Exploring Universal Life Insurance

A Major Qualifying Project Report submitted to the Faculty of the Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science in Actuarial Mathematics

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Abstract

This project focused on exploring Universal Life insurance by learning about its history, components, and process of reserving. To conduct our research, we read several textbooks, study notes and a Valuation Manual. We then created an Excel deliverable of a theoretical UL policy, created a Lesson plan about UL to teach to actuarial students, and a paper that explains the ins and outs of UL from a consumer standpoint and how the mechanics of a UL policy would work for a potential policyholder.

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Next, we would like to thank Stephen O'Brien, an actuary from Gen Re, for helping us with the Excel deliverable and providing us with suggestions on research topics related to Universal Life.

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1.0 Introduction

This project explains the basic elements of Universal Life insurance and investigates the considerations that go into its reserving. Initially, we learned about the different types of life insurance and how they compare to one another. In the case of insurance policies that are widely offered by insurance companies, such as whole and term life, there is plenty of information available for future customers interested in purchasing these types of insurance. However, while doing our research we noticed that although there is some information about Universal Life (UL), there is not nearly as much information available as for whole life or term life insurance. Most of the information available can be generic or not too specific nor detailed on UL and how it compares to other types of insurance. Therefore, we decided to focus on learning more about UL. We wanted to learn about the history of UL, its appeal to target customers, components such as loans and withdrawals, and its complex process of reserving. In addition, we will compare UL to other types of life insurance such as whole, term, and group life. This paper is intended to be an in-depth summary of UL's:

- Components
    - Loans
    - Withdrawals
    - Charges
    - Flexibility
- Reserving
    - Net Premium Reserve
    - Stochastic
    - Deterministic

Overall, our purpose was to have a clear but concise understanding of UL, so we can later explain these concepts to actuarial students through a lesson plan and an Excel sheet showing

UL cash flows. We aimed to accomplish this by studying and analyzing all the available information on UL from organizations such as the National Association of Insurance Commissioners (NAIC) and Society of Actuaries (SOA). This paper will strive to provide actuarial students who understand the basics of life insurance with an in-depth explanation of UL and an overview of how it compares to other life insurance options. Finally, this project will include a presentation explaining UL and an Excel illustration that can be modified to see how different interest rates, expenses, and premiums can impact a policyholder's policy value.

2.0 Background

2.1 Overview of Life Insurance

Traditionally, the main goal of life insurance is to protect the financial security of the policyholder's family in case the policyholder dies. The fundamental elements of any life insurance policy are its premiums and tax-free death benefit. The policyholder pays premiums into a life insurance policy, so at the time of their death the beneficiaries receive a death benefit (Fidelity, 2019b). However, life insurance can have other purposes, such as:

- A source of income during retirement
- A source of funding for large purchases
- Paying off debts
- Paying estate taxes for estates larger than the tax exemption threshold.

There are a variety of types of life insurance aimed at serving these purposes. In this paper, we explore the components of universal life (UL) insurance and understand its process of reserving.

2.1.1 Term Life

Term life insurance offers the policyholder coverage for a set period, typically for 10, 20, or 30 years. If the policyholder dies during that period, then beneficiaries receive a death benefit payment. If the policyholder does not die before the end of the term, the policy lapses and no one receives a death benefit. Premiums are determined and fixed when the policy is created. Term insurance ensures that a family's financial needs will be met for a specific period of time, even if the main breadwinner in the family dies. For example, term insurance can help pay for a dependent's college tuition, pay off a mortgage, or replace a significant portion of lost income to cover other expenses (Fidelity, 2019b). Term insurance is usually less expensive than

permanent insurance since the death benefit is only paid if the policyholder dies within the term of the policy. The policy lapses at the end of the term if the policyholder has not died.

2.1.2 Whole Life

Whole life insurance is a kind of permanent insurance, meaning that the policyholder will be covered for the rest of their life (True Blue, n.d.). The beneficiaries receive the death benefit whenever the policyholder dies, regardless of time of death. The death benefit is a fixed amount and the premium and payment schedule are fixed when the policy is issued. Premiums are typically paid monthly or annually. If the policyholder misses a payment, their policy will lapse. Whole life insurance can be used in estate planning to transfer wealth to beneficiaries (Fidelity, 2019b). Whole life policies build cash value, which is the portion of the policy that grows with interest. The policyholder can take out loans against this cash value (Allstate, 2017). The policyholder also has the option to surrender their policy. If they decide they no longer need their policy, then they can surrender and receive their policy's cash value minus surrender charges.

2.1.3 Universal Life

Universal life insurance is also a kind of permanent life insurance with a savings component. Contrary to whole life, this policy allows for flexible premiums and death benefits that can be determined by the policyholder. Similar to whole life insurance, UL policies build cash value that the policyholder can take out a loan against. They also have the option to fully or partially withdraw some of the policy's cash value. UL policies also have a surrender option, similar to whole life.

2.1.4 Group Life

Group life insurance policies are purchased by an employer to offer as a benefit for their employees, which allows the employees to pay less than they would have if they bought the policy on their own. Most of the time, group insurance is offered in the form of one-year term insurance with coverage that is a function of the employee's salary. Group life insurance can be in addition to an employee's personal life insurance (AXA, 2018). While group life insurance is common, we will not be discussing it in this paper.

2.1.5 Types of Life Insurance Summary

	Term Life	Whole Life	Universal Life
Premiums	Fixed	Fixed	Flexible
Death Benefit	Fixed	Fixed	Flexible
Surrender Option?	No	Yes	Yes

Table 1: Types of Life Insurance

2.2 History of Universal Life Insurance

The first use of the term "Universal Life Plan" occurred in 1971, when G.R Dinney gave his presidential address to the Canadian Institute of Actuaries. In his address, Dinney warned of trouble on the horizon for the insurance industry and described a product called a "Universal Life Plan" (Doll, D. C.). The trouble that Dinney was referring to was the social and economic change caused by women entering the workforce and therefore increasing the income of an average family. In 1975, the socioeconomic changes became more apparent and prompted the

president of *Tillinghast & Company,* James C.H Anderson, to further elaborate on “The Universal Life Insurance Policy” in various speeches and articles.

Anderson warned that social instability and changes were making traditional whole life insurance irrelevant to the needs of large segments of the market (Doll, n.d.). More and more of the general public were becoming increasingly informed and pressed to evaluate their financial situations due to inflation and increasing taxes. These financial evaluations included reviewing their life insurance policies. Many customers of life insurance were frustrated by how clumsy whole life operated as a financial instrument and began to doubt whether or not their policies would be able to keep up with inflation. It was for those reasons that many customers instead opted for a term life insurance policy combined with an investment saving component that used some other medium for savings. This change in customers' financial instruments caused life insurance companies to panic because they realized they were in danger of losing investment opportunities (Doll, n.d.).

Along with losing out on potential investment opportunities, customers who continued to hold their whole life policy started to more frequently utilize the policy loan provision. The increased use of the policy loan provision created a cash flow problem and forced companies to invest in low yield policy loans instead of investing in an option that would result in a much higher yield.

In order to escape this predicament life insurance companies were in, Mr. Anderson urged life insurance companies to use the changing social and economic landscape to their advantage. Since more and more women were starting to work, family incomes started to rise, which increased the ability and demand to pay for family security products. Along with rising income, there was also rising inflation. The two factors combined together put many taxpayers into higher tax brackets, creating a newfound appreciation for the tax advantages of certain life

insurance policies. Mr. Anderson heavily pushed for an increase in marketing of a UL product that catered to the needs of the changing clientele, and that also kept the tax advantages of whole life. The new policy Mr. Anderson was marketing gave the policyholder the security component of a term life insurance that they wanted but also allowed the insurance company to have an investment component to deal with inflation and rising income taxes.

2.3 Types of UL Insurance

There are multiple types of universal life insurance. Below is a brief description of the different types of UL insurance and how they vary from traditional UL policies.

2.3.1 Variable UL

A variable universal life (VUL) policy is similar to a UL policy, however, the policyholder has the option to choose from a range of investment accounts (i.e. equities, bonds, etc.) in which the fund value will be invested (Claire et al., 2018). These investments behave similarly to mutual funds, as the value can go up or down depending on the performance of the assets (Claire, Lombardi, & Summers, 2018). Therefore, a variable universal life policy earns interest based on the performance of the mutual fund selected by the policyholder. The policyholder assumes more risk which allows for greater returns or losses than on a traditional UL policy.

2.3.2 Indexed UL

An indexed universal life (IUL) policy is a type of UL policy that earns interest at a rate of interest that follows an external index. The external index is typically the S&P 500, although other indices or multiple indices may be used (Claire et al., 2018). A key difference between an IUL policy and a UL policy is the way the interest is credited. The credited interest of an IUL policy is based on a formula that reflects the changes of the selected index.

2.3.3 Secondary Guarantee UL

In traditional UL policies, the policy will lapse if the value of the investment account drops below zero. In secondary guarantee universal life (SGUL) policies, if the policyholder meets a minimum premium requirement, their policy will not lapse (Karapiperis, D., & CIPR Research Analyst II. (n.d.)).

2.3.4 Types of UL Table

	Traditional	Variable	Indexed	Secondary Guarantee
How Interest is Determined	Performance of insurance company	Underlying investment	Index	Performance of insurance company
Death Benefit	Non-guaranteed	Non-guaranteed	Non-guaranteed	Guaranteed

Table 2: Types of UL Insurance Table

2.4 Market for UL Insurance in the US Today

2.4.1 Who offers it

Universal life insurance is offered by many insurance companies as a more personalized and flexible type of permanent life insurance with a tax-free death benefit. There is currently a large market for UL within the insurance industry, with each insurance company offering different components and benefits to their policies. Some companies have focused on offering competitive premiums and additional features like cash value accumulation, while others have focused on lower premiums (Protective Life Insurance Company, 2009). The flexibility of UL makes it a popular choice for people looking for a permanent life insurance policy. Some of the

companies that offer UL are John Hancock, Protective Life, and State Farm. For example, Protective Life's UL policy allows the policyholder to pay level premiums for a fixed period so there is no risk of the policy lapsing once the period ends (TermLife2Go, 2019).

2.4.2 Target Market

The type of person interested in buying a UL policy is typically looking to secure life insurance on a permanent basis (David Fenelon, personal communication, Sept 15 2019). When deciding which type of insurance to purchase, they consider several factors such as risk tolerance, profile of the policyholder, estimated (future) cash flows, the flexibility of future premiums, and levels of guarantees (David Fenelon, personal communication, Sep 15 2019). Furthermore, the potential policyholder might be interested in other components other than the death benefit. For example, UL might be the best choice for people looking to accumulate cash for later in life. Some of the reasons people may want to accumulate cash value are (David Fenelon, personal communication, Sep 15 2019):

- A low cost of borrowing
- Cash to assist in financing a college education
- Cash to assist in financing retirement

In the case of traditional UL, this policy might be the best choice for a person that wants a lifelong policy that not only has a death benefit but also accumulates cash value. In addition, it is someone that wants the ability to choose their payments and payment schedule, depending on their financial situation. For example, a potential policyholder might be looking for the flexibility to pay higher premiums when they are performing well financially and lower or no premiums when they are not. Some examples of people who may be interested in UL are (Anderson, 2019):

- People who want a permanent life policy and want to accumulate cash value
- Individuals looking for flexible premiums
- Parents looking to provide life insurance and income for their children
- People looking for additional retirement income
- People who do not want to link their policy to the stock market

The typical policyholder for UL varies based on the type of policy. In general, for a potential policyholder that just wants to secure lifetime coverage without the risk of their policy lapsing, a guaranteed UL policy may be the best choice (Anderson, 2019). The people who may be interested in SGUL are (Anderson, 2019):

- Young individuals who do not want the stock market risk, but want the benefits of a permanent life policy
- Older individuals seeking a guaranteed death benefit that they will not outlive
- Older individuals who want term life, but do not qualify for a term life policy

Finally, in the case of Indexed Universal Life (IUL), the person who would show most interest in this policy is someone interested in accumulating cash value at a faster rate than a traditional UL policy, and is not concerned about their funds being tied to a stock market index (Anderson, 2019). This product allows the policyholder to experience the benefits of investing in the stock market while protecting them from market downturns (Anderson, 2019). The people who may be interested in IUL are (Anderson, 2019):

- People who want a permanent life policy and accumulate cash value.
- Individuals looking for flexible premiums
- Young clients who want to use IUL as savings for retirement
- Parents looking to provide life insurance and income for their children
- People looking for additional retirement income
- Clients who want less risk than traditional investments, such as mutual funds, but are willing to accept some risk

3.0 Mechanics and Management

3.1 Policy Basics

This section will explain the basics of a UL policy by following an example policy throughout the section.

3.1.1 Death Benefit Options

In a UL policy, there are two options for the type of death benefit: **option 1** (a.k.a. **option A**) and **option 2** (a.k.a. **option B**). In option 1, the policyholder decides on a fixed total death benefit (Figure 1). The **account value** (a.k.a. **fund value**) does not affect the total amount of death benefit until it reaches a certain proportion of the total death benefit, which is discussed later in the corridor factor section. The account value, or fund value, is the savings portion of a UL policy. The policyholder pays premiums to the insurance company, who puts those premiums into a separate account that grows with interest after certain expenses are deducted. The **net amount at risk** (a.k.a. **additional death benefit**) is the total death benefit minus the account value. The net amount at risk can be thought of as the amount of benefit the insurance company is liable for paying in addition to the account value.

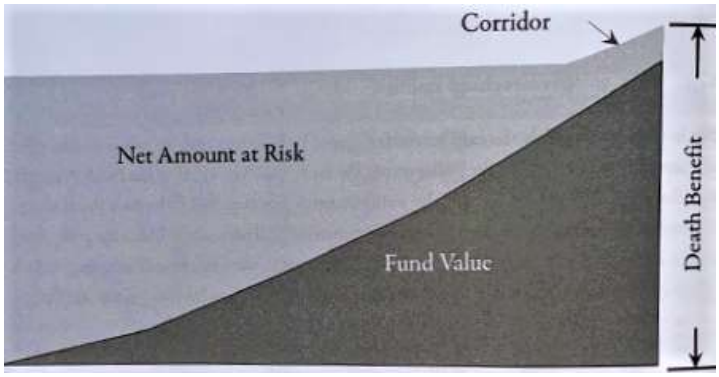

Figure 1: Death Benefit Option 1 (Claire et al., 2018, p. 300)

In option 2, the policyholder decides on a fixed **net amount at risk** (Figure 2). Therefore, their total death benefit varies based on their account value.

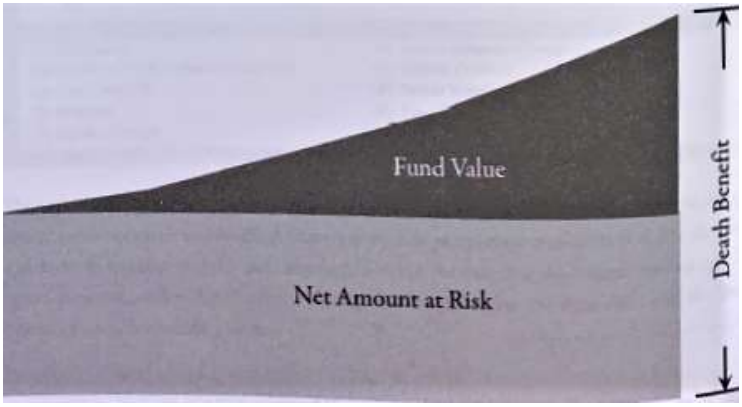

Figure 2: Death Benefit Option 2 (Claire et al., 2018, p. 300)

3.1.2 Account Value Cash Flows and Calculation

The savings portion of a UL policy is measured by the account value. The premiums paid into the policy are put into a separate account. These premiums can have multiple different payment schemes depending on what the policyholder wants. They can pay one lump sum at the beginning of the policy, pay annual premiums, or pay monthly premiums. The lump sum method is not common, so this paper will focus on multiple evenly spaced out payments. We are going to assume that the policyholder pays premiums annually. The account value is calculated by insurance companies at regular time intervals as well, often monthly. However, to simplify this explanation, we will assume it is calculated at the end of every **policy year**.

The first charge that is deducted from the account is the **commission charge**. The agent that sold the UL policy immediately receives a commission from the insurance company once the policy is sold. The insurance company regains this commission through a commission charge and the charge can be expressed in many ways. For example, it could be 5% of the total death

benefit spread over the first five policy years. So, if the death benefit is $100,000, then the annual commission charge for the first five policy years would be

$$\frac{100{,}000 \times 0.05}{5} = \frac{5{,}000}{5} = \$1{,}000$$

This method is used in the Excel sheet associated with this paper. However, there can be many other versions of the commission charge; it could be a one-time charge taken out immediately once the policy starts, a flat fee, or it could be spread over more policy years.

Another charge deducted from the account are **policy charges**, which are used by the insurance company to pay their expenses. A policy charge is typically a flat charge plus a percentage of the premium paid in that policy year. The percentage of the premium is typically used to pay state premium taxes. For example, the policy charge for one year could be

$$50 + (1\% \; of \; the \; premium \; paid \; in \; that \; policy \; year)$$

If the policyholder paid $3,000 in a given policy year, then the policy charge deducted from their account at the beginning of that policy year would be

$$50 + (0.01 \times 3{,}000) = \$80$$

The **cost of insurance (CoI)** is the charge that covers the cost of the death benefit. The CoI is calculated as a function of the mortality rate of the policyholder in that policy year, and the net amount at risk. If the CoI rate equals the mortality rate, then the formula for the CoI charge could be

$$CoI \; Charge = Mortality \; Rate \times Net \; Amount \; at \; Risk$$

For example, if we have 50-year-old policyholder whose probability of dying in the next year is 0.1%, has option 1 UL, a death benefit of $100,000 and account value of $4,000, then the CoI charge for that policy year would be

$$0.001 \times (100{,}000 - 4{,}000) = \$96$$

The premium is paid and all of the charges are deducted at the beginning of each policy year. The money that is left in the account grows with interest over the policy year. The amount of interest credited to the account is decided by the insurer, but it does have to be above a certain threshold determined when the policy was created. For example, if the policyholder is promised at least a 3% return, then the insurer cannot credit their account with 2% interest.

Once all of the cash flows are determined, then the account value for any given policy year can be calculated using the following recursive formula:

$$AV = (Prev.AV + Prem - Commiss.Charge - Policy\ Charges - CoI) \times (1 + Credited\ interest)$$

So, if we use all the previous example cash flows, a previous account value of $4,000 and 5% credited interest, then the account value for policy year 4 would be

$$AV = (4{,}000 + 3{,}000 - 1{,}000 - 80 - 96) \times (1 + 0.05) = \$6{,}115.20$$

However, note that If this were policy year 6 or after, then there would no longer be a commission charge.

3.1.3 Shadow Account Cash Flows

If the policyholder has a secondary guarantee UL policy, then a shadow account will be used to determine if the policy's secondary guarantee is still in effect. It is calculated using the same recursive formula as the ordinary account value, but with more conservative charges, interest,

and mortality rates. The shadow account is not a real account; it is a theoretical calculation used to determine if the policyholder has paid enough money into their policy to maintain the secondary guarantee. It represents a worst-case scenario. So, it measures the account value in the case that maximum policy charges are deducted, true mortality rate turns out to be higher than expected, and interest rates are lower than expected, that there is still enough money in the account to maintain the policy. If this shadow account value is less than zero, then the policy is no longer in effect under the secondary guarantee.

There is a maximum policy charge specified within the policyholder's UL contract that the insurance company is allowed to deduct from the account for a policy year. For example, if the maximum flat fee is $100 and the maximum percentage of premium is 10% and the policyholder pays a $3,000 premium in a given policy year, then the maximum policy charge is

$$100 + (0.1 \times 3{,}000) = \$400$$

So, the insurance company cannot deduct more than $400 from the account for policy charges for that policy year.

In the case of the CoI charge, the insurance company might use a higher CoI rate to represent higher mortality than expected. For example, they use a CoI rate of three times the mortality rate. If the expected mortality rate is 0.1%, the policyholder has option 1 UL, the death benefit is $100,000, and the account value of $4,000, then the shadow account CoI charge is

$$(3 \times 0.001) \times (100{,}000 - 4{,}000) = \$288$$

So, in that policy year, the insurance cannot deduct more than $288 from the account for the CoI charge.

The last calculation difference between the actual account value and shadow account value is the interest rate. The minimum interest rate guaranteed in the policyholder's contract is used to calculate the shadow account value. If that minimum interest rate is 3%, then that is the rate used for the calculation.

For the policyholder mentioned in the previous section, the shadow account value in policy year 4 would be

$$Shadow\ AV = (4{,}000 + 3{,}000 - 1{,}000 - 400 - 288) \times (1 + 0.03) = \$5{,}471.36$$

Since this value is greater than zero, his secondary guarantee will remain in effect.

3.1.4 Death Benefit and Corridor Factor

The total death benefit seems straightforward, but there are a few nuances to the death benefit in UL insurance. The first is the **corridor factor** test. In order for the policy to qualify as insurance and not strictly as an investment, the policy has to meet the requirements set in the Internal Revenue Service (IRS) tax code 7702. The ratio of the death benefit to the account value has to be greater than or equal to a number called a corridor factor. There is a different factor for every age, and they tend to decrease as the policyholder ages. Therefore, as the policyholder gets older, the account value is allowed to make up more of the total death benefit.

If the corridor factor for a 50-year-old is 1.50, their total death benefit is $100,000, and their account value is $4,000, then the ratio of the death benefit to account value is

$$\frac{100{,}000}{4{,}000} = 25 > 1.50$$

Since the ratio is larger than the corridor factor, then the requirement is satisfied. However, if the total death benefit is $100,000 and their account value is $200,000 instead, then the ratio is

$$\frac{100{,}000}{200{,}000} = 0.5 < 1.50$$

Since the ratio of the death benefit to the account value is less than the corridor factor, the death benefit has to be adjusted in order for the requirement to be satisfied. The adjusted death benefit is the corridor factor multiplied by the account value, which is

$$200{,}000 \times 1.50 = \$300{,}000$$

The new death benefit is $300,000, which meets the corridor factor requirement for this policy year.

3.1.5 Cash Value

The **cash value** (a.k.a. **surrender value**) of a policy is the amount of money the policyholder would receive if they cash out of their policy. The cash value is a function of the account value and will be less than or equal to the account value in a given policy year. For example, the cash value could be 90% of the account value for the first ten policy years, then 100% of the account value for the rest of the policy years. If the account value is $4,000 in policy year 4, then the cash value in policy year 4 is

$$0.9 \times 4{,}000 = \$3{,}600$$

Therefore, if the policyholder cashed out of their policy in policy year 4, they would receive $3,600 and there would be a $400 surrender charge since they are cancelling their policy.

3.2 Policy Nuances

3.2.1 Withdrawals

An important benefit of UL insurance that policyholders are able to utilize is the ability to take out **partial withdrawals** from their UL policy. The concept of partial withdrawals is what makes UL more attractive for potential policyholders as compared to Whole life insurance, where partial withdrawals are not possible. Put simply, this benefit allows the policyholder to withdraw tax-free funds from the account value of their UL policy. However, there are stipulations and considerations to be taken into account when using this benefit.

For starters, there is a set time period required by the insurance company that has to pass before being allowed to take out partial withdrawals. It is important to note that it is possible to withdraw funds before the set time period is over, but an early withdrawal fee set by the insurance company will be taken out of the policy account value. In addition, the amount of funds that can be partial withdrawn is only tax-free up to a certain amount. The amount that is available for the policyholder to take out tax-free is equal to the sum of the premiums the policyholder has paid into the policy, as opposed to being able to withdraw the full account value. Therefore, if a withdrawal taken from the policy is more than the sum of the premiums paid into the policy, income taxes will then have to be paid on the amount of the withdrawal that goes over the sum of the premiums. For example, if the sum of the premiums is $10,000 and the policyholder withdraws $11,000, then $1,000 of the withdrawal will be taxed.

Lastly, it is important to know that a partial withdrawal will also affect the death benefit and the cash surrender value. When a partial withdrawal is taken, the death benefit is immediately reduced by the amount taken out and lowers the amount of the cash surrender value. The purpose of lowering the death benefit is to prevent policyholders from taking out a withdrawal

and then being paid the withdrawal amount on top of the death benefit. For example, let's say a policyholder with a death benefit of $100,000 were to withdraw $50,000 and the death benefit was not reduced. Then they die and receive their $100,000 death benefit. The policyholder in essence, received $150,000 from this policy when he was only supposed to receive $100,000. This point especially is important to know because the policyholder could reduce the death benefit so much that the beneficiaries will not have enough funds to pay final debts, estate taxes, or ongoing living expenses that they were counting on paying for using these proceeds.

To help illustrate, the above concept of withdrawals, below are tables demonstrating a partial withdrawal impact on a theoretical UL policy with a death benefit of 100,000.

Year	Age	Premium	Account Value	Amount Available to Withdraw Tax-Free
1	51	3,000.00	2,016.00	N/A
2	52	2,000.00	2,942.19	N/A
3	53	2,000.00	3,900.35	N/A
4	54	2,000.00	4,890.51	N/A
5	55	2,000.00	5,912.53	N/A
6	56	2,000.00	8,016.09	N/A
7	57	2,000.00	10,205.88	N/A
8	58	2,000.00	12,484.67	N/A
9	59	2,000.00	14,855.31	N/A
10	60	2,000.00	17,320.77	N/A
11	61	2,000.00	19,884.14	N/A
12	62	2,000.00	22,548.71	N/A
13	63	2,000.00	25,317.97	N/A
14	64	2,000.00	28,195.71	N/A
15	65	2,000.00	31,186.06	N/A
16	66	2,000.00	34,293.64	33,000.00
17	67	2,000.00	37,523.66	35,000.00
18	68	2,000.00	40,882.06	37,000.00
19	69	2,000.00	44,375.76	39,000.00
20	70	2,000.00	48,012.85	41,000.00

Table 3: Withdrawal Wait Period

The above table demonstrates how the policy holder has to wait until year 16 before being allowed to make a partial withdrawal. In addition, it demonstrated that the amount allowed for a tax-free withdrawal at year 16, the first year that a withdrawal is available, is equal to the sum of all the premiums, which is different from the overall account value.

The below table demonstrates an account value when no partial withdrawals are taken out after the wait period has passed.

Year	Age	Premium	Account Value	Amount Available to Withdraw Tax-Free	Partial Withdrawal	DB After Corridor Factor	Cash Value
16	66	2,000.00	34,293.64	33,000.00	0.00	100,000.00	34,293.64
17	67	2,000.00	37,523.66	35,000.00	0.00	100,000.00	37,523.66
18	68	2,000.00	40,882.06	37,000.00	0.00	100,000.00	40,882.06
19	69	2,000.00	44,375.76	39,000.00	0.00	100,000.00	44,375.76
20	70	2,000.00	48,012.85	41,000.00	0.00	100,000.00	48,012.85
21	71	1,000.00	50,763.47	42,000.00	0.00	100,000.00	50,763.47
22	72	1,000.00	53,612.39	43,000.00	0.00	100,000.00	53,612.39
23	73	1,000.00	56,565.78	44,000.00	0.00	100,000.00	56,565.78
24	74	1,000.00	59,631.29	45,000.00	0.00	100,000.00	59,631.29
25	75	1,000.00	62,818.53	46,000.00	0.00	100,000.00	62,818.53
26	76	1,000.00	66,139.55	47,000.00	0.00	100,000.00	66,139.55
27	77	1,000.00	69,609.59	48,000.00	0.00	100,000.00	69,609.59
28	78	1,000.00	73,247.92	49,000.00	0.00	100,000.00	73,247.92
29	79	1,000.00	77,079.01	50,000.00	0.00	100,000.00	77,079.01
30	80	1,000.00	81,133.96	51,000.00	0.00	100,000.00	81,133.96

Table 4: No Partial Withdrawal After Wait Period

Table 4 shows years 16 through 30, with the premiums being paid during this time period. However, it is important to note that premium payments for year 1 through 15 are not pictured but are still accounted for in the calculations for the amount available to withdraw tax-free in the time 16 through 30 data. As can be seen, the death benefit remains the same at a value of 100,000 throughout the entire table.

Now, Table 5 below is going to show us what a UL policy from years 16 to 30 looks like under the exact same death benefit and premium structure as above, but with a withdrawal at year 16.

Year	Age	Premium	Account Value	Amount Available to Withdraw Tax-Free	Partial Withdrawal	DB After Corridor Factor	Cash Value
16	66	2,000.00	34,293.64	33,000.00	10,000.00	90,000.00	24,293.64
17	67	2,000.00	37,601.46	35,000.00	0.00	90,000.00	27,601.46
18	68	2,000.00	41,051.54	37,000.00	0.00	90,000.00	31,051.54
19	69	2,000.00	44,652.95	39,000.00	0.00	90,000.00	34,652.95
20	70	2,000.00	48,416.28	41,000.00	0.00	90,000.00	38,416.28
21	71	1,000.00	51,314.54	42,000.00	0.00	90,000.00	41,314.54
22	72	1,000.00	54,335.94	43,000.00	0.00	90,000.00	44,335.94
23	73	1,000.00	57,490.61	44,000.00	0.00	90,000.00	47,490.61
24	74	1,000.00	60,790.96	45,000.00	0.00	90,000.00	50,790.96
25	75	1,000.00	64,252.17	46,000.00	0.00	90,000.00	54,252.17
26	76	1,000.00	67,893.00	47,000.00	0.00	90,000.00	57,893.00
27	77	1,000.00	71,736.72	48,000.00	0.00	90,000.00	61,736.72
28	78	1,000.00	75,812.27	49,000.00	0.00	90,000.00	65,812.27
29	79	1,000.00	80,155.90	50,000.00	0.00	90,000.00	70,155.90
30	80	1,000.00	84,813.13	51,000.00	0.00	90,000.00	74,813.13

Table 5: Partial Withdrawal After Wait Period

Notice right away that the death benefit of the policy with a withdrawal of 10,000 is reduced from 100,000 to 90,000 and how the cash value from years 16 to 30 for the policy with a withdrawal is less compared to the cash value of the policy with no withdrawals.

3.2.2 Loans

In addition to a partial withdrawal, another benefit a policyholder can choose to utilize is the ability to take out a **loan** against the policy. Much like a loan there are both stipulations and considerations the policyholder must take into account before choosing to use this benefit.

First, unlike a withdrawal, a loan does not initially impact the cash surrender amount of the policy due to the fact that when a loan is taken out, the cash value of the policy is held as collateral for the loan. Being held for collateral in terms of a loan simply means that if the loan is not paid back before the policyholder dies, then at the time of death and before the beneficiaries are paid the death benefit, the outstanding loan balance will be deducted from the death benefit. Due to the fact that the cash surrender amount is not affected a loan is ideally used when a policyholder has already withdrawn the maximum amount allowed without being taxed from the policy, but still needs more cash.

Additionally, while the cash value and account value are not initially impacted right when the loan is taken out, they will be affected later on down the road. The loan has an interest rate determined by the insurance company, typically at a lower rate than the interest rate credit to the AV, and every period the interest will be deducted from the AV. At the same time that the loan is accumulating interest, the AV is also accumulating interest, so at the end of the period when the interest is credited to both the AV and loan, when the AV is calculated at the beginning of the period, the interest credit on the loan will negate some of the interest credited to the AV. Therefore, a loan hinders the earning potential of the interest credited to the AV and will cause a lower AV than if no loan had been taken out at all.

Next, it is important to know that the maximum amount available for a loan is the amount of the cash surrender value at the time when the policyholder plans to take out a loan. As mentioned in the previous paragraph, the outstanding loan balance will be deducted from the death benefit if it is not paid back before the death of the policyholder. However, it is important to know that the interest on the outstanding loan balance will be deducted from the account value every period and that the interest rate on the policy loan is set beforehand by the insurance company.

Lastly, just like with partial withdrawals there is a set time period set by the insurance company that must pass before the policyholder is allowed to start taking out loans against the policy.

To help illustrate the above concept of policy loans, below are tables demonstrating the impact of taking out a loan on a theoretical UL policy. The policy charges an annual interest rate of 2% on loans, a credited interest rate of 5%, a death benefit of 100,000 and there is an assumption that the loan will not be paid back at all during the years shown after a policy is taken out.

Year	Age	Amount Available for Loan	Cash Value
1	51	N/A	0.00
2	52	N/A	294.22
3	53	N/A	780.07
4	54	N/A	1,467.15
5	55	N/A	2,365.01
6	56	N/A	4,008.04
7	57	N/A	6,123.53
8	58	N/A	8,739.27
9	59	N/A	11,884.25
10	60	N/A	15,588.69
11	61	N/A	19,884.14
12	62	N/A	22,548.71
13	63	N/A	25,317.97
14	64	N/A	28,195.71
15	65	N/A	31,186.06
16	66	34,293.64	34,293.64
17	67	37,523.66	37,523.66
18	68	40,882.06	40,882.06
19	69	44,375.76	44,375.76
20	70	48,012.85	48,012.85

Table 6: Loan Wait Period

Table 6 above demonstrates that there was a wait period before the policyholder is allowed to take out a loan and how once they are allowed to take out a loan, the amount available for a loan is equal to the cash surrender value. Table 7 below demonstrates a policy account from years 1 to 20 and shows the 16 year wait period, AV, Credited interest and DB when no loan has been taken out after the wait period.

Year	Age	Premium	Credited Interest	Account Value	Amount Available for Loan	Loan	Oustanding Loan Balance	DB After Corridor Factor
1	51	3,000.00	96.00	2,016.00	N/A	0.00	0.00	100,000.00
2	52	2,000.00	140.10	2,942.19	N/A	0.00	0.00	100,000.00
3	53	2,000.00	185.73	3,900.35	N/A	0.00	0.00	100,000.00
4	54	2,000.00	232.88	4,890.51	N/A	0.00	0.00	100,000.00
5	55	2,000.00	281.55	5,912.53	N/A	0.00	0.00	100,000.00
6	56	2,000.00	381.72	8,016.09	N/A	0.00	0.00	100,000.00
7	57	2,000.00	485.99	10,205.88	N/A	0.00	0.00	100,000.00
8	58	2,000.00	594.51	12,484.67	N/A	0.00	0.00	100,000.00
9	59	2,000.00	707.40	14,855.31	N/A	0.00	0.00	100,000.00
10	60	2,000.00	824.80	17,320.77	N/A	0.00	0.00	100,000.00
11	61	2,000.00	946.86	19,884.14	N/A	0.00	0.00	100,000.00
12	62	2,000.00	1,073.75	22,548.71	N/A	0.00	0.00	100,000.00
13	63	2,000.00	1,205.62	25,317.97	N/A	0.00	0.00	100,000.00
14	64	2,000.00	1,342.65	28,195.71	N/A	0.00	0.00	100,000.00
15	65	2,000.00	1,485.05	31,186.06	N/A	0.00	0.00	100,000.00
16	66	2,000.00	1,633.03	34,293.64	34,293.64	0.00	0.00	100,000.00
17	67	2,000.00	1,786.84	37,523.66	37,523.66	0.00	0.00	100,000.00
18	68	2,000.00	1,946.76	40,882.06	40,882.06	0.00	0.00	100,000.00
19	69	2,000.00	2,113.13	44,375.76	44,375.76	0.00	0.00	100,000.00
20	70	2,000.00	2,286.33	48,012.85	48,012.85	0.00	0.00	100,000.00

Table 7: No Loan After Wait Period

Now below table shows the same exact policy as above in Table 7, but a loan of $10,000 has been taken out at year 16. The column of outstanding loan balance demonstrates how the loan also earns interest at a lower rate of 2%, but remember that the interest on the loan is subtracted from the credited interest each period.

Year	Age	Premium	Credited Interest	Account Value	Amount Available for Loan	Loan	Oustanding Loan Balance	DB After Corridor Factor
1	51	3,000.00	96.00	2,016.00	N/A	0.00	0.00	100,000.00
2	52	2,000.00	140.10	2,942.19	N/A	0.00	0.00	100,000.00
3	53	2,000.00	185.73	3,900.35	N/A	0.00	0.00	100,000.00
4	54	2,000.00	232.88	4,890.51	N/A	0.00	0.00	100,000.00
5	55	2,000.00	281.55	5,912.53	N/A	0.00	0.00	100,000.00
6	56	2,000.00	381.72	8,016.09	N/A	0.00	0.00	100,000.00
7	57	2,000.00	485.99	10,205.88	N/A	0.00	0.00	100,000.00
8	58	2,000.00	594.51	12,484.67	N/A	0.00	0.00	100,000.00
9	59	2,000.00	707.40	14,855.31	N/A	0.00	0.00	100,000.00
10	60	2,000.00	824.80	17,320.77	N/A	0.00	0.00	100,000.00
11	61	2,000.00	946.86	19,884.14	N/A	0.00	0.00	100,000.00
12	62	2,000.00	1,073.75	22,548.71	N/A	0.00	0.00	100,000.00
13	63	2,000.00	1,205.62	25,317.97	N/A	0.00	0.00	100,000.00
14	64	2,000.00	1,342.65	28,195.71	N/A	0.00	0.00	100,000.00
15	65	2,000.00	1,485.05	31,186.06	N/A	0.00	0.00	100,000.00
16	66	2,000.00	1,123.03	33,583.64	33,583.64	10,000.00	10,200.00	100,000.00
17	67	2,000.00	1,230.88	36,252.44	36,252.44	0.00	10,404.00	100,000.00
18	68	2,000.00	1,352.07	39,005.60	39,005.60	0.00	10,612.08	100,000.00
19	69	2,000.00	1,477.22	41,845.94	41,845.94	0.00	10,824.32	100,000.00
20	70	2,000.00	1,606.48	44,776.84	44,776.84	0.00	11,040.81	100,000.00

Table 8: Loan Taken Out After Wait Period

When comparing these two tables notice that after the loan at year 16 has been taken out that the DB has not been impacted in anyway. On top of that notice at year 16 that the AV and interest credited start to differ from table 7 to table 8. In table 8, both AV and interest credited are lower than that of table 7 starting at year 16, which reflects how the earning potential of the AV is hinder by the interest accumulated on loan. Lastly, since interest on the loan was taken from the AV every period and it was assumed that the loan was never paid back, it is important to mention that while the DB column is not impacted when the loan was taken out, if the PH were to die in year 20, the loan would be subtracted from the DB and the beneficiaries would receive $90,000 instead of $100,000.

3.3 Reserving for UL

Due to the flexibility of UL, there is not a straightforward method of reserving. Reserving for UL, it's regulated by several entities such as the NAIC and IRS. Reserving is done to ensure that the premiums collected do not exceed the cost of benefits and services. The NAIC sets insurance standards and oversees insurance practices, where they established reserving standards for UL through models such as Model 585 - Universal Life Insurance Model Regulation. Reserving methods are outlined and explained through Valuation Manual (VM-20) and Actuarial Guideline 38 (AG-38). While reading VM-20 we focused on the three types of Principle-Based Reserves (PBR) reserves: Net Premium Reserve (NPR), Deterministic Reserve (DR), and Stochastic Reserve (SR). Since our project is only focusing on one policy, we decided to exclude the deterministic and stochastic exclusion tests from our research.

3.3.1 Mechanics of Reserving with UL

We chose to follow Principle-Based Reserving (PBR), because this is the reserving method used in VM-20 which is the manual that insurance companies have to follow when reserving for life policies. PBR is used for determining the minimum reserves of a group of UL policies. Unlike formula-based reserving, PBR is more complicated than using a formula-based valuation as PBR requires a complex cash flow model, where the model is based on explicit assumptions under a range of economic scenarios. The total PBR amount for UL is a combination of the three reserves (NPR, DR, SR), where depending on what Exclusion Tests are passed the PBR might be mostly dependent on NPR and not take into account the DR or SR (Valuation Manual 2020).

3.3.2 NPR

The first reserve we looked further was Net Premium Reserve (NPR), where we focused on learning about all the components of NPR and how it is calculated. NPR is a seriatim reserve based on specific formulas using prescribed assumptions. VM-20 requires for the Net Premium Reserve to be calculated for all policies.

The general formula for calculating the NPR is equal to the present value of future benefits less the present value of future valuation net premiums, but not less than the greater of the policy's cash surrender value and the cost of insurance to the date to which the policy is paid. Where the cash surrender value used should be consistent with that used to determine the NPR on other-than-anniversary dates. A simplified formula is outlined below:

$$NPR = \left[PV(\text{benefits}) - PV(\text{valuation net premiums}) - E_{x+1} \right] \left[\frac{\text{Actual Account Value}}{\text{Account Value needed to prevent policy from lapsing}} \right]$$

Capped at 1

3.3.2.a Minimum Reserve

The minimum reserve is dependent on all three reserves: NPR, DR, and SR. However, the insurance company has the choice to perform exclusion tests that, if passed, exempts some policies from the Deterministic Reserve and/or the Stochastic Reserve. These tests are optional, and the company can decide to calculate all three reserves for all policies. If a group of policies that pass both the Stochastic and the Deterministic Exclusion Tests, the minimum reserve will equal the sum of the policy NPR. On the other hand, if a group of policies pass the Stochastic

but fail the Deterministic Exclusion Test, the minimum reserve will equal the sum of the Net Premium Reserves plus the excess of the DR for those policies divided by the sum of the NPR, minus any due and deferred premium asset held on account of those policies.
The formula for calculating the minimum reserve is shown below:

$$\text{Minimum Reserve} = \text{NPR} + \max\{0, \max\{\text{DR},\text{SR}\} - \text{NPR}\}$$

3.3.3 Stochastic

In contrast to the Deterministic Reserve, the Stochastic Reserve uses random economic scenarios to find the worst scenario reserves. SR follows the same assumptions as DR, with the exemption of assumptions dependent on economic scenarios. Before calculating the SR, the policies first have to fail the Stochastic Exclusion Test, then the Stochastic reserve needs to be calculated.

The steps to calculate the SR as outlined in VM-20 are listed below:

1. Determine the number of product groups that will be calculated for SR
2. Determine margins and Prudent Estimation Assumptions for all Risk Factors
3. Generate stochastic economic scenarios
4. Determine number of stochastic economic scenarios used
5. Then calculate stochastic reserve as followed:
    a. Project CFs for each model segment under each generated scenario
    b. Calculate Scenario Reserve for each generated scenario

3.3.4 Deterministic

The Deterministic reserve (DR) is calculated for a group of individual life insurance policies that fall within the scope of VM-20 and have failed to pass the deterministic exclusion test (VM-20). The deterministic reserve is measured according to projections of the insurance company obligations for a policy and the value of the assets placed to satisfy them based on a single scenario using moderately adverse economic conditions. The Deterministic Reserves for a group of policies is equal to the actuarial present value of benefits, expenses and related amounts, less the actuarial present value of premiums and related amount.

Formula for calculating the Deterministic Reserve:

$$\mathrm{DR} = \mathrm{APV}(\mathrm{benefits}) - \mathrm{APV}(\mathrm{premiums}) + \mathrm{Balance}(\mathrm{separate\ account}) + \mathrm{Loan\ Balance}$$

Where the actuarial present value (APV) of benefits, expenses and related amounts equals the sum of the present value of future benefits. The APV of premiums and related amounts equals the sum of the PV of future gross premium payments and future cash flows to the general account from the separate account less cash flows from the general account to the separate account and future net policy loan cash flows (VM-20).

4.0 Methodology

4.1 Developing the UL Excel Illustration

4.1.1 Goal

Our goal in this objective is to develop an Excel Illustration to clearly demonstrate the cash flows of a UL policy that will be easily understood by Actuarial students. Some of our research questions were:

- What are the cash flows that determine the account value?
- What assumptions are involved in determining these cash flows?
- How does changing these assumptions affect the cash flows?
- What is the best way to display the policy information so that it is easily understood by students who have never worked with UL insurance?

4.1.2 Determining the Information in the Excel Illustration

We wanted to include all cash flows that could be related to a UL policy. In order to figure out which cash flows were pertinent, we first read the “Actuarial Mathematics for Life Contingent Risks” (Dickson, Hardy, & Waters, 2009) which explained the charges, premiums, and other basic cash flows. We based the preliminary design of the illustration on an example illustration on page 439 of the book. We then talked to Gen Re actuary Stephen O’Brien, FSA, MAAA who previously worked for John Hancock, and looked at the example policies that he sent over from John Hancock for the more policy specific elements, such as loans and withdrawals.

4.1.3 Organizing the Excel Illustration

4.1.3a Inputs

We wanted the Excel sheet to be an interactive learning tool. Therefore, we added inputs that could be changed in order to view how the money invested in the policy changes with a change in each input.

One of the main components of UL insurance is an investment element, meaning that interest rates impact the value of the policy. Therefore, we included an option to change how much interest is credited to the policy. This option allows students to see how the cash flows that comprise the account value changes with higher or lower interest rates.

Another input we decided on was which kind of death benefit is used in the policy. There are two different kinds of UL insurance: option I and option II. Therefore, it made sense to create a sheet that allowed the user to see the cash flows for either option.

Adding optionality in the expenses allows the user to see how the account value is impacted by increasing or decreasing expenses.

4.1.3b Color Coding and Grouping Columns

When we were developing the Excel sheet, there were an overwhelming number of columns to keep track of. We decided on the following four categories to group the policy elements by reading “Actuarial Mathematics for Life Contingent Risks” (Dickson, Hardy, & Waters, 2009) and learning more about what makes up a policy from Stephen O’Brien:

- Account Value
- Loans / Withdrawals
- Death Benefit
- Secondary Guarantee / Shadow Account

Once we separated the Excel sheet into these four categories, we further organized the sheet by color coding some of the cells. Listed below are the color codes and the reasoning behind why we wanted to highlight the categories that the color codes represent:

- Yellow – Policyholder Controlled Values

  One of the main appeals of a UL policy is the amount of flexibility that the policyholder has, including choosing their premium payment schedule, death benefit, and ability to take out loans on their policy.
- Light Blue – Insurer Controlled Values

  In a UL policy, the insurer determines a lot of the values that affect the value of the policy, such as the credited interest and the policy charges.
- Light Green – Positive Cash Flows (as Related to the Account Value)

  These cash flows increase the account value. So, when a student is adjusting the inputs, they can quickly see how that change influences how the account value increases by just referencing the light green cells.
- Light Red – Negative Cash Flows (as Related to the Account Value)

  These cash flows decrease the account value.

4.1.3c Creating Two Kinds of Columns

As we developed the calculation columns for this sheet, we found that some of the columns needed further explanation as to why a specific calculation was being performed. Therefore, in addition to a column containing an actual number or cash flow, we included explanatory columns. These kinds of columns applied to two concepts: corridor factor and the secondary guarantee.

In the case of the corridor factor, we followed section 7702 of the IRS tax code as suggested in "Statutory Valuation of Individual Life and Annuity Contracts" (Claire, D.R., Lombardi, L.J., &

Summers, S.D., 2018). This section implies that if the ratio of the death benefit to the account value is less than the corridor factor for that policy year, then the death benefit needs to be increased so that the requirement is satisfied. To make this concept clear to a student just learning about corridor factors, we included column T that indicates when the requirement is satisfied or not so it is easy to see when the death benefit has been adjusted due to this requirement (Figure 3).

Figure 3: Corridor Factor Indicator

In the case of the secondary guarantee, the guarantee stays in effect as long as the value of the shadow account is greater than zero. To make it clear when the guarantee is still in effect, we added column AD as an indicator (Figure 4).

Shadow Account Value	Policy still in effect under the guarantee?
-1,091.40	No
-680.16	No
-306.52	No
23.07	Yes
301.28	Yes

Figure 4: Secondary Guarantee Indicator

4.2 Understanding Reserving for UL

4.2.1 Our Approach to Reading VM-20

An important concept of insurance is reserving; therefore, we did some thorough research on reserving for universal life. In order to understand reserving for UL, we read several guidelines

and books including the NAIC's Valuation Manual (VM-20) and Actuarial Guideline 38 (AG38). These guidelines explain the minimum reserve requirements for all UL products that have secondary guarantees, with or without shadow accounts. Since our sample policy has a secondary guarantee it was necessary for us to have the correct approach when building our sample illustration. While reading VM-20 we focused on the three types of reserves: Net Premium Reserve (NPR), Deterministic Reserve (DR), and Stochastic Reserve (SR). Since our project is only focusing on one policy, we decided to exclude the deterministic and stochastic exclusion tests from our research. VM-20 provided information on the process of reserving and the assumptions that need to be made within each type of reserve.

While reading VM-20, almost every section refers to other sections and subsections for further explanation, which made reading the paper a bit confusing. It was also tedious going back and forth in the paper. Therefore, while reading VM-20, we had two copies of the document open side by side so we could easily go to the referred section without losing our place in the first document. The sections explaining the calculations for NPR, Deterministic and Stochastic Reserve heavily referenced other sections to explain other components, or referred to equations, tables, and parameters to use while calculating the reserve. For example, the subsection secondary guarantee for UL heavily references Section 3 (Net Premium Reserve) for the calculation of components such as level gross premiums. In the case, a section was too difficult to understand or we felt there were some gaps in a section, we referred to a VM-20 practice notes.

Along with understanding the definitions and concepts outlined in VM-20, we also had to learn how to calculate every type of reserve. From our research, we noticed that calculating each reserve was not a straightforward process. Each type of reserve was dependent on many variables, and many of the formulas required to first calculate each variable within the formula and then plug them in the final formula. This procedure had to be done for each reserve, but on

our presentations and paper, we focused mainly on calculating NPR reserve. Along with calculating the types of the reserve, we also focused on understanding loans and withdrawals for UL, as it is a big advantage of having UL insurance.

Since much of our research of UL was theoretical, we wanted to have actual problems or examples of UL, so we handpicked exam problems from past MLC exams. These were later also shown in our lesson plan.

4.3 Developing the Lesson Plan

4.3.1 Audience and Approach

Before beginning to create the slides going into the PowerPoint lesson plan, our team had to think about who our target audience would be. Figuring out who our presentation was aimed at was key to deciding the level of depth of the material included in the slides. One of our goals was to create a week's worth of lessons for students in Actuarial Mathematic II. With this in mind, we decided the best audience to present this material to would be students who have taken Theory of Interest I & II and who have also taken Actuarial Mathematics I.

4.3.2 Creating Each Section of the Lesson Plan

4.3.2.a Background

After deciding the audience, we had to decide how best to structure the lesson plan. It would not make sense to jump right into discussing concepts such as reserving when the audience did not have a base knowledge of what UL is. For that reason, we decided to start the lesson plan with a background of UL as it would help to build their base knowledge and familiarize students with the vocabulary and concepts associated with UL. Therefore, when creating the background slides, we made sure to include material focused on explaining what UL insurance is, the purposes it serves, and how UL is different from Term Life and Whole Life.

4.3.2.b Components

After the background we decided to focus on adding a section on the components of a UL policy as we felt these were important topics concerning a UL policy, but were topics that did not directly impact any other section included in the lesson plan. The material that we felt fell under such sections were the topics of loans, withdrawals and secondary guarantees. The concepts of loans and withdrawals were important to include because they are a pretty significant aspect of a UL policy and could impact both the death benefit (DB) and account value should the policyholder choose to apply them to their policy. Therefore, we included lesson slides that explained how the amount of a loan or withdrawal that can be taken out is determined, how a loan could affect the account value of DB, how a withdrawal could affect the DB and lastly, we also included an example for each that demonstrated the concepts explained in each slide. Additionally, another concept we felt fell under this section was the concept of a secondary guarantee. The concept of a secondary guarantee was an important topic to include because it is another type of UL policy available to potential policyholders. Therefore, we decided to include slides that explained what a secondary guarantee is and how it affects the policy, how an SGUL policy compares to a traditional UL policy, the requirements needed to have and SGUL policy and an explanation of the requirements needed for an SGUL.

4.3.2.c Account Value

Next, we decided to include a section on building an account value in the lesson plan as we felt this was one of the most important topics due to the fact that the Long-Term Actuarial Mathematics exam contains questions pertaining to calculating the account value for a UL policyholder. We decided that the best way to demonstrate how to build an account value was through an example that broke down the various aspects slide by slide. Therefore we included slides that gave an overall outline of how building an account value works, the parameters of our example, each individual aspect that included how that aspect was determined and

demonstrated how it affected our example, and then a review slide that demonstrated how all the aspects together created the account value for our example.

4.3.2.d Reserving

Next, we decided to add material about reserving because not only is it an important concept to know in regards to UL, but for insurance as a whole. Reserving is an important topic that will continually appear throughout the career of an actuary. In this section, we focused on educating students on Principle Based Reserving. Therefore, we decided to start this section with slides that give an overview of PBR and explain why we have to use this method in specific for UL. Next, we wanted slides that broke down each specific method within PBR. We started with Net Premium Reserves and included slides that showed how an insurance company would determine to use this method for PBR, the two different formula methods within NPR, what time period each method calculation applied to, and step by step instructions that broke down each individual calculation for the formula of method 1 and 2. After NPR, we focused on including slides on the next method of PBR called Deterministic Reserving. For this topic, we included a slide that stated the formula for calculating DR and the assumptions used for this method of calculation. Lastly, we decided to include a slide about the third way of PBR called Stochastic Reserving. Stochastic Reserving is a type of reserving that is mostly used by large insurance companies who are reserving for thousands of UL policies at a time, and our team felt that it was important for students to be aware of this type of reserve, but did not need to know any information beyond a general explanation of how it worked. Therefore, we included a slide that stated what this type of reserve is ideal for and a general outline of the steps on how to calculate the reserve for UL policies using this method.

4.3.2.e Exam Questions

Once we decided on all the material going into each section of the lesson plan, we wanted to include practice examples in order to help reinforce all the material learned from the lesson plan. In addition, we wanted to expose students to what potential exam problems focused on UL could look like from the Long-Term Actuarial Mathematics exam. In order to complete this objective, we went through the past 10 years of LTAM exams and found UL specific questions to include in our slides. We also decided to place questions at the end of each section that they correlated with, so all exam questions related to calculating the account value went at the end of the Account value section, all questions related to the different types of reserving went at the end of their respective section and so on.

5.0 Future Works

Future work that actuarial MQP team could research could be analysis and in-depth explanations of other methods of reserving. This paper only focused on reserving methods for calculations based on a single policy. The following topics could be expanded upon:

1. More research on Stochastic reserving, which was briefly talked about. It could be interesting to see a team learn more about the assumptions used, how to use an economic scenario generator (ESG) and change the assumptions or factors of the ESG to see how that affects policies, use data from an (ESG) to calculate reserves, and create deliverable that could teach actuarial students about the ins and outs of Stochastic reserving.
2. The reserving talked about in our project is all principle-based reserving: instead of creating an Excel deliverable and paper explaining reserving based on PBR, more research could be done on statutory reserving. Research could be done on the different methods of reserve calculations for statutory reserves, and creating an Excel deliverable with UL policies evaluated using these methods.
3. Actuarial Guideline 38: this was a prevalent document that was tied heavily to statutory reserving and outlines the strict regulations for this type of reserving. More research could be done on exactly what types of regulations Actuarial Guideline 38 imposes on the reserving of life products and overall research on the regulations that impact UL products in general. Using this research, a brief study guide could be created to give a basic understanding of how regulations impact reserving on UL.

6.0 References

AIG Direct. (n.d.). Universal Life Insurance. Retrieved from https://www.aigdirect.com/life-insurance-products/universal-life-insurance

Allstate. (October 2017). What is Cash Value Life Insurance?. Retrieved from https://www.allstate.com/tr/life-insurance/cash-value.aspx

Anderson, R. (2018, March 6). Identifying Ideal Clients for Universal Life Products. Retrieved from https://agentsurvivalguide.com/identifying-ideal-clients-for-universal-life-products

What-is-group-life-insurance. (2018). Retrieved October 15, 2019, from https://equitable.com/life-insurance/questions/what-is-group-life-insurance

Claire, D.R., Lombardi, L.J., & Summers, S.D. (2018). *Statutory Valuation of Individual and Annuity Contracts* (5th ed., Vol. 1). New Hartford, CT: ACTEX Learning.

Doll, D. C. (n.d.). A Brief History of Universal Life. Retrieved September 16, 2019, from https://www.soa.org/globalassets/assets/library/monographs/50thanniversary/productdevelopment-section/1999/january/m-as99-3-06.pdf.

Fidelity. (2019a). Determining Your Coverage Need. Retrieved from https://www.fidelity.com/life-insurance/life-insurance-planning/how-much-life-insurance

Fidelity. (2019b). What is Life Insurance? Retrieved from https://www.fidelity.com/life-insurance/life-insurance-planning/what-is-life-insurance

LIMRA & SOA. (2019). U.S Individual Life Insurance Persistency. Retrieved from https://www.soa.org/globalassets/assets/files/resources/research-report/2019/2009-13-us-ind-life-persistency-update-report.pdf

Life Principle-Based Reserves (PBR). Retrieved from https://www.actuary.org/sites/default/files/files/publications/VM_20_PN_Revised_January_2019_Final.pdf

Karapiperis, D., & CIPR Research Analyst II. (n.d.). Reserving for Universal Life Policies with Secondary Guarantees and the Evolution of AG 38. Retrieved from https://www.naic.org/cipr_newsletter_archive/vol2_ag38.htm.

Northwest Mutual. (2019). Life Insurance Policies: What You Need to Know. Retrieved from https://www.northwesternmutual.com/video/life-insurance-policy-loans-what-you-need-to-know/

Protective Life Insurance Company. (n.d.). Understanding Universal Life. Retrieved from https://www.cpg.org/linkservid/3EB4A994-CF87-D422-524CCEF0F540FAE5/showMeta/0/

TermLife2Go. (2019, February 11). Best Universal Life Insurance Companies and Policies. Retrieved from https://termlife2go.com/best-universal-life-insurance-companies-and-policies/

True Blue Life Insurance. (n.d.). Universal Life Insurance. Retrieved from https://www.truebluelifeinsurance.com/universal-life-insurance-quote/