSV | WL curr CSV | |
| average | 3.22% | 0.94% | 4.91% | |
| max | 5.25% | 1.88% | 6.51% | |
| min | -1.38% | -0.33% | 3.25% | |
| | | | | |

The numbers in Table 13 need to be explained before they can be interpreted. Due to the nature of the available data, the internal rate of return for the Universal Life policies is for 40 years, whereas the rates for the whole life policies are for 30 year periods. Furthermore I want to call attention to the use of the cash value for the Universal Life policies and the use of the cash surrender value for the whole life policies. The reason for this practice is given by the nature of the two products. For Universal Life products, cash value and cash surrender value do not differ after the $20^{th}$ policy year, while whole life products always refer to the cash surrender value.

The values in Table 13 show, that for the face amount of $250,000 the average rates of return for the two products are very similar with 4.59% for Universal Life and 4.78% for the participating whole life products, each for the current assumption values. The average of the internal rate of return for the guaranteed whole life cash surrender value is 0.83%, less than one percent. The minimum value for this scenario is even negative, with -0.36%.

The values obtained for the $1,000,000 face amount present Universal Life performing worse than whole life. The average internal rate of return for Universal Life products in this case is 3.22%, compared to 4.91% for the whole life products. The minimum rate of return for the sample was even negative for the Universal Life products, with a value of -1.38%.

## 6.5 Conclusion

The results obtained in this chapter suggest the following conclusions:

- Universal Life and participating whole life are competitive products of similar type;
- Participating whole life insurance seems to outperform Universal Life insurance in the build-up of cash value;
- Premium levels for Universal Life insurance are lower than for comparable whole life insurance.

These results could have various causes. The higher internal rates of return for whole life insurance might be caused by the higher flexibility of the Universal Life product, especially concerning the partial withdrawal of accumulated funds. This flexibility forces the insurer to invest in more liquid assets, which typically provide a lower yield than long term investments.

The lower premium payments of Universal Life insurance contracts arise from the usage of more liberal assumptions for mortality and interest rates in the pricing process. These premium levels are not guaranteed and can change. An drop of the credited interest rate from

6% to 4% for a male non-smoker might lead to an increase of the necessary premium payments of 46%, a drop from 6% to 2% credited interest even to an increase of 121% of the premium (Klein and Butala, 2004).

In comparisons between non-guaranteed products, as e.g. Universal Life, and guaranteed products, as e.g. whole life, one always has to be careful on which assumptions are made.

From the data analyzed in this thesis one can support the argument of Carson, Forster, Russell and Flanigan (1996) that the life insurance market varies too widely, within and across products, to make any general conclusions. Information about the specific products in consideration is essential and cannot be derived from general observations.

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