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Pricing and Risk Management

JIM ASPINWALL GEOFF CHAPLIN MARK VENN F840,62 A801

Life Settlements and Longevity Structures

Pricing and Risk Management

Jim Aspinwall Geoff Chaplin Mark Venn



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Structures

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Contents

In	Introduction by Con Keating			1
1	Life	e Insura	ance: Primary and Secondary Markets	
			luction	
	1.1	History, application and termination of life insurance policies		5
		1.1.1 History: Early life insurance		2
		1.1.2		5
		1.1.3		ϵ
		1.1.4		6
		1.1.5	•	7
		1.1.6		7
		1.1.7		8
		1.1.8	Termination and surrender of life insurance policies	8
	1.2	Life In	nsurance policy types and underwriting	9
		1.2.1		9
		1.2.2	Variable universal life	11
		1.2.3	Term insurance	11
		1.2.4	Endowment insurance	11
		1.2.5	Whole life	12
		1.2.6	Policy riders	12
			opment of the viatical settlement and life settlement markets	13
		1.3.1		13
			Negative sentiments	14
		1.3.3	Market size	15
			Institutional involvement	15
	1.4	The pa	arties involved in a life settlement transaction	15
	1.5	5 The life settlement process		18
	1.6	Legal		22
	1.7	Other	issues	25
2	Mor	tality a	and Credit Structures, Valuation and Risk	27
		Introd	uction	27
	2.1	CDS a	and CDO contracts	27

Contents

		2.1.1 CDS	27
		2.1.2 CDO	27
		2.1.3 Synthetic and cash flow CDOs	29
		2.1.4 Life policy CDOs	29
	2.2	Valuation approach and data	30
	2.2.1 Approach		30
		2.2.2 Data	30
	2.3	The poisson process	31
	2.4	Single life mortality calculations	33
		2.4.1 Corporate mortality: CDS contracts and bond pricing	33
		2.4.2 Generic life policy valuation	37
		2.4.3 Mortality adjustments	38
		2.4.4 Risk analysis in the life assurance context – mortality curve stresses	39
	2.5	Correlation and portfolio calculations	40
		2.5.1 Copulas	43
		2.5.2 Bivariate copulas	43
		2.5.3 Gaussian copula and correlation in CDO structures	44
		2.5.4 Correlation in life insurance	47
		Rating transactions	
	2.7	Risk management of a structured life settlements portfolio	51
		2.7.1 Risk managing a book of traded financial assets	51
		2.7.2 Risk managing a portfolio of mortality risks in an insurance company	52
		2.7.3 Risk managing a life settlements portfolio	52
		2.7.4 Current risk management software	53
3	Stru	actured Products and Securitization	55
	3.1	Securitization	55
		3.1.1 Other examples: Synthetic securitization	58
		3.1.2 Prestructures	59
	3.2	Structured products	60
		3.2.1 Mortgage structures	60
		3.2.2 Other examples	65
	3.3	The risks of structured products	66
		3.3.1 Problems with correlations and volatility	67
		3.3.2 Pricing structures	68
	3.4	Modelling	69
		3.4.1 Implied models	69
		3.4.2 Parametric models	73
		3.4.3 Realized moments	75
	3.5	Life Settlement pool (LSP)	78
		3.5.1 Volatility in LSPs	79
		3.5.2 Correlation in LSPs	79
		3.5.3 Credit risks	81
		3.5.4 LSP: Examples	81
		3.5.5 Other risks	87
		3.5.6 Due diligence	88
	3.6 Conclusion		90
			70

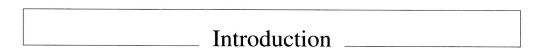
			Contents	vii
4	Exam	uples of LSP Securitization: A Principal Protected Fund		91
•	LAUII	Introduction		91
	4.1	A simple example		93
		4.2 Other pool examples		94
		4.2.1 Assumptions		95
		4.2.2 Statically managed fund		95
		4.2.3 A Managed pool		99
		4.2.4 Looking at risks		101
		4.2.5 Leveraged reinvested pools		102
	4.3	Group policies		105
	4.4 Conclusion			105
		4.4.1 Administration		105
		4.4.2 Modelling		106
		Appendix: Sample product description outline		107
		A4.1 Introduction		107
		A4.2 Product description		108
		A4.3 Marketing assessment		110
		A4.4 Modelling and pricing		111
		A4.5 Administration and accounting		112
		A4.6 Conclusion		112
5	Capit	al Markets Products: Principal Protection		115
		Introduction		115
	5.1	Bond constructions		116
	5.2	A zero coupon bond		117
	5.3	A coupon bond		119
	5.4	A convertible bond		120
		5.4.1 The convertible is exercised		121
		5.4.2 The convertible is not exercised		123
	5.5	Principal protection		125
	5.6	Longevity bonds		126
		5.6.1 The longevity bonds: Principal at risk		128
		5.6.2 Longevity bonds: Coupons at risk		129
		5.6.3 The inverse longevity bond		134
	5.7	Sharia compliant bonds		137
	5.8	Power bonds		137
	5.9	CIOs and PACs, TACs and VADAMSs		138
		5.9.1 A collateralized insurance obligation		138
		5.9.2 PAC		141
	<i>5</i> 10	5.9.3 PAC bond – breaching the boundaries by 40%		143
	5.10			144
	5.11	Conclusion		145
6	Struc	tured Financing: Guaranteed Loan repayment		147
	(1	Introduction		147
	6.1	Project financing: Commercial and industrial uses		147
		6.1.1 Purchase of a restaurant chain		147

2	O	4	
,	Con	ten	ITS

viii

		6.1.2 Leasing	150
		6.1.3 Balance sheet restructuring	150
	6.2	Retail product	151
		6.2.1 Principal reduced mortgages	151
		6.2.2 Credit enhancement for the retail borrower	153
	6.3	Reverse mortgage or equity reversal programme	154
	6.4	6.3.1 Home lease programme Asset swaps	156
	0.4	6.4.1 Simple review	156
		6.4.2 The sub-prime swap	156
		6.4.3 Risks of this transaction	158
	6.5	The pension swap	161 163
	6.6	A New CPPI product	164
		6.6.1 The initial CPPI study	164
		6.6.2 Allocation process	165
	6.7	Conclusion	167
7	Life S	Settlement Derivatives	169
		Introduction	169
	7.1	Longevity bonds	169
	7.2	Asset Swap	170
		7.2.1 Deterministic mortality swap 7.2.2 Mortality swap: Single payment	170
		7.2.2 Mortality swap: Single payment7.2.3 Mortality swap: Multiple periods	171
	7.3	Mortality curves	171
	,,,,	7.3.1 The forward mortality rate	173 176
		7.3.2 Interest rates	178
		7.3.3 Interest rate swap	178
		7.3.4 Forward rate agreements	182
		7.3.5 Mortality rate	183
	7.4	Futures and forwards	185
	7.5	Options	191
		7.5.1 Review of option pricing models used to price mortality options	191
		7.5.2 Options on longevity bond future	192
		7.5.3 Options on the longevity spot bond 7.5.4 Put option on the longevity of the pool	192
		i and reage in j or the poor	193
		7.5.5 Mortality caps, floors and swaptions7.5.6 Interest rate caps	194
		7.5.7 Interest rate swaption	194
		7.5.8 Mortality caps	195
	7.6	Synthetic pools	196 196
	7.7	Conclusion	196
8	Hedging		
		Introduction	199 199
	8.1	Hedging longevity or extension risk	199
		8.1.1 Longevity bonds	200

			Contents	ix
	8.1.2	Asset swaps		201
	8.1.3	Annuity hedging		203
	8.1.4	Single premium annuity		204
	8.1.5	80% runoff with no annuity vs. an annuity		206
	8.1.6	40% runoff with no annuity		206
	8.1.7			207
	8.1.8	80% runoff with an annuity payout per year		207
	8.1.9	Summary		208
8.2		ing with inverse longevity bond		208
	8.2.1	Hedging with a surety bond		210
	8.2.2	Hedging with an insurance wrap		211
	8.2.3			211
	8.2.4	Hedging with a mortality swap		212
8.3	Future	es-forwards		219
8.4	Optio			220
	8.4.1	Bond options		220
	8.4.2	Put option on the longevity		221
8.5	Caps,	floors and swaptions		222
	8.5.1	Caps		222
	8.5.2	Swaptions		224
8.6	Hedgi	ing liquidity risk		226
	8.6.1	Establishing a reserve		226
		Establishing a liquidity provider		226
	8.6.3	Partial portfolio sale		226
	8.6.4	Borrow against the portfolio		226
8.7	Hedgi	ing credit risk		227
	8.7.1	Diversification		227
	8.7.2	Credit risk		227
	8.7.3	Hedging efficiency		227
8.8	HER	(Hedge efficiency ratio) for an inverse longevity bond		228
	8.8.1	Theory		228
	8.8.2	Hedging effectiveness		228
	8.8.3	Effectiveness of a hedge: the calculation		229
	8.8.4	Risks		230
	8.8.5	HER for an annuity		231
	8.8.6	HER for an inverse longevity bond		231
	8.8.7	HER for a mortality swap		231
8.9	Concl	lusion		232
Appendix	ζ.			233
Bibliogra	phy			259
Index				261



by Con Keating

The proverb usually attributed to Benjamin Franklin that "In this world nothing can be said to be certain, except death and taxes" is apposite in the context of life assurance and offers some cold comfort from the uncertainty and financial market turmoil of recent times. As trust broke down, the very role of bank "inside money", in resolving the questions of uncertainty central to exchange in financial markets, came to be questioned. With volatility in financial markets surging to unprecedented levels, financial risk management for most assets became more black art than quantitative science. The mutual dependence of so many financial asset prices upon a common international liquidity became painfully evident with prices moving in near total lock-step; diversification, the workhorse of sound risk and investment management, has recently proved to be a very elusive concept in practice – and its value all the higher.

The search for investment assets that are not highly dependent upon the vagaries of the "animal spirits" evident in traditional financial markets is now more important than ever. Unfortunately the alternative investment world of hedge funds and private equity has proved disappointing to many; perhaps this should not have been a surprise given their dependence on credit from their prime brokers and bankers when executing their chosen investment strategies.

The essential risk process in any individual's life assurance policy is, of course, independent of the course of financial events. People live and die according to the natural rhythms of their life-cycles, unrelated to the performance of financial markets. Life settlements satisfy *the* primary requirement for risk diversification to be present and enduring.

It is important to realize, however, that some elements of the life assurance contract are affected by financial conditions more generally, and that complete independence of performance in consequence is not to be expected. For example, there is the obvious role of interest rates in discounting cash flows – as rates decline, this discount process results in higher present values for the cash flows expected under the policy, and vice versa. Indeed, as returns available elsewhere in financial markets vary, so the relative attraction of life settlements will co-vary and with that their quoted and traded prices.

The credit standing of the insurance company that has written the policy is a central issue, and of course also not entirely independent of the state of other financial markets. But it should nevertheless be noted that the recent much publicised difficulties of a few companies in the

insurance world do seem to have arisen more from their forays into financial engineering than from their traditional insurance activities. The principal liquidity route to bank insolvency, the depositor run, is of course not a relevant concern for insurance companies.

There has always been a strange ambivalence evident to the development of secondary markets in life assurance policies. Often precisely those people who advocate the use of life assurance in personal life-cycle financial management resist inchoately the development of secondary markets. For some this may cynically be viewed as preservation of the status quo and their profitability; poor surrender value and uncompetitive markets go far in enhancing insurance company profits and the remuneration of their managements. For others, however, it appears little more than some social taboo associated with death. Notwithstanding that resistance, the life settlements market in the USA is hardly recognizable when compared to the mid-1990s; the growth is quite remarkable, and seems likely to continue.

A particular problem for this market, and one that has delayed or slowed its development, has been the absence of a single authoritative source of description and analysis. The life settlements market has also widely adopted and adapted techniques more familiar in capital markets and actuarial science; the diverse professional backgrounds of the authors of this book are particularly relevant in this context. The ambition of the book is to provide that single authoritative introductory source to life settlements, together with an elementary explanation of the financial techniques in use in this market, while remaining accessible to a broad readership.

The US insurance market has a unique character which arises in part from its state by state authorization, regulation and supervision. Against this background it is most useful to have the historic development of these products and markets outlined, together with some discussion of the principal issues surrounding this development. Chapter 1 addresses this history and the practices that have developed over time, and ends with a synopsis of the principal legal issues; this sets the institutional and contractual scene within which the modelling and analysis of subsequent chapters is framed.

Readers are introduced in Chapter 2 to the elementary mathematics of mortality and survival. The analogous relationship between credit, default and corporate survival is exploited supplying motivation for many of the models subsequently discussed. Somewhat irreverently, the difference between human and corporate mortality was once described to me as being "largely the extent to which resurrection is possible and credible". Certainly one of the more intriguing analytical aspects of credit risk insurance is the extent to which the likelihood of default and/or the magnitude of recovery post-default can be influenced by the active intervention of the insurer. This, of course, is largely a question of the corporate insolvency laws applicable within a particular jurisdiction to life settlements which is outside the scope of this book. However, it should be remembered that their legal status is not identical: both have the rights of individuals but their responsibilities differ, which some argue was a contributing factor to the incentive distortions that inflated the credit crunch.

Chapter 2 ends with a discussion of transaction rating. The role and relevance of ratings agencies, or statistical ratings organizations (SROs) as they are more formally known, has been the subject of much debate recently and indeed there are proposals extant from, among many others, the European Commission (EC) to introduce regulation. The urge to regulate in the wake of any series of financial problems is entirely understandable, but of course the history of the world has long been littered with instances of regulation written in haste which subsequently caused mayhem themselves. The financial economists' roundtable (FER) has recently produced a considered paper which sees the need for three types of reform and whose

proposals are worth reproducing here in their entirety as this blueprint for regulation is clearly superior to that advanced by the EC:

First, FER supports strategies designed to improve SRO incentives by increasing the transparency of their modelling practices and holding their managements accountable for negligent ratings errors.

Second, the FER challenges the wisdom of incorporating SRO ratings in securities and banking regulations issued by governmental entities. By outsourcing public authority to private firms, this practice intensifies the conflicts of interest that SRO personnel must resolve.

Finally, to acknowledge differences in the degree of leverage that is embedded in different issues of securitized debt, FER recommends that SROs be required to state an express margin for error in their ratings for every tranche of securitized instruments.

If nothing else, these proposals may serve as useful measures and metrics for the likely efficacy of any regulations ultimately adopted.

Chapter 3 is most ambitious in scope and complexity, but introduces complex subjects with simple vanilla products and models. The distinction between securitizations and structured products is important, and is often overlooked by other commentators. The need for error estimates associated with model forecasts, contained also in the last sentence of the above FER statement on ratings, should be a salutary caution for all when journeying into the land of financial models. Rather more generally, George Box offered the observation that: "Essentially, all models are wrong, but some are useful." The November 2008 Financial Reporting Council consultation paper entitled Modelling is recommended to those interested in the broader detail of the evaluation of model construction, robustness and fitness for purpose.

It is refreshing to see the introduction of complex and newer areas of financial modelling such as neural networks and levy processes, although, in the spirit of William of Ockham, it should be recognized that complexity is not usually a virtue in a model. Indeed with many models, one should be questioning in the formal mathematical sense the very existence of the statistic or parameter being estimated; never more was this true than with the recent major market equity index volatilities of 60%, 70% and 80%. Put rather simplistically, with volatility this high and unstable, it is reasonable to question whether the variance of the distributions is well defined. We should not lose sight of one of the overarching principles of stochastic control systems: simplicity is a virtue and is often a prerequisite for effective control – something that does not yet appear to have percolated through broadly to the financial risk regulatory authorities.

Chapter 4 illustrates some commonly utilized investment structures for life settlements and focuses attention upon differences in their financial risk aspects. In offering this introduction I feel that I can use this opportunity to make a few brief but general points about risk and risk management in a financial context. Many commentators have recently compared financial risk management to gambling, although this is badly misguided. With a game of chance we can specify ahead of the gamble all possible outcomes and assign probabilities to them. This is the mathematics of closed systems and the principal theorems of academic finance – Arrow-Debreu and Lucas's rational expectations – are of this fixed point closed system form. The reality is that we cannot specify all future possible outcomes, let alone assign probabilities to them; this is the land of open systems with far greater complexity than a casino. In only too many cases in financial risk management are closed system models applied in the wrong circumstances, but with life settlements or mortality risk more generally we are not faced

by such open system risk management concerns – unless immortality becomes a realistic prospect. Indeed the effect of the time value of money is to limit the effect of mortality risk on current values.

The discussions of Chapters 5 and 6 – which are centred respectively on capital market mechanisms for the limitation of the risks of life settlements portfolios and the use of life settlement portfolios in mitigating the risks of traditional capital market instruments – are some of the strengths of this book. More often than not life settlements are first encountered in one of these settlings.

The newest area of development in mortality and longevity analysis and risk management has been the development of derivatives which have, as their underlying, these risk factors. While there has undoubtedly been much discussion of these techniques and instruments, there is, to date, little evidence of their use in the execution of commercial business. However, going forward, if the obvious counterparty credit exposure concerns can be remedied, it is clear that these techniques have applications far broader than just life settlements.

The final chapter is concerned with hedging and risk management and includes methods for the evaluation of hedging effectiveness. This latter aspect is rather important. If we take nothing else away from the credit crisis, it should be that credit risk did not diversify as the rating agency models implied – and of course the similarity between credit "risk" and longevity "risk" is more than passing.

Life Insurance: Primary and Secondary Markets

INTRODUCTION

This chapter explores the background to the development of the market for life settlements – the sale of life insurance policies to financial investors. It describes the parties involved in a typical life settlement transaction and the associated process. It concludes with a review of some of the legal and practical issues associated with life settlements.

1.1 HISTORY, APPLICATION AND TERMINATION OF LIFE INSURANCE POLICIES

1.1.1 History: Early Life Insurance

Risk protection has been a primary goal of humans and institutions throughout history. Protecting against risk is the reason for insurance. One of the first records of life insurance was in Rome, where burial clubs were formed, known as *Fratres*. These clubs were set up by the poor to pay for the funerals of their members and to help the surviving family members financially.

Following the fall of Rome most types of insurance were abandoned. Around 450 AD, guilds began to be established for the various types of highly skilled trades. Accounts from that date suggest that these guilds helped their members with various types of insurance, including life and disability.

Insurance in Asia can be traced back to the Vedas, the oldest sacred texts of Hinduism. For instance, Yogakshema, the name of Life Insurance Corporation of India's corporate head-quarters, is derived from references within the Rigveda, one of the texts. It is suggested that a form of "community insurance" was prevalent in India around 1000 BC, practised by the Aryans.

1.1.2 Modern Insurance

Illegal almost everywhere else in Europe, life insurance came into its own in England, where it was vigorously promoted in the late seventeenth century. During this time, insurance began to be transacted at Edward Lloyd's Coffee House in Tower Street, London, where ship owners and underwriters (known as "backers") met to put together insurance contracts and other shipping and merchant-related business.

While serving as a means of risk avoidance, life insurance also appealed strongly to the gambling instincts of England's burgeoning middle class. Gambling was so rampant that when newspapers published names of prominent people who were seriously ill, bets were placed at Lloyd's Coffee House on their anticipated dates of death. Reacting against such practices, 79 merchant underwriters broke away in 1769 and two years later formed a "New Lloyd's Coffee House" that became known as the "real Lloyd's". Making wagers on people's deaths ceased in 1774 when Parliament forbade the practice in the Life Insurance Act of that same year.

Slightly more tolerably – as one assumes they had at least some vested interest in the survival of the individuals in question – those same gamblers had made use of mortality information drawn from John Graunt's *Observations on the Bills of Mortality*¹ (published in 1662) to bet on the survival rates of those captains to whom they entrusted their ships. The tables published in Graunt's book are often cited as the first recorded example of a population mortality table and his work led to his election as a Fellow of the Royal Society – no mean feat for a haberdasher, at a time when those engaged in trade were largely ignored by this august body.

Life insurance is not gambling, but its development has spurred the growth of the mathematical science of probability. Today this science has been refined through actuarial studies and has become the foundation of pricing technology for credit default swaps (CDSs).

1.1.3 Insurance Moves to America

The US insurance industry was built on the British model. The year 1732 saw the birth of the first insurance company in the American colonies in Charleston, South Carolina, providing fire insurance. In 1759, the Presbyterian Synods in Philadelphia and New York sponsored the creation of the Corporation for Relief of Poor and Distressed Widows and Children of Presbyterian Ministers – the first life insurance corporation in America established for the benefit of ministers and their dependents. The first recorded issue of a life insurance policy for the general public in the United States occurred in Philadelphia, on 22 May 1761.

1.1.4 Summary

Life insurance was originally dominated by the mutual life insurance companies – companies owned by their policyholders, who therefore received a pro rata share of the company's profits from underwriting life insurance. Similar to the mutual life insurance companies were fraternal life insurance companies, which were started by the various trade associations and fraternal orders to assist their members, the first example being the Ancient Order of United Workmen, organized in 1868 in Meadville, Pennsylvania (Zelizer, 1983). These should be distinguished from stock life insurance companies where the profits are made for the benefit of the stockholders.

Today life insurance has become a major industry across the globe, with many different types of policies available for the consumer and offered by a multitude of insurance carriers. However, most development of structured life insurance products has been driven by the US market, primarily owing to its size. By the end of 2007, total life insurance coverage in the USA reached US\$19.5 trillion, including corporate and individual cover (ACLI, 2008).

Companies such as Lloyd's have been keeping statistics on life expectancies since the late nineteenth century. Actuarial estimation of life expectancies in the general population has therefore become a very exact science. The challenge for an investor is to apply this science to the much smaller populations involved in life settlements.

¹ The full title being "Natural and Political OBSERVATIONS Mentioned in a following INDEX, and made upon the Bills of Mortality". The Bills of Mortality published a list of deaths in London and surrounding areas, including cause of death. They were created by Charles II and his civil servants to provide an early warning system for the onset and spread of bubonic plague – Graunt used them to generate a statistically based estimation of the population of London.

1.1.5 Applications of Life Insurance

An individual might have several reasons for taking out a life insurance policy on his or her life. Examples of these reasons include:

- (1) to provide financial support to dependents in the event of the early death of the breadwinner;
- (2) to pay for funeral expenses, death and/or inheritance taxes;
- (3) to facilitate other financial contracts for example, many mortgage lenders require that a life insurance policy be taken out as a precondition to a mortgage loan;
- (4) to provide compensation for the disruption to a business in the event of the death of a senior employee or director (known as "key man" insurance); and
- (5) as a means of saving (often tied to retirement).

The reason for taking out life insurance will often drive the selection of the type of policy. Some policy types will be appropriate for one situation but not for another. For example, a policy that pays out only on death is appropriate for (2) above whereas a policy that pays out at a certain age, if the insured survives to that age, is appropriate for (5) above. Similarly, a term life policy (under which the policy terminates with no payment if the insured lives longer than the specified term) might be appropriate for (3) above but is unlikely to provide appropriate cover for (1) or (4).

With the spread of company-sponsored and private pension schemes, insurance to provide coverage for dependents (item (1) above) is now often part of a pension scheme and may also be included in the benefits package offered by some employers.

1.1.6 The Parties Involved in a Life Insurance Policy

Several parties are involved in the issue and maintenance of a life insurance policy and each has different roles, responsibilities and interests in the process.

The *owner* of a life insurance policy (also described as the *policyholder*) is the person responsible for making premium payments under that policy. This person is often – but not always – the same as the *insured*, the individual whose life is the subject of the life insurance policy. On occasion, the owner of a life insurance policy may be a trust or a corporation (a so-called "non-natural person"), which is typically the case in policies issued for retirement or tax planning and, of course, for "key man" policies which are usually owned by the employer company.

There may be more than one person insured under a life insurance policy (see "Life Insurance Products and Underwriting" below for a discussion of "first-to-die" and "second-to-die" policies). There will also be at least one (and potentially more than one) *beneficiary*. The beneficiary receives the payout on the policy if it matures through the death of the insured(s) during the prescribed term. The owner has the right to designate the beneficiary of the policy and to change the beneficiary at any time. The company that has issued the life insurance policy is referred to as the *carrier* or the *insurer*. As life insurance is heavily regulated in most jurisdictions, the carrier will need to be licensed to issue life insurance in the relevant territory. In the United States, a carrier wishing to underwrite life insurance throughout the nation will require licensing in each of the fifty states and Washington DC as well as territories such as Puerto Rico.

In many cases – certainly in the case of "traditional" life insurance policies – the owner and the insured will be the same person and the beneficiary or beneficiaries will be dependents of the owner/insured. It is also possible for the owner and the beneficiary to be the same