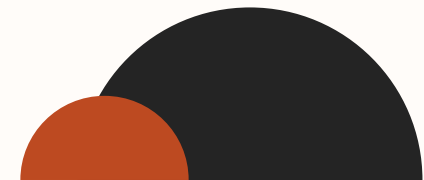


2024 BAS Case Competition

Team 13: Evan Dixon, Jeannie Koshpasharin, Kacey Yang



Objective: Lapse Rate Formula

01

**Recommended
Factors**

02

**Proposed
Formula**

03

**Future
Projection**

04

**Other
Factors**



01

Recommended Factors



Our Picks

Market
Value
Adjustment

Surrender
Charge

Crediting
Rate

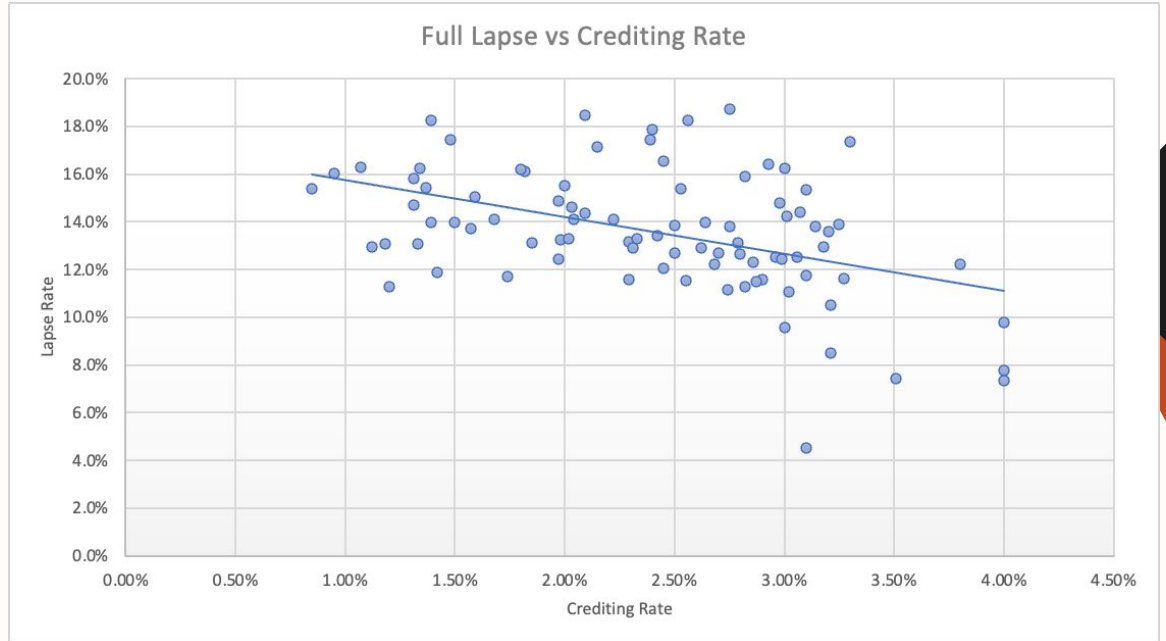
Policy Year

Correlations: Does it matter?

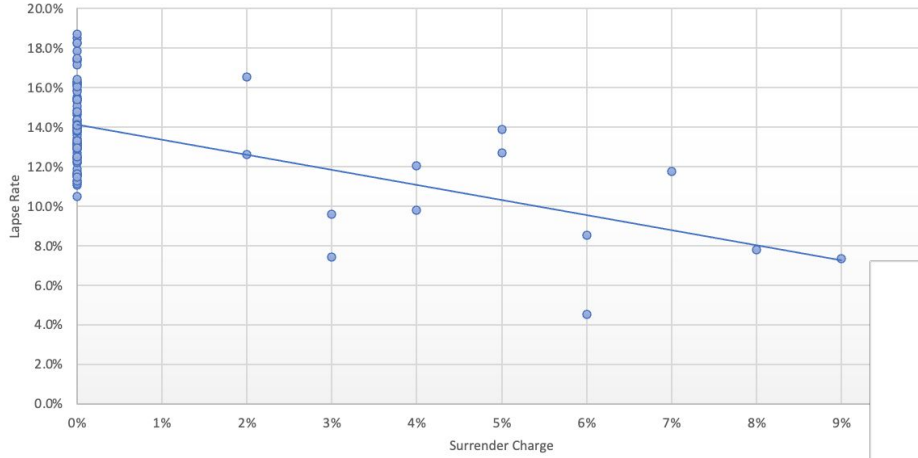
Scatter Plots



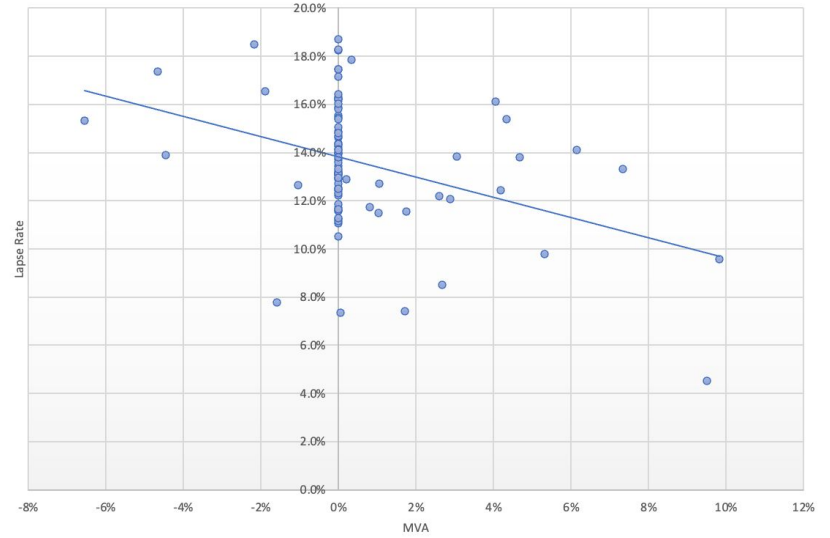
Regression
Line (r value



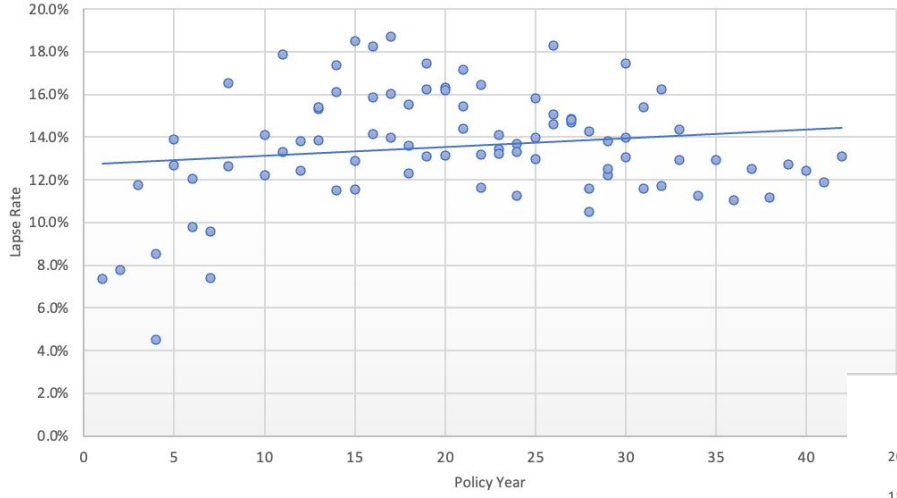
Full Lapse vs Surrender Charge



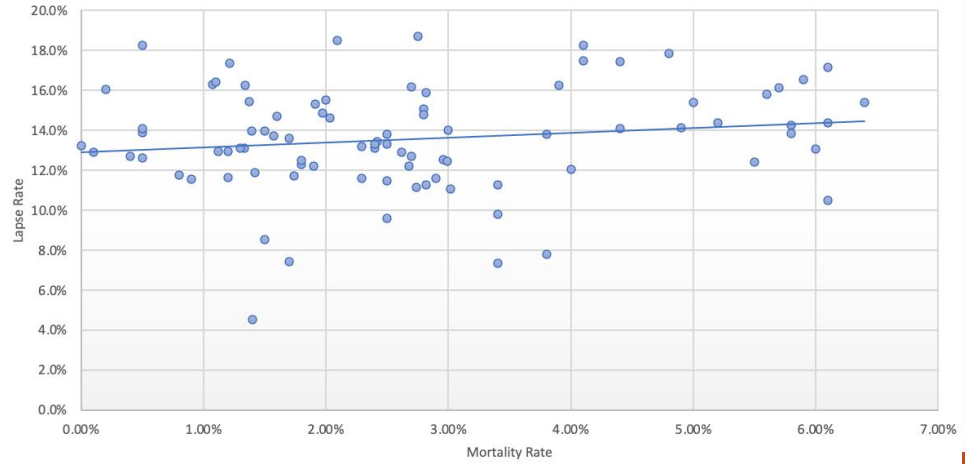
Full Lapse vs MVA



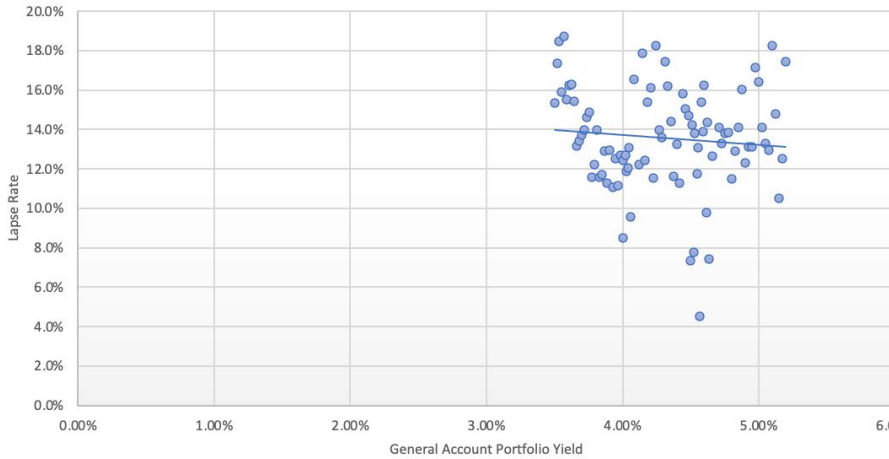
Full Lapse vs Policy Year



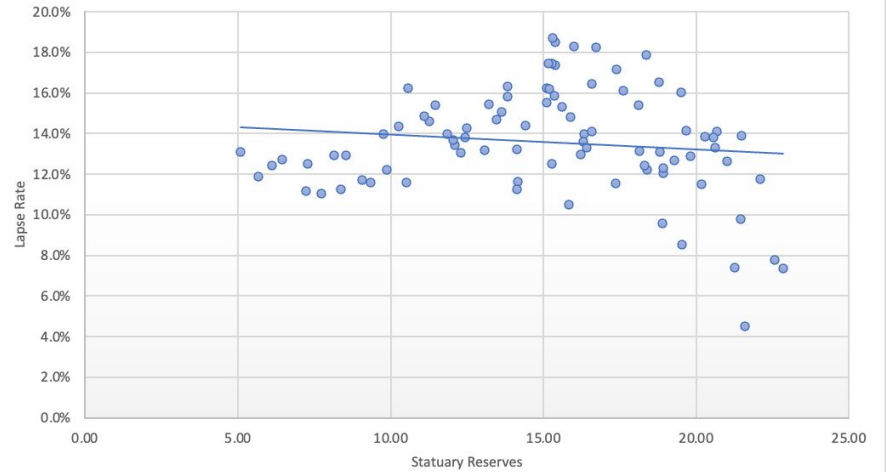
Full Lapse vs Mortality



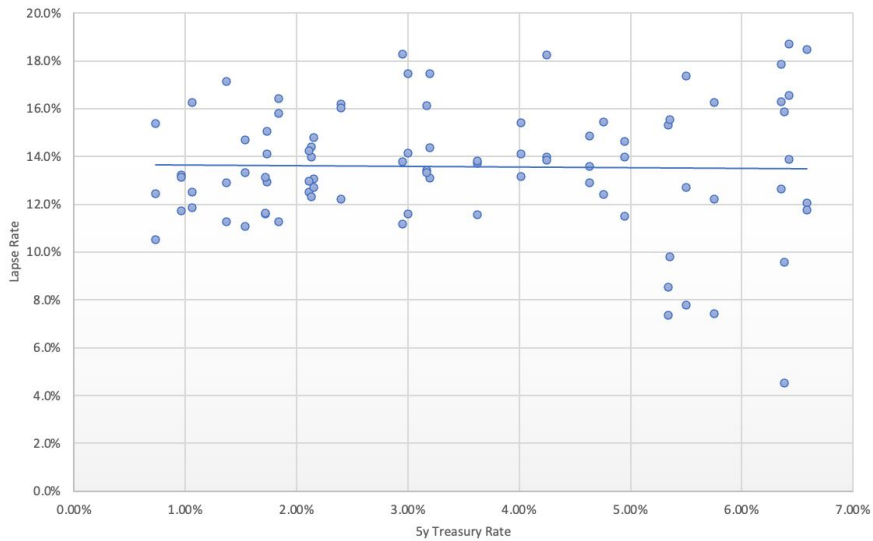
Full Lapse vs General Account Yield



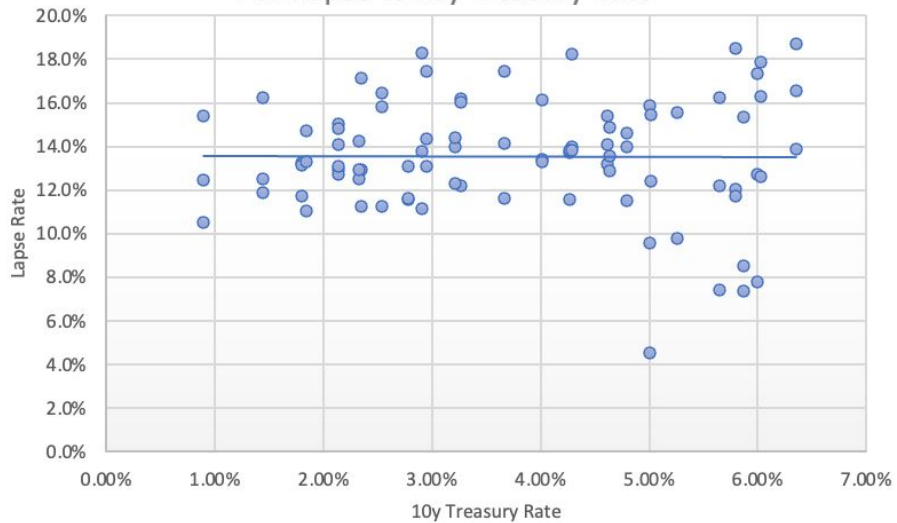
Full Lapse vs Statutory Reserves



Full Lapse vs 5y Treasury Rate



Full Lapse vs 10y Treasury Rate



Correlations

Clear Correlation

MVA
Crediting Rate
Surrender Rate

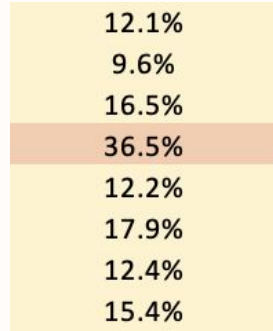
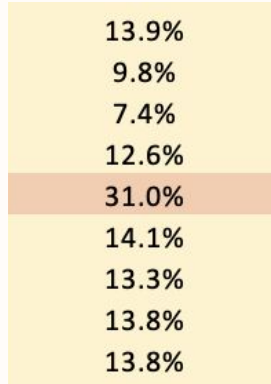
Partial Correlation

Policy Year
Mortality Rate
General Account Yield
Statutory Reserves

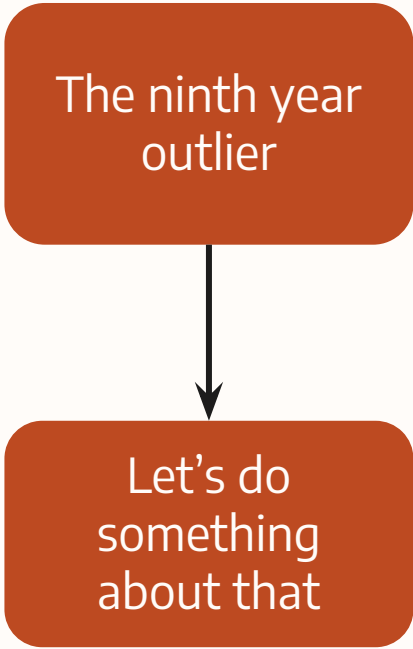
No Correlation →
Eliminate
5y Treasury Rates
10y Treasury Rates

Factor	r value
Policy Year	0.15899181
MVA	0.37952267
Mortality	0.15451973
Crediting Rate	0.44641988
5y Treasury	0.01646818
General Account Yield	0.09180008
Statuary Reserves	0.12290059
10y Treasuy	0.00153985
Surrender Charge	0.56699056

The Maybes



Policy Year!!



Logic: Should it matter?

What information do customers have access to when deciding whether or not to lapse?

Yes	Maybe	No
MVA Surrender charge Crediting rate	Policy year 5/10y treasury rates	Statutory reserves General account portfolio yield Mortality rate

Our Picks

Market
Value
Adjustment

Surrender
Charge

Crediting
Rate

Policy Year



02

Proposed Formula

Considerations

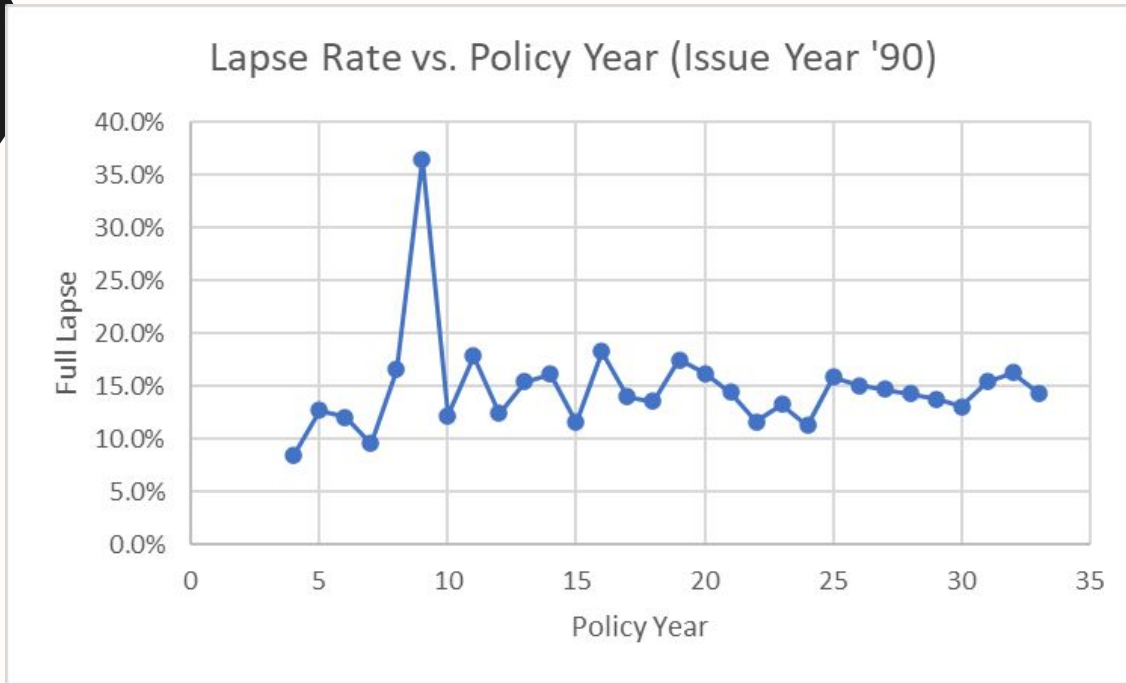
Simplicity

Accuracy

Interpretability

Multiple Regression with LINEST()

The Ninth Year Effect



Policyholders tend to hold until they can surrender for no charge, and then lapse in large numbers.

Add an extra predictor based on policy year to the formula (a “dummy variable”)

The Five Predictors

y	Policy Year	<ul style="list-style-type: none">• Lapse rates are expected to slowly subside over time
c	Crediting Rate	<ul style="list-style-type: none">• Lapse rates are expected to increase during years with low crediting rates
m	Market Value Adjustment	<ul style="list-style-type: none">• Lapse rates <i>increase</i> with decreasing MVA
s	Surrender Charge	<ul style="list-style-type: none">• Lapse rates are much lower when surrender rates are high
y_9	9th Year Variable	<ul style="list-style-type: none">• 9th year effect as described previously

The Formula

$$L = 19.24\% - \beta_1 y - \beta_2 c - \beta_3 m - \beta_4 s + \beta_5 y_9 \text{ where}$$

β_1	0.125% per year
β_2	0.415% per percentage increase in MVA
β_3	0.902% per percentage increase in CR
β_4	0.915% per percentage increase in SC
β_5	+19.85% if it is the 9th year of the policy

Significance Testing

Take coefficients

Divide by standard
error

Two-tailed t test,
1% significance
level

Result: All five predictors and the intercept are significant in predicting lapse

Evaluating Fit

- For our lapse rate formula, $R^2 = 80.3\%$
- 80.3% of variation can be predicted by the formula
- The remainder (19.7%) comes from elsewhere:
Variables excluded from the formula, random noise, etc.

Evaluating Fit

Compare the top 10 best candidate formulas...

R ²	Predictors			
80.29%	Policy Year	MVA	Crediting Rate	Surrender charge
79.58%	MVA	Crediting Rate	5yr Treasury Rate	Surrender charge
79.41%	MVA	Crediting Rate	10-Yr Treasury rate	Surrender charge
79.11%	MVA	Mortality Rate	5yr Treasury Rate	Surrender charge
78.98%	MVA	Mortality Rate	10-Yr Treasury rate	Surrender charge
78.97%	MVA	5yr Treasury Rate	Statutory Reserves	Surrender charge
78.91%	Policy Year	MVA	5yr Treasury Rate	Surrender charge
78.82%	Policy Year	MVA	Mortality Rate	Surrender charge
78.63%	MVA	5yr Treasury Rate	General Account Po	Surrender charge
78.59%	MVA	Crediting Rate	Statutory Reserves	Surrender charge



03

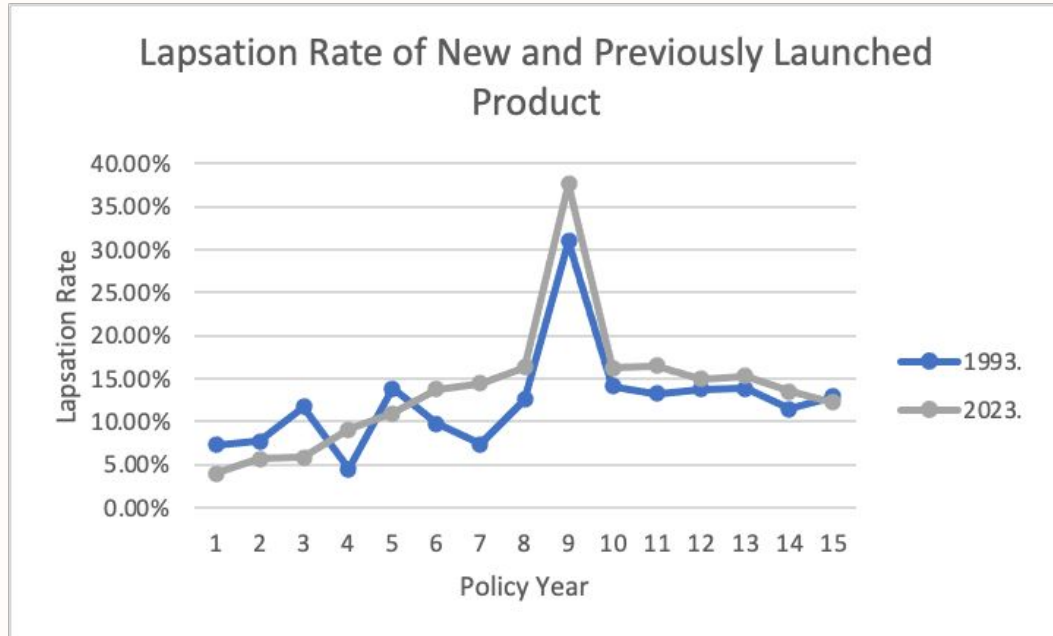
Future Projection



Lapse Rate Projection

Year	Policy Year	MVA	Crediting Rate	Surrender charge	9 Year	Projected Lapse
2023	1	0.1%	4.50%	12%	0.00	4.03%
2024	2	0.2%	4.50%	10%	0.00	5.69%
2025	3	-0.5%	4.50%	10%	0.00	5.84%
2026	4	-2.4%	4.70%	7%	0.00	9.07%
2027	5	-3.0%	4.80%	5%	0.00	10.97%
2028	6	-8.0%	4.80%	4%	0.00	13.80%
2029	7	-8.1%	5.00%	3%	0.00	14.49%
2030	8	-10.6%	5.00%	2%	0.00	16.31%
2031	9	-10.0%	5.00%	0%	1.00	37.60%
2032	10	-7.1%	5.20%	0%	0.00	16.24%
2033	11	-8.0%	5.20%	0%	0.00	16.51%
2034	12	-5.4%	5.50%	0%	0.00	15.02%
2035	13	-6.3%	5.50%	0%	0.00	15.29%
2036	14	-2.5%	5.50%	0%	0.00	13.56%
2037	15	0.3%	5.50%	0%	0.00	12.28%

Comparing Lapsation Rates



Comparing Product Features

	New Product	Previously Launched Product
Free Partial Withdrawal	10%	15%
Surrender Charge	12%, 10%, 10%, 7%, 5%, 4%, 3%, 2%	9%, 8%, 7%, 6%, 5%, 4%, 3%, 2%
Guaranteed Minimum Crediting Rate	1.50%	0.70%

Market Value Adjustment

New Product	Previously Launched Product
0.1%	0%
0.2%	-1.6%
-0.5%	0.8%
-2.4%	9.5%
-3.0%	-4.5%
-8.0%	5.3%
-8.1%	1.7%
-10.6%	-1.1%

New Product	Previously Launched Product
-10.0%	5.0%
-7.1%	6.2%
-8.0%	7.3%
-5.4%	4.7%
-6.3%	3.1%
-2.5%	1.0%
0.3%	0.2%



04

Other Factors

Other Factors

- Economic Conditions
 - Economic downturn, inflation rates
- Personal Factors
 - Health issues, satisfaction, individual's financial circumstances



Thank You!!