An Empirical Analysis of Life Insurance Policy Surrender Activity

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Abstract: We analyze life insurance policy surrender activity to determine whether surrender is a function of certain macroeconomic variables and, therefore, highly correlated across policies. Results support the Emergency Fund Hypothesis and the Interest Rate Hypothesis. In addition, we provide evidence that surrenders are significantly related to policy replacement activity, as in Outreville (1990), which we refer to as the Policy Replacement Hypothesis. The significant relationship between policy surrender and macroeconomic factors strongly supports insurer efforts to understand and actively manage disintermediation risk via insurance contract features and investment policy. [Key words: Life insurance, surrender, disintermediation, insolvency, regulation.] JEL Classification: E20, G11, G22.

INTRODUCTION

The option to surrender a life insurance policy exposes insurers to macroeconomic activity that may result in disintermediation and possible financial distress. Rapidly rising interest rate levels and volatility

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The authors acknowledge helpful comments from the Editor, two anonymous reviewers, and David Eckles, as well as participants at meetings of ARIA, WRIA, SRIA, and the German Insurance Science Association.

Journal of Insurance Issues, 2013, **36** (1): 35–57.
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during the late 1970s and early 1980s led life insurers to reexamine their exposure to interest rate fluctuations and to focus on asset/liability management, including the exposure arising from option-like features embedded in most life insurance policy obligations.[5] Significant economic shocks such as the Great Recession of 2008–2009 serve to accentuate the systemic risks associated with financial (i.e., bank and insurer) assets and liabilities that are highly correlated with macroeconomic conditions.[6]

Given the potential for significant cash outflows for life insurers, it is important to assess the degree to which economic factors such as adverse economic conditions and changing interest rates relate to policy surrender activity. We empirically examine the life insurance policy surrender decision, focusing on the macroeconomic factors that are expected to relate to policy surrender activity for the period 1995 through 2009. As a preview to our findings, the results indicate that surrender activity is significantly related to interest rates, unemployment, and income. We also find that surrender activity is significantly related to policy replacement. These findings suggest a correlation among insurer cash flows that, under adverse economic conditions, could ultimately result in insurer financial distress and that therefore should be actively managed by life insurers.

This paper is organized as follows: We first discuss the nature of the problem facing life insurers posed by embedded options in life insurance policies. We then review previous research on the topics of life insurance disintermediation, including policy surrenders and loans. We then present and discuss the empirical results, and we conclude with a summary and possible avenues for future research.

THE SURRENDER OPTION IN CASH VALUE LIFE INSURANCE

Smith (1982) and Walden (1985) argue that permanent life insurance may be viewed as a package of options, including the policy surrender option and the policy loan option, among others.[7] The surrender option,

[5]Examples would include guaranteed insurability options, term conversions to whole life insurance, policy surrender options, guaranteed interest rates, and guaranteed loan rates.

[6]As long ago as 1932, Linton suggested that life insurance surrenders and policy loans were functions of economic duress. A sharp increase in policyholder surrenders and loans during the Great Depression supported Linton's theory.

[7]Approximately 61 percent of life insurance policies purchased in 2010 were permanent life insurance policies (ACLI, 2011). Permanent life insurance policies include whole life, universal life, variable life, and endowment type contracts.

sometimes referred to as the lapse option, allows the policyholder to terminate coverage and to receive the cash surrender value, if any.[8] Surrender charges are levied to recover the company's initial costs of issuing the policy and to encourage policyholder persistence.[9] While several other options are embedded in the cash value life insurance policy, the surrender option involves the potential payout of large sums by the insurer and a complete termination of coverage. Thus, the surrender option represents a potential cash flow problem for the insurer, as policy surrenders could result in a significant drain on insurer assets and income.

Until the mid-1970s, life insurance policy surrenders were fairly steady, with increases that appear to occur around times of possible economic hardship or inflation, and decreases during periods of prosperity and price stability. The advent of relatively high interest rates and increased volatility in the late 1970s and early 1980s, coupled with the introduction of new life insurance products (such as universal life), led many policyholders to surrender their policies for various reasons including interest rate arbitrage, economic hardship, and policy replacement with new life insurance contracts and/or other financial products. Clancy (1985) notes that the unprecedented disintermediation that followed these surrenders cost the life insurance industry hundreds of millions of dollars. Insurers were forced to liquidate bonds to meet surrender requests at precisely the time when the values of bond portfolios were depressed by high interest rates.

The surrender option allows the policyholder to "put" the policy back to the insurer for a specified value determined by the contract provisions.[10] While typically there is a penalty (i.e., surrender charge) for exercising this option in the early years after a life insurance contract is issued, a whole life insurance contract can be thought of as a putable bond with a variable yield and an increasing strike price. However, unlike a floating rate note, the insurer is not bound by the contract to pay an interest rate based on a specific index or instrument.[11] The "stickiness" of insurer crediting rates, coupled with the surrender option, is what gives the policyholder the

[8]Stalson (1969) and Cummins (1973b) credit development of the modern-day surrender option to Elizur Wright, the first Insurance Commissioner of Massachusetts.

[9]For whole life contracts, the surrender charge is effectively embedded in the expenses and typically equates to most or all of the first year's premium. For universal life contracts, the surrender charge typically is a declining function of the policy's age.

[10]Cash value life insurance may be thought of as debt. Because cash value life insurance is issued with a surrender option, the policy can be considered a putable bond issued by the insurer (e.g., Bacinello, 2003).

[11]For participating whole life policies, the insurer's board "declares" an interest rate that is based on company performance as well as competitive concerns.

opportunity for interest rate arbitrage and creates interest rate risk for the insurer. Just as homeowners may refinance a mortgage, policyholders of some life insurance products have an incentive (actual or perceived) to surrender an older policy in favor of one that pays a higher return.[12] The expected connection between life insurance disintermediation and increases in interest rates has come to be known simply as the Interest Rate Hypothesis.

Regulation also plays an integral role in the insurer's offerings, which ultimately impact the insurer's overall risk. In the case of cash value life insurance, state regulation requires life insurers to offer policyholders the right to redeem their policies for a contractually guaranteed minimum value regardless of economic conditions. However, economic conditions could compel many policyholders to exercise the surrender option within a short period of time. While these demands for policy surrender proceeds (and/or policy loans) are not loss claims, they do represent cash outflows that could be correlated with certain macroeconomic factors that may not be effectively managed under the insurer's asset-liability management plan. These potentially correlated cash flows represent a liquidity risk for insurers, particularly because insurers invest a substantial portion of their assets in somewhat illiquid assets such as mortgages, real estate, and private placement securities.

Insurer liquidity and solvency are particularly threatened if life insurance surrenders are directly correlated with interest rates. Since an increase in interest rates would result in a decline in the value of fixed income assets, an increase in surrenders that accompanied an increase in interest rates would force the insurer to liquidate assets at a time when it was most inopportune to do so.

In addition to changes in interest rates, other macroeconomic events that result in financial hardship, such as unemployment, may also increase surrender activity and represent a potential correlated cash flow risk to the life insurer. Under Linton's Emergency Fund Hypothesis (1932), surrender activity should increase during periods of economic duress. Hence, insurers need to be prepared for a systematic increase in surrenders during recessions.[13]

[12]If the returns on life insurance cash values were adjusted instantaneously to reflect current market yields, then surrender activity might be insensitive to changes in interest rates. However, most insurer portfolios are invested in assets that have long durations and, as a result, dividends and crediting rates on cash values often reflect some degree of "stickiness" of income on insurer portfolios. In other words, this income stream is slow to adjust to changes in market rates. Without the surrender option, the life insurance policy would decline in value as interest rates rise, just as any fixed income instrument does.

Life insurers may have an exposure due to a correlation between surrender activity and sales. In the absence of unusual insurance market conditions, increases in surrender activity likely would be accompanied by decreases in life insurance sales, thereby exacerbating decreases in insurer liquidity and assets.[14] While life insurers typically are well prepared for policy surrenders, a flood of requests could threaten a company's (or the industry's) liquidity and, as a result, its solvency. Insurer asset liquidations also could drive asset prices lower, causing a "snowball effect" similar to the high-yield bond liquidations forced on savings and loans in the early 1990s.

Finally, other factors such as insurer credit quality and product innovations potentially relate to life insurance surrender activity. Some of these factors may be confined to certain insurers while other factors could affect the industry as a whole. Because surrender activity can be so damaging to a single company or to the life insurance industry if it occurs *en masse*, study of widespread surrender activity and its possible determinants is especially important.

LIFE INSURANCE DISINTERMEDIATION

Policy Surrender Literature

Life insurance policy persistency is integral to insurer profitability, liquidity, and, in extreme cases, solvency. Most life insurers expect to recapture their initial policy issuance expenses over many years; therefore, a policy that lapses (typically due to insufficient premiums being paid) after only a few years will force an immediate write-off of deferred acquisition costs. Lapsation and surrender activity represent an erosion of the customer base, which likely will lead to an increased fixed administrative cost per policy and require substantial marketing expenditures to rebuild.[15] Belth (1975) and Carson and Dumm (1999) found that high levels of

[13]Recent recessions include the periods 1981–1982, 1990–1991, 2001, and 2008–2009 (National Bureau of Economic Research, 2012).

[14]One example of abnormal market conditions occurred in the mid-1980s. This time period saw high levels of replacement activity externally (insurer to insurer) as well as internally; however, this market saw both an increase in the replacement/surrender activity and an increase in new life insurance sales.

[15]Policies without any cash surrender value that are terminated for non-payment of premium are said to have "lapsed"; policies that terminate with a cash surrender value are said to have been "surrendered."

lapsation, *ceteris paribus*, resulted in significantly higher cost for life insurance.[16]

The costs of disintermediation are well documented, but the causes of heightened surrender activity are a source of some disagreement; resolving this disagreement is a major focus of this paper. The Emergency Fund Hypothesis (EFH) links life insurance policy loan and surrender activity to an urgent need for funds during a time of crisis or need. Based on this hypothesis, we would predict an upswing in lapses, loans, and surrender activity during periods of prolonged or severe unemployment, or during periods of declining personal income. The Interest Rate Hypothesis (IRH) states that life insurance disintermediation activity is directly related to the differential return offered by alternative investment vehicles over returns on life savings products. Based on this proposition, one would expect an increase in interest rates to cause an increase in policy surrenders as policyholders, move funds out of fixed or "sticky" interest rate insurance products and into higher market rate instruments. The relationship between surrender activity and returns on alternative investments is confirmed by a New York Life (1986) survey of surrendering policyholders which found that the most common reason for surrendering was a better value on another insurance product or alternative investment.[17] Conversely, cash flows (net of surrender and loan activity) into insurance products would likely increase during periods of low interest rates and inflation since life insurance dividend/crediting rates generally would reflect income from investments made during a period of higher interest rates.

The IRH ties life insurance disintermediation to interest rate arbitrage opportunities. The IRH predicts that an increase in interest rates across the term structure would cause an increase in life insurance surrenders during periods of high or increasing interest rates. This is because the rates credited to the cash value inside a life insurance policy generally mimic a moving average of intermediate-term interest rates or reflect the

[16]Belth (1975) further suggested that expected lapse rate be a factor in life insurer stability ratings.

[17]The survey was completed during a timeframe where short-term interest rates in competing products were at unprecedented levels (e.g., money market interest rates in excess of 12 percent) so the results clearly show the impact of large interest rate changes on consumer behavior. Fifty-one percent of the respondents who lapsed bought another policy, while one-third said that family circumstances had changed. Forty-one percent said that they wanted a better return and thirty-six percent said that they could not afford to keep the policy or needed the surrender value. More recently, a 2011 study conducted by LIMRA reports that 13 percent of survey respondents indicated that they purchased a life insurance policy to replace a different life insurance policy.

performance of the insurer's general account.[18] Thus, crediting rates would tend to lag behind market rates in an increasing interest rate environment and make life insurance policies less attractive than alternative investments (e.g., Hoyt, 1994).

Dar and Dodds (1989) explored the relationships amongst interest rates, unemployment, and net flow of funds into endowment life insurance policies and surrender activity in the United Kingdom.[19] Using data from 1952 through 1985, they found net cash flows into endowment policies were directly related to the difference between rates on those policies and rates on alternative investments. While they also reported a direct relation between surrender activity and unemployment, no such relationship was identified between interest rates and surrender activity. Based on the findings from various models and tests, Dar and Dodds concluded that interest rate considerations drive life insurance *savings* decisions while "emergency" cash needs drive *surrender* activity, which supports the EFH.

In a subsequent effort to test the EFH, Outreville (1990) analyzed the effects of macroeconomic variables and life insurance industry trends on early lapsation. Using U.S. and Canadian data from the period 1955–79, Outreville finds that unemployment has a significantly positive effect on early lapsation while personal income has a significantly negative effect. He finds no significant relationship between interest rates and ordinary life insurance policies that lapse within 13 months of the policy issue date. Therefore, Outreville finds support for the EFH but not for the IRH.[20]

Kuo, Tsai, and Chen (2003) test the relative importance of the EFH and the IRH on life insurance lapse behavior using aggregate data from the ACLI for the period 1951 through 1998. The authors first report evidence

[18]If the company uses dividends as the means to return performance above the policy's contractual guarantees, management makes this decision based on the investment experience of the period that has just ended (i.e., it does not reflect investment performance expectations for the next period. Considering both the IRH and the EFH, for the policyowner who needs cash from the policy, it is highly unlikely he/she would surrender the policy in order to reinvest the proceeds, while the policyowner who surrenders the policy because of an interest rate investment opportunity is unlikely to consume the surrender proceeds.

[19]Endowment policies pay a fixed amount to the policyholder if he/she lives to the maturity date. If the policyholder dies prior to maturity, the beneficiary receives a death benefit. In recent years, endowment products have nearly vanished from the U.S. life insurance scene because changes in U.S. tax laws (the Deficit Reduction Act of 1984) drastically reduced the attractiveness of this policy as a tax shelter.

[20]Of course, differences across market share for various policy types exist over time, and the insurer is less exposed to surrender activity today than it would have been 30-plus years ago. Life insurance represented 38% of insurer income in 1975, but it has decreased to 22 percent as of 2009. Given that over one-fifth of the insurer's income comes from this area, the impact of adverse surrender activity continues to be significant.

consistent with support for both the IRH and the EFH. However, while the results support both of these hypotheses, the authors also find that interest rates have a greater economic impact on lapse behavior.

While it is difficult to control for policyholders who bought (and later lapsed) their policies solely because of a high pressure agent, it is desirable to account for the impact of replacement business on surrenders. Outreville (1990) used the ratio of new business to existing business as a proxy for replacements and found that this measure was directly related to lapsation; this study will employ this measure of replacement activity as well. We refer to Outreville's replacement theory as the Policy Replacement Hypothesis (PRH). The PRH contends that consumers surrender policies for the purpose of replacing the original policy with one that has a better price or more favorable terms.

Utilizing monthly cash flow data that allowed unbundling of a universal life policy's cash flows into premiums, loans, and surrenders, Hoyt (1994) examined the factors that drive surrender activity. He found that unemployment was the macroeconomic variable with the most explanatory power for universal life surrenders, lending support to the EFH. Hoyt also found that the flexible premium cash flow of the universal life insurance policy was directly related to the policy's crediting rate spread over certificates of deposit and inflation, but inversely related to unemployment.[21] These results suggest further study of several macroeconomic factors using a more broadly-based data set of cash value life insurance surrender data.[22]

Policy Loan Literature

Policyholders may access a portion of their cash value without terminating coverage by taking out a policy loan. Since exercise of this option effectively results in disintermediation of life insurance savings, clues to what drives surrender activity may be found in what stimulates policy loan demand.

Pesando (1974) and others have examined the interest sensitivity of life insurance cash flows, including flows in the form of surrenders and policy loans. Like Schott (1971) and Carson and Hoyt (1992), Pesando finds a

[21]Assuming sufficient prior funding, the flexible nature of universal life payment structure may reduce the probability of lapsation in poor macroeconomic situations relative to traditional fixed payment cash value policies.

[22]In his dissertation, Russell (1997) examines surrender activity at both the industry and company level. He finds evidence that surrender activity is positively related to inflation, real interest rates, and unemployment, while surrender activity is inversely related to real per capita income. The results provide support for the IRH and mixed support for the EFH.

strong positive relationship between interest rates and policy loan volume, supporting the IRH. Pesando also finds a small but significant positive relationship between the change in policy loans and a proxy for the surrender value of all policies outstanding.[23] This additional finding is expected, as a rise in policyholders' "credit limit" would be anticipated to have a positive effect on loan demand.

Cummins (1973a) reached a similar conclusion using life insurance company reserves rather than surrender values, where higher reserves mean a higher aggregate level of policy loans. Cummins found considerable evidence in support of the IRH, but found no relationship in support of the EFH. Cummins ran simulations of policy loan demand under various interest rate scenarios and policy loan rate proposals. His theory, that variable policy loan interest rates would likely reduce interest rate arbitrage possibilities and loan demand, became testable following implementation of variable loan rates in the early 1980s. Carson and Hoyt's (1992) findings support the theoretical contentions of Cummins (1973a).

Carson and Hoyt (1992) focused on the impact of interest rates (policy loan rates and market interest rates) and unemployment on policy loan demand. They found that implementation of the NAIC's model legislation recommending variable rate policy loans had reduced the demand for policy loans significantly, and they conclude that variable loan rates eliminated most of the interest rate arbitrage that was possible during the pre-1985 era of fixed rate loans. Pointing to the relationship between policy loan volume and interest rates during the pre-1985 period, Carson and Hoyt claim that policy loan demand was determined largely by interest rates; these findings support the IRH. They also found that changes in policy loan demand are inversely related to unemployment, providing evidence against the EFH.[24] Following Carson and Hoyt (1992), Liebenberg, Carson, and Hoyt (2010) examine household data and find support for the EFH based on income and major expenses for families, among other findings. Further support for the EFH is provided by Liebenberg, Carson, and Dumm (2012) in their microeconomic analysis of life insurance demand. In this study, we also examine this question of whether policy surrenders are directly related to unemployment (and various other factors).

[23]While the cash value of the policy serves as collateral for the policy loans, insurers limit the amount that can be borrowed against the policy cash value (e.g. (1–*i*)*cash value, where *i* is the policy loan rate). At surrender, the policyowner will receive a payment net of the outstanding loan value. At death, the beneficiary will receive a death benefit payment that is net of the outstanding policy loan.

[24]Hoyt (1994) suggested that the inverse relationship between policy loan demand and unemployment may be caused by an increase in surrenders, since surrendering a policy results in an automatic repayment of any policy loan outstanding.

Life Insurance Surrender Option Considerations

Since there is no secondary market for life insurance policy surrender options, nor is there any precise way for policyholders to replicate their surrender option position in the open market, exercise of the policyholder's surrender option is the only way for the option owner to *realize* its value. Increased surrender activity is evidence that more policyholders are exercising their surrender options. This would likely occur when the value of those options, or the net benefit from exercising, is relatively high, or when policyholders have an increased need for funds. In these cases, the surrender of a life insurance policy may represent the best or only source of funds. Unlike policy loans that maintain a policy in force, surrender activity represents a more drastic method for consumers to reduce their holdings of life insurance savings and obtain available capital.[25]

EMPIRICAL ANALYSIS OF SURRENDER ACTIVITY

Previous work has tested the Emergency Fund Hypothesis (EFH), the Interest Rate Hypothesis (IRH), and/or the Policy Replacement Hypothesis (PRH) for life insurance disintermediation. This study utilizes state-level data from 1995 through 2009 to test each of these hypotheses. The periods covered by this study and the data used here have not been utilized in any known related research work to date. Therefore, the study provides important evidence on the questions surrounding life insurance disintermediation.

We model life insurance surrender activity as a function of the need for cash as the result of household liquidity constraints or interest rate/investment arbitrage opportunities, and life insurance market dynamics, as in equation (1):

$$Surrender = f(Liquidity\ Needs,\ Arbitrage,\ Market\ Dynamics). \quad (1)$$

By using proxies for liquidity needs (i.e., income and unemployment), interest rate arbitrage opportunities (i.e., short- and long-term interest rates), and life insurance market dynamics (rate of new to existing life

[25]The development of a secondary market for life insurance in recent years represents another way to capture value from a life insurance policy. That market remains relatively small, following a boom period from 2004 to 2007. However, for larger policies held by insureds in poor health, selling the policy will net more proceeds than surrendering the policy (as discussed by Gatzert, Hoermann, and Schmeiser, 2009).

insurance business), we analyze annual aggregate state-level surrender activity for its relationship with macroeconomic factors. Significant relationships indicate that surrender activity across the cash value life insurance line is affected by a series of macroeconomic factors and market conditions. Thus, we would suggest that cash outflows are correlated for life insurers that offer cash value life insurance. This creates the potential for an industry-level disintermediation problem.

Data

Our panel dataset comprises cross-sections from states from 1995 through 2009. Kennedy (1998), Wooldridge (2002), and Greene (2008) describe the problems associated with analyzing panel data. Because our panel data display evidence of heteroskedasticity, we report our results with robust standard errors.[26] Further, results from the Hausman test indicate that fixed effects are preferred over random effects. We thus include state fixed effects to account for state-specific variation in the model.

Surrender activity data as well as macroeconomic data are collected for all 50 U.S. states and the District of Columbia, yielding a total of 765 state-year observations. Life insurance surrender activity data for each state are obtained from the States Pages from the National Association of Insurance Commissioners (NAIC) annual statements. We also obtained data on the dollar amount of life insurance issued from the NAIC to calculate the *Flux* variable (discussed below) utilized by Outreville (1990). Because surrender values reported by the NAIC combine both life insurance policies and annuity contracts, we must screen the data to ensure that we are specifically focusing on life insurance surrender activity. To accomplish this task, we remove any insurer that reports having collected premiums for annuity contracts in a given state for a given year.[27] Once we remove insurers that write annuity business, we aggregate across insurers at the state level to create our state-level insurance variables.

Additional sources beyond the NAIC annual statements are used for the purpose of data collection. Short-term, intermediate-term, and long-term interest data are obtained from the U.S. Federal Reserve.[28] State-specific unemployment rates are collected from the U.S. Bureau of Labor Statistics.

[26]The Breusch-Pagan/Cook-Weisberg test confirms the existence of heteroskedasticity in our model.

[27]We recognize that the removal of firms that write annuity business does not entirely eliminate the possibility that some annuity-based surrender activity remains in the sample, and we acknowledge this limitation. However, we believe that this most directly allows us to screen out surrender activity attributed to the surrender of annuity contracts.

Finally, we obtain state-specific real per capita income and data regarding the proportion of each state's population over the age of 65 from the U.S. Census Statistical Abstracts (U.S. Department of Commerce, various years). Each of the variables incorporated in the models is discussed below.

Policy Surrenders. Our primary dependent variable is state-specific cash-value life insurance policy surrender activity. For the purpose of this study, we examine individual life insurance policy surrender activity (as in Outreville, 1990). Policy surrender activity is calculated as the natural logarithm of the ratio of the dollar value of annual surrender benefits for individual life insurance to the dollar value of individual life insurance in force for a given state in a given year. A higher value of this ratio suggests an increasing level of surrender activity with respect to total life insurance in force, while a lower value suggests a decreasing level of surrender activity.

Interest Rates. In order to test the IRH, we estimate four different models using interest rates of differing lengths. We include a short-term interest rate (90-day), an intermediate-term interest rate (10-year), a long-term interest rate (20-year), and an interest rate spread variable constructed as the long-term rate minus the short-term rate. The short-, intermediate-, and long-term interest rates are included to test for the direct effect that interest rates have on state-specific surrender activity. The interest rate spread variable (*LongShort*) is included as a measure of the potential for future economic downturn. As discussed by Browne, Carson, and Hoyt (1999), long-term interest rates decline prior to an economic recession, so as the gap between long-term and short-term interest rates declines, we expect to see an increase in surrender activity. The IRH predicts a positive relation between each of the interest rate measures and policy surrenders, and a negative relation between policy surrenders and the *LongShort* interest rate variable. Interest rates are based on the market yield on U.S. Treasury securities with constant maturities and are obtained from the U.S. Federal Reserve.

Unemployment. State-specific unemployment is also included in our models to test the EFH. Prior literature often uses the unemployment rate as a measure of economic distress when testing the EFH (e.g., Outreville, 1990; Carson and Hoyt, 1992; Kuo et al., 2003; Jiang, 2010). As unemployment increases, we anticipate that a greater proportion of insureds would surrender cash-value life insurance policies to gain access to the cash surrender value. We expect a positive and significant relation between the state-specific unemployment rate and surrender activity.

[28]While the majority of variables in our analysis vary over time and state, state-varying interest rates were unavailable and thus the interest rate variables only vary over time.

Real Per Capita Income. We include real per capita income as an additional factor to test the EFH. Prior empirical research typically provides evidence that life insurance demand increases as income increases, suggesting that insureds would be less likely to surrender policies (Zietz, 2003). Furthermore, increased income generally should reduce the need for the insured to access the cash surrender value. Similar to unemployment, we anticipate that as real per capita income decreases, individuals will be more likely to surrender cash-value policies to obtain the cash surrender value, whereas an increase in real income should lead to a reduction in state-specific surrender activity.

Policy Replacement. As discussed previously, a potential cause for policy surrenders could be the demand for new policies with better terms. For example, the introduction of universal life insurance policies during a time of elevated interest rates led to a wave of replacement-motivated surrender activity during the late 1970s and early 1980s. In order to consider the potential effect of policy replacements on surrenders (i.e., the Policy Replacement Hypothesis), we incorporate Outreville's "flux" variable in our models, where *Flux* measures the ratio of the dollar amount of new to existing life insurance business. An increase in replacement activity would increase the volume of new insurance purchases relative to the existing policy base and would thereby increase the "flux" ratio.[29] An increase in the "flux" ratio would provide support for the Policy Replacement Hypothesis.

Age. In addition to controlling for the economic factors noted above, we also include a control variable for the impact that age could have on state-specific surrender activity. More specifically, we include the proportion of a state's population that is aged 65 or over in a given year. A common reason often given for the purchase of life insurance is that it provides financial security to beneficiaries in the event of premature death. However, at later ages an individual may find that the "financial security" motive decreases as children leave the home, educational expenses cease, and the home is paid off. These life changes may cause older policyholders to drop coverage simply because it is no longer needed. Older individuals also are more likely to be retired, suggesting a potential future need for funds if savings and pensions are not sufficient to cover future expenses, which would be consistent with the EFH. It is also possible that older individuals are *less* likely to lapse policies if the insured has a bequest motive and/or has the financial means to continue paying the premium.

[29]The flux variable was first used by Outreville (1990) in a study that measured the effect of several variables on policy lapsation in the first two years of a policy's life. The dependent variable used in this study differs from Outreville's in that he measured early policy lapsation (i.e., policies that have little or no surrender value).

Given the potential for a variety of outcomes, we do not offer an *a priori* expectation regarding the relation between age and surrender activity.

Homeownership. Homeownership has also been shown to be related to the demand for life insurance (e.g., Gandolfi and Miners, 1996). We account for homeownership by including the proportion of the state population that owns a home in a given year. Given the additional costs of owning a home (e.g., mortgage, insurance, real estate taxes) and the unanticipated major repair costs, homeowners may find themselves in a situation where additional funds are needed to cover homeownership costs or they do not have additional funds to pay life insurance premiums.

Definitions and summary statistics for the dependent and independent variables are presented in Table 1 and correlations between all variables are reported in Table 2.

A number of points can be taken away from the summary statistics reported in Table 1. First, the average value for the *Surrender* variable is –5.3738, yielding an unlogged value of 0.0046. This suggests that for every $100,000 of cash value life insurance in force in a given state, approximately $460 is received in the form of surrender benefits. Second, we note the wide dispersion in state-specific real per capita income, with a mean real per capita income of $32,730, a minimum of $20,936, and a maximum of $60,823. Third, we observe that the interest rates (*Short*, *Intermediate*, and *Long*) vary substantially over the sample period. Finally, the summary statistics suggest that replacement activity takes place over the course of the entire sample period. Specifically, the *Flux* variable (representing policy replacements) has a mean of 19.32, indicating that roughly $190 in new business is written for every $1,000 of life insurance that is currently in force.

Prior to the empirical analysis, we provide visual support of the relation between surrender activity and some of our variables of interest. Figures 1 illustrates the relation between policy surrender activity and short-term (90-day) interest rates, Figure 2 presents the relation between policy surrender activity and potential impending economic duress, and Figure 3 presents the relation between surrender activity and policy replacement.[30] In Figure 1, there is evidence of a positive correlation between short-term interest rates and surrender activity, consistent with the notion of the Interest Rate Hypothesis that individuals may surrender policies for the purpose of exploiting higher market rates.

[30]For the purpose of Figures 1, 2, and 3, surrender activity is calculated as the (unlogged) ratio of surrender benefits to total life insurance in force. We multiply the ratio by 1,000 for the purpose of improving the ease of comparison between surrender activity and the other variables of interest.

Table 1. Variable Definitions and Descriptive Statistics (N = 765)

Variable	Definitions	Mean	Std. dev.	Min.	Max.	Expected sign
Dependent variable						
Surrender	Natural logarithm of the ratio of surrender benefits to total life insurance in force	–5.3738	0.6903	–6.7992	–2.7347	
Interest Rate Hypothesis						
Short	Short-term interest rate (90-day)	3.5567	1.8733	0.1500	6.0000	+
Intermediate	Intermediate-term interest rate (10-year)	4.9900	1.0033	3.2600	6.5700	+
Long	Long-term interest rate (20-year)	5.5133	0.8743	4.1100	6.9500	+
LongShort	Difference between the long-term interest rate and the short-term interest rate	1.9567	1.3263	0.1500	3.9600	–
Emergency Fund Hypothesis						
Unemploy	Percent of the population that is unemployed for a given state in a given year	5.0333	1.5510	2.3000	13.6000	+
Income	Real per-capita income for a given state in a given year	32730.66	5938.67	20935.90	60823.10	–
Policy Replacement Hypothesis						
Flux	Ratio of the dollar amount of new business to existing business for a given state in a given year	19.3266	7.4919	5.4489	128.2500	+
Control variables						
Pct65Up	Proportion of the population aged 65 or older for a given state in a given year	12.6881	1.8226	4.9000	18.6000	
Homeown	Proportion of the state population that owns a home in a given year	68.9224	6.3276	39.2000	81.3000	

The column titled "Expected Sign" indicates the expected direction between a given variable and the dependent variable (*Surrender*) in our empirical models. A "+" denotes an anticipated positive relation between a given independent variable and the dependent variable, while a "–" denotes an anticipated negative relation between a given independent variable and the dependent variable.

Table 2. Correlation Matrix

	Surrender	Short	Intermediate	Long	LongShort	Unemploy	Income	Flux	Pct65Up	Homeown
Surrender	1.0000									
Short	0.5221***	1.0000								
Intermediate	0.5554***	0.8793***	1.0000							
Long	0.5453***	0.7677***	0.9771***	1.0000						
LongShort	–0.3780***	–0.9064***	–0.5978***	–0.4251***	1.0000					
Unemploy	–0.3607***	–0.4771***	–0.3691***	–0.3111***	0.4688***	1.0000				
Income	–0.2198***	–0.2766***	–0.4131***	–0.4451***	0.0972***	0.0590	1.0000			
Flux	0.1924***	0.1005***	0.1880***	0.2394***	0.0159	–0.1314***	–0.0983***	1.0000		
Pct65Up	0.1164	–0.0228	–0.0310	–0.0330	0.0104	–0.0970***	–0.0453	–0.1136***	1.0000	
Homeown	–0.0767**	–0.1169***	–0.1586***	–0.1652***	0.0561	–0.2034***	–0.3809***	–0.0292	0.0838**	1.0000

*, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. *Surrender* = natural logarithm of the state-specific ratio of surrender benefits to total life insurance in force in a given year; *Short* = the short-term interest rate (90 days); *Intermediate* = the intermediate-term interest rate (10 years); *Long* = the long-term interest rate (20 years); *LongShort* = the difference between the long-term interest rate and the short-term interest rate; *Unemploy* = the percent of the population that is unemployed for a given state in a given year; *Income* = real per-capita income for a given state in a given year; *Flux* = the ratio of the dollar amount of new business to existing business for a given state in a given year; *Pct65Up* = the proportion of the population aged 65 or older for a given state in a given year; *Homeown* = the proportion of the state population that owns a home in a given year.

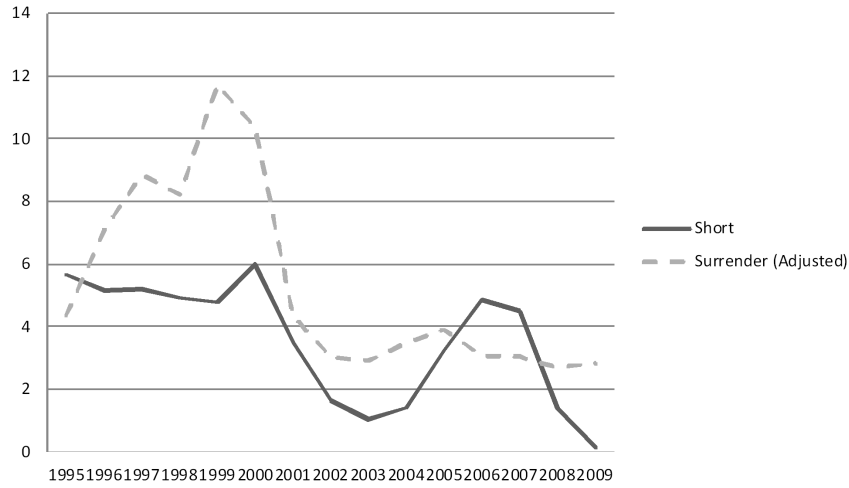

Fig. 1. Relation between surrender activity and the short term (90 day) interest rate. Note: *Short* denotes the short-term (90-day) interest rate. *Surrender (Adjusted)* is equal to the (unlogged) ratio of surrender benefits to total life insurance in force, multiplied by 1,000. The adjustment is made only for the purpose of comparing the movement between short-term interest rates and state-specific surrender activity *(Surrender (Adjusted))* in this figure.

Similarly, in Figure 2 we see a general inverse relation between potential impending economic distress and surrender activity. Prior literature suggests that recessions are often preceded by a decline in long-term interest rates (Browne, Carson, and Hoyt, 1999). The *LongShort* variable presented in Figure 2 represents the difference between long-term (20-year) and short-term (90-day) interest rates. As the difference declines, we expect to see an increase in surrender activity, which is illustrated in Figure 2. Finally, Figure 3 shows that increases in surrender activity are also generally associated with increases in replacement activity.[31] Overall, the figures provide initial evidence that recent surrender activity is consistent with some of the previously discussed hypotheses.

Empirical Results

Our tests of the Interest Rate Hypothesis, Emergency Fund Hypothesis, and Policy Replacement Hypothesis are presented in Table 3.[32] As noted previously, we estimate four different models based on interest rates of

[31]Each of these relations is also exhibited to some degree in the correlation matrix presented in Table 2.

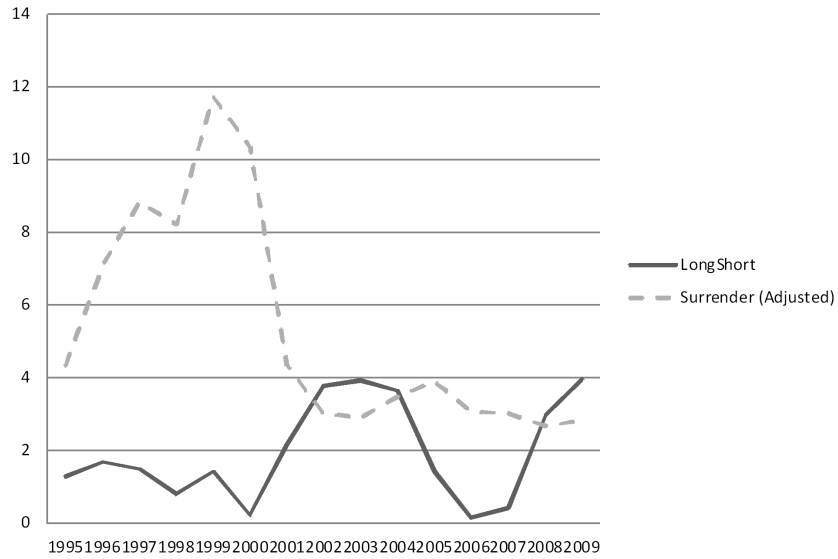

Fig. 2. Relation between surrender activity and the interest rate spread.
Note: *LongShort* denotes the difference between the long-term (20-year) interest rate and the short-term (90-day) interest rate. *Surrender (Adjusted)* is equal to the (unlogged) ratio of surrender benefits to total life insurance in force, multiplied by 1,000. The adjustment is made for only for the purpose of comparing the movement between *LongShort* and state-specific surrender activity *(Surrender (Adjusted))* in this figure.

varying lengths. The coefficients associated with each of the interest rate variables (*Short*, *Intermediate*, and *Long*) are positive and significant at the 1 percent level, suggesting that as interest rates increase, state-specific surrender activity increases. Additionally, the variable that captures the spread between long-term and short-term interest rates, *LongShort*, has a negative and significant coefficient, indicating that surrender activity increases as the interest rate spread decreases. These findings support the Interest Rate Hypothesis and are particularly interesting given the findings of Carson and Hoyt (1992), who show that disintermediation (from policy loans) was significantly reduced following the introduction of variable policy loan rates. Our results suggest that while variable loan rates may effectively limit policy loan activity, policyowners still respond to market rates through the use of policy surrender.

[32]Variance inflation factors (VIFs) are calculated for each of the models presented below. VIFs do not exceed a value of 2, indicating multicollinearity is not influencing the results.

Fig. 3. Relation between surrender activity and policy replacement.
Note: *Policy Replacement (Flux)* is calculated as the ratio of new business to business currently in force. *Surrender (Adjusted)* is equal to the (unlogged) ratio of surrender benefits to total life insurance in force, multiplied by 1,000. The adjustment is made only for the purpose of comparing the movement between *LongShort* and state-specific surrender activity *(Surrender (Adjusted))* in this figure.

We find some evidence that policy surrender decreases with unemployment, in contrast to expectations for the Emergency Fund Hypothesis. This finding is potentially explained by evidence in Liebenberg et al. (2010) that policy loan activity increases in the face of household financial stress. In addition, results for all four models show a negative relation between real per capita income and surrender activity, consistent with the Emergency Fund Hypothesis and with prior literature (e.g., Outreville, 1990; Russell, 1997). Additionally, we find evidence that individuals are surrendering life insurance policies for the purpose of purchasing a new policy, as indicated by the results for the *Flux* variable, and this finding supports the Policy Replacement Hypothesis, consistent with Outreville (1990).

Overall, the results in Table 3 support the link between life insurance policy surrender activity and macroeconomic factors. The findings imply that when various economic conditions are present, insureds are more likely to surrender their life insurance policies. Such a tendency further implies that insurer cash flows are likely to be correlated across policies. If

Table 3. Empirical Results

Variables (expected sign)	(1)	(2)	(3)	(4)
Interest Rate Hypothesis				
Short (+)	0.1295***			
	(0.0185)			
Intermediate (+)		0.3000***		
		(0.0411)		
Long (+)			0.3258***	
			(0.0482)	
LongShort (–)				–0.1275***
				(0.0218)
Emergency Fund Hypothesis				
Unemploy (+)	–0.0366	–0.0522*	–0.0795***	–0.0670**
	(0.0290)	(0.0271)	(0.0251)	(0.0283)
Income (–)	–0.0001***	–0.0000**	–0.0000*	–0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Policy Replacement Hypothesis				
Flux (+)	0.0144***	0.0121***	0.0094**	0.0144***
	(0.0052)	(0.0044)	(0.0035)	(0.0052)
Control variables				
Pct65Up	0.0527	0.1001	0.1081	0.0243
	(0.0705)	(0.0652)	(0.0677)	(0.0788)
Homeown	0.0205	0.0206	0.0152	0.0128
	(0.0188)	(0.0183)	(0.0180)	(0.0192)
Constant	–6.0702***	–8.7064***	–8.6423***	–3.4291**
	(1.4494)	(1.6348)	(1.7204)	(1.4135)
Observations	765	765	765	765
R-squared	0.4066	0.3963	0.3840	0.3934
F-statistic	56.12***	65.00***	66.58***	45.96***

*, **, and *** denote statistical significance at the 10, 5, and 1 percent levels, respectively. Robust standard errors are presented below coefficients in parentheses. The Hausman test indicates that fixed effects were favored over the use of random effects in the above models; accordingly, state fixed effects are included in each of the models. The dependent variable for each model is the natural logarithm of the state-specific ratio of surrender benefits to total life insurance in force in a given year (*Surrender*). *Short* = the short-term interest rate (90 days); *Intermediate* = the intermediate-term interest rate (10 years); *Long* = the long-term interest rate (20 years); *LongShort* = the difference between the long-term interest rate and the short-term interest rate; *Unemploy* = the percent of the population that is unemployed for a given state in a given year; *Income* = real per-capita income for a given state in a given year; *Flux* = the ratio of the dollar amount of new business to existing business for a given state in a given year; *Pct65Up* = the proportion of the population aged 65 or older for a given state in a given year; *Homeown* = the proportion of the state population that owns a home in a given year.

economic conditions were such that a large proportion of insureds were inclined to surrender policies simultaneously (i.e., a run on insurers), life insurers could face significant cash flow problems stemming from disintermediation. If surrenders were significant enough, the insurer could face financial distress or even insolvency. Thus, the findings of correlated life insurer cash flows in this study further support the continued importance of insurer asset/liability management.

SUMMARY AND CONCLUSIONS

We analyze life insurance policyholder surrender activity to determine whether policy surrender is a function of certain macroeconomic variables and, therefore, highly correlated across all policies. Increases in the volatility of interest rates and other financial markets highlight the importance of insurer cash flows and their relation to the economy. Results indicate that life insurance policy surrender activity is significantly related to interest rates (positively) and to state income levels and interest rate spreads (negatively). We also provide evidence of policy replacement activity. The findings provide some support for the Emergency Fund Hypothesis (EFH), and support for the Interest Rate Hypothesis (IRH) and the Policy Replacement Hypothesis (PRH). These findings suggest that insureds tend to surrender policies when market interest rates increase, when real per capita income decreases, and when policy replacement activity increases.

Taken together, our results show that surrender activity appears to be correlated with several macroeconomic variables that could produce cash flow problems for life insurers in certain economic environments. While these cash flows are not death claims, this correlation violates the basic tenet of insurance that claims (in this case, cash flows) be random and that the uncertainty surrounding the expected payouts (cash outflows) be minimal or manageable. In the event of a spike in interest rates or severe economic duress, insurers may be forced to liquidate assets to meet surrender requests. If this disintermediation occurs during a time of significant asset devaluation, the likelihood of insolvency is increased.[33] Limitations of the current study and possible avenues for future research include the possible effects of agent density, loan activity, policy size, and other measures of economic duress, and their relation to policy surrender. Future

[33]We do not examine the extent to which this risk already is priced in the life insurance contract.

research in this area also might evaluate elasticities of liquidity needs, arbitrage, and market dynamics in relation to policy surrender activity.

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