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Individual Life and Annuity Life Pricing

SECTION 1

Introductory Note

This section of the study manual contains material to supplement the course of reading on **Understanding the feasibility step of new product development and how it drives design**.

Contained in this section are summary outlines of required readings.

The student is cautioned that these outlines are **not** to be considered as replacements for the original work, but are to be used only as study aids in conjunction with the original work.

ACTEX Publications would like to acknowledge the publishers of the original works upon which these outlines are based.

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Understanding the feasibility step of new product and how it drives design

MARINO & GROBE, CHAPTER 1, THE HISTORY OF LIFE INSURANCE POLICY TAXATION

Note from the author: This chapter provides information on the evolution of taxation of life insurance policies in Canada. It is a subject of many possible questions and is worth giving more time to understand the impact of the Carter Commission, the 1968 Federal Budget and the 1977 Federal Budget. Most important are the details of the impact of the 1981 Budget.

I. Introduction

A. For income tax purposes, life insurance includes annuity and segregated fund policies.

B. Issues peculiar to insurance policies and insurance industry in general

1. Contingent and long-term nature of a life insurance policy.
2. Question of whether there should be taxation of mortality gains.
3. Issue of how income earned from investment of policy reserves should be taxed.
4. Question of who should be responsible for paying tax in respect of policy, namely the policyholder or the insurer.

C. Before 1968, policies and policyholders were exempt from tax.

II. Pre-1968 History

A. Income War Tax Act of 1917 provided explicit exemption from taxation.

B. In 1948, explicit exemption removed, but gains were still not to be subject to tax.

III. The Carter Commission Report - Recommendations

A. Life insurance policy premiums should not be deductible.

B. Investment income accumulated should be included in policyholder's income in the year in which it is accumulated.

C. As an alternative, withholding tax on investment income on policy reserves.

D. Policy dividends should be included in income.

E. After transition period, mortality gains/losses should be included in income.

IV. The 1968 Federal Budget

A. Taxation of policy gains on disposition

1. Realization of accumulated investment income on disposition

a. Surrender or termination.
b. Disposition by operation of law only.
c. Maturity of policy.
d. Entitlement to a policy dividend.

2. Disposition excludes

a. Termination due to death.
b. Termination due to total and permanent disability (1973-74).
c. Collateral assignment of policy.
d. Lapse with reinstatement within 60 days.
e. When policy is annuitized.

3. Proceeds of disposition in excess of ACB are included in income

a. Amount of dividends to which policyholder is entitled.
b. Value of the interest: cash surrender value.

4. ACB is the adjusted cost basis.

B. Relief for existing policies

1. New rules apply to dispositions made after January 1, 1970, for individuals and 1970 taxation year for corporations.

2. An alternative calculation of the ACB was provided.

V. A New Act: Section 148 of new Act corresponds to section 79D of old Act.

VI. The 1977 Federal Budget

A. Introduction

1. Proposition to tax investment income realized on death.
2. Exemption for 1st $10,000 if taxpayer is deceased or deceased's spouse.
3. Inclusion of policy loans in definition of disposition.
4. New tax anniversary date was also proposed.
5. Attempt to tax portion of death benefit proceeds did not pass.

B. Policy loans as a disposition

1. If made after March 31, 1978.
2. If policy loan exceeds ACB, a taxable gain arises.
3. Repayment of policy loan is added to ACB.
4. Interest paid on policy loans is added to ACB.

C. New tax anniversary date

1. Income reflected in CV of policy running from 1st anniversary after March 31, 1977 would become taxable for dispositions after March 31, 1978.

VII. The 1981 Federal Budget - Changes proposed

A. Policies issued after Nov 12, 1981 should be subject to triennial tax reporting.

B. Any remaining untaxed investment income was to be taxed upon death.

C. For partial disposition, include in income amount in excess of portion of ACB to which proceeds relate.

D. Upon disposition, ACB was to exclude portion of any premium not attributable to savings element (mortality costs).

E. Measures relating to dispositions were to have retroactive application.

F. Proposal to reduce ACB by mortality costs was confined to policies issued after Nov 12, 1981.

G. Effective date then became June 29, 1982.

H. Broad outlines of new rules to policies issued after June 28, 1982 were set out.

VIII. The Dec 1, 1982 Notice of Ways and Means Motion and Dec 7, 1982 Bill C-139

A. New rules – post-December 1, 1982 policies

1. Accrual taxation

a. Policyholder must include in income on 3rd anniversary date of policy, excess of MTAR (maximum tax actuarial reserve) over ACB at that time.
b. This was changed in 1989 to provide for accrual taxation on annual basis.
c. For corporate policyholders, accrual reporting was required annually.
d. Only investment income earned between last accrual reporting date and date of death need be reported and does not include mortality gains.

2. "Exempt policies"

a. Policy is compared with theoretical benchmark (exempt test policy).
b. Accumulating fund within policy must not exceed that of benchmark.
c. Exempt testing is performed on every policy anniversary.
d. Exempt test policy is endowment at age 85 payable over 20 years.
e. Increases in DB after issue are subject to limitations (no more than 8%).
f. Another provision prevents large lump-sum deposits after its 7th anniversary.
g. Regulation 306 was amended to clarify that exempt test policy is to have a level DB based on coverage at time of exempt test.
h. If policy fails exempt test, it will always be non-exempt.
i. However, a 60-day grace period is allowed to restore exempt status.
j. Onus is not placed upon policyholder.
k. Many insurers guarantee to keep policies exempt.

3. Reduction of ACB by NCPI and the treatment of premiums for certain riders

a. NCPI = NAR x q_{x+t} using 1969-1975 CIA S&U tables.
b. NAR = DB - accumulating fund ignoring policy loan or CV.
c. NCPI may exceed premium paid, eroding/eliminating ACB.
d. No taxable gain upon ACB reduced to 0 unless disposition of policy.
e. Premiums paid for ADB, disability benefits and substandard ratings, cost of conversion, settlement options and GIB riders are excluded from ACB.
f. Only premiums of base policy, term riders and PUA are included in ACB.

4. Prorating ACB for partial dispositions such as withdrawals but not policy loans.

5. Annuitization as a disposition.

B. Old rules – pre-December 2, 1982 policies ("grandfathered policies")

1. The tax rules

a. Not subject to exempt testing.
b. No accrual tax reporting for these contracts.
c. Policy gains are only taxed on a disposition.
d. No prorating of ACB on partial disposition.
e. Full amount of premiums paid are included in calculating ACB.
f. No reduction to ACB for NCPI.
g. Annuitization does not trigger disposition.
h. Annuity not subject to annual accrual taxation.
i. Exercise of RPU option would not result in disposition.

2. The effect of changes made to grandfathered policies

a. Policy becomes subject to exempt testing.
b. If it fails test, policy becomes non-exempt subject to accrual taxation.
c. If it passes test, gains will only be taxable upon disposition.
d. However, ACB will be calculated in accordance with new rules.
e. Some changes are not permitted including changes in ownership.
f. Prescribed premium is basically an unscheduled increase in premium paid after Dec 1, 1982.

3. A premium increase is not a prescribed premium if it arises from

a. Change in underwriting class.
b. Change in frequency of premium payments.
c. Addition or deletion of WP, DI, AD or GIO benefits.
d. Use of dividends to provide term insurance or PUA.
e. Adjustments required by the terms of the policy on class basis.
f. Correction of incorrect information in application.
g. Re-dating of lapsed policies within 60 days.
h. Late or early payment of premium.
i. Payment of loan interest after 1977 not deducted as interest expense.

4. An increase in Death Benefit is not a prescribed increase if it results from

a. Dividends used to provide PUA.
b. Adjustments required by the terms of the policy on class basis.
c. Prepayment of premiums not considered prescribed premiums.
d. DB being factor of CV and this has not changed.
e. Gratuitous increase made on a class basis.

5. The addition of a term rider or the exercise of a GIO is deemed to be a separately issued policy and so the original policy retains its grandfathered status.

6. Changes not affecting status include

a. Collateral assignment of policy.
b. Beneficiary changes.
c. Change in dividend options.
d. Level term conversion at attained age to whole life or level DB UL.
e. Change to RPU.
f. Change to less expensive policy.
g. Cancellation of any additional benefits.
h. Renewal of term policy.
i. Reduction in amount of insurance.

7. Changes causing loss of grandfathered status include

a. Conversion of level term with increase in DB.
b. Conversion of level term to new policy that fails exempt test.
c. Change to non-exempt policy with payment of prescribed premium.
d. Re-dating of lapsed policy after 60 days.

8. Life insurance capital dividend account

a. Under Bill C-139, where corporation becomes beneficiary, gain will no longer be included in corporation's CDA.
b. Establishment of a life insurance capital dividend account (LICDA).
c. Tax-free dividends were permitted to be paid out of LICDA.
d. LICDA rules were repealed 2 years later under 1985 Budget.

IX. Conclusion

A. Significant changes over time but certain basic truths have prevailed.

B. Life insurance DBs remain non-taxable.

C. Investment growth within policies is not subject to tax until disposition of policy, if it is either grandfathered or qualifies as exempt policy.

D. Non-exempt policies are subject to accrual taxation.

E. Modernization has been an agenda item for insurance industry since 1998.

X. Questions

A. What were the recommendations of The Carter Commission Report?

B. What are the characteristics of the 1968 Federal Budget on the taxation of policy gains on disposition?

C. What are the characteristics of the 1977 Federal Budget on the taxation of life insurance policies?

D. In the 1981 Budget, what are the new rules that apply to post-December 1, 1982 policies?

E. In the 1981 Budget, what are the old rules that apply to pre-December 2, 1982 "grandfathered policies"? In particular, give the effect of changes made to grandfathered policies, such as an increase in premium and an increase in death benefit.

F. In the 1981 Budget, which of the following changes would affect the status of a grandfathered policy?

Beneficiary changes.
Cancellation of any additional benefits.
Change in dividend options.
Change to less expensive policy.
Change to non-exempt policy with payment of prescribed premium.
Change to RPU.
Collateral assignment of policy.
Conversion of level term with increase in DB.
Conversion of level term to new policy that fails exempt test.
Level term conversion at attained age to whole life or level DB UL.
Re-dating of lapsed policy after 60 days.
Reduction in amount of insurance.
Renewal of term policy.

DESROCHERS, CHAPTER 6, SPECIFIC PRODUCT ISSUES

Note from the author: The most important item in this chapter is to understand the special issues created by Multiple-Life Plans, Group Universal Life and Accelerated Death Benefit riders under Sections 7702 and 7702A. It is important to understand the two broad types of multiple-life plans. The more common features of a GUL must also be understood.

I. Variable Life (VL)

A. Introduction

1. Tax rules applicable to life insurance contracts generally apply to VL plans.
2. Special compliance rule

a. VL contracts must be tested for CVAT or GPT only when DBs change.
b. In any event, determination must be made at least once in each year period.
c. DEFRA Blue Book indicates that annual determination must be made at same time each year.

B. Diversification Rules

1. Assets of segregated asset account must be adequately diversified.
2. Contract must be structured such that policyholders do not have excessive control of underlying investments.

C. Offshore and Private Placement Products

1. Applicable law requirement under 7702 encompasses foreign laws.
2. Federal tax treatment is then the same onshore and offshore.
3. Private placement VL is sold under special rules.

D. M&E and Asset-Based Expenses

1. Interest rate can be reduced by %-of-asset charges specified in contract.
2. Care is required in recognition of asset-based expense charges where

a. Part of charge is attributable to mortality risk since it may be limited by reasonable mortality safe harbors.
b. Charges are attributable to separate account expenses and are not contract expenses.
c. A varying level of charges is imposed depending on allocation of funds in contract.

II. Multiple-Life Plans

A. Joint Life or first-to-die contracts

1. Typically structured as either fixed or flexible premium UL.
2. Formulas

a. ${}_tp_{xy} = {}_tp_x \cdot {}_tp_y$.
b. $q_{x+t\,y+t} = q_{x+t} + q_{y+t} - q_{x+t} \cdot q_{y+t}$.
c. $A_{xy} = \sum v^t \cdot {}_{t-1}p_{xy} \cdot q_{x+t-1:y+t-1}$, from t=1.

B. Survivorship or last-to-die contracts

1. Traditional

a. Actuarial values are based on 3-status method.
b. CVs are adjusted on the first death.
c. $A_{xy}^{Survivor} = A_x + A_y - A_{xy}$.
d. Only permanent CV contracts use traditional method.

2. Frasierized

a. Actuarial values are based on 1-status method.
b. CVs are not adjusted on the first death.
c. Assume that $z = \overline{xy}$.
d. $A_{\underline{z}} = \sum v^t \cdot {}_{t-1}p_z \cdot q_{z+t-1}$, from t=1.
e. ${}_tp_z = {}_tp_x + {}_tp_y - {}_tp_{xy}$.
f. $q_{z+t-1} = 1 - {}_tp_z / {}_{t-1}p_z$.
g. It can be used to determine reserves, CVs as well as COI charges for UL.
h. Values are greater than traditional ones when both insureds are alive.
i. Values are less than traditional ones after the first death.

C. Determining the Insured's "Age"

1. Exact basis or equivalent-equal-age basis.
2. Advantage of exact age: it avoids need to develop appropriate joint-equivalent-age formula.
3. Use of equivalent ages limits number of age and class combinations.
4. Appropriate joint equivalent ages are derived from table of age adjustments.

D. Reduction in Benefits on Survivorship Contracts

1. Rule that applies for life of contract entered into on or after Sept 14, 1989.
2. Rules relating to MECs are applied as if contract had originally been issued at reduced benefit level.
3. It would apply to reduction in DB or rider or in QAB.
4. Permanent extension of look-back rule eliminated the SPII design.

III. Paid-Up Life Riders and Combination Plans

A. Contract that provides for purchase of paid-up or deferred additions will be treated as a single life contract.

B. Used to allow fixed premium plans to compete with flexibility of UL plan.

C. Combination Plans

1. Base plan and rider benefits.
2. 1997 private letter ruling dealt with 2 such components: variable base contract and rider.
3. In 1995 private letter ruling, IRS determined that future benefits include aggregate amount of base and riders at issuance.

IV. Interest-Sensitive Whole Life and Fixed-Premium UL (FPUL)

A. Application of DEFRA Blue Book Footnote 53

1. For guideline premium products, based on notion that stipulated premium will endow the contract, compliance under footnote 53 is intended to demonstrate that GLP and gross premium are equal.
2. Other potential problems include treatment of lumps sum payments, face amount decreases and modal premiums.

B. Waiver Rulings under Footnote 53

1. Error that was subject of waiver dealt with understanding of company's actuaries regarding relationship of tabular values to accumulation values.
2. Error was corrected by adding a CVAT endorsement to comply with CVA test retroactively to original issue date.
3. Another ruling granted similar waiver in 2002.

C. Applicability of the Adjustment Rules

1. Under plan addressed in a 1998 ruling, policyholders either paid

a. Initial lump sum premium to produce paid-up contract, or
b. Scheduled premium.

2. 2 errors occurred in testing of contracts

a. Because of product design error, subsequent scheduled premium payments caused sum of premiums paid to exceed permitted amounts.
b. Company personnel permitted extra-contractual decreases in proportion to amount of face reduction.

3. Correction was 2-fold

a. Contracts were endorsed to be tested under CVAT.
b. DBs were adjusted as needed to maintain compliance with CVAT.

V. Group Universal Life (GUL)

A. More common features of GUL include

1. Certificates are funded on an employee-pay-all-basis.
2. Employers collect premiums for insurer through payroll deductions and may provide other administrative services.
3. Certificates provide for an Option 2 death benefit.
4. Covered employees generally have all rights of ownership in their individual certificates and their beneficiaries are entitled to all proceeds on death.

B. It is the premium and CV for each individual certificate, based on that individual's date of coverage that must be considered.

C. GUL provides challenges in administration under 7702 and 7702A.

D. Provisions of a memorandum of understanding (MOU) should be considered.

E. Care should be taken in mortality assumptions used.

F. IRS has concluded that change in contract's terms results in an exchange rather than an assumption reinsurance arrangement for federal income tax purposes.

VI. Accelerated Death Benefits and Long-Term-Care Riders

A. Accelerated Benefit Riders

1. Lien Method

a. Loans as high as 80%-90% of policy death benefit can be made.
b. This is done by placing a lien against contract death benefit.
c. Proposed Regulation 1.7702-2 clarifies treatment of such unique loans.
d. It never became final and such benefits have been addressed legislatively.

2. HIPAA Rules

a. Amounts paid to terminally or chronically ill insured are treated as if insured had died enabling amounts to be received tax-free.

3. Contract has lower DB, which raises questions such as

a. Effect of payment of accelerated DB on premiums paid.
b. Whether payment is reduction in benefit under 7702A.
c. Whether payment constitutes adjustment event under 7702 requiring redetermination of guideline premiums.

4. Regulations have yet to be issued on this matter, leaving industry to develop answers on its own.

B. Long-Term Care (LTC) and Critical Illness Riders: 7702B treats such coverage as separate contract for tax purposes.

VII. Special Products

A. Burial or Pre-Need Contracts

1. They qualify as life insurance using CVAT.
2. Tax Reform Act of 1986 specifies that DB increases may be considered in applying CVAT if contract

   a. Has initial DB of $5,000 or less and a maximum DB of $25,000 or less.
   b. Provides for fixed predetermined annual increase not to exceed 10% of initial DB or 8% of DB at end of preceding year.

3. TAMRA clarified that rule would be prospectively effective for contracts entered into on or after October 22, 1986.

B. Cash Value Bonuses

1. Appropriate to recognize guaranteed increases in policy values in determination of 7702 test plan values.
2. Where effect is reflected in guaranteed interest rate, rate would be compared to statutory assumption to determine its applicability.
3. When payment is subject to discretion of management, it may well be a dividend and not a rate guaranteed on issue.

C. Church Retirement Plans: Exception to applicable law requirement for DB paid under such plans.

D. Decreasing Face Amount Plans

1. The 4 computational rules of 7702 constrain future contract benefits that are deemed to apply in determining 7702 test plan values.
2. It could be argued that contractual pattern of decreasing benefits should be followed if it is part of contract guarantee structure.

E. Life Insurance and Annuity Combinations: No issues if design of plan is not structured as a combination plan as provided in the Le Gierse case.

F. Premium Deposit Funds and Term and Annuity Combinations

1. In 1995 private letter ruling, IRS ruled that premium deposit fund rider was not life insurance contract or endowment contract.
2. Rider could be funded with lump sum single deposit.
3. 1999 ruling provided that proceeds payable under term rider on annuity contract would be excludable from gross income of beneficiary.

G. Return-of-Premium (ROP) Plans

1. Can be analogized to a partial endowment for amount of benefit.
2. These products appear to create CV that must meet 7702 limitations.
3. ROP provisions under decreasing mortgage term plan may be problematic.

H. Reversionary Annuity Plans: If they do not provide CV accumulation or surrender value, they qualify as life insurance contracts.

I. Single Premium "Net" Rate Products

1. In these designs, CV is single premium accumulated at net rate of interest.
2. Application of gross-up rule has created a certain complexity in calculation of guideline limitations for these plans.
3. Gross-up rule was subject of 5 letter rulings in the late 1980s.
4. GSP is simply the endowment amount discounted at whatever the interest rates happen to be.
5. Formula for CV is used to find implied interest rates.
6. Application of gross-up rule creates iterative process.
7. Each successive trial GSP is smaller than the last.

VIII. Questions

A. Describe the 2 broad types of multiple-life plans and explain how proposed Regulations recommend to Determine the Age for multiple life products.

B. What are the more common features of a Group Universal Life plan?

C. What are the questions that the payment of an accelerated death benefit rider that leave the contract with a lower death benefit may raise?

SOCIETY OF ACTUARIES
REPORT ON PREMIUM PERSISTENCY ASSUMPTIONS STUDY OF FLEXIBLE PREMIUM UNIVERSAL LIFE PRODUCTS, MAY 2012

I. Executive Summary

A. Key Findings
1. Many participants assume 100% premium persistency.
    a. The implication of the 100% assumption for multiple premium funding patterns is declining overall premium funding pattern
2. Common to price using multiple premium funding patterns
3. 48% of participants adjust premium persistency assumption in pricing to ensure the policy doesn't lapse.
4. Premium persistency factors for flexible premium UL (FPUL) products generally vary by duration but not by issue age or gender.

B. General Questions
1. 63% of participants use the same basis (e.g. company data, actuarial judgment) for determining the premium persistency assumption for all function (pricing, cash flow testing or GAAP/IFRS).
2. It is rare for premium persistency assumptions to differ from standard assumptions if there is a rolling vs standard commission target premium.

C. FPUL Product Specific Questions
1. The most common premium funding pattern modeled for UL with Secondary Guarantees (ULSG) are level premium, single premium and limited pay.
2. The most common premium funding pattern modeled for remaining FPUL product types (AccumUL, CAUL, IUL, VUL) is a level premium funding pattern.
3. For all FPUL product types except VUL, the same premium funding patterns and persistency factors are often assumed for cash flow testing and GAAP/IFRS.
    a. However, pricing frequently uses different assumption due to inclusion of more types of funding patterns.
4. Dynamic premium persistency assumptions, where premium persistency varies depending on interest rate environment, are rare.
5. Sensitivity testing of premium persistency assumptions is also rare.

II. Questions

1. What are the main findings of this report reported in the conclusion?

2. Give some indications on the assumptions used for pricing.

SOCIETY OF ACTUARIES
MODELING OF POLICYHOLDER BEHAVIOUR FOR LIFE INSURANCE AND ANNUITY PRODUCTS, 2014

I. Policyholder Behaviour (PHB) Defined

1. PHB refers to the decisions that policyholders make in the selection and utilization of benefits and guarantees embedded in life insurance and annuity products.
2. Factors leading to increased attention on PHB:
    a. Development of products that give increased flexibility to policyholders
    b. More insurance products with investment components that policyholders control
    c. Increased market volatility
    d. Increasingly sophisticated financial reporting and regulatory standards
    e. Social and technological advances that greatly influenced behaviors and allowed info to spread more quickly
    f. Development of Behavioral Economics
3. Many aspects of insurance company operations are affected by PHB, especially:
    a. Product design: type of PHB to encourage or discourage, risks the company wants to take on or avoid
    b. Pricing: PHB needs to be incorporated in pricing decisions to not over- or under-price products
    c. Reserving/capital: PHB not only impact level of reserves and required capital but also the volatility of those reserves and capital
    d. Asset and liability cash flows: PHB risks typically considered non-diversifiable and non-hedgeable
    e. Enterprise risk management (ERM): uncertainty of PHB presents risks that the company needs to manage proactively through its ERM program
4. From both the PH and insurer's perspective, information asymmetry exists.
    a. Information asymmetry also introduces "curse of knowledge" for actuaries setting PH assumptions
5. There are many data challenges when collecting info on PHB, such as lack of credible data or lack of causal linkages.
6. Recent emergence of a host of information and analytical models is greatly enhancing the capability of better understand PHB, including:
    a. Increased acceptance of behavioral economics
    b. Increased amount of data now available to study PHB
    c. Increased computing power to simulate millions/billions of consumer interactions
    d. New analytical techniques that enable the building of dynamic models of behavior

II. Survey of Dynamic Policyholder Behavior Assumptions

1. For life insurance products, PHB includes:
    a. Shock lapse and related anti-selective mortality on level premium plans

   b. Conversion elections
   c. Loan utilization
   d. Dividend elections
   e. Premium persistency, funding patterns, and withdrawals for flexible premium plans
   f. Index elections and transfers between indices for indexed products
   g. Traditional lapse and surrender for all life products

2. For annuity products, PHB includes:
   a. Additional premium deposits
   b. Annuitization rates
   c. Renewal rates
   d. Withdrawals
   e. Living benefit elections and utilization on variable and indexed products with these guarantees
   f. Index elections and transfers between indices for indexed products
   g. Fund elections, fund transfers, and fixed account transfers for variable products
   h. Full surrender rates

3. Universal life (UL) products currently have the greatest number of assumptions modeled with a dynamic structure.
   a. Accumulation UL and secondary guarantee UL are currently the life product types that rely most heavily on dynamic assumption structures.

4. A small number of companies are currently using dynamic structures in the modeling of anti-selective mortality on high lapse, as well as improvements on mortality on low lapse.

5. Annuity products are generally ahead of Life products in the consideration and implementation of dynamic structures for PHB assumptions.

6. The term “financial efficiency” is broadly used to indicate whether the PH are using their insurance policies in a way that maximizes the present value of benefits to the PH. This should be considered in setting PHB assumptions.

7. Most companies have either established a formal governance process or are in the process of reviewing current practices in order to establish a more formal process.

8. Data availability/credibility, resources, and model complexity are the most commonly cited challenges for companies.

9. Current modeling techniques include:
   a. Traditional actuarial modeling
   b. Predictive modeling of behavior based on PH attributes
   c. Monte Carlo simulation
   d. Neural nets
   e. Agent-based simulation

10. Modeling techniques have become more sophisticated, with increased credibility of experience data and increased understanding of factors that impact results.

III. Current Practices and Recommendations from the Research Team

1. In terms of data collection, analysis, and assumption setting:
    a. Review sources of internal and external data
    b. Consider collecting and analyzing data from customer service and other customer interaction data
    c. Consider applicability of experience on older in-force blocks whose features are similar to newer product offerings
    d. Better understand potential variations in PHB experience results under more extreme positive or negative scenarios
    e. Apply predictive modeling
    f. Centralize all internal sources of data regarding PHB
2. In terms of modeling:
    a. Put in place assumption setting and review practices that balance modeling assumption with a more dynamic structure vs added model complexity
    b. Review current modeling to identify inconsistencies
3. In terms of validation:
    a. Establish formal validation process and document results of validation
    b. Establish role with responsibility for review of model updates, assumption changes across various actuarial functions for a particular product
4. In terms of governance process steps:
    a. Implement formal process for experience data updates, review of results, and formulation of recommendations; identify individuals providing sign-off
    b. Establish a cross functional data analytics repository and create cross functional platform for discussions and agreement on assumptions
    c. Establish a basis for experimenting with advanced statistical techniques to better understand PH.

IV. Behavioral Economics: Policyholder Behaviors Review

1. PHB associated with major life and annuity products and applicable behavioral economics principles, see text page 45-47 summary tables
2. Two main hypotheses for why PH decide to lapse a product:
    a. Interest rate hypothesis: lapse rates are negative related to internal rates of return and positively related to external rates of return
    b. Emergency funds hypothesis: PH surrender policies due to financial distress
3. Four categories introduced in Behavioral Economics include: i) decision shortcuts; ii) value assessments; iii) emotional impacts; iv) social impacts.

A. Lapse and surrenders
    1. Decision shortcuts
        a. Relative choices: most people make decisions by comparing products to one another, rather than performing a ground-up valuation of each option
        b. Mental accounting: people have a common tendency to create artificial budgets covering different categories of spending and saving, and this tendency can lead to seemingly irrational decisions.
    2. Value assessments

a. Hyperbolic discounting: individual behave as if they have increasing discount rates across time horizons
b. Love of free: consumers respond disproportionately well to the concept of "free"

3. Emotional impacts
   a. Risk aversion: people purchase insurance products primarily due to risk aversion
   b. Loss aversion: people will select "winners" to sell and hold onto "losers" even though they know it is not tax optimal to do so
   c. Self-control facilitation: people are willing to accept less freedom in order to prod themselves into saving and preparing for the future in a disciplined manner
   d. Hot and cold states: people in good moods make unrealistically optimistic judgments and decisions, while bad moods lead to pessimistic views

4. Social impacts
   a. Bandwagon effect: individuals may significantly impact members of their social network; this effect is more pronounced in extreme conditions

B. Premium and Funding Levels
1. Decision shortcuts
   a. Reliance on defaults: individual exhibit a large degree of inertia in decision-making process and often rely on default assumptions that were used in the past
   b. Status quo bias: people have a tendency to stick with prior choices

2. Value assessments
   a. Anchoring: tendency of numerical estimates to be influenced by suggested numbers
   b. Hyperbolic discount: PH must accept periodic short-term pains (premium payments) in exchange for a relatively long-term payoff

3. Emotional impacts
   a. Self-herding: PH who have been paying premiums to keep a policy inforce tend to continue to do so, and confirmations from the insurer can contribute to self-reinforcing behavioural loop.
   b. Hyperbolic discount: PH must accept periodic short-term pains (premium payments) in exchange for a relatively long-term payoff

C. Timing of Withdrawals
1. Decision shortcuts
   a. Reliance on defaults: the communications and tiering of withdrawal rates likely has a signalling effect to PH of when they should begin taking withdrawals
   b. Mental accounting: people's perceptions toward the associated money are affected by how they often set up divisions or categorizations of their finances

2. Emotional impacts
   a. Over confidence: gap exists between how PH may have planned to use an insurance product for retirement income vs. how they end up needing to use the product; excess optimism

D. Partial Withdrawal Amounts
   1. Decision shortcuts
      a. Mental accounting: people have a common tendency to create artificial budgets covering different categories of spending and saving, which leads to seemingly irrational decisions
      b. Reliance on defaults: systematic payout/withdrawal programs and product designs may be seen as a "sensible" amount endorsed by experts or social norms
   2. Value assessments
      b. Anchoring: people are easily affected by numbers presented to them, even when the numbers aren't relevant to decision making

E. Investment Decisions and Fund Transfers
   1. Decision shortcuts
      a. Relative choices: investors can be overwhelmed by the options, study has shown that relative number of equity funds offered correlates with the amount invested in equities
      b. Framing: individuals may be influenced by whether an investment account is designated as a "retirement account" vs. "asset accumulation tool"
      c. Mental accounting: individuals use implicit methods for tagging and coding their balances, which impact how assets are allocated and reallocated
      d. Reliance on defaults: many PH rely on default allocations provided by the investment company
      e. Procrastination: people can experience inertia and procrastination on their decision-making process and actions
   2. Emotional impacts
      a. Risk aversion: individuals have a tendency to weigh losses more heavily than gains
      b. Loss aversion
      c. Overconfidence
      d. Hot vs. cold state
   3. Emotional impacts
      a. Bandwagon effect: people often do things because many other people do the same

F. Annuitization
   1. Decision shortcuts
      a. Reliance on defaults: annuitization can be set as one of the default or recommended options in an annuity contract
      b. Framing: annuitization rate has historically been lower than expected
   2. Emotional impacts
      a. Risk aversion: people feel the need and desire for fixed living benefits, and use an annuity to supplement Social Security and private pension benefits
      b. Loss aversion: may discourage people from wanting to annuitize, if they are concerned they may only get to collect benefits for several years after they annuitize