Where Less is More: Reducing Variable Annuity Fees to Benefit Policyholder and Insurer*

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1 Motivation

2 Financial Model

3 Results for Innovative VA Provider

4 Results for Competitive Market

5 Conclusion
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Motivation

- **Variable Annuity (VA):** Popular long-term savings vehicle (in U.S.)
  - Investment flexibility + favorable tax treatment + downside protection

- Recently: decline in demand
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![Graph showing VA Sales (in $b) from 2005 to 2016](image)
Many financial advisers advocate against buying VAs. Why???

Forbes:

5 Reasons Why You Should Never Buy A Variable Annuity:
1. You’ll Pay High Fees

Kiplinger.com:

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• Why are VA fees so high?
  ▶ Fee charged at level rate in proportion to VA account value
  ▶ Fee covers expenses & costs of guarantees
  ▶ Insurer pays acquisition expenses, recovers them through VA base fee

• Frequent policy lapses further increase the fee rate
  ▶ If VA is lapsed, insurer loses future fee income
  ▶ Market reentry ("1035 exchange") triggers new policy acquisition expenses

• Simply reducing VA fee rate could make product unprofitable

• Our proposal: Time-dependent fee structure
  ▶ Reduce VA fee after some policy years
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Benefits of a Time-Dependent Fee

● With level fee rate, policy lapses are free for PH

▷ Example: You purchase VA with single premium (& guaranteed amount) 100
▷ You pay level fee rate $\phi$ each year, in proportion to (random) account value
▷ If VA account value increases to 120 . . .

☆ Guarantee value is low & fee payments are high
⇒ Lapse-and-Reentry: Exchange VA for identical product (to upgrade guarantee)
☆ Guaranteed amount stepped up to VA account value
☆ All other VA specifications (incl. fee rate) are identical ⇒ Arbitrage!

● With time-dependent (front-loaded) fee, lapsing is costly

▷ Lapse-and-reentry makes policyholder forego (or delay) fee reduction
⇒ Fewer lapses ⇒ Fewer expenses ⇒ Finances fee reduction
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- Time-dependent fee can make both parties better off
  - Policyholder pays lower fee rate
  - VA provider: expense savings outweigh reduced fee income
  - By eliminating transaction costs (i.e. repeated policy acquisition expenses)
- Discourages lapse-and-reentry, but also pure lapses
  - VA provider less exposed to policyholder behavior risk
    - Improves hedging of embedded guarantee (Kling, Ruez, and Russ, 2014)
- Easy to implement on new and existing policies: “Customer loyalty”
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   VA Product Features
   Policyholder’s Decision Making
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Financial Model

VA Product Features

- Implement typical (B-share) VA from U.S. market
- Face amount/premium $100,000
  - Time-\(t\) account value: \(A_t (A_0 = 100,000)\)
- Includes return-of-premium GMDB
  - Guaranteed amount denoted by \(G_t\)
  - \(G_1 = 100,000; G_t\) changes only upon lapse-and-reentry
  - If PH dies in year \(t\), receives \(\max(A_t, G_t)\) at time \(t\)
- If PH survives to maturity (time \(T\)), receives \(A_T\)
- 7-year surrender schedule
  - 7% in year 1, 6% in year 2, \ldots, 0% for \(t \geq 7\)
Financial Model

VA Product Features, cont’d

- Annual fee rate $\phi_t = \begin{cases} 
\phi_{ini}, & m_t < n_{red} \\
\phi_{red}, & m_t \geq n_{red} 
\end{cases}$

  - $m_t$ is the time (in years) under the current VA policy
  - Fee charged continuously in proportion to $A_t$

- PH can lapse on policy anniversary dates
  - Re-enters market by acquiring identical policy
  - Begins new policy with $m_t = 0$; same $A_t$ (minus surr. fee); $G_{t+1} = \text{new } A_t$

- Expenses are paid by insurer
  - For policy acquisition (incl. reentry): $\epsilon_{ini}$
  - Annually recurring: $\epsilon_{rec}$
  - Assessed at beginning of year in proportion to $A_t$
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Policyholder’s Decision Making

• Continuation value of VA policy: \( V^{\text{cont}}_t(A_t, G_t, m_t) = \tilde{V}(t, A_t, G_t, m_t) \),
  - With intermediary function \( \tilde{V}(t, A_t, G_{t+1}, m_t) = q_{x+t} \left[ A_t e^{-\phi m_t} + \text{Put}(A_t, G_{t+1}, \phi m_t) \right] + (1 - q_{x+t}) e^{-rE}\pi [V_{t+1}(A_{t+1}, G_{t+1}, 1 + m_t)] \).

• Lapse-value of VA policy:
  \[ V^{\text{lapse}}_t(A_t, G_t, m_t) = \tilde{V}(t, [1 - s(m_t)]A_t, [1 - s(m_t)]A_t, 0) \]

• PH chooses to lapse and reenter if \( V^{\text{lapse}}_t > V^{\text{cont}}_t \)
  \[ V_t(A_t, G_t, m_t) = \max \left\{ V^{\text{cont}}_t(A_t, G_t, m_t), V^{\text{lapse}}_t(A_t, G_t, m_t) \right\} \]

• Terminal condition: \( V_T(A_T, G_T, m_T) = [1 - s(m_T)]A_T \)

• Time-0 risk-neutral policy value: \( V_0 := \tilde{V}(0, A_0, A_0, 0) \)
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Financial Model

Valuation to VA Provider

- PV of insurer’s expenses, from time t forward: \( EPVE_t(A_t, G_t, m_t) = \)
  \[
  \begin{cases}
  EPVE(t, [1 - s(m_t)]A_t, [1 - s(m_t)]A_t, 0, \epsilon_{ini} + \epsilon_{rec}) , & \text{if lapse} \\
  EPVE(t, A_t, G_t, m_t, \epsilon_{rec}) , & \text{if cont.}
  \end{cases}
  \]

  - \( EPVE(t, A_t, G_{t+1}, m_t, \epsilon) = \epsilon A_t + (1 - q_{x+t}) e^{-r_{t}^{Q}} [EPVE_{t+1}(A_{t+1}, G_{t+1}, 1 + m_t)] \)
  - Terminal condition: \( EPVE_T(A_T, G_T, m_T) = 0 \)

- Time-0 present value of all expenses:
  \[
  EPVE_0 = EPVE(0, A_0, A_0, 0, \epsilon_{ini} + \epsilon_{rec})
  \]

- Time-0 NPV of VA policy to insurer:
  \[
  NPV_0 = NPV_0(\phi_{red}, n_{red}, \phi_{ini}) = A_0 - V_0 - EPVE_0
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Implement numerically via **recursive dynamic programming**

⇒ State space: $A_t, G_t, m_t$

- Black-Scholes Economy

- Parameters (Moenig and Zhu, 2016):

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▶ Mortality: 2012 IAM basic male mortality table
Numerical Implementation

- Implement numerically via **recursive dynamic programming**
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• Fix $\phi_{ini} = 150.7$ bps (level break-even fee)
  ▶ Insurer chooses $n_{red}$ and $\phi_{red}$ to maximize $NPV_0$
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## Results for Innovative VA Provider

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<td>( NPV_{0}^{*} ) ($)</td>
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<td>( V_{0} ) ($)</td>
<td>77,340</td>
<td>81,290</td>
<td>78,980</td>
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<td>( EPVE_{0} ) ($)</td>
<td>22,660</td>
<td>15,110</td>
<td>14,850</td>
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<td>( L_{0} ) ($)</td>
<td>1.45</td>
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- Fee reduction (almost) eliminates lapses
  - Also: reduces fee income for insurer (\( \Rightarrow \text{prefers to delay to} \ n_{\text{red}} = 18 \))
- Saved expenses distributed between insurer ($6,170) and PH ($1,640)

\( \Rightarrow \) Innovative VA provider could benefit substantially
### Results for Innovative VA Provider

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<td>81,290</td>
<td>78,980</td>
</tr>
<tr>
<td>( EPVE^*_0 ) ($)</td>
<td>22,660</td>
<td>15,110</td>
<td>14,850</td>
</tr>
<tr>
<td>( L_0 )</td>
<td>1.45</td>
<td>0.04</td>
<td>0.02</td>
</tr>
</tbody>
</table>

- Fee reduction (almost) eliminates lapses
  - Also: reduces fee income for insurer (⇒ prefers to delay to \( n_{\text{red}} = 18 \))
- Saved expenses distributed between insurer ($6,170) and PH ($1,640)

⇒ Innovative VA provider could benefit substantially
## Results for Innovative VA Provider

### Select Valuation Statistics

<table>
<thead>
<tr>
<th></th>
<th>No Red.</th>
<th>$n_{red} = 7$</th>
<th>$n_{red} = 18$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\phi_{red}^*$ (bps)</td>
<td>150.7</td>
<td>93.2</td>
<td>47.4</td>
</tr>
<tr>
<td>$NPV_0^*$ ($)</td>
<td>0</td>
<td>3,600</td>
<td>6,170</td>
</tr>
<tr>
<td>$V_0$ ($)</td>
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Results for Competitive Market

1. Motivation

2. Financial Model

3. Results for Innovative VA Provider

4. Results for Competitive Market

5. Conclusion
Choose $\phi_{ini}$, $\phi_{red}$, and $n_{red}$ to maximize $V_0$ s.t. $NPV_0 = 0$

- Constraint ($NPV_0 = 0$) implies a unique $\phi_{ini}$ for any given $\phi_{red}$:
Choose $\phi_{ini}$, $\phi_{red}$, and $n_{red}$ to maximize $V_0$ s.t. $NPV_0 = 0$

- Constraint ($NPV_0 = 0$) implies a unique $\phi_{ini}$ for any given $\phi_{red}$:
Same graph, with truncated y-axis:

(If $n_{\text{red}} \geq 7$:) Reducing $\phi_{\text{red}}$ allows provider to reduce $\phi_{\text{ini}}$ as well

- Reduced expenses outweigh loss in fee income
- ... until lapse rate = 0; then provider needs to increase $\phi_{\text{ini}}$
Results for Competitive Market

Lapse Rates

Carole Bernard & Thorsten Moenig
Where Less is More: Reducing VA Fees to Benefit PH and Insurer
• Reducing $\phi_{red}$ to policyholder’s benefit
  ▶ Initially: big impact due to reduced policy acquisition expenses
  ▶ Minor impact as $\phi_{red}$ gets smaller (due to lower recurring expenses)
Results for Competitive Market
Maximized Policy Value

- Same graph, with truncated x-axis & y-axis:

- Mathematical optimum: front-load all fees ($n_{red}=1$, $\phi_{red} = 0$)

- But: moderate front-loading captures vast majority of benefits
When $\phi_{\text{red}}$ is small, reducing it further increases $V_0$ a little. Why?

- Making $\phi_{\text{red}}$ even smaller leads to increase in $\phi_{\text{ini}}$ (see prior slides)
- Larger $\phi_{\text{ini}}$ means that $A_t$ is reduced faster at the beginning
  - And more slowly later on b/c of lower $\phi_{\text{red}}$
- We assumed that insurer’s recurring expenses are in proportion to $A_t$
- Lower $A_t$ $\implies$ fewer expenses $\implies$ larger $V_0$

In practice, part of insurer’s expenses may be fixed

$\implies$ (Minor) impact of fee reduction (below threshold) overstated

Focus on big impact of reduced fee policy: fewer lapses & acquisition expenses
When $\phi_{\text{red}}$ is small, reducing it further increases $V_0$ *a little*. Why?

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### Results for Competitive Market

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<table>
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<tr>
<th></th>
<th>No Red.</th>
<th>max. $V_0$</th>
<th>max. $\phi_{\text{red}}$ s.t. $L_0 &lt; 0.005$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$n_{\text{red}}$ (years)</td>
<td>—</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>$\phi_{\text{ini}}$ (bps)</td>
<td>150.7</td>
<td>2,001.2</td>
<td>133.8</td>
</tr>
<tr>
<td>$\phi_{\text{red}}$ (bps)</td>
<td>—</td>
<td>0.0</td>
<td>70.7</td>
</tr>
<tr>
<td>$V_0$ ($)</td>
<td>77,340</td>
<td>85,470</td>
<td>84,870</td>
</tr>
<tr>
<td>$EPVE_{0}$ ($)</td>
<td>22,660</td>
<td>14,530</td>
<td>15,130</td>
</tr>
<tr>
<td>$L_0$</td>
<td>1.45</td>
<td>0.00</td>
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</tr>
</tbody>
</table>

- Policy value ($V_0$) increased by $\approx 10\%$ over current status-quo
  - B/c of up to $8,130$ in reduced expenses
- Can capture most of benefits with moderate front-loading of fees
1 Motivation

2 Financial Model

3 Results for Innovative VA Provider

4 Results for Competitive Market

5 Conclusion
Conclusion

• Assess impact of partial frontloading of VA fees on PH behavior
  ▶ Simple & financially impactful
  ▶ Makes PH share cost of lapse decision
    ✫ Under level fee: cost of lapsing is fully socialized
  ▶ Benefits both PH and insurer (by reducing expenses & fee rates)
  ▶ Can be implemented on new and existing policies

• Directly addresses concerns about VAs being too expensive
  ▶ Without compromising VA’s attractive features

• Fewer lapses allows VA provider to increase investment horizon
  ▶ Invest in illiquid, long-term assets
  ▶ Benefits investors and economy overall (Gollier, 2015)
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THANK YOU
Where Less is More: Reducing Variable Annuity Fees to Benefit Policyholder and Insurer*

Carole Bernard & Thorsten Moenig†

† Temple University — moenig@temple.edu

2017 ASTIN/AFIR Colloquia, Panama City

* Research supported by Fundación MAPFRE
Empirical observation of VA policy lapses (Paris, 2017)

Surrenders vary by living benefit type

- GMWB
- None
- GLWB
- GMIB

Years Remaining in Surrender Charge Period

Surrender Rate

0% to 30%