Empirical Investigation of Life Settlements: The Secondary Market for Life Insurance Policies*

Afonso V. Januário† Narayan Y. Naik‡

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Abstract

In recent years, a secondary market for life insurance policies, known as the life settlement market, has developed in the United States. This market enables policyowners wishing to discontinue their life insurance policies to realize the market value of their policies. Using a comprehensive dataset from a single large market participant of 9,002 policies insuring 7,164 individuals with an aggregate net death benefit of $24.14 billion purchased as life settlements from their original owners between 2001 and 2011 across 50 different U.S. states, we answer two important questions. First, to what extent did the presence of the secondary market make the policyowners wishing to sell their policies better off? Second, what rates of return could investors purchasing these policies have expected to make, given the life expectancy estimates of the insureds, optimized cash flow projections over time and other policy characteristics?

We find that by selling their policies in the secondary market, the policyowners in our sample collectively received more than four times the amount they would have received had they surrendered their policies to their respective life insurance companies. We notice that an increasing number of policyowners are retaining a share in the net death benefit when selling their policies, thereby eliminating the burden of having to fund future premium payments while retaining an interest in the policies' value. We also observe that a greater number of policies with smaller net death benefits are being sold through a more cost and time efficient process compared to standard life settlements, thereby enabling owners of these policies to also participate in and benefit from the secondary market. Overall, the evidence suggests that the life settlement market has helped significantly in enhancing the welfare of policyowners who, instead of surrendering, sold their policies in the secondary market. Furthermore, it has provided the government an additional source of tax revenue, which could potentially be used to fund socially beneficial welfare programs.

Regarding expected returns to investors, we find that the average cost weighted internal rate of return investors purchasing this sample of life settlements could have expected to make is 12.5% per annum, which is 8.4% in excess of treasury yields. The expected return ranges from a high of 18.9% in 2001 to a low of 11.0% in 2005, 2006 and 2007. In recent years, we find that the average

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†London Business School, Regent's Park, London NW1 4SA. E-mail: afonsovj.phd2010@london.edu. Tel: +44-20-7000-8241, Fax: +44-20-7000-8951.

‡London Business School, Regent's Park, London NW1 4SA. E-mail: nnaik@london.edu. Tel: +44-20-7000-8223, Fax: +44-20-7000-8201.

expected return has risen substantially to 18.3% per annum in 2011, which is 15.9% in excess of treasury yields.

It is important to note that our estimates of expected returns critically depend on the accuracy of the life expectancy estimates of the insureds. Therefore, we conduct sensitivity analysis to potential underestimation of life expectancy estimates. We find that even when the life expectancy estimates are assumed to have been understated by 3 years, investors purchasing this sample of life settlements could still have expected a positive return of 3.2% per annum. Given this, and given that longevity risk is largely uncorrelated with other financial markets, the life settlement option appears to be not only greatly beneficial for policyowners wanting to sell their policies, but also provides an interesting investment opportunity for institutional investors willing to include longevity risk in their portfolio and to commit capital for the medium term.

1 Introduction

Over the past few decades, there has been a significant increase in longevity and decrease in birth rates.[1] These demographic trends have accentuated the underfunding of defined benefit pension plans and increased the pressure on U.S. government social insurance and health programs, such as Medicaid and Medicare.

In recent years, a secondary market for life insurance policies has developed that could increase the flexibility of the financing choice of retirees. A life settlement is a transaction in which a life insurance policyowner sells a policy to a third party for more than the cash surrender value (CSV) offered by the life insurance company. The buyer pays all subsequent premiums to the life insurance company and receives the net death benefit (NDB) of the policy at its maturity. In terms of cash flows, for the buyer, a life settlement is a negative coupon bond with uncertain duration. For the seller, it is a form of equity release similar to that in a reverse mortgage.[2]

The existence of a secondary market for life insurance policies offers policyowners an option that didn't exist before, and a chance to realize the market value of their policy. By selling it, they not only eliminate the burden of having to fund future and often increasing premium payments, but also receive an up-front cash lump sum. That cash can potentially be used by the policyowner to access better health care, long-term care and to widen lifestyle choices. For investors, it offers an opportunity to gain exposure to longevity risk through the purchase of securities whose performance is life contingent, and thereby largely uncorrelated with other financial markets.

This paper is the first to empirically examine settlement transactions by original policyowners in the life settlement market. We conduct our research using a comprehensive dataset provided by Coventry First - a pioneer and leading provider in the life settlement market.[3] The data consists of comprehensive information pertaining to policies purchased by Coventry First from original policyowners in the secondary market for life insurance from January 2001 to December 2011. Using this data, we answer two important questions: First, to what extent did the presence of the secondary market make the policyowners wishing to sell their policies better off, thereby improving their welfare? Second, what rates

[1] In the United States, life expectancy at birth increased from 70 years in 1960 to almost 80 years in 2010. At the same time, birth rates decreased from 25 in 1960 to 15 per 1,000 per year in 2010. Data from the World Bank at http://data.worldbank.org/.

[2] See Mayer and Simons (1994) for a discussion on the potential for reverse mortgages in the U.S. market.

[3] See Pleven and Silverman (2007).

of return could investors purchasing these policies have expected to make, given the life expectancy estimates of the insureds, optimized cash flow projections over time and other policy characteristics?

We find that by selling their policies in the secondary market, policyowners received \$3.11 billion of value comprised of \$2.83 billion in cash and \$0.28 billion in the form of the expected present value of retained death benefit.[4] This amounts to more than four times the \$0.77 billion CSV they would have received had they surrendered their policies to their respective life insurance companies.

A policyowner's decision to sell a policy could be driven by a combination of factors that result in a change in life insurance needs or a need for liquidity, such as an income shock, a health shock, an increase in medical costs, a need for long-term care funding, a loss of bequest motive, or a change in estate tax law. Irrespective of the reason, it is clear that the life settlement market endows policyowners wishing to discontinue their policies the ability to realize the market value of their policies. In our sample, this ability to sell their policies as a life settlement enabled policyowners to receive an amount substantially greater than that they would have received had they surrendered their policies. Clearly, the presence of the life settlement market has helped significantly in enhancing the welfare of policyowners who have sold their policies. Furthermore, the market has provided an alternative to lapsing or surrendering that could potentially be of value to all policyowners.[5]

Having quantified the extent to which policyowners are better off by selling their life insurance policy in the life settlement market, next we estimate the returns investors purchasing these policies could have expected to earn from their investment. Towards that end, we compute the expected annual internal rate of return (IRR) for each policy using the expected policy cash flows and the insured's estimated survival probabilities. We find that the cost of purchase weighted average expected IRR on the life settlements in our sample is 12.5% per annum, and it ranges from a high of 18.9% in 2001 to a low of 11.0% in 2005, 2006 and 2007. In recent years, we find that the expected IRR has risen substantially to 18.3% per annum in 2011, which is 15.9% in excess of treasury yields.

The accuracy of these expected IRRs critically depend on the precision of the life expectancy (LE) estimates provided by different third-party medical underwriters. From an investor's point of view, all else being equal, longer estimates of LE can lower the expected returns. Therefore, as a robustness check, we extend all LE estimates and find that the average expected IRR in our sample decreases from 12.5% to 9.0%, 6.1% and 3.2%, as we extend all LE estimates by 12, 24 and 36 months, respectively. Thus, in this sample, even if the LE estimates are assumed to be 36 months longer than stated by the underwriters, investors would still have had an average positive expectation of returns.

As stated above, the scope of this paper includes the examination of expected returns. It does not attempt to assess realized returns. Challenges to the assessment of realized returns on life settlements, both in general and for this sample of policies in particular, include (i) the majority of policies have

[4] The retained death benefit (RDB) can potentially change over time. We use RDB at the time of funding for simplicity here, but all policy valuations are based on complete future projections of NDB to investors. We discount the RDB taking into account both survival probabilities of the insured and the treasury yield curve prevailing at the time of funding (explained in more detail in the data section).

[5] It is conceivable that the insurance companies may be responding to a reduction in lapsation over time as policyowners choose to settle by raising premiums, which would adversely affect not only all existing policyowners, but also the decision of prospective buyers of policies in the primary market for insurance. Although we are not able to say if this is the case or not, we would like to note that most states have adopted a form of the Life Insurance Illustration Regulation which requires that a qualified "Illustration Actuary" certify each year that their products are not lapse supported under a defensible set of assumptions regarding future lapses and expenses. However, when an Illustration Actuary tests for lapse support, they are testing the impact of lapsation of insureds in standard health. In the case of life settlements, the market is selecting insureds in poor health and reducing their lapse rates.

not yet matured, and (ii) there is insufficient activity and transparency in the current tertiary market to establish an accurate market discount rate for, and hence valuation of, the policies still in force. Both of these challenges are expected to be attenuated over the coming years.

It is important to note that both the life settlement benefit to the policyowner and the expected IRRs of the investor estimated in this paper are analyzed on a "pre-tax" basis. The after-tax amount received by policyowners would generally be lower than that measured by us because the policyowner needs to recognize the excess of the sale price over the cost basis as taxable income.[6] Similarly, the after-tax expected returns will also be lower because when the policy matures, the death benefit received by an investor in excess of the costs incurred is taxable. Irrespective of the amount of the income and its tax treatment (capital gains or ordinary income), the fact remains that because of the presence of life settlement market, tax authorities receive an additional source of revenue, which they could potentially use for socially beneficial purposes such as supporting social insurance and health programs like Medicaid and Medicare, thereby improving the welfare of means-tested, elderly and certain disabled Americans.

The rest of the paper proceeds as follows: Section 2 reviews literature on insurance and life settlement markets. Section 3 gives an overview of the life settlement market. Section 4 describes the data. Section 5 explains the life settlement pricing methodology. Section 6 discusses our econometric analysis. Section 7 concludes and discusses future research.

2 Literature Review

The literature on the life settlement market is relatively small. There are a few contract theory papers and there are some practitioner-oriented papers. The topics usually discussed include the positive/negative implications of life settlements, regulatory aspects and market characteristics. In this section, we summarize the existing literature. In the following section, we describe the life insurance and life settlement markets and their regulatory framework in more detail.

In a seminal paper, Hendel and Lizzeri (2003) model the life insurance market and show that for long-term life insurance contracts to exist, policyowners need to pay a premium schedule that is in excess of the actuarial fair amount during the early part of the contract and vice-versa during the latter part of the contract. Without such front loading of premiums, the long-term life insurance market cannot survive as insureds with improved health drop their policies in favor of cheaper ones in the spot market and only insureds with worsened health remain in the pool of insureds. Daily et al. (2008) extend this model by allowing for changes in the need for life insurance coverage. They argue that on one hand the life settlement market raises life insurance prices by diminishing the amount of lapsed insurance policies, while on the other hand, it can increase welfare by allowing policyowners to partially insure against health shocks.

There exist a number of other papers highlighting the different implications of life settlements. On the positive side, Doherty and Singer (2003) describe, *inter alia*, the benefits that accrue to policyowners from an active secondary market in life insurance policies. The authors argue that, without a secondary market, the insurance companies enjoy a monopsony power over policyowners wishing to surrender their life insurance policies. Although competition in the primary life insurance market results in

[6] See Internal Revenue Service (n.d.) for details.

reasonably competitive surrender values for insureds with standard health, these do not adequately compensate owners of policies with impaired lives. This is because the shortened life horizon of the insureds implies that the expected present value of the death benefits net of future costs exceeds the respective CSVs. The secondary market for life insurance policies helps owners of policies insuring impaired lives to realize the market value of their policies which are in excess of the CSVs offered by the insurance companies. The flexibility offered by the secondary market enables the policyowner to respond to changes in life situation more effectively, thereby increasing the value of the policy even further.

On the negative side, Deloitte Consulting LLP and The University of Connecticut (2005) highlight that although the policyowners obtain a "life settlement value" that is in excess of the CSV, it is less than the "intrinsic economic value" of their policies. Their definition of intrinsic economic value is based on the assumption that the policyowner retains the policy and pays the related premiums until maturity. The future cash flows are then discounted at a risk free rate, assumed to be 5%. We argue that a risk free rate is not the appropriate discount rate and therefore their estimate of intrinsic economic value is not reflective of a true market value as it does not include any risk premium for the uncertain timing of maturity, the relative illiquidity of the asset class and the opportunity cost of not being able to access the asset's value during the insured's lifetime. Moreover, like in any other market, intermediaries in the life settlement market also need to be compensated for their efforts. As there are no major barriers to entry in the life settlement market, over time one expects competitive forces to drive down the transaction costs.

Braun et al. (2012) analyze open-end funds investing in U.S. life settlement policies. The authors construct a life settlement index from available open-end funds, for the period of December 2003 to June 2010, and analyze its performance vis-a-vis other asset classes. This index has an annualized return and volatility of 4.85% and 2.28%, respectively. The authors argue that the life settlement index performance compares relatively well to stocks, which performed poorly during the same period. Other asset classes such as government bonds and hedge funds had higher returns but also higher volatility. The authors suggest that life settlement funds offer attractive returns paired with low volatility and are uncorrelated with other asset classes.[7] We believe that these findings need to be interpreted with caution. This is because their life settlement index, like many hedge fund indexes, suffers from potential self-selection, survivorship and delisting biases.[8] In addition, the monthly net asset values of life settlement funds in their sample are generally "marked to model" and may not accurately reflect the changes in health of the funds' pool of insureds over time.

Regulators and market participants have also expressed recent interest in the life settlement market. The United States Government Accountability Office (2010) report measures the size of the market during 2006-2009 and documents that policyowners received \$5.62 billion more than the amount they would have received had they surrendered their policies to their insurance companies during this period. This report also highlights regulatory differences across U.S. states and it recommends to the U.S. Senate the harmonization of regulation in order for the market to offer policyowners a consistent and minimum level of protection across states. The Life Settlements Task Force (2010) examines emerging issues in the life settlement market and makes recommendations to the Securities and Exchange Commision (SEC) in order for the market to offer greater protection to investors in life settlement

[7] Rosenfeld (2009) analyzes the performance of the QxX index (an index comprising 50,000 lives provided by Goldman Sachs) and finds similar results.

[8] See Fung and Hsieh (2000) for a detailed overview of hedge fund biases.

policies.

Two insurance industry reports, Fitch Ratings (2007) and Moody's (2006), raise a number of criticisms of the life settlement industry. Many of the concerns raised in these reports are related to the increasing efficiency of the life settlement market to fully optimize the value of guarantees and options embedded in life insurance. The Moody's report states that "many policy and product designs are not fully self-supporting", meaning that such products rely on a minimal amount of policy lapses prior to payment of any death benefit. The Fitch report cautions that "direct financial risk to insurers comes primarily from actual lapse and mortality experience diverging from pricing assumptions."

The Fitch report focuses much of its attention on a lack of an insurable interest between the policyowner and the insured, noting that most states have laws requiring such insurable interest. The report fails to point out that such insurable interest is generally only required at the inception of the insurance policy and that the property rights of policyowners to sell their policies has long been established in U.S. law.[9] It focuses instead on a smaller set of market participants who would seek to have new policies issued under fraudulent pretenses or with the intention of immediately selling them to investors ("Stranger Originated Life Insurance", or STOLI). The Fitch report also questions whether it is in an insured's best interest to allow "strangers" to have a financial interest in their early demise. As noted in the Moody's report, such "strangers" are primarily institutional in nature, who are rational investors and arguably view life settlements as an asset class with its own risk-return characteristics. Additionally, the financial benefit of early demise is analogous to the life contingent income annuity products sold by insurers.

Given its relatively short history and the lack of data, there are no large-scale empirical studies of the life settlement market using individual transactions with original policyowners. Our paper is the first to use such a large, all-inclusive single-source dataset to quantify the benefits to policyowners wanting to sell their policies, to estimate the returns expected by investors purchasing these policies and to discuss the findings in the context of welfare improvement of life settlement market participants.

3 Overview of Life Insurance and Life Settlement Market

This section provides an overview of the life insurance and life settlement markets, and an analysis of the economic rationale for both. It considers policyowners, life insurance companies, and investors who purchase these policies.[10]

The secondary market for life insurance has been historically small and predominantly present in the United States, Germany and the United Kingdom. The market developed in the 80's with the introduction of viatical settlements, which focus on insureds with life expectancies of less than two years. These were mostly HIV patients who sold their policies to pay for medical treatment. In contrast, the life settlement market is focused on larger policies, older lives and longer life expectancies.

[9] The legal basis for the life settlement market dates back to the 1911 ruling by the Supreme Court in Grigsby v. Russell (Vol. 222 U.S. 149, 1911), which upheld that "insurable interest" only needs to be established at the time a policy becomes effective. However, the life settlement market only grew after the Health Insurance Portability and Accountability Act was signed into law in 1996. This Act confirmed the right of the owner of the life policy to transfer ownership interest to a third party having no insurable interest in the life of the originally insured.

[10] A few references deliver a comprehensive introduction to the life settlement market with details on the deals executed in recent years. See for example Aspinwall et al. (2009) and Bhuyan (2009). In addition, Gatzert (2010) examines the differences in key characteristics of the secondary markets in the United Kingdom, Germany and United States; Rosenfeld (2009), Aspinwall et al. (2009) and Cowley and Cummins (2005) describe the life insurance securitization process.

According to the American Council of Life Insurers (2011) there was $18.4 trillion worth of life insurance in-force in 2010 in the United States. The value (number) of policies purchased increased from $2.51 trillion (33 million) in 2000 to $2.81 trillion (29 million) in 2010. With no definitive study on the size of the market, Conning Research & Consulting (2011) estimates the annual total NDB of policies settled in the U.S. increased from $2 billion in 2002 to $12.2 billion in 2007, and decreased to $3.8 billion in 2010.

Although the life settlement market is at an early stage of development, it has important implications for the primary life insurance market. The American Council of Life Insurers (2011) reports that lapse rates among individual policies, weighted by face value, have decreased from 7.1% to 5.4% from 2000 to 2010 while over the same period, surrender rates among individual policies have decreased from 2.2% to 1.4%. Although we don't have direct evidence, we can conjecture that the presence of the life settlement market may have contributed to this fall, either through life settlement transactions taking policies to maturity or through the pre-emptive actions of life insurance companies.[11]

In the U.S., as with the insurance industry generally, the re-sale of life insurance policies is regulated and supervised at the individual state level. According to the Life Insurance Settlement Association (LISA), 42 states and Puerto Rico currently have some form of regulation in place regarding these operations.[12] This regulation focuses on protecting policyowners by imposing licensing, disclosure and other requirements on life settlement brokers and providers. Investments in life settlements are regulated by the SEC, where its jurisdiction allows, and regulators of securities in different states.[13]

It is interesting to note that in the U.K., regulation exists that requires insurers to inform policyowners who are considering surrendering their policy of potential settlement alternatives which may offer them a value greater than the CSV of the policy.[14] While such regulation does not currently exist in the U.S., Gallo (2001) contends that policyowner advisors may be liable if they fail to disclose to their clients the availability of life settlement alternatives when reviewing the retention, sale or transfer of life insurance policies. Thus, it appears that both regulators and fiduciaries have clearly recognized the potential for the life settlement market to improve the welfare of policyowners.

There are two main types of life insurance policies: term insurance and permanent insurance. Term insurance provides coverage for a specified period of time, usually greater than one year, and can be renewed at the end of its term.[15] Term insurance represented 39% of new life insurance sold in the U.S. in 2010.[16]

Permanent life insurance, unlike term insurance, provides protection for as long as the insured lives. There are four main types of permanent life insurance: whole life (WL), universal life (UL), variable life (VL) and variable universal life (VUL). WL policies have scheduled premiums, while for UL policies, premiums are flexible and therefore the CSV varies depending on how premiums are paid over the life of the policy. If the policy is funded at the minimum level, just to cover the cost of insurance, then the CSV is likely to remain very low, while if a UL policy is funded at the fixed premium level, the CSV

[11]For example, through the increase in accelerated death benefits (i.e., living benefits with reduced death benefits), guarantees on cash value performance and living benefits.

[12]For more information see LISA's website: http://www.lisa.org/.

[13]See Life Settlements Task Force (2010), a report to the SEC on the regulation of life settlement investments. The SEC's jurisdiction is limited to variable products and/or non-institutional investors.

[14]See Financial Services Authority (2002).

[15]Some term policies also include a conversion provision, which allows the policy to be converted to permanent coverage without seeking new underwriting.

[16]See the American Council of Life Insurers (2011) for more details on life insurance products and numbers.

will increase initially and then decrease once the cost of insurance starts to increase. In VL policies the NDB and/or CSV vary according to a portfolio of investments chosen by the policyowner. VUL combines the features of both VL and UL policies. Joint or survivorship policies constitute another class of life insurance policies that are a subset of both term and permanent policies. Typically, these policies pay the NDB when the second insured under the policy dies.

CSV is the savings component of permanent life insurance policies. It is typically zero for term policies. CSV depends on the size of the policy, the underwriting classification of the insured at issue and the amount of premiums paid into the policy since issue. Importantly, it does not depend on the current health condition of the insured. The difference between settling a policy in the secondary market and surrendering it, is that the life insurance company "buys back" the policy at CSV, while the life settlement participants bid up the price to the policy's market value.

Policyowners submit their policies to the life settlement market to receive bids from potential investors. If the policyowner receives bids, they will be higher than CSV and the highest bid is the market value. If the policyowner receives no bids from investors, then the CSV offered by the insurance company is effectively the market value. From the point of view of a health impaired older insured, CSV is frequently below the market value of a policy and this is what drives the existence of the secondary market for life insurance.

Demand for individual life insurance can be driven by a number of factors, including a bequest motive, estate planning, obtaining a mortgage, maintaining one's family's standard of living, the continuation of a business, the education of children or grandchildren, enforced saving and charitable giving. The reasons for taking out life insurance usually determine the type of life insurance policy taken out. For example, a term policy might be appropriate when taking out a mortgage, or for some other temporary need, while policies that build cash value might be used for savings purposes or estate planning.

Demand for a life settlement is parallel to the demand for life insurance. Examples of factors that may lead a policyowner to sell the life insurance policy include the loss of a bequest motive, the termination of a financial contract such as a mortgage, an income shock, a health shock, different life insurance needs, and other investment objectives.

For investors, demand for the life settlement asset class comes from the diversification benefits of the exposure to longevity risk. Other risks associated with the asset class include liquidity risk, underwriting risk, operational risk, legal and regulatory risk. For international investors, there may also be currency risk.

Figure 1 illustrates the interactions among the main parties involved in a life settlement transaction. In (1) the policyowner approaches an advisor. In (2) the advisor submits the policy to a life settlement provider. In (3) the life settlement provider submits the insured's medical records to a medical underwriter who provides a life expectancy report for each insured. In (4) the life settlement provider values the policy and makes an offer to purchase. In (5) the life settlement provider purchases the policy. In (6) the life settlement provider sells the policy to an investment vehicle. In (7) the servicer facilitates premium payments from the investment vehicle to the life insurance company, optimizes policy performance, monitors the insurance company to assure that the policies are administered consistently with the contract language, and monitors and processes death claims. In (8) the investment vehicle receives the net death benefit from the life insurance company. A life settlement transaction may also include other parties such as insurance agents, life settlement brokers, escrow agents, trustees, collateral managers and tracking agents.[17]

[Figure 1]

4 Data

Our study uses data on 9,002 life insurance policies insuring 7,164 individuals with an aggregate NDB of $24.14 billion purchased as life settlements from their original owners in the secondary market between 2001 and 2011 across 50 U.S. states. The data includes all life settlements funded by Coventry First during this period with the exception of 106 policies for which the data in Coventry First's systems is incomplete as a result of system upgrades that have been implemented since 2001.[18]

There are four types of life settlements in the data: an overwhelming majority of settlements are standard life settlements (LS). In addition, there are settlements in which the policyowner and/or their beneficiaries retain a portion of the death benefit (LS-RDB), simplified life settlements (SLS) and simplified life settlements with a retained death benefit (SLS-RDB). For every settlement type, the obligation to pay all future premiums is transferred to the investor. In LS and SLS, the investor receives the net death benefit, while in LS-RDB and SLS-RDB, the policyowner retains a partial interest in the death benefit.

In case of LS, medical records of the insured are gathered and LE estimates are obtained from medical underwriters. In contrast, SLS are programs usually for policies with face value under $1 million, which are purchased based on a review of the responses to a medical questionnaire rather than an assessment of detailed medical records.[19]

For each policy, the dataset includes: policy ID, settlement type (LS, LS-RDB, SLS or SLS-RDB), month and year of funding, first insured and policyowner state of residence, policyowner zip code, policyowner type (individual, trust, corporation, partnership or other), current carrier name, S&P and Moody's carrier rating at time of funding, policy type (WL, UL, VL, VUL or term), original policy type (if conversion), month and year of issue, month and year of original issue (if conversion), policy NDB, NDB maturity age, net death benefit to investor (NDBI), existing loan, new loan/withdrawal at funding, RDB at funding, CSV, premiums at funding, total offer to seller and net total cost of purchase.

For each insured, the dataset includes: insured ID, gender, month and year of birth, mortality rating[20], LE, underwriting age, smoking status, date of estimate and decision type (clinical, no quote, not predictably terminal (NPT)). Data from the most recent underwriting assessments received by Coventry First prior to funding from four leading third-party medical underwriters are included. This may be one, two, three or four assessments, depending on the number of underwriters asked to assess

[17] See Aspinwall et al. (2009) and A. M. Best (2012) for more details.

[18] In recent years, life insurance policies purchased in the secondary market have been sold in a tertiary market. Our dataset does not include any transactions from the tertiary market.

[19] The responses to the questionnaire are analyzed by funder's underwriters and a mortality rating is provided. For SLS policies in this dataset, an LE is included based on the application of the funder's mortality rating to the 2008 Valuation Basic Table (VBT) from the U.S. Society of Actuaries (SOA). Due to the reduced scrutiny of medical information, SLS transactions can close considerably faster than the standard life settlement transactions.

[20] Mortality rating is a medical underwriter specific measure of health status. This measure is directly related to a LE estimate through the medical underwriters' proprietary mortality tables (except in cases where LE is determined by clinical judgement). The mortality rating is used to estimate the conditional survival probabilities of the insured.

each insured. Primary diagnosis and up to three international classification of disease (ICD) codes and their diagnoses are received from certain of these medical underwriters, and are also included.

For 7,890 policies insuring 6,376 individuals, the dataset includes projected cash flows by policy ID, including premiums, loan payments, NDB and NDBI from month of funding through policy maturity. Projected cash flow data is not included for the remaining 1,112 policies due to it being incomplete in Coventry First's systems as a result of system upgrades that have been implemented since 2001.[21]

NDB is the amount the life insurance policy pays to policy beneficiaries upon death of the insured. Although the face value of a policy typically remains constant, the NDB can be lower if policyowners partially liquidate the policy, for example, through policy loans, withdrawals or accelerated death benefits (i.e., living benefits with reduced death benefits). NDBI is the NDB paid to the investor after subtracting the RDB.

Summary Statistics Table 1 presents the sum, mean, median, and distribution of key sample variables across years (Panel A) and age deciles (Panel B). NDB, NDBI, RDB and CSV are as defined previously. CP is the net total cost of purchase and is defined as the total cost of purchase minus new loans/withdrawals at funding.[22] Offer is defined as the total cash paid to the policyowner at funding plus premiums paid to the carrier at or immediately prior to funding. Since RDB is a payment in the future and the timing of the death is uncertain, we define dRDB as the discounted (at treasury yields) present value of RDB, which accounts for insured's survival probabilities.[23]

Panel A shows that the aggregate NDB in our sample is \$24.14 billion. The policyowners in our sample collectively received \$3.11 billion of value in the form of \$2.83 billion in Offer and \$0.28 billion in dRDB, more than four times the \$0.77 billion CSV they would have received had they surrendered their policies to their respective life insurance companies. Collectively, the policyowners received 12.9% of aggregate NDB in Offer and dRDB.

In 2001, when the life settlement market was in its infancy, the aggregate NDB funded was \$1,068 million. The value of policies funded peaked in 2009 at \$3,545 million. The number of policies funded also increased during the period from 77 policies in 2001 to a maximum of 1,463 policies in 2008. CP and Offer have generally increased up to 2007, and since then have decreased.

The average (median) NDB of the policies in the sample is \$2.68 million (\$1.00 million). Other corresponding average (median) numbers are as follows: CP: \$381,000 (\$160,000); CSV: \$85,000 (\$1,000); In settlements with no RDB component (representing 8,493 policies with an average NDB of \$2.63 million): Offer: \$330,000 (\$120,000); For settlements with RDB (representing 509 policies with an average NDB of \$3.46 million), the initial amount of RDB is \$725,000 (\$393,000).

[21] Ernst & Young LLP (EY) performed certain agreed-upon procedures on the data. The procedures were designed to confirm that the data is complete with respect to Coventry First's systems and that it is consistent with both the data in Coventry First's systems and the original funding documents. Firstly, EY observed that the query used to extract the data from Coventry First's systems extracted 9,002 policies and agreed the policy IDs of these policies with those in the data. Secondly, on the basis of a sample they selected, EY agreed the values of total offer to seller and net total cost of purchase with those in Coventry First's systems and the corresponding original funding documents. Lastly, and again on a sample basis, EY agreed the value of the total premiums with those in Coventry First's systems.

[22] In aggregate, these new loans/withdrawals total \$0.48 billion, which increases the gross initial outlay of the investors from \$3.43 billion to \$3.91 billion.

[23] Treasury yields are the monthly nominal constant maturity rate series from the Federal Reserve obtained from http://www.federalreserve.gov/releases/h15/data.htm. During the sample period, treasury yields have maturities that range from one month to 30 years. When policy cash flows occur at dates different from the maturities available on the website, we interpolate the yields using a spline function. We use the longest dated treasury yield for discounting all policy cash flows beyond that date.

Relative to the size of each policy, as measured by its NDB, the average CP is 16.3%, average CSV is 4.8%; Offer for life settlements with no RDB component is 13.0%; Settlements with RDB had an average RDB of 25.3%.

Panel B of Table 1 shows these summary statistics in ten age groupings from youngest (decile 1) to oldest (decile 10). Deciles 4 and 8 have the highest average NDB of about $3.23 million. Decile 9 has the highest average CP and the highest average Offer, with values of $557,000 and $490,000, respectively. Decile 10 as the highest average CSV and dRDB, with values of $143,000 and $103,000, respectively. Decile 10 also has the highest average Offer (including dRDB) relative to NDB, which is 25.4% of NDB. Panel B of Table 1 suggests that both young and old individuals sell policies with similar average NDBs. However, as the age of the insured increases, the average CP, Offer and CSV also increase. RDB increases with age too, suggesting that older individuals retain a higher amount of death benefit for their beneficiaries.

[Table 1]

Life Expectancy Estimates Our dataset includes LE estimates for the insureds from up to four medical underwriters. We construct a unique LE measure for each insured by taking an average of the LE estimates, after accounting for the time elapsed between the date of estimation and the date of funding. We discuss the distribution of LE below.[24]

Figure 2 presents medical underwriter LE estimates for each insured (scatter points) and its average (line), for males and females, by age, in panels (a) and (b), and by year of funding, in panels (c) and (d), respectively. In addition, the figure plots the average LE assuming that the insureds are of standard health (dashed line).[25] Each observation is on a per policy basis (some policyowners sell more than one policy) and we split joint policies into two individual observations.

As one would expect, LE estimates generally decrease as the insureds get older. The figure shows that, the average LE for 60 year old males in our sample is 156 months compared to 288 months for standard health, suggesting that health impairments reduce their average LE by 133 months (127 months for females). The LE of older insureds is closer to the LE under standard health. For example, 85 year old males in our sample have health impairments that reduce their average LE by 26 months compared to those with standard health (22 months for females). The figure also shows that, on average, given the same age, females have a longer LE than males, and given the same LE, males are younger than females.

Panels (c) and (d) of Figure 2 show that LE estimates of the insureds have generally become longer up to 2008, and have become slightly shorter thereafter. During 2002, the average LE estimate is 86 months for males and 79 months for females, while during 2011, the corresponding numbers are 135

[24] In Appendix A, in Table A.1 report the distribution of primary health conditions across gender, age and health state, for the sample with available information on medical conditions. Additionally, in Table A.2 we examine the relation between the LE measure and health conditions by modeling LE as a function of primary health conditions, gender, age, and cohort dummy variables. We find that this model can explain 65% of the variation in the average LE estimates, thereby confirming that the average LE measure is significantly related to different health conditions.

[25] For illustrative purposes here, standard health refers to an insured for which mortality is expected to be 100% of the SOA VBT mortality table. In current practice, underwriters may assume longer life expectancies for healthy unimpaired lives. We take the survival probabilities from the 2001 VBT and the 2008 VBT (age-last-birthday and standard health tables). The VBT tables can be found at:

http://www.soa.org/research/experience-study/ind-life/valuation/2008-vbt-report-tables.aspx
http://www.soa.org/research/experience-study/ind-life/tables/final-report-life-insurance-valuation.aspx

months for males and 122 for females.[26] In terms of health impairment relative to standard health, during 2002 the average LE estimates are shorter by 76 months for males and 89 months for females, while the corresponding numbers in 2011 are 42 months for males and 27 months for females. The convergence of LE estimates towards those of individuals under standard health could be the result of a combination of factors such as (i) more realistic/conservative LE estimates, as the life settlement market matures and medical underwriters are better able to estimate LE; (ii) an improvement in actual LE of insured individuals in the sample (e.g.: from more effective medical treatments), and (iii) an increase in demand for policies with longer LE estimates.

[Figure 2]

Figure 3 presents LE estimates versus LE under standard health for (a) males and (b) females. 94.6% of insureds fall above the 45 degree line, reflecting the fact that, according to the LE estimates of the medical underwriters, the policies purchased in the secondary market are predominantly of insureds with health impairments. Policies falling above the 45 degree line may generally only be purchased in certain specific circumstances. These include when the policy contains features particularly attractive to the settlement option, such as when the insured was assessed as being in preferred health at issue based on medical underwriting or potential commercial considerations, and/or when policy options or guarantees are available which reduce the expected future premiums.

[Figure 3]

In addition to LE estimates, medical underwriters also provide mortality ratings and information related to diseases or impairments. We believe that LE estimates are a better input for the estimation of survival probabilities given that (i) mortality rating measures are useful only when applied to medical underwriter's proprietary tables, which are not available, (ii) a LE estimate already incorporates a mortality rating and a mortality table, and (iii) mortality ratings are not available on clinical cases. This belief is further reinforced by the observation that the pair-wise correlation between the LE estimates of the four different medical underwriters ranges between 0.74 and 0.87, while their mortality ratings have a correlation between 0.28 and 0.66. We reverse engineer consistent mortality multipliers across policies ourselves, as explained in the following section.

Other Cross Sectional Characteristics Figure 4 presents the distribution of policies across (a) policy type, (b) policyowner type, (c) settlement type, (d) gender, (e) smoking status, (f) number of LE estimates, (g) S&P carrier rating at time of funding, (h) month of funding, (i) top ten carriers, (j) age at funding, and (k) top eight policyowner states of residence.

The figure shows that an overwhelming majority (88%) of the sample is composed of universal life UL policies, and policyowners are mostly trusts (44%) and individuals (44%). Most of the sample is of standard life settlements (91%), although simplified life settlements and life settlements with RDB have became more popular over time. 67% of the sample are males, 23% females and 9% of the sample are joint policies.[27] The percentage of males and females in our sample is stable over the years. For 97% of policies the insureds are non-smokers.

[26]Using regulatory filings data of two life settlement providers, Milliman (2008) finds that the average LE estimate in their sample has increased from 101 months in 2004 to 127 months in 2006.

[27]Joint policies are defined as those in which two insureds are alive at funding, and not necessarily all those that are survivorship policies.

We find that close to 27%, 40%, 28% and 5% of the sample has LE estimates from 1, 2, 3 and 4 medical underwriters, respectively. We also observe that 97.7% of policies are from insurance companies with an S&P carrier rating at time of funding of A- or better.[28]

We don't find significant monthly seasonality in the number of policies funded. In March, August and October-November, the average funding value and number of policies are slightly higher than the remaining months; however, these differences are not economically significant.

We note that 38% of policies funded are from the top 5 insurance carriers by number of policies. The group of top 10 insurance carriers represents a total of 53% of the sample.

The settlements in our sample are well distributed around 75 year old insureds. At funding, 18% of insureds are in their 60's, 56% are in their 70's, while 24% are in their 80's. We also find that the average age at funding is relatively constant over the 11-year period.

Regarding the state of residence of the policyowner, 41% of the policies in the sample are from the States of California, Florida, New York and Texas, with each state representing between 5% and 15% of the sample. These states are followed by Illinois, North Carolina, Pennsylvania and New Jersey, each representing between 4% and 5% of the sample. This is consistent with the fact that California, Florida, New York, Texas, Pennsylvania, Ohio, Illinois, Michigan, North Carolina and New Jersey are, in descending order, the states with the highest population above 60 years of age in the U.S., representing collectively 52.8% of this segment of the U.S. population.[29]

[Figure 4]

Figure 5 shows the relative (a) number of policies and (b) NDB for different life settlement types, across year of funding, where the settlement type may be a LS, LS-RDB, SLS or SLS-RDB. The figure shows that RDB settlements have become more common in the life settlement market over time, as have SLS policies, which were not introduced by Coventry First until 2008. In 2011, 30% of transactions had an RDB component and close to 20% of transactions were SLS.

The recent rise in the number of LS-RDB policies is interesting for several reasons. From the investor's point of view, the presence of RDB provides better alignment of incentives between the investor and the policyowner. It also means that the RDB beneficiaries, who are typically in closer contact with the insured, have an incentive to report the maturing of a policy promptly, thereby reducing the potential for delay in claiming the NDB of the policy. From the policyowners' perspective, RDB allows policyowners to retain a portion of the death benefit coverage while eliminating the financial burden of further ongoing premium payments. This feature can be particularly attractive to policyholders that can no longer afford to pay the increasing costs of their policy or may have a reduced insurance need and may have difficulty buying new coverage in the primary market due to a deterioration in the insured's health. RDB offers the policyowners an option that is similar to the reduced paid up (RPU) nonforfeiture option that is typically embedded in their policies, with an important difference. Unlike the RPU option, RDB is based on current market valuation which reflects the insured's current health condition, which is more valuable to insureds with health impairment.

[28] S&P carrier rating at time of funding was available for 99% of the sample. Carrier ratings are financial strength ratings. Note that investors, as owners of policies, would generally have priority over insurance company equity owners and debtors in a liquidation of an insolvent insurance company.

[29] From the census and population estimates on age, from the Administration on Aging at the Department of Health and Human Services: http://www.aoa.gov/AoARoot/Aging_Statistics/Census_Population/Population/2009/index.aspx.

The trend in the number of SLS policies settled over time is also interesting for several reasons. First, these are policies with face value under $1 million. This is considerably smaller than the average NDB of $2.68 million in our sample. As SLS are purchased based on streamlined underwriting involving insured medical questionnaires, they can close faster and cost less to settle compared to standard LS policies, which call upon the full services of medical underwriters and a more detailed documentation of medical records. The recent rise in the number of SLS policies may be indicative of a new trend representing the entry of middle-income Americans in the life settlement market. The rapid increase in the number of SLS policies funded may be indicative of a potential widening of the life settlement market to include a larger section of the U.S. population. It may also be driven by the desire of baby boomers approaching retirement age to release cash tied up in illiquid assets to be used for health care or other lifestyle choices.

[Figure 5]

Figure 6 plots the distribution of the ratio of Offer plus dRDB to CSV. As can be seen, Although collectively the policyowners in our sample received more than four times the CSV of their policies, there is a considerable variation across policies.

[Figure 6]

Figure 7 shows the distribution of policyowners across the United States. Dots represent individual policies, which are matched with ZIP code coordinates. States are shaded according to the percentage of their share relative to the total number of observations.[30] The figure is consistent with panel (k) of Figure 4.

[Figure 7]

5 Expected Internal Rates of Returns

Next we proceed with the description of the methodology we use in estimating the expected annual internal rate of return (IRR) on a life settlement policy. The expected IRR is the annual discount rate that, when applied to the future probabilistic cash flows, results in a policy value equal to the investor's cost of purchase. All computations are performed based on monthly increments of time. Probabilistic cash flows are based on the characteristics of the life insurance policy adjusted at each future point for the probability that the insured survives to such point or dies during the month ending at such point. For simplicity, the computations below are described for a policy insuring one living insured. In the case of a joint life policy insuring two living insureds, the computations mirror these with the modification that survival and mortality probabilities are determined based on the joint probabilities of either life living to a given month or the 2nd death occurring during a given month.[31]

[30] ZIP code coordinates are from the ZIP Code Tabulation Areas (ZCTAs) from the 2012 TIGER/Line® Shapefiles at the United States Census Bureau. More information on the 2012 TIGER/Line® Shapefiles and ZCTAs can be found at: http://www.census.gov/geo/maps-data/data/tiger-line.html. The Shapefile for the U.S. states and territories is from the National Weather Service, which can be found at: http://www.nws.noaa.gov/geodata/catalog/national/html/us_state.htm.

[31] These joint calculations are commonly referred to as fraserized probabilities in actuarial literature and make the assumption that the two lives are independent.

Given the age, gender, smoking status and LE of the insured at the time of funding (or the valuation date), we estimate the conditional probability that the insured is alive at the beginning of each month in the future, t, S_t, and the conditional probability that the insured will die during that month, D_t. For conservatism all premium payments are assumed to be paid at the beginning of the month in which they are due, and death claims are assumed to be collected at the end of the month in which the insured dies. We multiply the optimized premiums with S_t and the $NDBI_t$ with D_t. The expected value of the policy as of the valuation date is then:

$$V = \sum_{t=0}^{T} \left\{ \beta^{t+1} \times D_t \times NDBI_t - \beta^{t} \times S_t \times Premium_t \right\} \tag{1}$$

Where, T is the earliest duration for which the probability of survival is assumed to be zero; $\beta < 1$ is the monthly discount factor based on the annual expected IRR; $NDBI_t$ is the net death benefit to be payable to investors in period t; $Premium_t$ is the premium to be paid in period t.

The survival and mortality probabilities are determined by the constraint that:

$$LE = \sum_{t=0}^{T} S_t \times t + {}^1\!/_2 \tag{2}$$

where, S_t and D_t are determined using accepted actuarial calculations and by applying a constant multiple, m, to the expected rates of deaths as published in the valuation basic mortality tables constructed by the Society of Actuaries specific to the of age, gender, year of funding and smoking status of the insured on the valuation date. The constraint implies that the mortality multiplier, m, is reverse engineered from the LE estimate, and then used to scale the death rates. For every life settlement policy, we compute the expected IRR and expected IRR in excess of treasury yields. While computing the expected excess IRR, we match the maturity of treasury yields with the dates of the policy cash flows.

Since survival probabilities constructed from SOA tables are in annual terms and we have monthly cash flows (optimized premiums and net death benefits), we interpolate monthly survival probabilities (from annual survival probabilities) with a cubic interpolation. The SOA tables follow a select and ultimate pattern with a selection period that extends from the date of underwriting to a maximum of 25 years after which no selection effect remains.

5.1 Valuation Example

Figure 8 gives an example of the multiple steps followed in order to price a policy and illustrates the changes in expected IRRs of a policy for different realizations of mortality.

[Figure 8]

The figure depicts (a) the cumulative probability of survival, and (b) the mortality probability distribution for a 75 year old male non-smoker in standard, good and poor health. These health states are equivalent to an LE of 14, 16 and 12 years, respectively or a mortality multiplier of 1, 0.8 and 1.5, respectively.

The figure also plots (c) the probabilistic net death benefit, probabilistic premiums and probabilistic net cash flow of a policy with a net death benefit (NDB) of $1 million, an increasing monthly premium schedule of $NDB \times 50\% \times \textit{monthly death rate}$, up to age 100 and zero thereafter, and an insured in standard health. A policy with these characteristics would be approximately valued at $168,040 using a discount rate of 10%. Panel (d) plots the IRR for different realizations of actual life duration (AL) duration relative to LE estimate, given a cost of purchase equal to this value.[32]

6 Econometric Analysis

6.1 Offers to Sellers

As argued earlier, the life settlement market enables some policyowners wishing to surrender their policy to obtain a value in excess of the CSV. In this section, we investigate the determinants of offer to sellers. In particular, we run the following regression:

$$\begin{aligned} Offer_i + dRDB_i - CSV_i = a_0 + a_1 NDBI_i + NDBI_i\left(a_2 LowNDB_i + a_3 MediumNDB_i + a_4 HighNDB_i\right) \\ + a_5 LE_i + a_6 InsuredState_i + a_7 Year_i + \varepsilon_i \end{aligned} \tag{3}$$

where ε_i is the error term with mean zero and standard deviation σ_{ε_i}. Note that each policy is funded in our sample only once, and we therefore use individual subscripts i for each individual policy. $NDBI_i$ is the dollar amount of the net death benefit to investors in excess of $2.7 million. $Low/Medium/HighNDB_i$ are dummy variables for NDB size. $LowNDB_i$ is an indicator variable for policies with NDB below $500,000 (29.3% of observations), $MediumNDB_i$ is for policies with NDB between $500,000 and $3.8 million (46.9% of observations), and $HighNDB_i$ is for policies with NDB above $3.8 million (23.9% of observations). LE_i is the life expectancy estimate of the insureds in excess of 130.5 months. $InsuredState_i$ is a set of dummy variables that indicates whether the policyowner state of residence represents less than 1%, between 1% and 3%, between 3% and 5%, or above 5% of the sample. $Year_i$ is a set of year dummy variables that controls for the year of funding of each policy. We report coefficients relative to the base year of 2001.

Table 2 presents our findings. The first column of the table, specification (1), shows us that a policy's NDBI explains 44% of the variation in Offer+dRDB-CSV. The slope coefficient on NDBI implies that on average policyowners receive 8% of each additional dollar amount above $2.7 million, in addition to a fixed $266,000. Specification (2) adds LE estimates in excess of 130.5 months to the regression, which increases the explanatory power of the model to 50%. This specification shows that an insured with 130.5 months of LE will receive on average a constant $266,000 and 8% of any additional NDBI amount in excess of $2.7 million. For each additional month of LE, the policyowner would receive $2,540 less. Specification (3) includes dummy variables for NDB size. We find that for each NDB dollar in excess of $2.7 million, low and medium NDB policies receive 14% of that amount, while high NDB policies receive 7% of that amount. This suggests that policies with large NDBs are offered lower prices relative to their size, presumably because of concentration risk in the portfolio.

[32]This example uses the 2008 VBT for male non-smokers from the SOA.

Specification (4) includes dummy variables for the sample size within the insured state and for year of funding. We find that in states representing 3% to 5% of our sample, 1% to 3% of our sample and less than 1% of our sample, receive between $15,720 to $20,360 less. As a percentage of average of Offer plus dRDB in our sample, these amounts translate to between 4.5% and 5.9% less on average for their policies compared to states representing more than 5% of our sample.[33]

[Table 2]

6.2 Expected Internal Rates of Return

Figure 9 plots for each month the (a) expected IRR, both raw and in excess of treasury yields, averaged over the previous quarter, (b) treasury yields of selected maturities, and (c) number of policies funded over the previous quarter. IRRs are shown on a CP weighted basis. The expected IRRs in excess of treasury yields take into account the term structure of treasury yields for the dates of cash flows (premium and death benefit payment dates). For the purpose of robust inference, we remove outliers by winsorizing 0.5% of observations on each end of the distribution of expected IRRs. The figure shows the expected IRRs and policies funded on a quarterly rolling basis.

[Figure 9]

Table 3 shows the same results on a yearly basis. IRRs are shown both on a CP weighted basis and equal (EQ) weighted basis.[34] The table shows that, on a CP weighted basis, the expected average annual IRRs decreased over time from 18.9% in 2001 to around 11.0% in 2005, 2006 and 2007, and have subsequently increased to 18.3% in 2011. The expected average annual IRRs in excess of treasury yields follow a similar pattern, decreasing from 14.6% in 2001, to 6.1% in 2006. The latter increased substantially after the financial crisis to 15.9% in 2011, converging with raw expected IRR as both the level and the slope of the treasury yields have decreased substantially in recent years.

[Table 3]

As a robustness check, Figure 10 plots CP weighted and EQ weighted raw IRR averaged over the previous quarter for LE and LE plus 12 months. Table 4 reports IRR, both raw and in excess of treasury yields, on a yearly basis, for LE, LE plus 12, 24 and 36 months. We find that by increasing LE estimates by 12, 24 and 36 months, CP weighted raw expected IRRs decrease from 12.5% to 9.0%, 6.1% and 3.2%, respectively. EQ weighted raw expected IRRs decrease from 12.9% to 9.2%, 5.9% and 2.6%, respectively. These results suggest that while actual returns on these policies are materially dependent on the accuracy of the LE estimates, significant under-estimations of life expectancies still continue to produce positive expected returns to investors.[35]

[33] Note from Table 1 that average Offer plus average dRDB equals $315,000 plus $31,000, or $346,000.

[34] As discussed in the Data section, this subsample consists of policies for which we received projected cash flow information. Table B.1 of Appendix B reports the equivalent of Table 1 for the subsample of policies for which we received projected cash flow information, after removing outliers by winsorizing 0.5% of each side of the distribution of expected IRRs. This table reports two additional values: dNDBI is the net death benefit payable to investors (NDBI) discounted at the expected IRR of each policy, accounting for survival probabilities. dPremium is the sum of premiums payable to the carrier discounted at the expected IRR of each policy, accounting for survival probabilities. As can be seen, this subsample of 7,811 policies (insuring 6,314 individuals) is qualitatively very similar to the sample in Table 1.

[35] It is important to note that the LEs in our sample reflect the balance of third-party medical underwriters used by the investors in those policies. Other market participants may have been using a different balance of third-party underwriters and/or their own proprietary underwriting over this period and, as a consequence, their expected IRRs may have been different than those estimated in this paper.

[Figure 10]

[Table 4]

This variation in expected average annual IRRs over time exhibits a U-shaped pattern. During the early years of the life settlement market, there were fewer players resulting in lower competition and greater expected returns to investors. Investors may also have had concerns about the ability of medical underwriters in analyzing non-viatical policies, which could have resulted in investors demanding a higher rate of return on life settlements. As the market developed with more players entering during 2003-2006, competition increased and investor confidence may have increased through greater familiarity with the asset class. This would have resulted in the bidding up for policies, resulting in lower expected returns. This bottoming of the expected returns seem to have occurred in 2006-2007. We conjecture that after witnessing the flight to quality and flight to liquidity during the 2008 crisis, the $85 billion bailout of AIG - one of world's biggest life insurers, and the collapse of Lehman Brothers, arguably investors' appetite for illiquid insurance-linked securities with negative carry and a promise of a future payment would have reduced. As a result, investors would have demanded a much higher rate of return for investing in life settlements. The reduced number of policies settled and substantial increase in expected IRRs in 2010-2011 seem to corroborate this conjecture.

7 Concluding Remarks

This paper empirically investigates the life settlement market for the first time using a large and comprehensive dataset on 9,002 sales transactions by original policyowners in the U.S. from January 2001 to December 2011 with aggregate net death benefit of $24.14 billion. Using this data, we answer two important questions: First, we document the extent by which the presence of the life settlement market makes the policyowners wishing to sell their policies better off. Second, we estimate the rates of return investors purchasing these policies could have expected to make and their sensitivity to underestimation of LE estimates.

We note that a policyowner's decision to sell a policy can be driven by a number of factors. Irrespective of the reason, in our sample, we demonstrate that the ability to sell their policies as a life settlement enabled policyowners to receive an amount more than four times greater than what they would have received had they surrendered their policies to their insurance companies. Clearly, the presence of the life settlement market helped significantly in enhancing the welfare of policyowners who sold their policies, receiving in aggregate terms more than four times what they would have received by settling their policies with their insurance companies. We argue that the sale of a life insurance policy has also brought about additional tax revenue to government authorities, which could potentially be used for socially beneficial purposes such as Medicaid and Medicare, thereby improving the welfare of means-tested, elderly and certain disabled Americans.

We estimate the returns investors could have expected to earn by computing the expected annual IRR for each policy using the CP, expected policy cash flows and the insured's estimated survival probabilities. We find that the CP weighted average expected IRR on the life settlements in our sample is 12.5% per annum, and it ranges from a high of 18.9% in 2001 to a low of 11.0% in 2005, 2006 and 2007. In recent years, the expected IRR has risen substantially to 18.3% per annum in 2011, which is 15.9% in excess of treasury yields.

As the magnitude of these expected IRRs critically depends on the correctness of the LE estimates provided by different medical underwriters, as a robustness check, we uniformly increase all LE estimates and observe that the average expected IRR in our sample decreases from 12.5% to 9.0%, 6.1% and 3.2%, as we extend all LE estimates by 12, 24 and 36 months, respectively. Thus, in this sample, even if the LE estimates turn out to be 36 months longer than stated by the underwriters, investors, on average, would still expect positive returns. Given this and the fact that the longevity risk is largely uncorrelated with other financial markets, the life settlement option appears not only beneficial for owners wanting to sell their policies, but also provides an interesting investment opportunity for institutional investors willing to include longevity risk in their portfolio and to commit capital for the medium term.[36]

A number of recent papers in contract theory have studied the qualitative welfare effects from life settlements.[37] Longevity and health risks have also been a recent topic in life cycle finance literature.[38] We believe that future research should combine the contract theory and life cycle literature, to not only qualify but also quantify the welfare implications of life settlement market. This could be done in the context of a model economy calibrated to the characteristics of a sample of individuals representative of the U.S. population, in the presence of different life insurance market structures. Such an analysis should incorporate potential increase in premiums caused by insurance companies' factoring in a reduction in lapsation due to settlements. It should also take into account increased tax revenue to government authorities.

The focus of this paper is to examine expected returns as opposed to realized returns. As mentioned earlier, challenges to the assessment of realized returns on life settlements, both in general, and for this sample of policies in particular, include the fact that a majority of policies have not yet matured, and there is insufficient activity and transparency in the current tertiary market to establish an accurate market discount rate for, and hence valuation of, the policies still in force. We believe that both these challenges will get attenuated over the coming years and we hope to address them as a part of our ongoing research agenda.

Finally, there is some debate about the morality of life settlements. Life settlements, like reverse mortgages, are neither moral nor immoral. The popular press has sometimes referred to them as "death bonds". The fact remains that depending on the health condition, the insured would have died at a certain point in time. The life settlement market provides an additional option to the policyowners, but they are under no obligation to use it, such as in cases where the policyowners have the need and the resources to retain the policy themselves. By exercising the option to sell the policy, the policyowner not only eliminates the burden of having to fund future and often increasing premium payments, but also receives an up-front cash lump sum. The additional cash could arguably be used to access better health care, long-term care, etc., for the insured, thereby improving the insured's welfare.

[36] It is important to note that all our estimates are on a pre-tax basis.

[37] See Daily et al. (2008) and Fang and Kung (2010).

[38] For example, Koijen et al. (2011) shows that access to variable annuities during retirement is welfare increasing by allowing investors to combine protection against longevity risk, with protection against market conditions at time of retirement. Cocco and Gomes (2012) extend the work of Farhi and Panageas (2007) on endogenous retirement age to include a longevity bond and show that there are substantial benefits from investing in financial assets designed to hedge shocks to aggregate survival probabilities.

Furthermore, the economic exposure of a life settlement investor is similar to that of a long position in the shares of an insurance company which has sold life-contingent income annuities. To understand why this is the case, consider an insurance company which focuses primarily on the sale of life-contingent income annuities. If the insureds live shorter than anticipated, the amount of annuity benefit paid out by the insurance company is smaller, resulting in greater profit, higher stock price and higher return to the investor. In contrast, if the insureds live longer than expected, the amount of annuity benefit paid out by the insurance company is larger, resulting in smaller profits, lower stock price and poorer returns to the investor. If someone has no issues with investors taking a long position in the shares of insurance companies selling life-contingent income annuity products, then the same person should not have any issues with buying life settlements.

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Table 1: ***Summary Statistics***

The table presents the sum, mean, median, and distribution of key sample variables across years (Panel A) and age deciles (Panel B). NDB is the net death benefit. NDBI is the NDB payable to investors after subtracting the retained death benefit. CP is the total cost of purchase minus new loans/withdrawals at funding. Offer is the total cash paid to the policyowner at funding plus premiums paid to the carrier at or immediately prior to funding. CSV is the cash surrender value. RDB is the retained death benefit (present in 509 out of the 9,002 policies). dRDB is the retained death benefit discounted using the treasury yield curve, respectively, taking into account the survival probabilities of the insured. Treasury yields are the monthly nominal constant maturity rate series from the Federal Reserve obtained from http://www.federalreserve.gov/releases/h15/data.htm. During the sample period, treasury yields have maturities that range from one month to 30 years. When policy cash flows occur at dates different from the maturities available on the website, we interpolate the yields using the Matlab spline function. We use the longest dated treasury yield for discounting all policy cash flows beyond that date. Dollar values are in thousands unless stated otherwise. Results are presented for the period January 2001 to December 2011.

Panel A: Across Year

	Sum	Mean	Median	Year										
				2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	(billion $)													
NDB	24.14	2,681	1,000	1,608	1,657	2,013	2,150	2,213	2,243	2,732	3,268	3,545	3,421	2,572
NDBI	23.77	2,640	1,000	1,608	1,657	2,000	2,146	2,180	2,238	2,721	3,235	3,471	3,218	2,419
CP	3.43	381	160	352	370	408	431	389	330	495	465	317	226	236
Offer	2.83	315	112	234	264	312	356	360	384	408	354	211	106	146
CSV	0.77	85	1	34	64	152	132	117	148	66	44	41	32	25
RDB	0.37	41	0	0	0	14	4	33	5	11	33	75	203	152
dRDB	0.28	31	0	0	0	12	3	21	3	8	23	58	160	121
CP/NDB (%)	14.22	16.32	13.37	25.06	23.56	22.13	22.62	19.27	15.80	17.96	15.86	9.60	8.32	10.12
(Offer+dRDB)/NDB (%)	12.89	14.76	10.61	17.77	17.04	17.37	18.82	19.70	17.29	15.72	12.72	8.21	8.23	11.66
(Offer+dRDB-CSV)/NDB (%)	9.72	9.95	7.14	13.01	11.53	10.00	11.48	12.00	10.44	11.05	10.31	6.10	6.72	9.91
Offer/NDB (%)	11.74	13.64	9.82	17.77	17.04	16.89	18.40	18.82	17.21	15.28	12.00	6.25	3.74	5.78
CSV/NDB (%)	3.17	4.81	0.10	4.76	5.51	7.37	7.34	7.70	6.85	4.67	2.41	2.11	1.51	1.74
dRDB/NDB (%)	1.15	1.12	0.00	0.00	0.00	0.47	0.42	0.88	0.07	0.44	0.72	1.96	4.50	5.88
Observations	9,002			77	421	469	787	1,266	1,389	933	1,463	1,382	514	301

Table 1: ***Summary Statistics (cont.)***

Panel B: Across Age Deciles

	Age									
	Dec1	Dec2	Dec3	Dec4	Dec5	Dec6	Dec7	Dec8	Dec9	Dec10
	(0-67.5]	(67.5-70.3]	(70.3-72.5]	(72.5-74.1]	(74.1-75.8]	(75.8-77.9]	(77.9-79.1]	(79.1-81.0]	(81.0-83.6]	(83.6-95.5)
	(billion $)									
NDB	1,840	1,772	2,243	3,228	3,166	3,165	2,859	3,230	2,980	2,331
NDBI	1,823	1,762	2,225	3,193	3,131	3,134	2,824	3,181	2,921	2,209
CP	194	202	241	344	389	452	434	516	557	486
Offer	147	173	186	257	306	369	352	432	490	439
CSV	35	62	58	74	81	91	84	108	116	143
RDB	17	10	19	34	35	31	35	49	59	122
dRDB	10	6	12	24	23	21	26	38	48	103
CP/NDB (%)	13.15	12.31	13.06	12.75	13.95	15.89	17.90	18.68	21.08	24.54
(Offer+dRDB)/NDB (%)	10.24	9.60	10.64	10.48	12.00	14.36	16.08	18.12	20.49	25.69
(Offer+dRDB-CSV)/NDB (%)	8.12	6.89	7.20	7.61	7.75	9.10	10.55	11.24	14.24	16.84
Offer/NDB (%)	9.46	8.95	10.07	9.57	11.35	13.67	15.30	16.74	18.69	22.73
CSV/NDB (%)	2.11	2.70	3.43	2.87	4.25	5.26	5.54	6.88	6.26	8.84
dRDB/NDB (%)	0.78	0.65	0.57	0.91	0.65	0.69	0.79	1.39	1.81	2.96
Observations	906	898	899	909	889	901	920	892	896	892

Table 2: ***Regression: Predicting Offers to Sellers***

This table presents results of ordinary least squares estimation of Offer plus discounted retained death benefit net of cash surrender value on predictive variables. $NDBI_i$ is the dollar amount of the net death benefit to investors in excess of \$2.7 million. $Low/Medium/HighNDB_i$ are dummy variables for NDB size. $LowNDB_i$ is an indicator variable for policies with NDB below \$500,000, $MediumNDB_i$ is for policies with NDB between \$500,000 and \$3.8 million and $HighNDB_i$ is for policies with NDB above \$3.8 million. LE_i is the life expectancy estimate of the insureds in excess of 130.5 months. $InsuredState_i$ is a set of dummy variables that indicates whether the policyowner state of residence represents less than 1%, between 1% and 3%, between 3% and 5%, or above 5% of the sample. $Year_i$ is a set of year dummy variables that controls for the year of funding of each policy. We report coefficients relative to the base year of 2001. ***, **, and * denote the significance of the explanatory variable at 1%, 5% and 10% confidence levels, respectively. Dollar values are in thousands. Results are presented for the period January 2001 to December 2011.

Dependent variable	Offer + dRDB - CSV			
Specification	(1)	(2)	(3)	(4)
$NDBI$	0.08***	0.08***		
$\times$ $LowNDB$			0.14***	0.14***
$\times$ $MediumNDB$			0.14***	0.14***
$\times$ $HighNDB$			0.07***	0.07***
LE		-2.54***	-2.60***	-2.94***
$Insured\,State_{\{3\%,5\%\}}$				-19.41*
$Insured\,State_{\{1\%,3\%\}}$				-15.72*
$Insured\,State_{\{<1\%\}}$				-20.36*
Constant	265.53***	265.64***	341.59***	240.94***
Year Dummies	No	No	No	Yes
Observations	9,002	9,002	9,002	9,002
Adj. R^2	0.44	0.50	0.51	0.53

Table 3: ***Internal Rates of Return***

This table presents internal rates of return (IRR), both raw and in excess of treasury yields, on a yearly basis. IRR are calculated relative to cost of purchase, and shown on a cost of purchase (CP) weighted and equal (EQ) weighted basis. IRR in excess of treasury yields take into account the adequate treasury yields for the maturity of cash flows (premium and death benefit payment dates). Treasury yields are interpolated with Matlab spline function for cash flows with maturities different from the ones available. For maturities equal or above the maximum available maturity, we assume a rate equal to the rate of the maximum available maturity. Treasury yields are monthly nominal constant maturity yields series from the Federal Reserve and can be found here http://www.federalreserve.gov/releases/h15/data.htm To remove outliers, we winsorize observations by 0.5% on each side of the distribution of internal rates of return. Results are presented for the period January 2001 to December 2011.

	All	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Panel A: Internal rate of return (%)												
CP weighted	12.5	18.9	16.3	14.7	12.6	11.0	11.0	11.0	11.3	13.0	18.8	18.3
EQ weighted	12.9	19.8	17.0	15.6	13.4	11.9	11.2	11.5	11.5	12.9	17.2	17.2
Panel B: Internal rate of return in excess of treasury yields (%)												
CP weighted	8.4	14.6	12.3	11.1	8.6	6.7	6.1	6.4	7.6	9.6	15.6	15.9
EQ weighted	8.9	15.4	12.8	11.9	9.3	7.5	6.3	6.9	7.6	9.5	13.9	14.5
Observations	7,811	42	317	359	601	834	1,301	848	1,360	1,349	508	292

Table 4: ***Internal Rates of Return for Different LEs***

This table presents internal rates of return (IRR), both raw and in excess of treasury yields, on a yearly basis, for LE, LE plus 12, 24 and 36 months. IRR are calculated relative to cost of purchase, and shown on a cost of purchase (CP) weighted and equal (EQ) weighted basis. IRR in excess of treasury yields take into account the adequate treasury yields for the maturity of cash flows (premium and death benefit payment dates). Treasury yields are interpolated with Matlab spline function for cash flows with maturities different from the ones available. For maturities equal or above the maximum available maturity, we assume a rate equal to the rate of the maximum available maturity. Treasury yields are monthly nominal constant maturity yields series from the Federal Reserve and can be found here http://www.federalreserve.gov/releases/h15/data.htm To remove outliers, we winsorize observations by 0.5% on each side of the distribution of internal rates of return. Results are presented for the period January 2001 to December 2011.

	All	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Panel A: Internal rate of return (%)												
CP weighted	12.5	18.9	16.3	14.7	12.6	11.0	11.0	11.0	11.3	13.0	18.8	18.3
CP weighted (LE+12m)	9.0	14.3	11.8	11.0	8.9	7.7	7.0	8.4	8.4	9.6	13.8	13.9
CP weighted (LE+24m)	6.1	10.7	7.5	7.8	5.8	4.5	4.7	6.0	5.8	6.6	9.5	10.2
CP weighted (LE+36m)	3.2	7.7	3.4	4.5	3.0	1.3	1.6	3.9	3.3	3.7	5.8	7.2
EQ weighted	12.9	19.8	17.0	15.6	13.4	11.9	11.2	11.5	11.5	12.9	17.2	17.2
EQ weighted (LE+12m)	9.2	14.9	12.0	11.2	9.2	8.1	7.5	8.6	8.4	9.3	12.4	12.6
EQ weighted (LE+24m)	5.9	11.1	7.6	7.5	5.6	4.7	4.3	5.9	5.8	6.1	8.2	8.7
EQ weighted (LE+36m)	2.6	7.9	3.3	3.5	2.3	1.0	0.7	3.3	3.1	2.9	4.2	5.3
Panel B: Internal rate of return in excess of treasury yields (%)												
CP weighted	8.4	14.6	12.3	11.1	8.6	6.7	6.1	6.4	7.6	9.6	15.6	15.9
CP weighted (LE+12m)	4.8	9.8	7.6	7.1	4.7	3.0	2.1	3.7	4.5	5.9	10.3	11.2
CP weighted (LE+24m)	1.8	6.0	3.7	3.7	1.4	-0.3	-0.3	1.3	1.8	2.8	5.8	7.3
CP weighted (LE+36m)	-1.1	2.8	0.1	0.4	-1.7	-3.0	-3.4	-0.8	-0.8	-0.3	2.0	4.0
EQ weighted	8.9	15.4	12.8	11.9	9.3	7.5	6.3	6.9	7.6	9.5	13.9	14.5
EQ weighted (LE+12m)	5.0	10.3	7.7	7.4	4.9	3.7	2.6	3.8	4.5	5.6	8.8	9.7
EQ weighted (LE+24m)	1.6	6.3	3.2	3.4	1.1	0.1	-0.6	1.1	1.7	2.3	4.4	5.6
EQ weighted (LE+36m)	-1.7	3.0	-1.1	-0.7	-2.5	-3.3	-4.2	-1.5	-1.0	-1.1	0.5	2.0
Observations	7,811	42	317	359	601	834	1,301	848	1,360	1,349	508	292

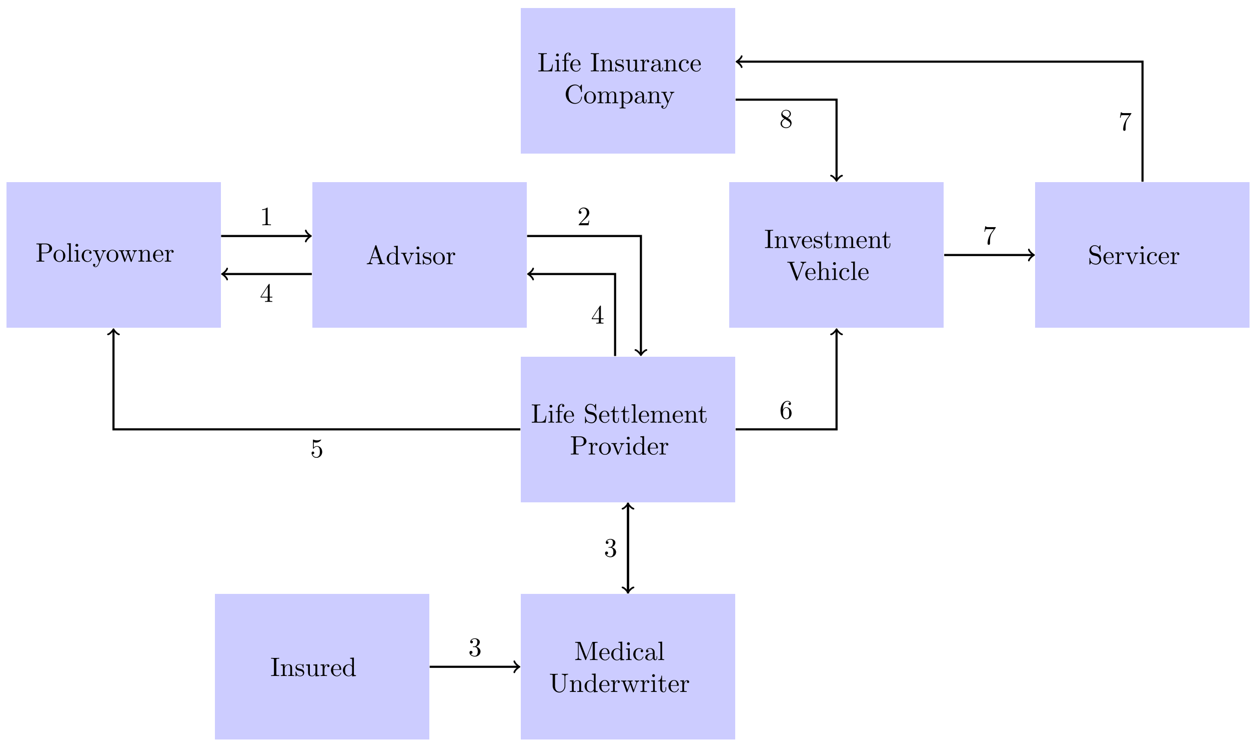
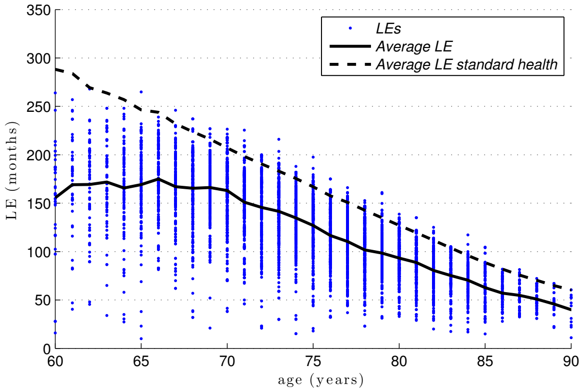
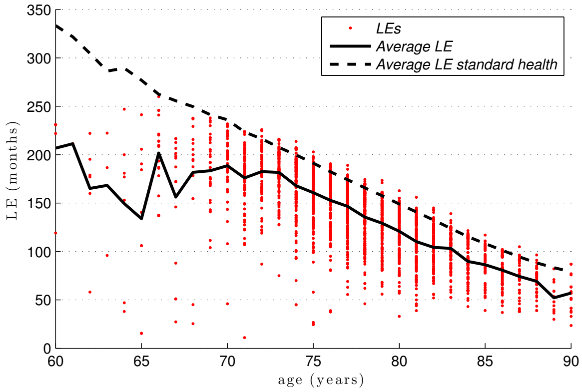


Figure 1: ***Life Settlement Transaction***

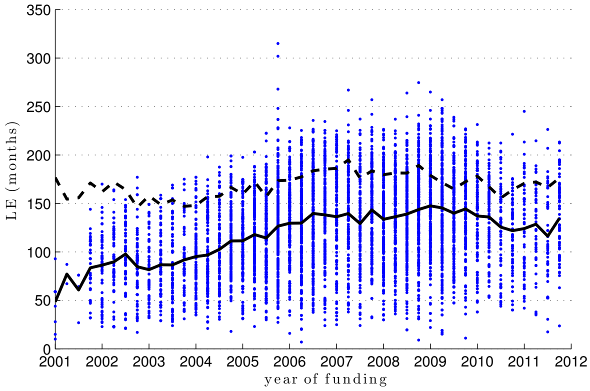
The figure illustrates the interactions among the main parties involved in a life settlement transaction. In (1) the policyowner approaches an advisor. In (2) the advisor submits the policy to a life settlement provider. In (3) the life settlement provider submits the insured's medical records to a medical underwriter who provides a life expectancy report for each insured. In (4) the life settlement provider values the policy and makes an offer to purchase. In (5) the life settlement provider purchases the policy. In (6) the life settlement provider sells the policy to an investment vehicle. In (7) the servicer facilitates premium payments from the investment vehicle to the life insurance company, optimizes policy performance, monitors the insurance company to assure that the policies are administered consistently with the contract language, and monitors and processes death claims. In (8) the investment vehicle receives the net death benefit from the life insurance company. A life settlement transaction may also include other parties such as insurance agents, life settlement brokers, escrow agents, trustees, collateral managers and tracking agents.



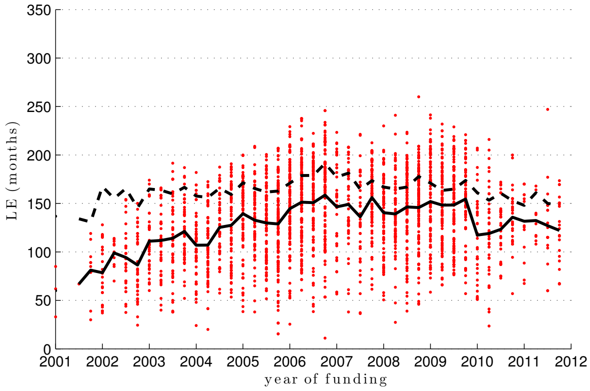
(a) Males by age



(b) Females by age

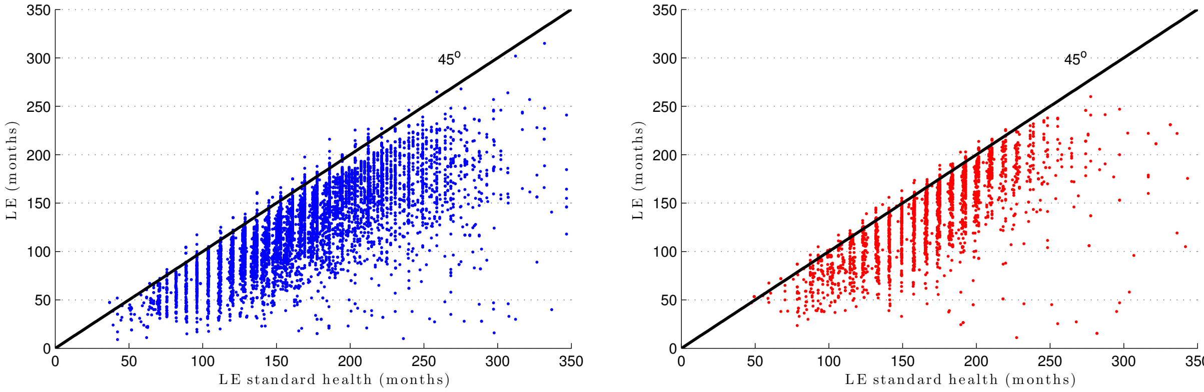


(c) Males by year of funding



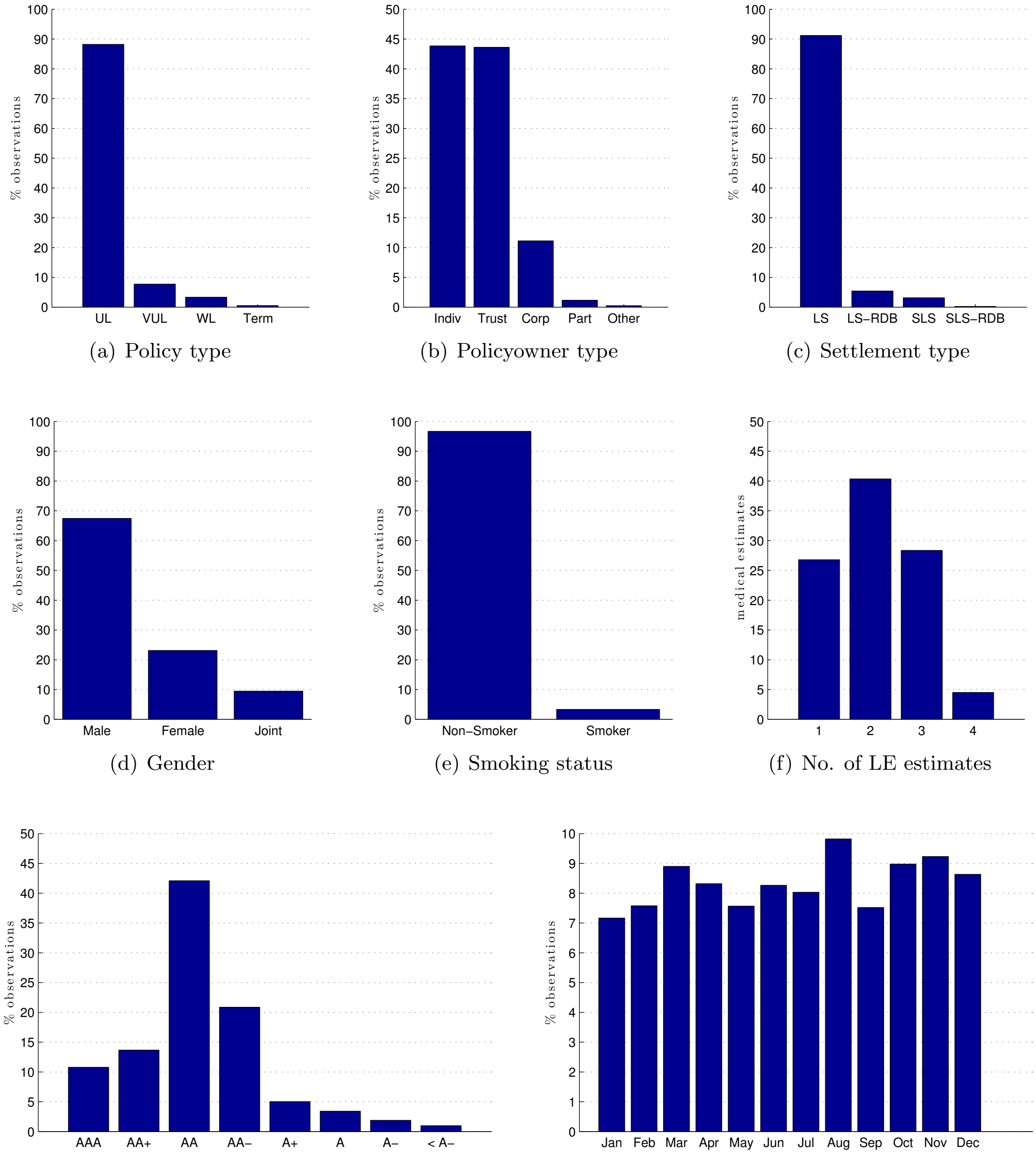
(d) Females by year of funding

Figure 2: ***Life Expectancy Estimates, by Gender, Age and Year of Funding***
This figure presents life expectancy (LE) estimates for each insured (scatter points) and its average (line), for males and females, by age, panel (a) and (b), and by year of funding, panel (c) and (d), respectively. In addition, the figure plots the average LE assuming that the insureds are of standard health (dashed line). LE is the average life expectancy estimate across the available medical underwriter estimates. LE under standard health is implied from the mortality tables of the U.S. Society of Actuaries, given age, gender, smoking status, year of funding (using 2001 and 2008 mortality tables) and a mortality multiplier of 1 (standard health). Each observation is on a per policy basis (some policyowners sell more than one policy) and we split joint policies into two individual observations. The results are presented for the period January 2001 to December 2011.



(a) Males (b) Females

Figure 3: ***Life Expectancy Estimates versus Life Expectancy under Standard Health***
This figure presents life expectancy (LE) estimates versus LE under standard health for (a) males and (b) females. LE is the average life expectancy estimate across the available medical underwriter estimates. LE under standard health is implied from the mortality tables of the U.S. Society of Actuaries, given age, gender, smoking status, year of funding (using 2001 and 2008 mortality tables) and a mortality multiplier of 1 (standard health). Each observation is on a per policy basis (some policyowners sell more than one policy) and we split joint policies into two individual observations. The results are presented for the period January 2001 to December 2011.



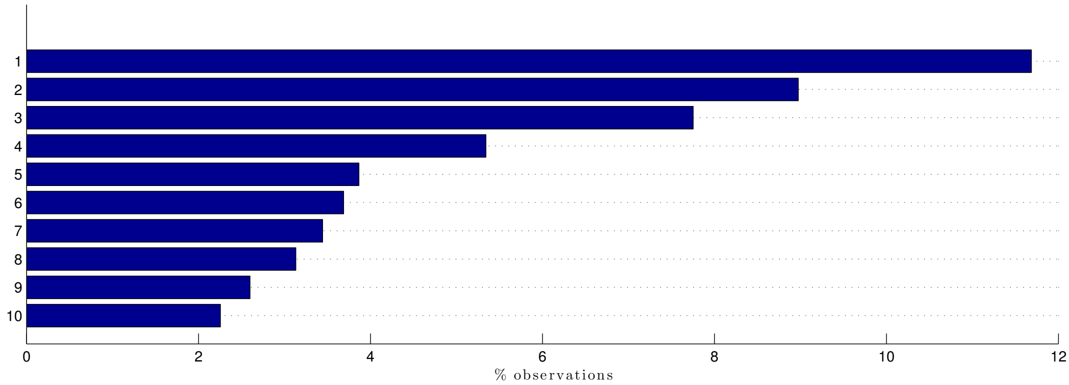
(a) Policy type (b) Policyowner type (c) Settlement type

(d) Gender (e) Smoking status (f) No. of LE estimates

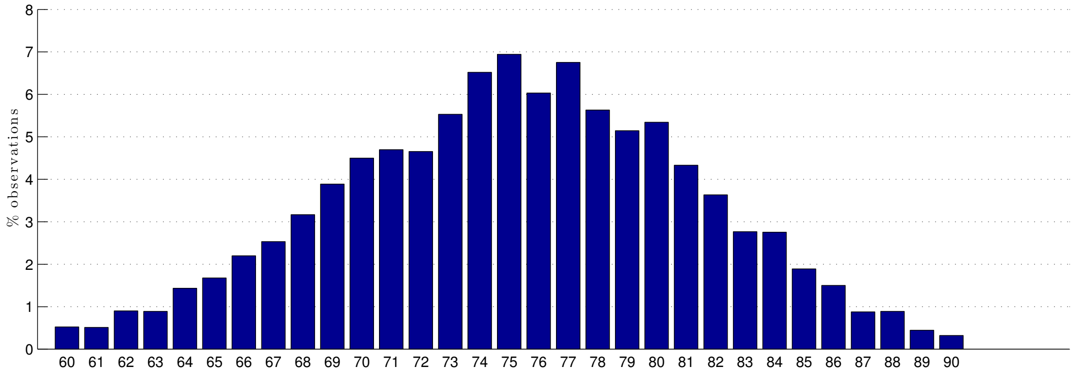
(g) S&P carrier rating at time of funding (h) Month of funding

Figure 4: ***Cross-Sectional Distribution of Policies***

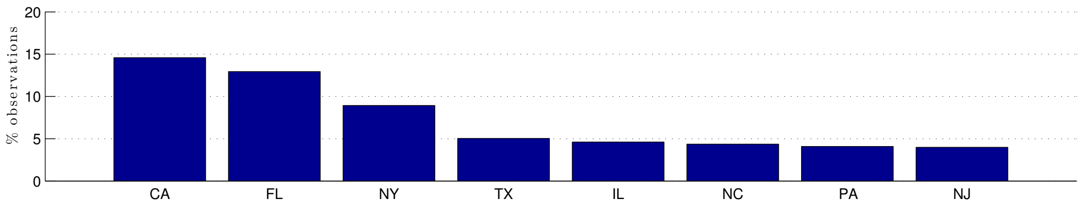
This figure presents the distribution of policies across (a) policy type (universal life (UL), whole life (WL), variable life (VL), variable universal life (VUL) or term), (b) policyowner type (individual, trust, corporation, partnership or other), (c) settlement type (standard life settlement (LS), standard life settlement with retained death benefit (LS-RDB), simplified life settlement (SLS) or simplified life settlement with retained death benefit (SLS-RDB)), (d) gender, (e) smoking status, (f) number of life expectancy estimates, (g) S&P carrier rating at time of funding, (h) month of funding, (i) top ten carriers, (j) age at funding, and (k) top eight policyowner states of residence. For the purpose of this illustration, each observation is on a per policy basis (some policyowners sell more than one policy). The results are presented for the period January 2001 to December 2011.



(i) Top ten carriers

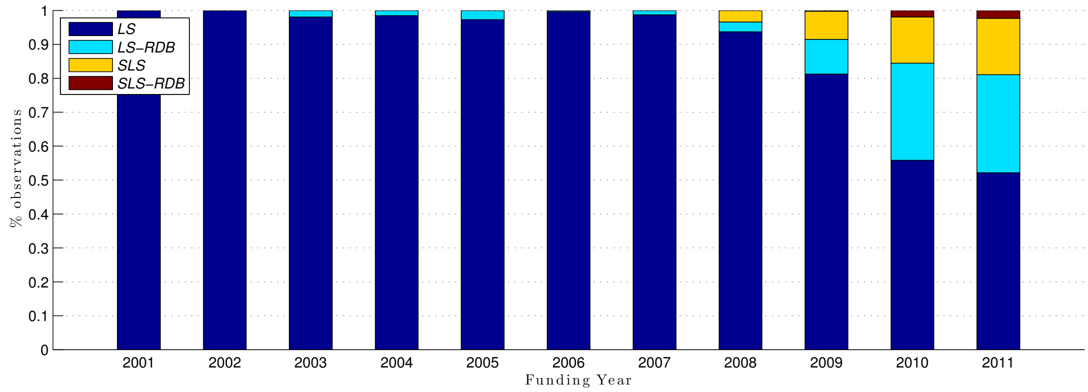


(j) Age at funding

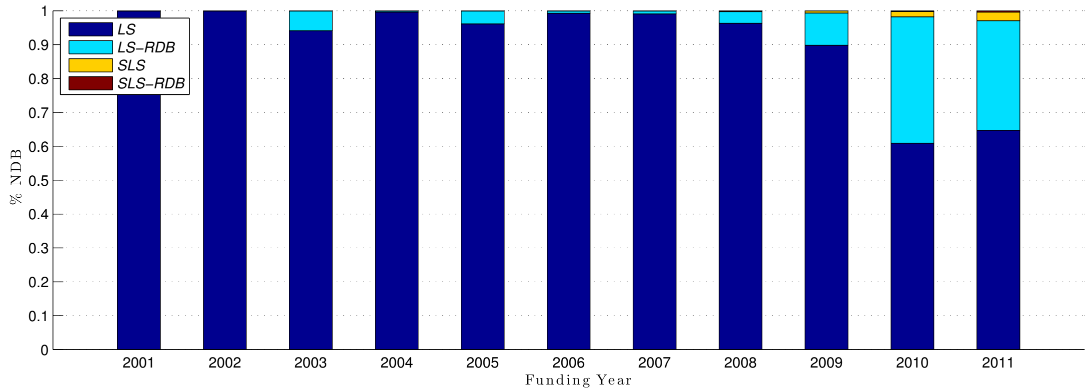


(k) Top eight policyowner states of residence

Figure 4: ***Cross-Sectional Distribution of Policies (cont.)***



(a) % Observations



(b) % NDB

Figure 5: ***Settlement Types Across Year of Funding***

This figure shows the relative (a) number of policies and (b) net death benefit for different life settlement types, across year of funding, where the settlement type may be a standard life settlement (LS), standard life settlement with retained death benefit (LS-RDB), simplified life settlement (SLS) or simplified life settlement with retained death benefit (SLS-RDB).

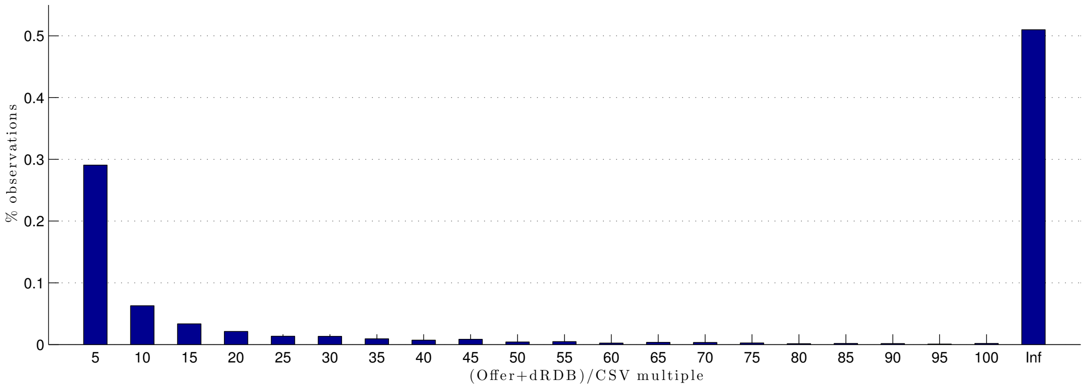


Figure 6: ***(Offer+dRDB)/CSV multiple***

This figure shows the distribution of the ratio of Offer plus dRDB to CSV. The x-axis labels are the upper bound of the range of multiples included in each each bar, while the lower range is the label of the previous bar. Offer is the total cash paid to the policyowner at funding plus premiums paid to the carrier at or immediately prior to funding. CSV is the cash surrender value. dRDB is the retained death benefit discounted at the treasury yield curve, taking into account the survival probabilities of the insured. Treasury yields are the monthly nominal constant maturity rate series from the Federal Reserve obtained from http://www.federalreserve.gov/releases/h15/data.htm. During the sample period, treasury yields have maturities that range from one month to 30 years. When policy cash flows occur at dates different from the maturities available on the website, we interpolate the yields using the Matlab spline function. We use the longest dated treasury yield for discounting RDB beyond that date. Results are presented for the period January 2001 to December 2011.

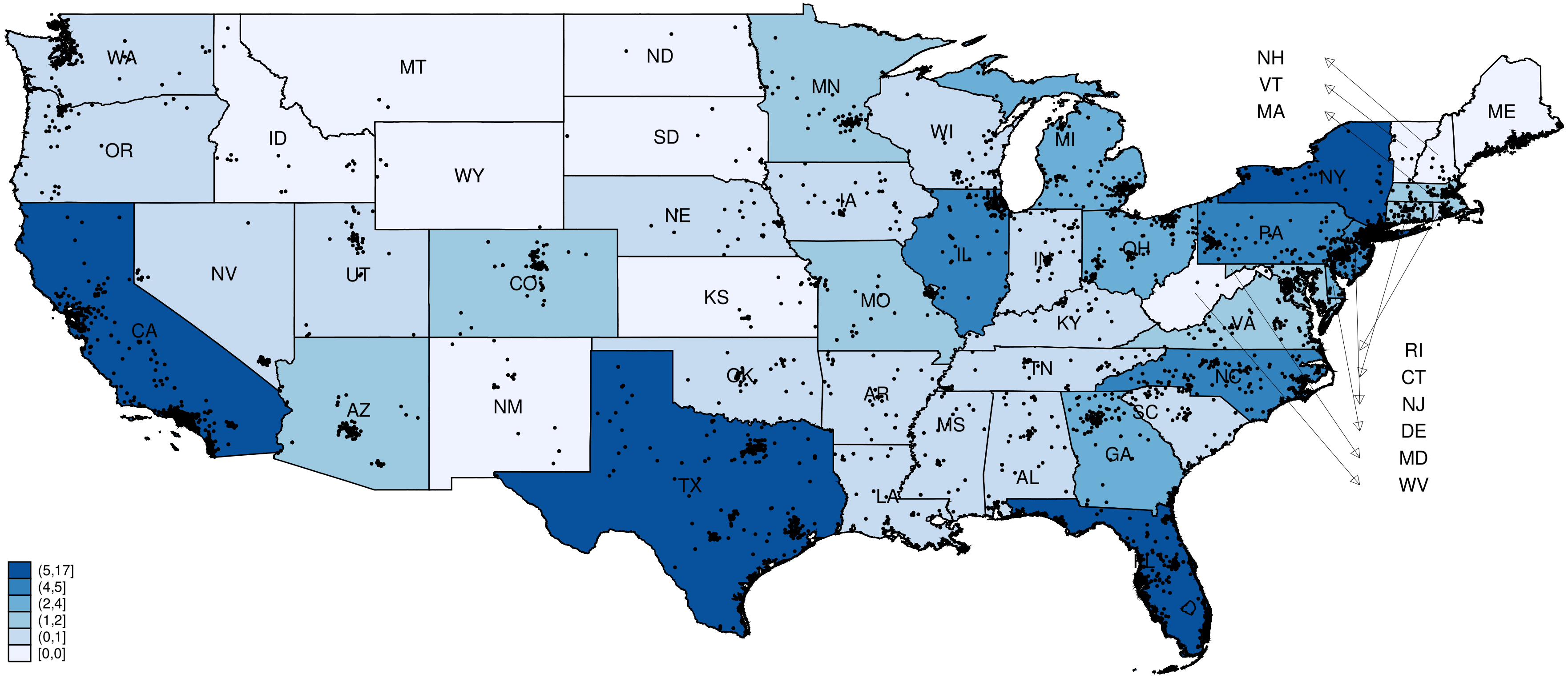
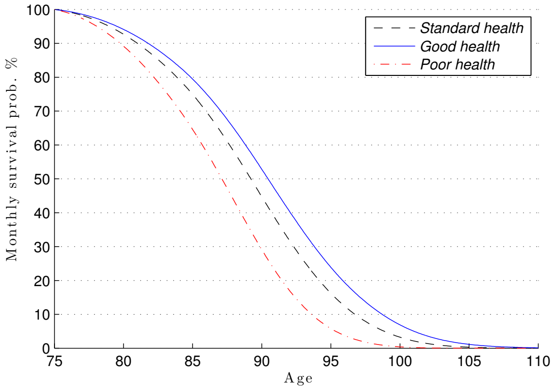
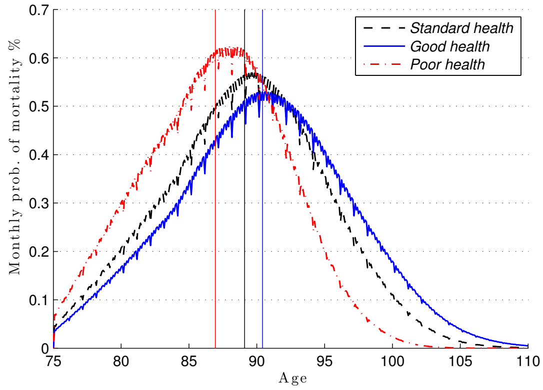


Figure 7: ***Distribution of Policyowners across the United States***

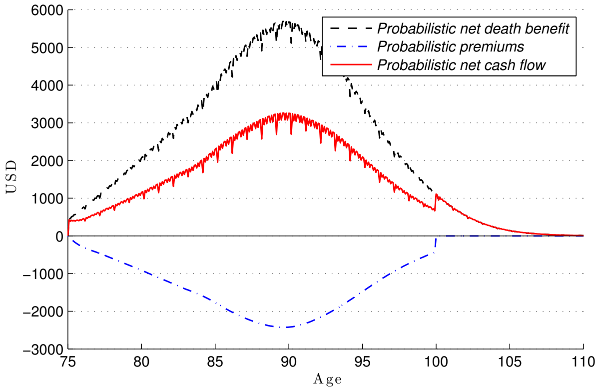
The figure shows the distribution of policyowners across the United States. Dots represent individual policies, which are matched with ZIP code coordinates. States are shaded according to the percentage of their share relative to the total number of observations (percentage values in legend). ZIP code coordinates are from the ZIP Code Tabulation Areas (ZCTAs) from the 2012 TIGER/Line® Shapefiles at the United States Census Bureau. More information on the 2012 TIGER/Line® Shapefiles and ZCTAs can be found at: http://www.census.gov/geo/maps-data/data/tiger-line.html. The Shapefile for the U.S. states and territories is from the National Weather Service, which can be found at: http://www.nws.noaa.gov/geodata/catalog/national/html/us_state.htm.



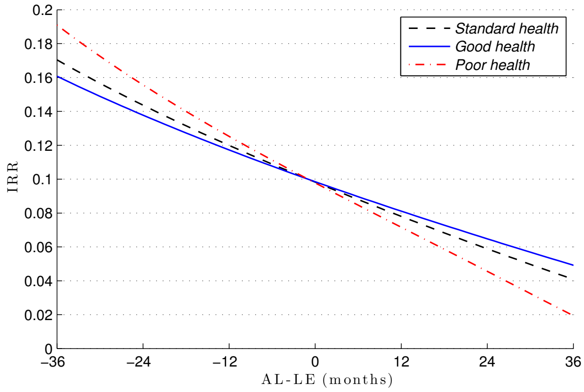
(a) Cumulative probability of survival



(b) Mortality probability



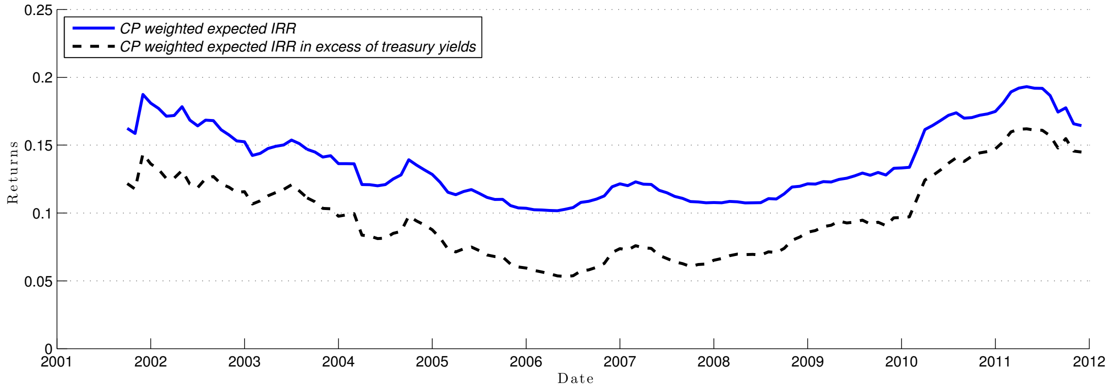
(c) Probabilistic monthly cash flows



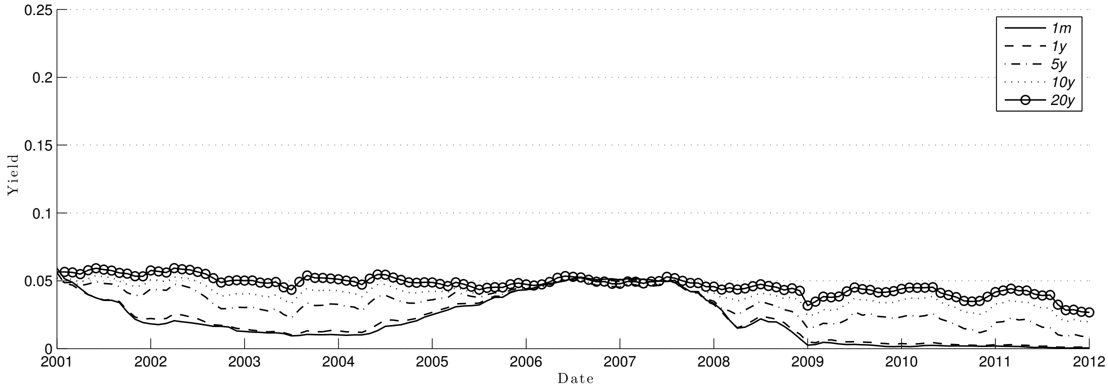
(d) IRR for different AL-LE realizations

Figure 8: ***Valuation Example***

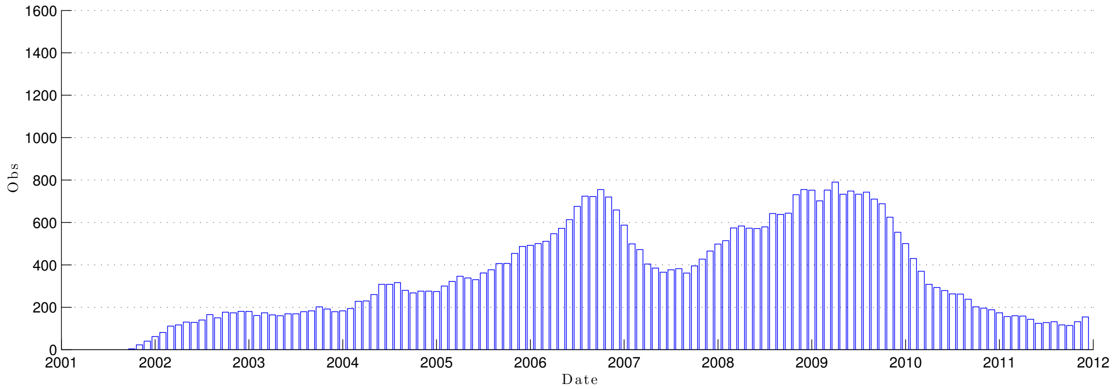
This figure presents (a) the cumulative probability of survival, and (b) the mortality probability distribution for a 75 year old male non-smoker in standard, good and poor health. These health states are equivalent to a life expectancy (LE) of 14, 16 and 12 years, respectively or a mortality multiplier of 1, 0.8 and 1.5, respectively. The figure also plots (c) the probabilistic net death benefit, probabilistic premiums and probabilistic net cash flow of a policy with a net death benefit (NDB) of \$1 million, an increasing monthly premiums schedule of $NDB \times 50\% \times monthly\ death\ rate$, up to age 100 and zero thereafter, and an insured in standard health. A policy with these characteristics would be approximately valued at \$168,040 using a discount rate of 10%. (d) plots the internal rates of return (IRR) for different realizations of actual life duration (AL) duration relative to LE estimate, given a cost of purchase equal to this value. This example uses the 2008 valuation basic table (VBT) for non-smoker males from the U.S. Society of Actuaries.



(a) Internal rates of return

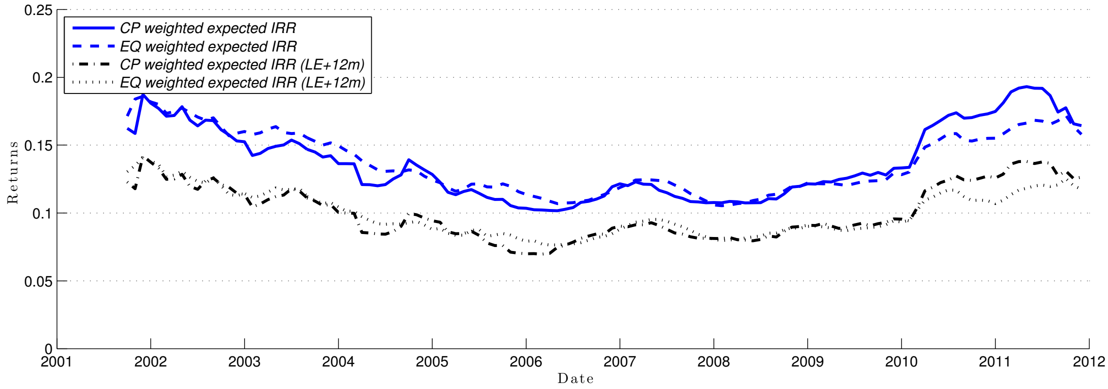


(b) Treasury yields

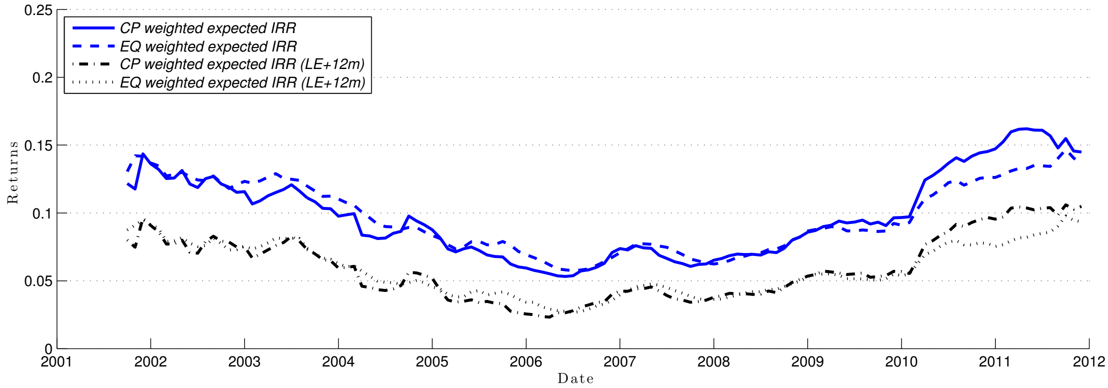


(c) Volume

Figure 9: ***Expected Internal Rates of Return, Treasury Yields and Volume***
This figure plots the (a) cost of purchase (CP) weighted expected internal rates of return (IRR), both raw and in excess of treasury yields, averaged over the previous quarter, (b) treasury yields of selected maturities, and (c) number of policies funded over the previous quarter. Internal rates of return in excess of treasury yields take into account the adequate treasury yields for the date of cash flows (premium and death benefit payment dates). Treasury yields are interpolated with Matlab spline function for cash flows with maturities different from the ones available. For maturities equal or above the maximum available maturity, we assume a rate equal to the rate of the maximum available maturity. Treasury yields are monthly nominal constant maturity yields series from the Federal Reserve and can be found here http://www.federalreserve.gov/releases/h15/data.htm. To remove outliers, we winsorize observations by 0.5% on each side of the distribution of expected IRRs. The results are presented for the period January 2001 to December 2011.



(a) Raw internal rates of return



(b) Internal rates of return in excess of treasury yields

Figure 10: ***Expected Internal Rates of Return for Different LEs***

This figure plots (a) cost of purchase (CP) and equal (EQ) weighted raw internal rates of return (IRR), and (b) CP and EQ weighted IRR in excess of treasury yields, averaged over the previous quarter for LE and LE+12 months. Internal rates of return in excess of treasury yields take into account the adequate treasury yields for the date of cash flows (premium and death benefit payment dates). Treasury yields are interpolated with Matlab spline function for cash flows with maturities different from the ones available. For maturities equal or above the maximum available maturity, we assume a rate equal to the rate of the maximum available maturity. Treasury yields are monthly nominal constant maturity yields series from the Federal Reserve and can be found here http://www.federalreserve.gov/releases/h15/data.htm. To remove outliers, we winsorize observations by 0.5% on each side of the distribution of expected IRRs. The results are presented for the period January 2001 to December 2011.

Appendices

A Life Expectancy and Health Conditions

Table A.1 reports the distribution of primary health conditions for single insureds of different ages and health states. Health conditions are constructed using extensive information on doctor-diagnosed primary health conditions collapsed into 14 main health conditions. Good health is defined as having a LE higher than the median, conditional on cohort, age and gender. Poor health is defined as not being in good health. LE is the average life expectancy estimate across the available medical underwriter estimates. Cohort dummy variables indicate the year of birth of the policy insureds and are divided in groups of individuals born before 1915, and each 5-year period thereafter.

We find that for the subsample of males in poor health and less than 70 years old for whom we have primary health conditions, heart problems (18.8%), cancer (13.6%) and diabetes (13.0%) are the three most common health conditions. Older insureds in poor health have a higher incidence of heart problems (21.6%) and a lower incidence of cancer (8.9%) and diabetes (10.4%). The primary health condition of younger male insureds in good health is diabetes (13.5%), followed by heart problems (10.2%) and cancer (7.8%). Older insureds in good health also have a higher incidence of heart problems (12.0%) and by hypertension (8.0%). The number of females in the sample is much smaller, which does not allow for a fair comparison of health conditions between males and females. However, for the subsample of females over 70 years old, one can see that their primary health conditions are similar to men, with the primary health conditions for the ones in poor health including heart problems (21.6%), diabetes (10.4%) and cancer (8.9%).

Table A.1: ***Primary Health Conditions Across Gender, Age and Health State***
This table reports the distribution of primary health conditions (whenever information is available) for single insured individuals of different ages and health states. Health conditions are constructed using information on doctor-diagnosed primary health conditions collapsed into 14 main medical conditions. Good health is defined as having a life expectancy (LE) higher than the median, conditional on cohort, age and gender. Poor health is defined has not being in good health. LE is the average life expectancy estimate across the available medical underwriter estimates. Cohort dummy variables indicate the year of birth of the policy insureds and are divided in groups of insureds born before 1915, and each 5-year period thereafter. The results are presented for the period January 2001 to December 2011.

Gender	Male				Female				All
Age	<70		≥70		<70		≥70		
Health State	Poor	Good	Poor	Good	Poor	Good	Poor	Good	
% of Observations by Health Condition									
Atherosclerosis	1.4	0.6	2.1	0.8	0.0	0.0	2.1	0.6	1.5
Cancer	13.6	7.8	8.9	7.0	21.2	0.0	8.9	6.0	8.6
Cerebrovascular	2.1	1.8	1.6	0.5	0.0	0.0	1.6	0.9	1.6
Cholesterol	0.9	4.5	2.0	7.0	0.0	0.0	2.0	8.4	3.4
Dementia	0.4	1.2	3.1	0.4	0.0	0.0	3.1	0.6	2.4
Diabetes	13.0	13.5	10.4	7.3	13.5	0.0	10.4	4.8	9.6
Heart problems	18.8	10.2	21.6	12.0	19.2	0.0	21.6	7.5	17.2
Hypertension	3.7	4.5	4.4	8.0	0.0	50.0	4.4	15.0	6.3
Lung disease	2.8	2.4	2.8	1.9	5.8	0.0	2.8	3.0	3.0
No significant disease	0.6	0.3	2.2	8.6	0.0	0.0	2.2	6.9	3.4
Obesity	1.5	1.8	1.0	0.9	3.8	0.0	1.0	1.2	1.1
Parkinson's	1.1	0.9	1.4	0.9	1.9	0.0	1.4	0.9	1.0
Renal disease	1.4	2.7	1.9	1.2	9.6	0.0	1.9	0.3	1.6
Stroke	1.7	1.5	1.7	0.6	1.9	0.0	1.7	0.3	1.6
Other	37.1	46.2	35.0	42.8	23.1	50.0	35.0	43.5	37.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Observations	848	333	2206	998	52	2	2206	333	5827

To ensure that our LE measure is valid and related to health conditions, we model LE as a function of primary health conditions. Table A.2 reports the results of a regression model used to predicts LE estimates. The explanatory variables include dummy variables for female, doctor-diagnosed health conditions, age, and cohort. Doctor-diagnosed health problems are constructed using information on doctor-diagnosed primary health conditions collapsed into 14 main medical conditions. The omitted cohort and health condition is of those born in before 1915 and with no significant disease, respectively. The table reports the marginal effects on LE (in percentage points) with heteroskedasticity-robust t-statistics.

We find that with this model we can explain 65% of the variation in the LE estimates and that the addition of health conditions increases the R-square of the model by 6%.

Table A.2: ***Predicting Life Expectancy Estimates with Primary Health Conditions***
The regression model is used to predict life expectancy (LE) estimates. LE is the average life expectancy estimate across the available medical underwriter estimates. The explanatory variables include dummy variables for female, doctor-diagnosed health conditions, age, and cohort. Doctor-diagnosed health conditions are constructed using information on doctor-diagnosed primary health conditions collapsed into 14 main medical conditions. Cohort dummy variables indicate the year of birth of the policy insureds and are divided in groups of insureds born before 1915, and each 5-year period thereafter. The omitted cohort and health condition is of those born in before 1915 and with no significant disease, respectively. The table reports the marginal effects on LE (in percentage points) with heteroskedasticity-robust t-statistics. ***, ** and * denote the significance of the explanatory variable at 1%, 5% and 10% confidence levels, respectively. The sample consists of single insureds for whom there are primary health conditions funded between 2001 and 2011.

Dependent variable	Life Expectancy			
Specification	(1)		(2)	
Explanatory variable	Coefficient	t-stat	Coefficient	t-stat
Female	28.99***	32.82	28.26***	34.69
$age - 75$	-1.21***	-7.06	-2.05***	-12.00
Health conditions:				
Atherosclerosis			-33.19***	-10.52
Cancer			-41.59***	-17.52
Cerebrovascular			-38.45***	-14.91
Cholesterol			-0.32	-0.18
Dementia			-47.30***	-21.23
Diabetes			-23.62***	-13.63
Heart problems			-34.35***	-20.15
Hypertension			-10.56***	-6.19
Lung disease			-41.03***	-16.11
Obesity			-16.44***	-4.72
Parkinson's			-30.77***	-9.92
Renal disease			-26.86***	-7.99
Stroke			-38.02***	-13.28
Other			-18.16***	-12.19
Constant	49.47***	14.83	89.48***	22.74
Cohort	Y		Y	
Observations	5,827		5,827	
Adj. R^2	0.59		0.65	

B Summary Statistics for IRR Subsample

Table B.1: ***Summary Statistics for IRR Subsample***

This table reports the equivalent of Table 1 (see Table 1 for legend) for the subsample of polices for which we received projected cash flow information, after removing outliers by winsorizing 0.5% of each side of the distribution of expected internal rate of return (IRR). This table reports three additional values: dNDBI is the net death benefit payable to investors (NDBI) discounted at the expected IRR of each policy, accounting for survival probabilities. Premium is the sum of premiums payable to the carrier. dPremium is the Premium variable discounted at the expected IRR of each policy, accounting for survival probabilities. Since the purchase of a life settlement comes with an obligation to pay the premiums until the maturity of the policy, the total expected outlay on the part of the investor equals CP plus dPremium.

Panel A: Across Year

	Sum	Mean	Median	Year										
				2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	(billion $)													
NDB	20.88	2,673	1,000	2,077	1,780	1,887	1,962	2,315	2,231	2,434	3,142	3,481	3,422	2,619
NDBI	20.55	2,631	1,000	2,077	1,780	1,885	1,958	2,272	2,226	2,424	3,110	3,416	3,224	2,463
dNDBI	6.57	841	361	648	598	605	677	783	694	837	1,054	1,045	832	666
CP	2.80	359	152	414	370	382	390	394	325	417	440	303	227	241
Offer	2.21	283	100	275	261	276	279	300	369	346	335	202	107	150
CSV	0.51	65	0	26	58	95	69	46	136	69	45	40	32	25
RDB	0.33	42	0	0	0	2	5	43	5	10	32	65	198	155
dRDB	0.25	32	0	0	0	2	3	27	3	8	22	50	156	123
Premium	8.94	1,144	454	564	523	556	691	893	964	984	1,406	1,720	1,467	1,103
dPremium	3.76	482	184	234	228	223	288	389	369	420	614	742	605	425
CP/NDB (%)	13.43	15.54	12.63	22.10	21.40	21.26	22.40	19.05	15.72	17.50	15.65	9.51	8.37	10.22
(Offer+dRDB)/NDB (%)	11.77	13.44	9.66	15.02	15.14	15.74	17.25	16.06	16.70	15.48	12.54	7.96	7.96	11.79
(Offer+dRDB-CSV)/NDB (%)	9.33	9.59	6.90	13.07	10.11	9.51	11.77	12.58	10.42	10.41	10.00	5.88	6.53	9.99
Offer/NDB (%)	10.59	12.28	8.67	15.02	15.14	15.53	16.70	14.91	16.66	15.03	11.83	6.18	3.74	5.86
CSV/NDB (%)	2.44	3.85	0.00	1.96	5.03	6.23	5.49	3.48	6.28	5.07	2.54	2.07	1.43	1.79
dRDB/NDB (%)	1.18	1.16	0.00	0.00	0.00	0.21	0.55	1.14	0.04	0.45	0.72	1.78	4.22	5.92
Observations	7,811			42	317	359	601	834	1,301	848	1,360	1,349	508	292

Table B.1: ***Summary Statistics for IRR Subsample (cont.)***

Panel B: Across Age Deciles

	Age									
	Dec1	Dec2	Dec3	Dec4	Dec5	Dec6	Dec7	Dec8	Dec9	Dec10
	(0-67.5]	(67.5-70.3]	(70.3-72.5]	(72.5-74.1]	(74.1-75.8]	(75.8-77.9]	(77.9-79.1]	(79.1-81.0]	(81.0-83.6]	(83.6-95.5)
	(billion $)									
NDB	1,893	1,713	2,233	3,259	3,179	3,157	2,920	3,158	2,947	2,417
NDBI	1,876	1,703	2,219	3,225	3,145	3,122	2,879	3,102	2,878	2,287
dNDBI	404	415	619	848	918	998	981	1,127	1,188	1,038
CP	194	184	240	337	371	427	421	485	521	467
Offer	144	154	178	250	275	333	321	386	439	402
CSV	33	53	47	58	55	75	60	80	89	113
RDB	17	10	14	34	35	35	41	57	69	129
dRDB	10	6	9	22	21	24	30	43	55	110
Premium	675	690	1,010	1,417	1,381	1,364	1,271	1,358	1,314	1,040
dPremium	209	231	379	511	548	571	559	641	667	570
CP/NDB (%)	12.59	11.90	12.90	11.94	13.25	15.40	17.30	18.22	20.25	23.48
(Offer+dRDB)/NDB (%)	9.54	8.97	9.86	9.63	10.71	13.24	14.93	16.83	19.35	23.70
(Offer+dRDB-CSV)/NDB (%)	7.64	6.71	7.27	7.26	7.53	8.90	10.41	11.00	14.03	16.67
Offer/NDB (%)	8.83	8.33	9.35	8.66	10.04	12.49	14.03	15.30	17.24	20.56
CSV/NDB (%)	1.90	2.26	2.59	2.37	3.18	4.34	4.52	5.83	5.33	7.02
dRDB/NDB (%)	0.71	0.64	0.51	0.97	0.67	0.75	0.90	1.52	2.11	3.14
Observations	843	832	820	804	778	776	758	763	731	706

Table B.2: ***Regression: Predicting Offers to Sellers***

This table presents results of ordinary least squares estimation of Offer plus discounted retained death benefit net of cash surrender value on predictive variables. $NDBI_i$ is the dollar amount of the net death benefit to investors in excess of \$2.7 million. $Low/Medium/HighNDB_i$ are dummy variables for NDB size. $LowNDB_i$ is an indicator variable for policies with NDB below \$500,000, $MediumNDB_i$ is for policies with NDB between \$500,000 and \$3.8 million and $HighNDB_i$ is for policies with NDB above \$3.8 million. LE_i is the life expectancy estimate of the insureds in excess of 130.5 months. $InsuredState_i$ is a set of dummy variables that indicates whether the policyowner state of residence represents less than 1%, between 1% and 3%, between 3% and 5%, or above 5% of the sample. $Year_i$ is a set of year dummy variables that controls for the year of funding of each policy. We report coefficients relative to the base year of 2001. ***, **, and * denote the significance of the explanatory variable at 1%, 5% and 10% confidence levels, respectively. Dollar values are in thousands. Results are presented for the period January 2001 to December 2011.

Dependent variable	Offer + dRDB - CSV			
Specification	(1)	(2)	(3)	(4)
$NDBI$	0.08***	0.08***		
$\times$ $LowNDB$			0.13***	0.14***
$\times$ $MediumNDB$			0.13***	0.13***
$\times$ $HighNDB$			0.07***	0.07***
LE		-2.60***	-2.63***	-2.84***
$Insured\,State_{\{3\%,5\%\}}$				-23.34**
$Insured\,State_{\{1\%,3\%\}}$				-21.65**
$Insured\,State_{\{<1\%\}}$				-26.83**
Constant	254.95***	263.99***	337.65***	287.84***
Year Dummies	No	No	No	Yes
Observations	7,811	7,811	7,811	7,811
Adj. R^2	0.44	0.50	0.52	0.53