ECONOMICS
RESEARCH
REPORT

THE IMPLICIT PRICES OF CONTRACT ELEMENTS IN LIFE INSURANCE POLICIES MARKETED IN NORTH CAROLINA

MICHAEL L. WALDEN

ECONOMICS RESEARCH REPORT NO. 45
DEPARTMENT OF ECONOMICS AND BUSINESS
NORTH CAROLINA STATE UNIVERSITY
RALEIGH, NORTH CAROLINA 27650
ERR 45 JULY 1983

THE IMPLICIT PRICES OF CONTRACT ELEMENTS IN LIFE INSURANCE POLICIES MARKETED IN NORTH CAROLINA

Michael L. Walden

Economics Research Report No. 45
Department of Economics and Business
North Carolina State University
Raleigh, North Carolina 27650
July 1983

ABSTRACT

This report presents an empirical investigation of price variation among both whole life insurance policies and term insurance policies. It is hypothesized that price differences between policies can be explained by differences in policy contract provisions and differences in selected company characteristics.

Information was collected from a sample of whole life policies and term policies marketed in North Carolina in 1982. The empirical results strongly support the hypothesis that policy contract provisions and selected company characteristics account for differences in whole life policy prices; the results indicate that fewer contract provisions and company characteristics are related to differences in term policy prices.

Table of Contents

ACKNOWLEDGMENTS

Partial financial support through the Frank J. Schwentker Research Grant of the North Carolina Insurance Education Foundation is acknowledged and appreciated. Helpful comments and encouragement were provided by Joseph E. Johnson of the University of North Carolina at Greensboro and Charles Knoeber, Raymond Palmquist, and James A. Seagraves of North Carolina State University. Blanche Johnson is thanked for mailing the survey and typing the report and Ann Phillips is thanked for editing the report.

THE IMPLICIT PRICES OF CONTRACT ELEMENTS IN LIFE INSURANCE POLICIES MARKETED IN NORTH CAROLINA

I. Introduction

The life insurance industry has been the focus of considerable study regarding the pricing of life insurance policies. The general conclusion of these studies is that significant variation exists in the prices of comparable life insurance [1, 2, 3, 4, 6, 7, 8, 10, 12, 13, 15, 16]. This has led some to conclude that the life insurance market is inefficient in the sense that policies which offer no additional benefits to consumers are sold at higher prices. Furthermore, the Federal Trade Commission has concluded that additional regulation is required at the state level in order to reduce the price variation between policies [8].

A fundamental problem with the aforementioned studies is that they fail to account for differences in contract provisions between policies.[1] This is important because differences in contract

[1] At most, previous studies only consider premiums, cash value, and dividends in measuring price. Two measures of price are typically used: (1) the interest-adjusted price, which sums the present value of premiums and subtracts both the present value of projected dividends and the present value of the cash value at some specified future point, and (2) the rate-of-return measure (primarily for whole life policies), which calculates the implicit rate of return earned on the cash value of a policy.

provisions will affect the value of the policies to consumers and so their prices, just as differences in fuel economy, trunk room, and the presence or absence of air conditioning will affect the prices of automobiles. For example, a whole life policy offering a loan interest rate of 6 percent is likely to be preferred to another whole life policy carrying a loan interest rate of 8 percent. The former policy will probably command a higher price in the market.

Additionally, the studies fail to account for company characteristics which might influence the prices consumers are willing to pay for life insurance. For example, companies which are viewed as less risky by consumers, or companies which offer greater service to policyholders, are likely viewed favorably by consumers. Policies offered by such companies will therefore command higher prices.

The basic point is that the studies which find wide dispersion in the prices of comparable life insurance policies are probably not dealing with comparable policies at all. Since life insurance policies vary by contract provisions and by the characteristics of the companies which offer them, these factors should be considered before any conclusions are reached about price variation or market efficiency.

The purpose of this study is to investigate the impact of contract provisions and company characteristics (which a consumer would value) on the price of life insurance policies. The policies are limited to those which were marketed in North Carolina in 1982. The analysis is performed separately for whole life policies and for term policies. As will be discussed, the analysis was able to statistically explain over 80 percent of the price variation in the sampled whole life policies and over 70 percent of the price variation in the sampled term policies.

The report is organized as follows. Part II reviews previous work which has examined price variation in the life insurance market. Part III develops the model and hypotheses and explains the variables which are used in the analyses. Part IV discusses the data; results and interpretations are presented in Part V; and conclusions and policy implications are offered in Part VI.

II. PREVIOUS WORK

Previous work in analyzing price variation in life insurance policies has been limited.[2] Pritchett and Wilder [14] attempted to statistically explain price variation among whole life policies issued by South Carolinia companies by differences in company characteristics. Price was measured as the present value of premiums net of expected dividends and cash value. They found a company's expense ratio positively related to price, a company's investment returns negatively related to price, a company's profits positively related to price for mutual companies only, a company's premium income (a measure of size) negatively related to price for stock companies only, and mutual companies listed in New York as offering cheaper policies. Pritchett and Wilder were able to account for 62 percent of the price variation in policies of stock companies and 77 percent of the price variation in policies of mutual companies.

Kamath and Lin [11] also studied price variation in a sample of whole life policies. Using the interest-adjusted surrender cost index as the measure of price, they found the following variables positively related to price: five-year average size of policies in force, the policy loan ratio, the rate of return on admitted assets, and the current year's investment expense ratio; and the following variables negatively related to price: the current year's average size of policies in force, and the five-year average investment expense ratio.

Lastly, Winter [18] also analyzed price differences in a sample of whole life policies. He found the company's rate of return

---

[2] Studies which analyze reasons for price variation in the life insurance market [11, 14, 18] are to be distinguished from studies which measure price variation [3, 4, 7, 8, 13, 15, 16].

negatively related to price, companies listed in New York as offering lower priced policies, and companies with a very favorable mortality rating as offering lower priced policies.

There are two major problems with these studies. First, the studies do not present a framework for explaining why consumers would be willing to pay more for certain policies. Second, and related to the first problem, the studies do not account for the effects of differences in policy contract provisions on policy prices. This means the impacts of the factors included in the studies will not be correctly assessed - that is, their impacts will be biased because of the omission of the relevant contract provisions.

III. A MODEL FOR ANALYZING PRICE VARIATION IN LIFE INSURANCE POLICIES

Theoretical Model

All of the techniques used for comparing life insurance policy prices assume that a policy is only composed of a protection component, a cash value component (if whole life), and a dividend component (if participating). However, life insurance policies are more than this because, in most cases, policies contain numerous contract provisions. Since some contract provisions are more favorable to the policyholder than others, it is expected that policies with more favorable contract provisions will command a higher price on the market. In other words, life insurance policy prices should be partially a function of contract provisions. This is consistent with ideas recently forwarded by Hite [9] and Smith [17].

Company characteristics, *per se*, should have no impact on policy prices in a competitive market. For example, a company with higher expenses can try to pass those higher expenses on to consumers in the form of higher policy prices, but the higher prices will not be sustainable in the face of competition. Only if company characteristics are proxies for policy contract provisions or proxies for services which consumers value will company characteristics have an impact on price in a competitive market. For example, if companies with higher expenses provide more service to policyholders, then higher expenses will be positively related to higher policy prices.

In summary, the price of a particular policy i (p_i) is related to the policy's contract provisions (x_{i1}, x_{i2}, x_{i3}. . . . x_{in}) and company characteristics that are proxies for policy contract provisions or service characteristics (c_{i1}, c_{i2}, c_{i3}. . . c_{im}):

(1) $p_i = f(x_{i1}, x_{i2}, x_{i3} \ldots x_{in}, c_{i1}, c_{i2}, c_{i3} \ldots c_{im})$

Empirical Model

Since contract provisions differ between whole life and term policies, these two types of policies are analyzed separately.

Whole Life Policies

A whole life policy provides protection and accumulates a cash value in exchange for payment of the premiums. Price of the whole life policy at the time of purchase is calculated as the present value of the scheduled premiums to some future point in time. Future dollars are discounted using an interest rate for a riskless security having a term equal to the time period of the price calculation.

The factors that are hypothesized to influence the policy price are categorized into contract provisions and company characteristics and are listed below:

Contract Provisions:

1. Cash value - The value of the cash value at some specified future point in time is calculated as its present value. Since the cash value is a potential return to the policyholder, consumers are expected to prefer policies with higher cash values (per $1,000 of the face value) and to be willing to pay more for such policies. The level of the cash value should thus be positively related to price.
2. Dividends - Since dividends are a return to the policyholder, dividends are expected to be positively related to price. However, dividends cannot be forecasted exactly. Therefore, dividends are simply measured by their existence or non-existence. A "dummy" variable measures the existence of dividends, taking the value of "1" for participating policies and "0" for non-participating policies.
3. Reinstatement time limit - The reinstatement time limit is a provision stating the maximum length of time (in years) before which a lapsed policy can be reinstated without evidence of insurability. It is expected that consumers prefer longer reinstatement periods to shorter periods; hence, a positive

relationship is expected between the reinstatement time limit and price.

4. Reinstatement interest rate - The reinstatement interest rate is the interest rate charged on skipped premiums in order to reinstate a lapsed policy. Consumers are expected to prefer a lower interest rate and therefore should be willing to pay a higher price for such a provision. Consequently, the reinstatement interest rate is expected to be negatively related to price.
5. Incontestability time limit - The incontestability time limit is the number of years after which the company cannot contest the policy. Consumers are expected to prefer shorter incontestability time limits, hence the relationship to price should be negative.
6. Suicide time limit - The suicide time limit is the number of years before which the policy won't pay because of suicide of the insured. Again, since consumers are assumed to prefer shorter suicide time limits, the suicide time limit should be negatively related to price.
7. Minimum dividend interest rate - Generally, participating policies guarantee a minimum interest rate which will be paid on dividend options. Consumers likely prefer higher minimums; hence, the minimum dividend interest rate should be positively related to price.
8. Effective loan interest rate - Whole life policies typically allow policyholders to borrow on their accumulated cash value. The effective loan interest rate is the cost of such a loan when interest is paid at the end of each year. Since consumers are expected to prefer lower interest rates, consumers will pay more for policies with a lower effective loan interest rate. Hence, the effective loan interest rate should be negatively related to price.
9. Paid-up insurance - Whole life policies generally include as one of their non-forfeiture options an amount of paid-up insurance. If consumers prefer greater amounts of paid-up insurance, then the amount of paid-up insurance at a point in time should be positively related to price.

10. Minimum amount necessary to select settlement option - Most whole life policies provide for a number of settlement options for the policy proceeds in case of death of the insured. However, the company will honor the policyholder's option selection only if the policy proceeds are greater than a minimum amount. Since a lower minimum amount will allow more policyholders to have their settlement option honored, it is expected that the average consumer will prefer lower minimum amounts, thus leading to a positive relationship between the minimum amount and price.
11. Number of settlement options - The number of settlement options for the policy proceeds in case of death of the insured varies among policies. Since a greater number of settlement options gives the policyholder greater flexibility in settlement of the policy proceeds, it is expected that consumers prefer a greater number of settlement options and would be willing to pay a higher price for policies with more options. Hence, the number of settlement options is expected to be positively related to price.
12. Average minimum interest rate on settlement options - Policies guarantee a minimum interest rate paid on settlement options (other than the option to receive the policy proceeds in a lump sum). If consumers prefer higher minimum interest rates, then the guaranteed minimum interest rate should be positively related to price.
13. Premiums can be reduced - Some policies include a provision stating that premiums can be reduced in the future. Since consumers are expected to prefer and to be willing to pay for such a provision, policies including this provision are expected to be higher priced.
14. Smoker/non-smoker - Smokers have a higher annual probability of death than non-smokers. Therefore, policies issued to smokers will be issued at higher prices.
15. Face value amount - Fixed company costs per $1,000 of face value generally decline as the policy face value increases. Therefore, the policy face value amount is expected to be negatively related to price.

views, in which case the total effect of the company's investment rate of return on price would be near zero.

Other company characteristics unrelated to company risk were also included in the analysis:

20. Mutual/stock company - Some analysts of the life insurance market have claimed that since mutual companies are owned by policyholders they will offer lower prices [7]. There is no economic justification for this expectation. Since stock companies and mutual companies must compete in the same market, the form of ownership should have no impact on price. Therefore, a variable representing form of ownership (mutual or stock) is expected to have no influence on price.
21. Lapse rate - A higher than average lapse rate may cause higher than average costs to the company and therefore may be expected to be positively related to price. However, in a competitive market such higher costs will not be able to be passed on to the consumer. Therefore, the lapse rate is expected to have no influence on price.
22. Expense rate - If the expense rate of the company is directly related to the service provided by the company to policyholders, and if consumers are willing to pay more for a policy from a company providing greater service, then the company's expense rate should be positively related to price. Alternatively, if a company's expense rate is not related to the company's policyholder service, then the expense rate should not be related to price. This is because higher company expenses not related to a service provided by the company will not be able to be passed on to the consumer in a competitive market.
23. Average policy size in force - The average size of the policies in force by a company is one measure of the company's scale of operation. It may be expected that economies of scale resulting from offering larger policies would result in lower company costs and therefore lower policy premiums. However, it is expected that the lower costs resulting from offering policies of larger face amount will be captured by the variable measuring

the face value amount of the policy. Any residual savings from offering larger policies will be removed by competition. Therefore, it is hypothesized that the company's average policy size in force will have no impact on policy price.

24. Surplus funds - A company accumulating surplus funds may attempt to gain a competitive advantage by using those funds to lower policy prices. If so, then the amount of surplus funds will be negatively related to price.

Term Policies

A term policy provides protection in exchange for payment of the premiums. No cash value accumulates with a term policy. Price of the term policy at the time of purchase is calculated as the present value of the scheduled premiums to some future point in time.

The factors that are hypothesized to influence the term policy price are again categorized into contract provisions and company characteristics. Where the provisions or characteristics are the same as for whole life policies, only a short comment reviewing the hypothesis is provided.

Contract Provisions:

1. Dividends - As with whole life policies, dividends are a return to the policyholder of a term policy; consequently, dividends are expected to be positively related to price. Again, dividends are measured by a "dummy" variable, with "1" for participating policies and "0" for non-participating policies.
2. Maximum age to renew - Term policies set limits on the policyholder's age for which the policy will be renewed. It is expected that consumers prefer higher age maximums since a higher maximum gives them an opportunity to continue the policy for a longer period of time. Therefore, the maximum age to renew the policy should be positively related to price.
3. Incontestability time limit - As for whole life policies, the incontestability time limit is expected to be negatively related to price.
4. Suicide time limit - As for whole life policies, the suicide

time limit is expected to be negatively related to price.

5. Minimum dividend interest rate - As for whole life policies, the minimum dividend interest rate is expected to be positively related to price.
6. Minimum amount necessary to select settlement option - As for whole life policies, the minimum amount necessary to select a settlement option is expected to be positively related to price.
7. Number of settlement options - As for whole life policies, the number of settlement options is expected to be positively related to price.
8. Average minimum interest rate on settlement options - As for whole life policies, the average minimum interest rate on settlement options is expected to be positively related to price.
9. Maximum age for conversion of policy - Most term policies allow the policyholder to convert to a whole life policy; however, such a conversion can only take place before a stated maximum age. The higher the maximum age, the greater the opportunity for policyholders to convert. Therefore, it is expected that consumers would be willing to pay a higher price for policies with a higher maximum age for conversion.
10. Years policy is renewable. Policies renewable for a period longer than one year generally provide for level premiums during that time period. If consumers prefer such level premiums as compared to annual increasing premiums, then the years that the policy is renewable will be positively related to price.
11. Premiums can be reduced - As for whole life policies, policies including a provision stating that premiums can be reduced are expected to command a higher price in the market.
12. Smoker/non-smoker - As for whole life policies, smoker policies will be issued at higher prices.
13. Face value amount - As for whole life policies, the policy face value amount is expected to be negatively related to price.

Company Characteristics:

The same set of company characteristics, for the same reasons, is expected to be related to term policies as was related to whole life policies. The directions of the relationships are also expected to be the same.

IV. DATA

All U.S. companies marketing life insurance policies in North Carolina (415 in number) were asked to provide information for their most popular whole life and term policies for a male aged 35. Ninety-nine (99) companies returned whole life policies and 81 companies returned term policies.[3] Fifty-nine (59) of these whole life policies and 47 of these term policies contained complete information, and these policies are the samples for the analysis. The policies contained no riders or other special provisions. None of the policies were marketable only to special groups.

Since the companies issuing these policies are not necessarily a random sample of North Carolina or U.S. life insurance companies, it is important to compare the major characteristics of the sample companies to the same characteristics for all North Carolina and U.S. life insurance companies. This is done in Table 1. It is apparent that the sample companies are larger in terms of assets and insurance in force. Therefore, technically the results should apply only to large life insurance companies, although there is no reason to believe that smaller companies would behave differently with respect to pricing and marketing of policies.

Policy data were taken directly from the policies. In calculating the price of policies, a 30-year term of comparison was used for the male aged 35. In converting future dollars to the present,

---

[3]Other companies responded but were not used for the following reasons: a) 14 sent "special" whole life policies (i.e., adjustable face value), b) 3 companies issued policies only to "special" clientele, c) 15 companies issued non-life policies, e.g., health, credit, or group policies, and d) 19 companies sent decreasing term or other non-traditional term policies.

Table 1. Major characteristics of sample, North Carolina, and U.S. life insurance companies (1981 data)

	Assets per company	Total insurance in force per company (Includes ordinary, group, industrial and credit insurance)
59 whole life sample companies	$2,326,350,491	$18,277,407,310
47 term sample companies	$2,991,566,383	$22,213,111,230
All companies operating in N.C. (415)	not available	$224,108,430
All U.S. companies (2028)	$268,631,160	$2,563,491,100

Sources: North Carolina Department of Insurance
Best's Insurance Reports: Life-Health, 1982.

a 13 percent interest rate (discount rate) was assumed.[4] This was the average interest rate of 30-year Treasury bonds for January through September, 1982. The 13 percent interest rate was used to discount future premiums.

Company characteristics were taken from the 1982 edition of Best's Insurance Reports: Life-Health [5]. This report provides company data as of December 13, 1981. Most of the variables used to measure company characteristics correspond directly to those characteristics discussed in the previous section; however, some comments on a few variables should be noted. Assets are measured by Best's variable "admitted assets," which include, for example, the value of bonds, stocks, mortgage loans, real estate, policy loans, premiums due, cash, and accrued investment income. The company's investment rate of return is measured by Best's variable "net yield," which is the ratio of net investment income to net invested assets, plus accrued investment income modified by a half year's interest. The calculation is after deducting investment expenses but before taxes. The expense rate is Best's measurement of the company's renewal expense ratio for all business. This is a weighted cost based on both new insurance issued and insurance in force and is designed to avoid over-emphasis of high costs associated with new business [5 p. xii]. Lastly, surplus funds are measured by Best's capital surplus funds, which include special surplus, capital surplus, paid-in and contributed surplus, and unassigned surplus.

---

[4] Future dollars are worth less because a dollar today can be held and invested and yield a greater nominal amount in the future. Therefore, future dollars are converted to present value by reducing them at a rate corresponding to the rate at which a dollar could earn a return on a riskless investment. Typically, the interest rate on a Treasury security corresponding to the term of comparison is used as the discount rate.

V. EMPIRICAL ANALYSIS

Since all of the policies had incontestability time limits of two years and suicide time limits of two years, these contract provisions were eliminated from consideration in the analysis of both whole life and term policies.

Table 2 lists the variables used in the analysis and their corresponding names. Descriptive statistics are presented in Table 3. The policy price variables, cash value variables, and paid-up insurance amount variables are measured per $1,000 of policy face value. Since 70 percent of the companies supplying whole life policies and 80 percent of the companies supplying term policies had company ratings by Best of A+, the Best's company rating variable was used to test the impact on price of a rating below A+.

In both the whole life policy analysis and the term policy analysis two variables were not able to be tested because of their strong association with other variables in the analyses. These were the variables MIN. DIV. R (minimum interest rate paid on dividends) and MUTUAL CO (mutual company). Both variables were highly associated (correlated) with DIV (representing the payment of dividends). This is the statistical problem of collinearity and is eliminated only by dropping one of the collinear variables from the analysis.[5]

---

[5]DIV and MIN. DIV. R were correlated because of the fact that MIN. DIV. R was 0 for companies not paying dividends (non-participating companies). The correlation arose because a "0" value on DIV (for a non-participating company) was matched with a "0" value for MIN. DIV. R, whereas a "1" value for DIV (for a participating company) was matched with a positive value for MIN. DIV. R. The correlation between DIV. and MUTUAL CO. was -.62 for whole life policies and -.60 for term policies. The parameter estimate for MUTUAL CO was -7.61 with a t-value of 1.53 in the whole life analysis and -3.74 with a t-value of 0.67 in the term analysis. Since MUTUAL CO. and MIN. DIV. R were not statistically significant when included in the analysis with DIV, they were dropped from the analysis. Technically, DIV therefore picks up some of the effects of both MUTUAL CO. and MIN. DIV. R.

Table 2. Variable names

Variable	Variable Name
Price, whole life (present value)	PWL
Price, term (present value)	PT
Cash value (present value)	CV
Dividend (1 for dividends, 0 for no dividends)	DIV
Reinstatement time limit	REINST TIME
Reinstatement interest rate	REINST R
Minimum dividend interest rate	MIN. DIV. R
Effective loan interest rate	LOAN R
Paid-up insurance amount (present value)	PAID-UP AMT.
Minimum amount for settlement option selection	MIN. SETTLE. AMT.
Number of settlement options	NUM. SETTLE OPTS.
Average minimum interest rate on settlement options	MIN. SETTLE. R
Premiums can be reduced	REDUCE PREM.
Smoker/non-smoker	SMOKER
Face value amount	FACE AMT.
Maximum age to renew (term)	MAX. AGE RENEW.
Maximum age for conversion (term)	MAX. AGE CONVERT.
Years policy is renewable (term)	YRS. POL. RENEW.
Best's company rating	BEST'S RT.< A+
Company age	CO. AGE
Company assets	ASSETS
Company investment rate of return	INVEST. R
Mutual/stock company	MUTUAL CO.
Company ordinary lapse ratio	LAPSE RT
Company renewal expense ratio	EXPENSE RT
Company average policy size in force	AVER POL SIZE
Company surplus funds	SURPLUS

Table 3. Descriptive Statistics

Variable	Mean Value	Standard Deviation	Minimum Value	Maximum Value
I. Whole life (n = 59)				
PWL ($, per $1,000 of face amount)	130.73	18.59	97.03	189.00
CV ($, per $1,000 of face amount)	362.39	35.31	316.15	461.54
DIV (1=dividends; 0=no dividends)	0.41	0.50	0.00	1.00
REINST TIME (yrs.)	5.41	1.31	3.00	9.00
REINST R (%)	6.00	0.45	5.00	8.00
MIN. DIV. R (%)	2.93	0.78	0.00	5.00
LOAN R (%)	7.71	0.89	5.03	9.00
Paid-UP AMT.($, per $1,000 of face amount)	776.36	21.83	739.00	850.00
MIN SETTLE. AMT ($)	2,137.63	1,199.26	120.00	5,000.00
NUM SETTLE. OPTS.	4.47	0.50	4.00	5.00
MIN. SETTLE. R (%)	3.06	0.43	2.50	5.00
REDUCE PREM (1 = yes; 0 = no)	0.08	0.28	0.00	1.00
SMOKER (1 = smoker; 0 = non-smoker)	0.85	0.36	0.00	1.00

Table 3. Descriptive Statistics -- (continued)

Variable	Mean Value	Standard Deviation	Minimum Value	Maximum Value
I. Whole life (n = 59)				
FACE AMT. ($)	48,813.56	22,444.16	5,000.00	150,000.00
BEST'S RT. <A+ (1=yes; 0=no)	0.29	0.46	0.00	1.00
CO. AGE (yrs.)	66.56	39.77	4.00	147.00
ASSETS ($)	2,326,350,492.00	5,787,338,472.00	6,705,000.00	36,758,160,000.00
INVEST. R (%)	8.46	1.16	6.78	13.00
MUTUAL CO. (1=mutual; 0=stock)	0.31	0.46	0.00	1.00
LAPSE RT. (%)	12.95	4.13	6.80	29.00
EXPENSE RT. (%)	4.49	1.23	3.30	12.00
AVER. POL. SIZE ($)	18,325.53	10,735.65	2,755.00	72,206.00
SURPLUS ($)	145,087,102.00	273,743,179.00	2,545,000.00	1,406,590,000.00

Table 3. Descriptive Statistics (continued)

Variable	Mean Value	Standard Deviation	Minimum Value	Maximum Value
II. Term (n = 47)				
PT ($, per $1,000 of face amount)	45.92	8.09	32.75	87.00
DIV. (1=dividends; 0=no dividends)	0.34	0.48	0.00	1.00
MAX. AGE RENEW. (yrs.)	85.79	13.82	65.00	100.00
MIN. DIV. R	3.05	0.50	2.50	4.00
MIN. SETTLE. AMT ($)	2,204.68	1,317.24	120.00	5,000.00
NUM. SETTLE. OPTS.	4.57	0.50	4.00	5.00
MIN. SETTLE. R(%)	3.13	0.46	2.50	5.00
MAX. AGE CONVERT. (yrs.)	68.53	8.44	50.00	100.00
YRS. POL. RENEW. (yrs.)	1.45	1.61	1.00	10.00
REDUCE PREM. (1=yes); 0=no)	0.02	0.15	0.00	1.00
SMOKER (1=smoker; 0=non-smoker)	0.81	0.40	0.00	1.00

Table 3. Descriptive Statistics (continued)

Variable	Mean Value	Standard Deviation	Minimum Value	Maximum Value
II. Term (n = 47)				
FACE AMT. ($)	59,574.47	20,558.24	25,000.00	100,000.00
BEST'S RT. <A+ (1=yes; 0=no)	0.19	0.40	0.00	1.00
CO. AGE (yrs.)	73.98	41.71	4.00	147.00
ASSETS ($)	2,991,566,383.00	6,474,817,550.00	6,705,000.00	36,758,160,000.00
INVEST. R (%)	8.42	1.00	6.78	13.00
MUTUAL CO. (1=mutual; 0=stock)	0.40	0.50	0.00	1.00
LAPSE RT. (%)	12.58	3.68	7.00	24.00
EXPENSE RT. (%)	4.30	0.71	3.03	6.00
AVER. POL. SIZE ($)	18,791.53	11,349.34	4,238.00	72,206.00
SURPLUS ($)	180,344,702.00	305,967,181.00	3,565,000.00	1,406,590,000.00

Whole Life Policy Analysis

An ordinary least squares (OLS) regression analysis was used to analyze the impacts of contract provisions and company characteristics on life insurance policy prices. This methodology assumes that the impacts of contract provisions and company characteristics are combined linearly to form the total impact on price.

The results of the whole life policy analysis are presented in Table 4. The numbers in the first column are the "parameter estimates" for the explanatory variables (the contract provision and company characteristics). These numbers are the estimated impact on the whole life price of a one unit change in the explanatory variable. For example, an increase of $1 in the cash value at age 65 is estimated to increase the present value price of the policy by $0.21. The existence of dividends is estimated to increase the present value price of the policy by $18.98. Conversely, a 1 percentage point increase in the effective loan interest rate is estimated to decrease the present value price by $2.84.

The second column of numbers, labeled "t statistic," gives an indication of how much confidence can be put in generalizing the results to other whole life policies not included in the sample. In other words, the t-statistic measures how confident the reader can be in judging the paramenter estimates to be statistically different than zero. Asterisks next to the t-statistic indicate the degree of confidence: one asterisk (*) means the parameter estimate, given the actual parameter is zero, could have occurred by chance only 1 out of 10 times; two asterisks (**) indicate the parameter estimate could have occurred by chance only 5 out of 100 times; three (***) indicates the parameter estimate could have occurred by chance only 1 out of 100 times. T-statistics with no asterisks mean the parameter estimate, when the actual parameter is zero, could have occurred by chance more than 1 out of 10 times; typically, such estimates are

Table 4. OLS regression results for whole life policy analysis

Dependent variable = PWL (present value of premiums per $1,000 of face amount)

Explanatory Variables	Parameter Estimate	t Statistic	Variable Label
INTERCEPT	170.523	2.115**	
CV	0.214	4.240***	Cash value at age 65
DIV	18.980	5.734***	1 if dividends, 0 if no dividends
REINST TIME	-1.379	-1.193	Reinstatement time limit
REINST R	-0.072	-0.022	Reinstatement interest rate
LOAN R	-2.838	-1.686*	Effective loan interest rate
PAID-UP AMT.	-0.171	-1.785*	Paid up insurance at age 65
MIN. SETTLE AMT.	$-2.523X10^{-3}$	-2.111**	Minimum amt. for settlement option selection
NUM SETTLE OPTS.	-1.646	-0.530	Number of settlement options
MIN. SETTLE. R	6.775	2.085**	Average minimum interest rate on settlement options
REDUCE PREM.	9.891	1.936*	Premiums can be reduced (1 if yes, 0 if no)
SMOKER	6.745	1.726*	1 if smoker, 0 if non-smoker
FACE AMT.	$-0.228X10^{-3}$	-3.602***	Face value amount
BEST'S RT. <A+	-8.737	-2.213**	Best's Company rating (1 if below A+, 0 if A+)
CO. AGE	0.052	1.122	Company age
ASSETS	$0.085X10^{-5}$	1.994**	Company assets
INVEST R	2.727	1.903*	Company investment rate of return
LAPSE RT	0.527	1.373	Company ordinary lapse ratio
EXPENSE RT	1.367	1.121	Company renewal expense ratio
AVER POL SIZE	$-0.129X10^{-3}$	-0.965	Company average policy size in force
SURPLUS	$-0.015X10^{-3}$	-1.602	Company surplus funds

R^2 = 0.86, F value = 11.708***

$\bar{R}^2$ = 0.79

Number of cases = 59

*** significant at the .01 level

** significant at the .05 level

* significant at the .10 level

considered statistically insignificant. Conversely, t-statistics with asterisks indicate the parameter estimates are statistically significant.

With this background in mind, the results can be summarized as follows. Among the contract provisions, a greater cash value (CV) has a positive impact on price, as expected, and the estimate is very statistically significant. Policies with dividends (DV) are also more costly, and the parameter estimate is very statistically significant. A longer reinstatement time period is estimated to reduce price, which is opposite of our expectations, but the estimate is not statistically significant. A higher reinstatement interest rate lowers the policy price, as expected, but the result is not statistically significant. A higher effective loan interest rate also lowers the policy price, as expected, and the estimate is statistically significant. The paid-up insurance amount at age 65 is significantly negatively related to price, which is opposite of our expectations. The minimum amount necessary for settlement option selection is negatively related to price, as expected, and the result is statistically significant. The number of settlement options is negatively related to price, contrary to our expectations, but the result is not statistically significant. The average minimum interest rate on settlement options and a provision for reducing premiums are both positively related to price, as expected, and both are statistically significant. Finally, policies sold to smokers cost more and policies of larger face amounts cost less. Both these results conformed to our expectations and were statistically significant.

Among the four company characteristics measuring risk, Best's rating and company assets performed as expected.[6] Policies from

[6]Company characteristics were also measured as five-year averages; however, the results in both the whole life and term policy analyses did not change.

companies with a Best rating below A+ are sold at a discount, whereas policies from companies having greater assets are sold at a premium. Both of these results are statistically significant. Company age is positively related to price, but the result is not significant. The company's investment rate of return is significantly positively related to price, indicating that consumers put greater weight on the company's ability to meet its claims than on the greater risk associated with a higher rate of return.

Among the other company characteristics, the lapse rate is positively related to price, but not statistically significant, as expected. The expense rate is also positively related to price but not statistically significant. Recall that with respect to the expense rate, two hypotheses were proposed. If the expense rate measures service provided to the policyholder, then it should be positively related to price. However, if the expense rate measures costs unrelated to service, then it should not be related to price in the statistical sense. The result seems to conform to the latter hypothesis. The average policy size of the company is negatively related to price but not statistically significant, as hypothesized. Finally, the company surplus is negatively related to price, as expected, but the result is not statistically significant.[7]

The statistic at the bottom of Table 4, R^2, indicates the percentage of the variation in price that is "explained," in a statistical sense, by the model. The R^2 result, 86 percent, is high and is statistically significant.

In general, the results of the model performed quite well with respect to our expectations. Twelve (12) of the variables, excluding the intercept, were estimated to be significantly related, in the statistical sense, to price. Of these 12, the results for 11

---

[7]Company assets and company surplus were strongly correlated with each other (-.80 in the whole life analysis and -.75 in the term analysis). Such a correlation could account for SURPLUS not being statistically significant. However, when company assets and company surplus were each included in the analysis separately, their parameter estimates were not statistically significant.

conformed to our expectations. Three variables had statistically insignificant parameter estimates that matched our hypothesis of no impact on price. Of the remaining five variables which were found not to be statistically significantly related to price, the parameter estimates for three of them nevertheless conformed to our expectations. The results seem to indicate that contract provisions and company characteristics related to consumers' perceptions of the policy have a significant impact on policy price.

Term Policy Analysis

The results of the term policy analysis are presented in Table 5. Five of the 18 variables (excluding the intercept) are statistically significant. However, the parameter estimates for four of the five variables have the expected impact on price: policies promising to pay dividends are higher priced, policies including a provision for possible reduction of premiums are higher priced, policies sold to smokers cost more, and policies with higher face value amounts cost less. The results also indicate that term policies issued from companies experiencing higher lapse rates cost more, but that the company's expenses and operating scale (AVER POL SIZE) have no significant impact on price, as expected.

Among the other variables which are not statistically significant, the following do have the anticipated parameter sign: maximum age for renewal (positive), number of settlement options (positive), average minimum interest rate on settlement options (positive), years policy is renewable (positive), Best's company rating below A+ (negative), company age (positive), and company investment rate of return (positive). Only the minimum settlement amount, maximum age for conversion, company assets, and company surplus have impacts contrary to our expectations.

The model as a whole "explains" a statistically significant amount of the variation in term policy prices (77 percent).

Table 5. OLS regression results for term policy analysis

Dependent variable = PT (present value of premiums per $1,000 of face amount)

Explanatory variables	Parameter Estimate	t Statistic	Variable label
INTERCEPT	20.919	0.997	
DIV	5.077	2.037**	1 if dividends, 0 if no dividends
MAX AGE RENEW	$8.911X10^{-3}$	0.127	Maximum age to renew
MIN. SETTLE. AMT.	$0.507X10^{-3}$	0.695	Minimum amount for settlement option selection
NUM. SETTLE. OPTS.	0.244	0.127	Number of settlement options
MIN. SETTLE. R	1.400	0.727	Average minimum interest rate on settlement options
MAX. AGE CONVERT.	-0.145	-1.409	Maximum age for conversion
YRS. POL. RENEW.	0.839	1.159	Years policy is renewable
REDUCE PREM.	51.820	8.542***	Premiums can be reduced (1 if yes, 0 if no)
SMOKER	7.198	2.989***	1 if smoker, 0 if non-smoker
FACE AMT.	$-0.140X10^{-3}$	-2.636***	Face value amount
BEST'S RT. <A+	-0.078	-0.031	Best's Company rating (1 if below A+, 0 if A+)
CO. AGE	0.040	1.325	Company age
ASSETS	$-0.010X10^{-5}$	-0.394	Company assets
INVEST R	0.850	0.829	Company investment rate of return
LAPSE RT	0.586	1.732*	Company ordinary lapse ratio
EXPENSE RT	1.844	1.214	Company renewal expense ratio
AVER. POL. SIZE	$0.059X10^{-3}$	0.735	Average policy size in force
SURPLUS	$0.080X10^{-5}$	0.154	Company surplus funds

R^2 = 0.77, F value = 5.100***

$\bar{R}^2$ = 0.62

Number of cases = 47

*** significant at the .01 level

** significant at the .05 level

* significant at the .10 level

VI. CONCLUSIONS AND POLICY IMPLICATIONS

This research has produced evidence to support the general hypothesis that policy contract provisions and company characteristics which affect consumers' perceptions of policies have a significant impact on the price of a whole life insurance policy. Specifically, (1) the size of the cash value, (2) the payment of dividends, (3) the level of the average minimum interest rate on settlement options, (4) a provision for possible reduction of premiums, (5) a smoker provision, (6) the size of the company's assets, and (7) the company's investment rate of return were found to be positively related to whole life policy price; whereas (1) the effective loan interest rate, (2) the dollar amount of paid-up insurance at age 65, (3) the minimum required amount for settlement option selection, (4) the face value amount of the policy, and (5) a Best's company rating under A+ were found to be negatively related to policy price. All of these results conformed to our expectations except for one: the negative impact of the paid-up life insurance amount. It was expected that, all other things equal, consumers would prefer policies with a higher promised paid-up insurance amount (at age 65) and therefore consumers would be willing to pay a higher price for such policies. However, the results indicate that consumers pay less for policies promising a higher paid-up insurance amount (at age 65).

The research produced less evidence to support the hypothesis that policy contract provisions and company characteristics which affect consumers' perceptions of policies have a significant impact on the price of term insurance policies. Only the promised payment of dividends, a provision providing for possible reduction of premiums, a smoker provision, the policy face value amount, and the company lapse rate were found to be significantly related to the term policy price. Perhaps, since the whole life policy is a more complicated

and costly policy than the term policy, consumers are more motivated to take into account differences in contract provisions and company characteristics on whole life policies than on term policies. Consumers may evaluate that the costs of assessing differences in contract provisions and company characteristics between term policies are greater than the benefits derived from savings on price resulting from such a comparison. In addition, financial failure of a life insurance company means a greater loss for whole life policyholders, who lose both protection and savings (cash value), than for term policyholders who lose only protection. This may partially explain the insensitivity of term price to company risk variables.

One factor was not able to be precisely measured in the analysis - the level of service provided by the company to the policyholder. It is expected that consumers would be willing to pay more for policies from companies providing a higher level of service. The omission of a variable directly measuring service provision alters the results only if such a variable is strongly related to (correlated with) one of the other variables in the analysis.

Since the major studies of comparative prices between policies and the charges of market inefficiency are based on whole life policies, the results for whole life policies are perhaps more important. On the basis of the research presented here, two conclusions can be made. First, contract provisions and company characteristics do have a significant impact on policy price, therefore suggesting that differences in the price of whole life policies can be explained, to a significant degree, by variation in contract provisions and company characteristics affecting consumers' perceptions of policies. Second, constructed price indices used for comparing whole life policies, such as those proposed by Belth and others [1, 7, 8], are wrong and misleading since they do not account for differences in contract provisions and selected company characteristics. One way to modify the interest-adjusted cost index, for example, would be to subtract the value of contract provisions and company characteristics using the parameter estimates from Table 4 or a similar analysis. However, the parameter estimates in Table 4

are market averages; each consumer's valuation of a contract provision or company characteristic is likely to vary. Therefore, it is better to let consumers apply their own subjective valuations of contract provisions and company characteristics, which is, of course, what consumers do in comparing policies.

In summary, it is too simplistic to compare life insurance policies on the basis of only their price, dividend provision (if available), and cash value provision (if available). Life insurance policies are more complicated products. This research has provided evidence to support the claim that life insurance policy prices vary because of differences in contract provisions and company characteristics. The claim is best supported by an analysis of whole life policies, while weakly supported by an analysis of term policies. Additional research on other policy samples is recommended.

REFERENCES

1. Belth, Joseph. Life Insurance: A Consumer's Handbook, Bloomington, Indiana: Indiana University Press, 1973.

2. Belth, Joseph, "Price Disclosure in Life Insurance," Wisconsin Law Review, Vol. 1972, No. 4, pp. 1054-1067.

3. Belth, Joseph. "The Rate of Return on the Savings Element in Cash-Value Life Insurance," Journal of Risk and Insurance, Vol. 35, No. 4, December 1968, pp. 569-582.

4. Belth, Joseph. "The Cost of Life Insurance to the Policyholder - A Single Year Attained Age System," Journal of Risk and Insurance, Vol. 28, No. 4, December 1961, pp. 23-31.

5. Best's Insurance Reports: Life-Health, Oldwick, New Jersey: A. M. Best Company, 1982.

6. Cargill, Thomas F. and Terrie E. Troxel. "Modeling Life Insurance Savings: Some Methodological Issues," Journal of Risk and Insurance, Vol. 46, No. 3, September 1979, pp. 391-410.

7. Consumers Union. Consumers Union Report on Life Insurance, Mt. Vernon, N.Y.: Consumers Union, 1980.

8. Federal Trade Commission. Life Insurance Cost Disclosure, July 1979.

9. Hite, Gailen L. "Review of FTC'S 'Life Insurance Cost Disclosure'," Journal of Risk and Insurance, Vol. 47, No. 3, September 1980, pp. 568-574.

10. Hutchins, Robert C. and Charles E. Quenneville. "Rate of Return Versus Interest-Adjusted Cost," Journal of Risk and Insurance, Vol. 42, No. 1, March 1975, pp. 69-79.

11. Kamath, Ravindra R. and Cheyeh Lin. "Factors Affecting the Cost of Participating Whole Life Insurance," Nebraska Journal of Economics and Business, Vol. 26, No. 3, Summer 1981, pp. 55-69.

12. Launie, J. J. "Price Differentials in Life Insurance," Journal of Risk and Insurance, Vol. 35, No. 2, June, 1969, pp. 283-286.

13. Murray, Michael L. "Analyzing the Investment Value of Cash Value Life Insurance," Journal of Risk and Insurance, Vol. 43, No. 1, March 1976, pp. 121-128.

14. Pritchett, S. Travis and Ronald P. Wilder. "Company Characteristics and Policyowner Cost Structures for Cash Value Life Insurance," Journal of Risk and Insurance, Vol. 44, No. 3, September 1977, pp. 355-372.

15. Scheel, William. "Yearly Prices of Protection and Rates of Return in a System of Life Insurance Cost Disclosure," Journal of Risk and Insurance, Vol. 44, No. 1, March 1977, pp. 37-51.

16. Schwarzschild, Stuart. "Rates of Return on the Investment Differentials Between Life Insurance Policies," Journal of Risk and Insurance, Vol. 35, No. 4, December 1968, pp. 583-595.

17. Smith, Michael L. "The Life Insurance Policy as an Options Package," Journal of Risk and Insurance, Vol. 49, No. 4, December 1982, pp. 583-601.

18. Winter, Ralph. "On the Rate Structure of the American Life Insurance Market," Journal of Finance, Vol. 36, No. 1, March 1981, pp. 81-96.

Agricultural Research Service

North Carolina State University
at Raleigh

D. F. Bateman, Director of Research