

# **An Empirical Analysis of Life Insurance Surrender Activity**

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# Introduction and Background

- Interest and non-interest factors impact policy lapses, which ultimately impact the financial stability of insurers
- What is the relation between macro-economic factors and surrender activity?
  - A relation may suggest cash flow correlation risk for the insurer
- Results can be used to:
  - Identify risks posed by the surrender option
  - Suggest alternative policy terms to reduce the cost of offering the option
  - Recommend regulatory reform
  - Reform the management of life insurance company assets

# Cash-Value Life Insurance

- In 2010, whole life policies accounted for 58.9 percent of individual life insurance purchases
- Package of Options (Smith, 1982) – Features include:
  - Cash value accumulation
    - Depends on interest rates, company reserves, company dividend/crediting history, policy age, policy expenses, outstanding loans, and surrender charges
  - Guaranteed minimum return and minimum death benefits
  - Policyholder access to cash value in the form of a policy loan or a policy surrender (nonforeiture → legally required)

# Prior Literature

- Emergency Fund Hypothesis

- Linton (1932); Dar and Dodds (1989); Outreville (1990); Hoyt (1994); Liebenberg, Carson and Hoyt (2010)

- Interest Rate Hypothesis

- Schott (1971); Cummins (1973); Pesando (1974); Carson and Hoyt (1992)

- Policy Replacement Hypothesis

- Outreville (1990)



# Hypotheses

- Life insurance surrender activity is a function of liquidity needs, interest rate arbitrage opportunities, and life insurance market dynamics
  - EFH, IRH, PRH
- Hypothesis: Surrender activity is related to macro-economic factors → correlation of cash flow risk

# Sample

- Sample only consists of insurers that only write individual life insurance business (no individual annuities)
  - NAIC combines life insurance surrenders and annuity surrenders
- Sample Period from 1995 through 2009
  - Current dataset excludes 1999
  - 14 years x 51 states = 714 state-year observations

# Average Companies Per State By Year

Year	Average Companies	Min	Max
1995	268	207	319
1996	263	209	311
1997	256	211	295
1998	250	205	292
2000	240	194	285
2001	212	168	253
2002	209	166	244
2003	203	156	241
2004	202	158	246
2005	201	156	244
2006	198	157	240
2007	187	146	226
2008	186	148	222
2009	185	153	220

# Data

- National Association of Insurance Commissioners
  - Dollar Amount of Annual Surrender Benefits, Dollar Amount of Life Insurance in Force, Dollar Amount of New Life Insurance Purchases
  
- Bureau of Labor Statistics
  - Unemployment
  
- U.S. Federal Reserve
  - Interest Rates (90 day, 10 year, and 20 year)
  
- U.S Census Statistical Abstracts
  - Real Per Capita Income, Percent of Population Age 65 and Up, Homeownership



# Methodology and Model

- Dependent Variable

$$Surrender = \frac{Annual\ Surrender\ Benefits}{Life\ Insurance\ in\ Force}$$

- Fixed Effects

- State FE

- Heteroskedasticity

- Robust standard errors

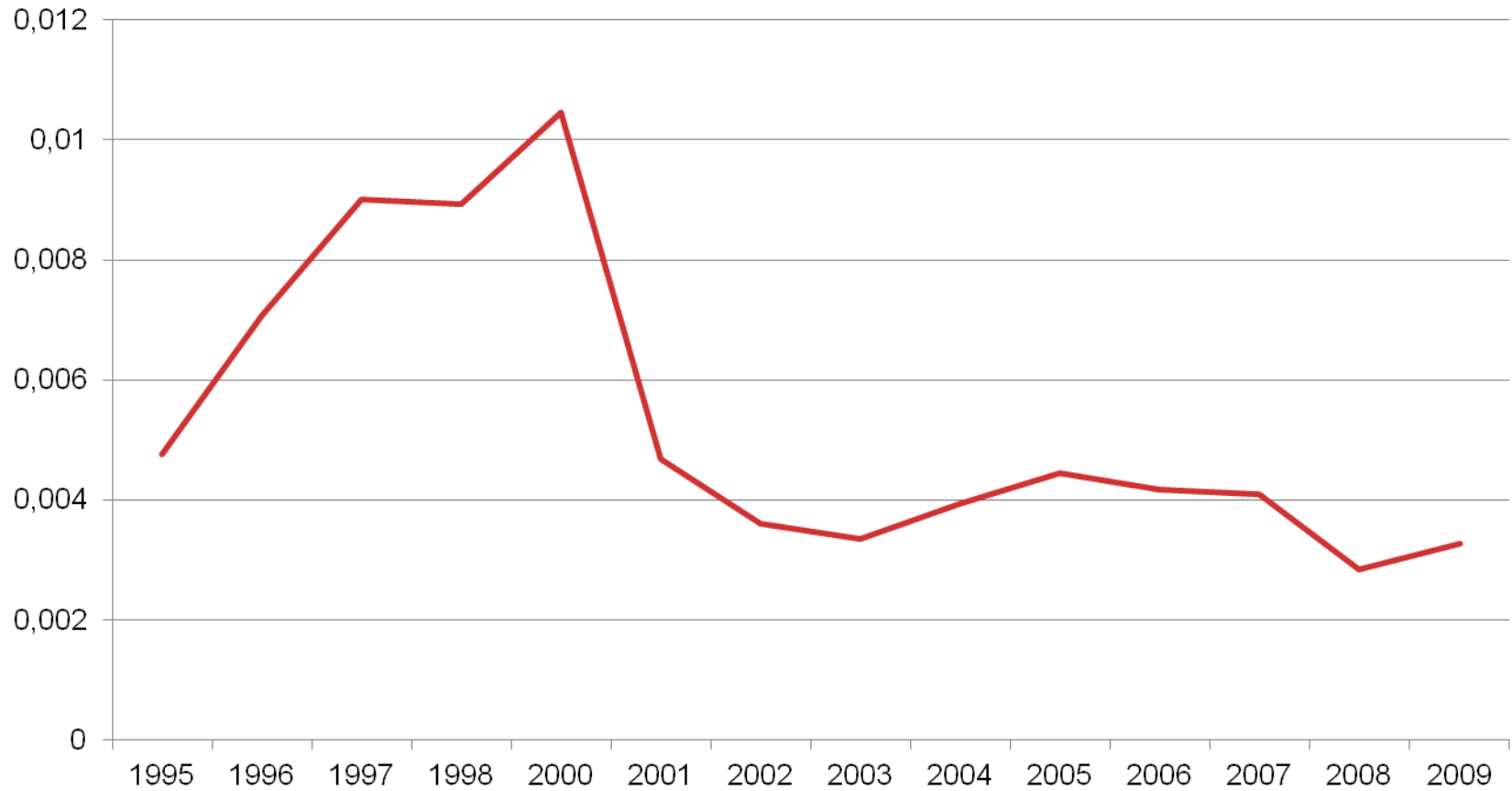
# Variable Definitions

Variable	Definition
Surrender	Natural logarithm of the ratio of surrender benefits to total life insurance in force
Short	Short-term interest rate – 90 days
Intermediate	Intermediate-term interest rate – 10 years
Long	Long-term interest rate – 20 years
LongShort	Difference between the short-term interest rate and the long-term interest rate
Unemploy	Percent of the population that is unemployed for a given state in a given year
Flux	Ratio of new business to existing business for a given state in a given year
Income	Real per-capita income for a given state in a given year
Pct65Up	Proportion of the population aged 65 or older for a given state in a given year
Homeown	Proportion of the state population that owns a home in a given year

# Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
Surrender	-5.4615	0.6473	-6.9086	-2.8926
Short	3.4693	1.9094	0.1500	6.0000
Intermediate	4.9429	1.0224	3.2600	6.5700
Long	5.4643	0.8848	4.1100	6.9500
LongShort	1.9950	1.3648	0.1500	3.9600
Unemploy	5.0994	1.5617	2.3000	13.6000
Flux	0.1855	0.0637	0.0493	0.7958
Income	32849.13	6003.48	20935.87	60823.07
Pct65Up	12.6868	1.8162	4.9000	18.6000
Homeown	68.9427	6.2979	39.2000	81.3000

# Surrender Activity Over Time

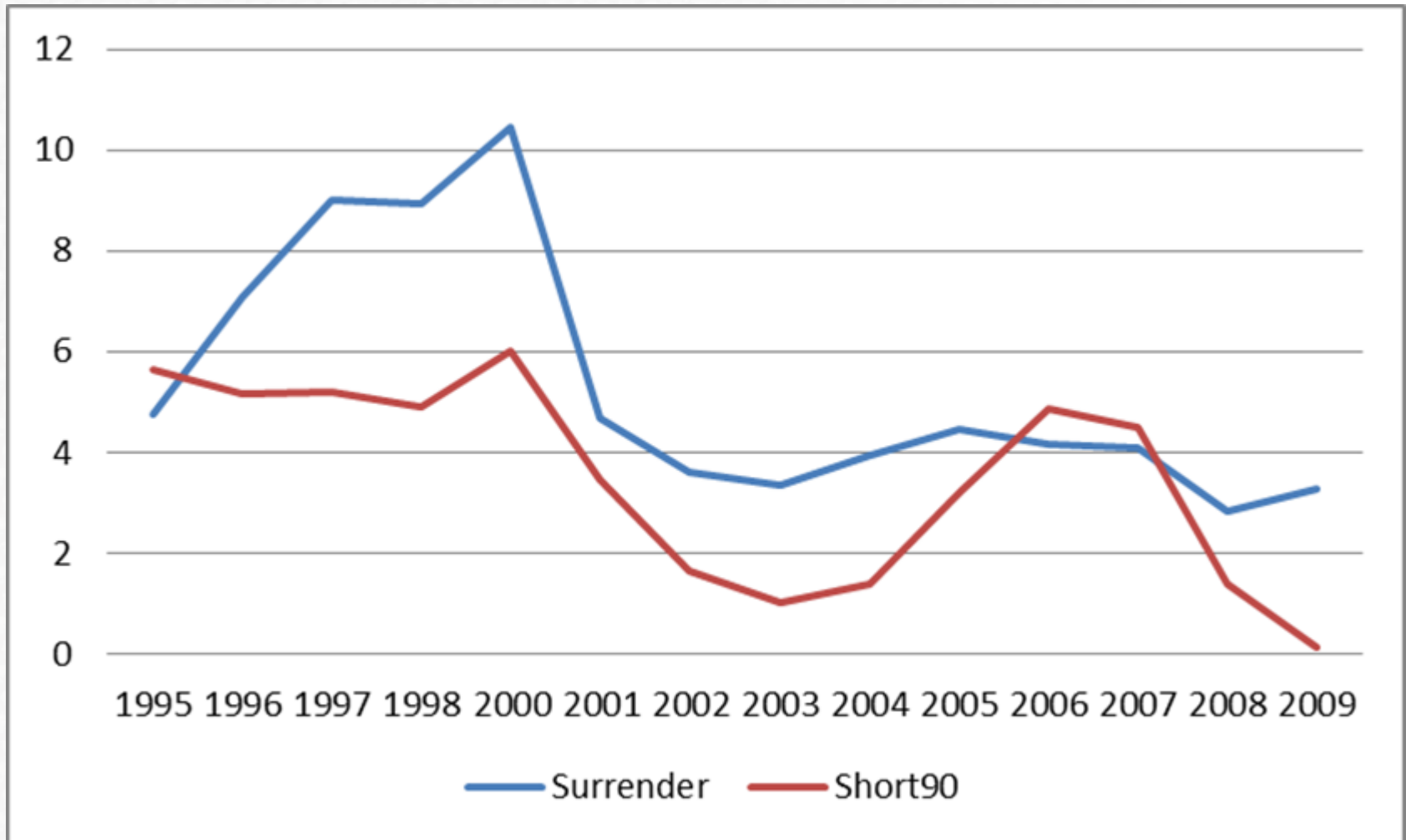




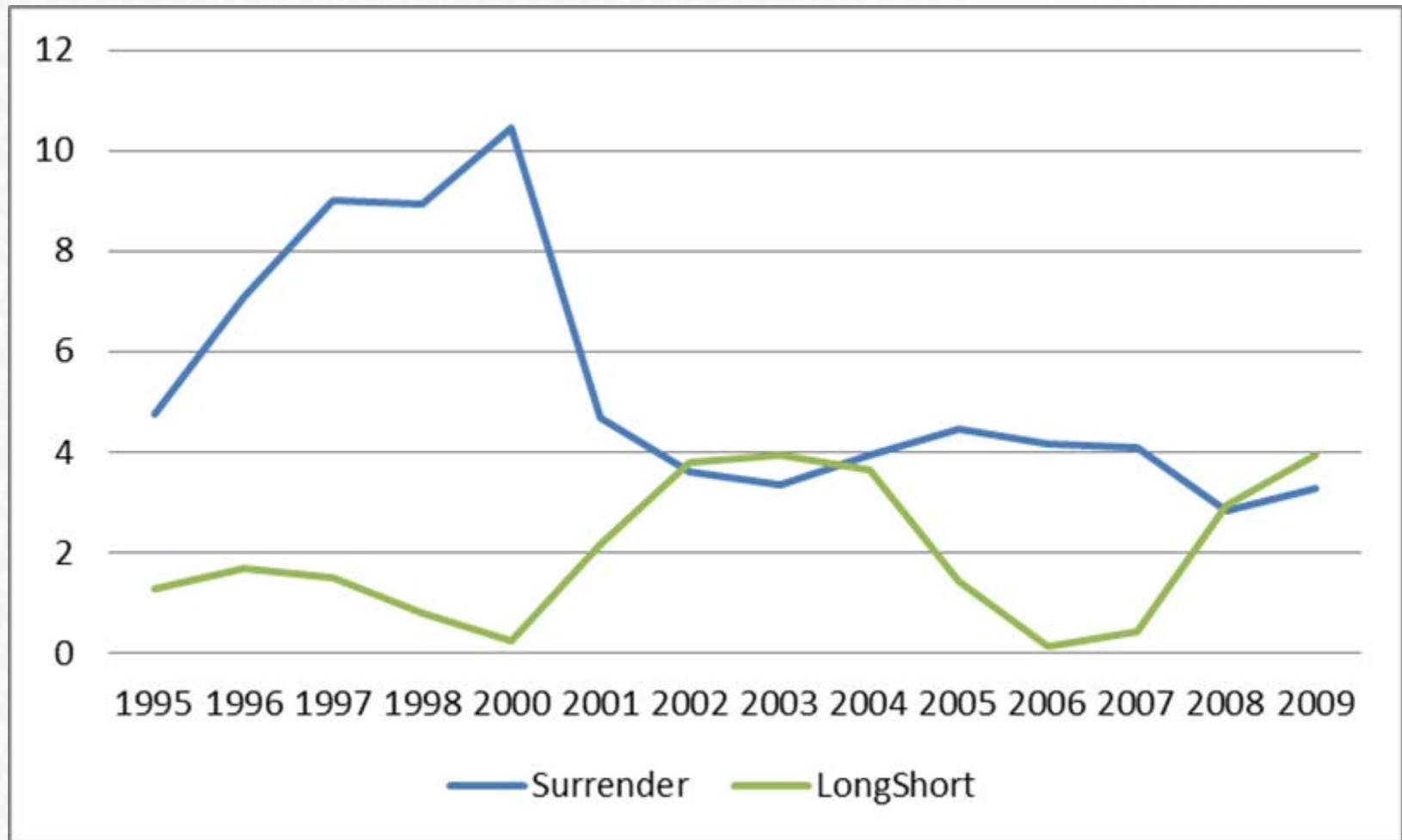
Variables	Model (1)	Model (2)	Model (3)
Short	0.1193*** (0.025)	0.1323*** (0.018)	
Intermediate	0.0704 (0.060)		
Long		0.0559 (0.055)	
LongShort			-0.1482*** (0.018)
Unemploy	0.0112 (0.022)	0.0114 (0.022)	-0.0188 (0.021)
Flux	1.7623*** (0.421)	1.7452*** (0.424)	1.8529*** (0.428)
Income	-0.0000*** (0.000)	-0.0000*** (0.000)	-0.0001*** (0.000)
Pct65Up	0.0460 (0.052)	0.0452 (0.052)	0.0033 (0.053)
Homeown	0.0262** (0.012)	0.0263** (0.012)	0.0165 (0.012)
Constant	-7.3152*** (1.187)	-7.2917*** (1.244)	-3.7795*** (0.845)
Observations	714	714	714
F-statistic	18.69	18.65	17.42
Prob > F	0.0000	0.0000	0.0000
R-squared	0.532	0.531	0.521

# Results

# Relation Between Surrenders and Short-Term Interest Rate



# Relation Between Surrenders and the Difference Between Long and Short-Term Interest Rates



# Conclusions

## ■ Results

- Results consistent with Interest Rate Hypothesis
  - Mixed evidence regarding the Emergency Fund Hypothesis
    - Significant negative relation between surrenders and income
    - Insignificant relation between surrenders and unemployment
  - Results are consistent with the Policy Replacement Hypothesis
- ## ■ Correlation of cash flows across policies