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An Econometric Analysis of the Demand For Life Insurance Policy Loans

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ABSTRACT

This article assesses the impact that redesigned life insurance policy loan provisions and changes in financial markets have had on the demand for policy loans. The study investigates policy loan demand for the years 1970 through 1989, which encompasses periods of fixed and variable loan rates. The results suggest that policy loan demand has changed since the introduction of variable loan rates and the redesign of policies. Specifically, the findings show that demand for policy loans driven by arbitrage potetntial has been reduced.

Driving Forces of Policy Loan Demand

Previous research has found several variables related to the demand for life insurance policy loans, including market interest rates (Schott, 1971; Bykerk and Thompson, 1979; Cummins, 1973), personal income (Wood, 1964; Rejda, 1966), the unemployment rate (Cummins, 1973), and costs of alternative sources of credit (Day and Hendershott, 1977). Policy loans constitute a form of disintermediation for insurers and are important because they disrupt insurer cash flow and impose an opportunity cost if the market interest rate exceeds the policy loan interest rate.[1]

This article assesses the impact that redesigned life insurance policy loan provisions and changes in financial markets have had on the demand for policy loans and the risk of disintermediation. The research extends previous work—which has focused exclusively on periods of fixed loan rates—by investigating policy loan demand from 1970 through 1989, a period encompass-

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[1] Cash flow disruption was a more pertinent problem when insurer investments in corporate bonds and mortgages were made in the form of forward commitments. These types of commitments are less common today, as insurers have shifted from privately placed assets to those that are likely to be publicly traded, as discussed in Carter and Van Auken (1990).

ing both fixed and variable loan rates.[2] Because the structure of policy loan demand may have shifted over the sample period, a test for structural change is performed. While previous econometric analyses of policy loan demand have used quarterly data, this study uses monthly data.

Market Conditions

On policies issued before 1980, loan rates generally were fixed at between 5 and 6 percent. Thus, for various reasons, when market interest rates were equal to or in excess of policy loan rates, relatively more policyowners exercised their option to access cash values, and insurers lost the use of large amounts of assets. Policy loans outstanding at the end of 1970 equaled $14.1 billion and grew to $34.8 billion by the end of 1979.

In response to the problem of policy loan disintermediation, a number of remedies have been proposed to reduce the outflow of funds. Wood and Rottman (1970) examine the use of variable loan rates, and Kraegel and Reiskytl (1977) and Larsen (1981) discuss the use of adjusted dividends to borrowing policyowners. In an effort to mitigate disintermediation, the National Association of Insurance Commissioners adopted the *Model Policy Loan Interest Rate Bill* in 1980. A version of this bill is now law in all states. According to the *Model Bill*, insurers may not set interest rates on policy loans in excess of Moody's Composite Yield on seasoned corporate bonds two months prior to the interest rate determination date. As interest rates decline, insurers must reduce the loan interest rate accordingly (see Black and Skipper, 1987, p. 140).

Thus, since the early 1980s, a growing percentage of policy loan interest rates has been sensitive to market conditions. Of course, the shift to variable loan rates was not immediate: typically only new policies contained the variable rate provision. However, insurers offered inducements to fixed loan rate policyowners to switch to variable rate policies. The inducements generally took the form of increased projected dividends or dividend scales dependent upon loan utilization. In the early 1980s, insurers began to offer enhanced dividends to policyowners in exchange for higher policy loan rates or variable loan rates. New fixed loan rates were often raised to 8 percent (see Black and Skipper, 1987). It is likely that the introduction of interest-sensitive policy loan rates has altered the demand structure for policy loans in the last decade.

Other factors may be responsible for a shift in the demand structure for policy loans. The volatility of interest rates might affect demand for policy loans because the flexible nature of policy loan repayment enables policyowners to repay loans without incurring the prepayment penalties often associated with other types of loans. The deregulation of financial markets,

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[2] Policy loan data are not available after 1989 on a monthly basis, according to the *Federal Reserve Bulletin*.

which allows greater access to money market returns, also may have led to a shift in the demand for policy loans.

The introduction of nontraditional policies, such as universal life and variable life, that are said to be less loan tolerant, may have had an impact on the demand for policy loans. Policyowners generally have more flexibility in payment of premiums with the newer types of policies. Also, nontraditional policies tend either to utilize variable policy loan rate provisions or to credit a lower interest rate on the portion of the cash value account supporting a policy loan (commonly referred to as direct recognition: see Black and Skipper, 1987, pp. 92-93).

Tax Laws

Changes in tax laws relating to the deductibility of consumer interest payments may have impacted the demand for policy loans. Before enactment of the 1986 Tax Reform Act (TRA), a taxpayer could deduct policy loan interest as long as he or she was the policyowner when the interest was accrued and was not systematically borrowing against cash values to pay premiums. However, the 1986 TRA phased out the deduction for personal interest payments. The percentage of personal interest that could be deducted was 65 percent in 1987, 40 percent in 1988, and 20 percent in 1989.[3]

The tax law change affected the deductibility of all types of personal interest. This change, coupled with the fact that the disallowance of the interest deduction was being phased in during the latter years of the study, minimizes the effect of the tax law change.

Because policy loans are repaid from death benefits upon the death of an insured, the mortality of insureds whose policies had outstanding loans could have an impact on the demand for policy loans. During the period under study, death rates declined steadily, as did the ratio of death benefits to insurance in force. This ratio is a proxy of the extent to which deaths may affect the amount of outstanding policy loans. The ratio declined from 0.46 percent in 1970 to 0.22 percent in 1989, but the relatively small magnitude of these ratios makes it unlikely that the death of insureds with outstanding policy loans would have a significant impact on the demand for loans.[4]

Figure 1 illustrates the monthly growth in policy loans, as well as the ratio of policy loans to assets, from 1970 through 1989. The ratio of policy

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[3] A deduction is allowed only for cash-basis taxpayers when the interest is actually paid. If the interest is simply added to the existing loan or is deducted from the proceeds of a new loan, the interest is not deductible. Also, under the 1986 TRA, taxpayers engaged in trade or business retained the right to deduct policy loan interest, subject to certain limitations on the amount of the deduction.

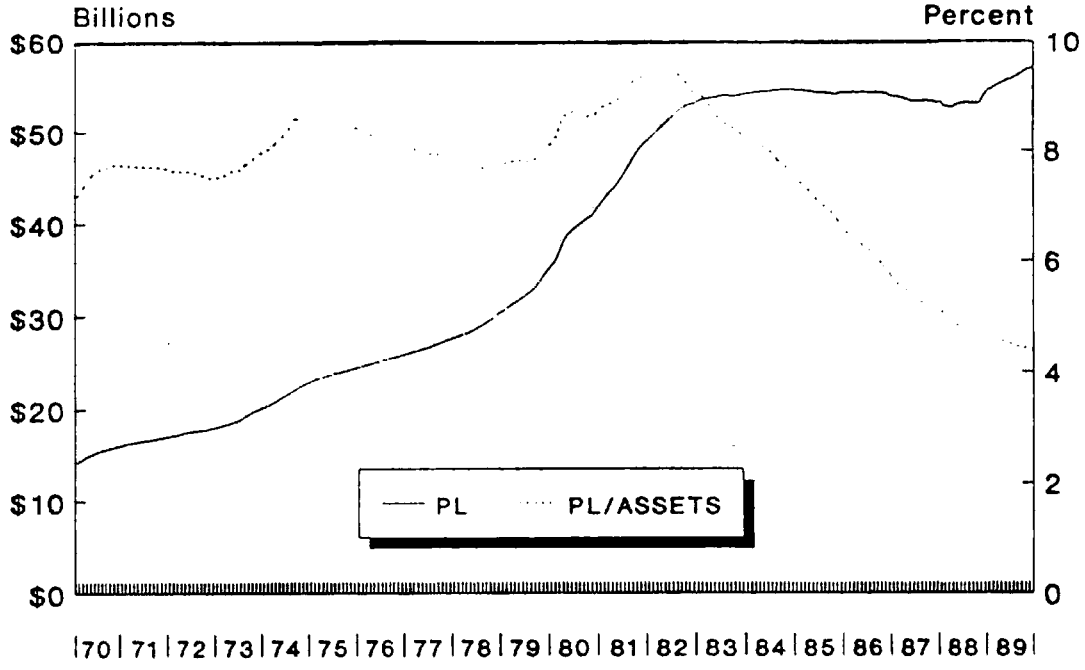
[4] Modeling of the effect of mortality on policy loan demand is made difficult since monthly data on mortality of insureds with outstanding policy loans are not available.

loans to assets reached a high of 9.42 percent in 1982 and has declined steadily ever since. The amount of policy loans began to level off by 1983.

Demand Hypotheses

Several hypotheses have been advanced to explain policyowners' motivations to utilize policy loans. The arbitrage hypothesis asserts that policyowners are motivated by differences between market interest rates and policy loan interest rates. As the differential between market rates and policy loan rates increases, the level of policy loans will increase.

Figure 1
Policy Loans and Policy Loans/Assets



monthly, 1970-1989

The emergency fund hypothesis suggests that policy cash values are viewed as a source of funds to be used in cases of emergency. Thus, one might expect a higher demand for policy loans during periods of high unemployment, economic recession, or low personal income.

The alternative funds hypothesis relates to the availability of credit from sources other than policy cash values. The hypothesis suggests that if alternative sources of credit are difficult to obtain, the policy loan option is more likely to be exercised. Finally, the rising prices/inflation hypothesis states that policy loans increase as the need for additional sources of income becomes greater in periods of rising prices and declining discretionary incomes.

Policy Loan Research

The literature on policy loans is extensive.[5] Using quarterly data to examine the factors influencing net changes in policy loan demand for 1965 through 1970, Schott (1971) found support for both the arbitrage and alternative funds hypotheses. He concludes that interest rate variations had the greatest influence on the demand for policy loans.

Reinforcing and extending research by Wood (1964), Rejda (1966) examines the correlation of monthly cyclical residuals between new policy loans and disposable personal income during business cycle peaks and troughs. He found an absence of negative correlation between the relative cyclical residuals of the two variables. These studies provide little support for the emergency fund hypothesis during the period 1947 through 1961. They find that market interest rates were more influential than changes in personal income in affecting policy loan demand.

Cummins (1973), econometrically analyzing policy loan demand using quarterly data for the period 1955 through 1972, found a negative relationship between changes in the unemployment rate and changes in policy loans. He also found that policy loan fluctuations were due primarily to interest rates, supporting the interest arbitrage and alternative sources hypotheses.

Day and Hendershott (1977) use a constrained model of household financial behavior to analyze the demand for policy loans. They find that the rising cost and declining availability of alternative sources of credit were the major determinants of policy loan demand from 1959 through 1973.

Bykerk and Thompson (1979) analyze quarterly demand for policy loans and examine the empirical relationship between loan demand and the difference between the market interest rate and the contractual loan rate for the years 1956 through 1976. The authors find that the adjusted commercial paper rate is significant in a regression model with absolute levels of policy loans as the dependent variable.

Econometric Model and Data

Four hypotheses have been proposed to explain the variation in demand for policy loans. It has been theorized that policy loans are positively related to increases in the excess of market interest rates over policy loan interest rates, the unemployment rate, costs of alternative sources of funds, and the inflation rate. Obviously, a certain amount of overlap among the hypotheses exists. Independent variables were carefully selected to isolate their specific relationships to the alternative explanations for policy loan demand. Absent empirical testing, it is unclear if the vector of variables that influenced

[5] For a brief review of several other articles related to policy loans, see Bykerk and Thompson (1979).

policy loan levels in the past has remained unchanged, and several questions arise. If the same variables are important, do they all exhibit the same signs as they did previously? Have variables that were significant become insignificant since interest rates on policy loans have become sensitive to market interest rates?

The equation used to test the hypotheses is:

$$CHGLOAN_t = \alpha + \beta_1\ AMOODY_t + \beta_2\ ATBILL3_t + \beta_3\ INFLATE_t + \beta_4\ UNEMP_t + \beta_5\ LASSET_{t-1} + \beta_6\ CHGASSET_t + \varepsilon_t,$$

where

CHGLOAN = monthly change in policy loans, in millions of dollars, seasonally adjusted. *Federal Reserve Bulletin;*

AMOODY = Moody's Composite Yield on Seasoned Domestic Corporate Bonds, minus the inflation rate, *Federal Reserve Bulletin;*

ATBILL3 = 3-month Treasury-bill rate, auction average rate on new issues, minus the inflation rate. Standard and Poors Statistical Service, *Current Statistics;*

INFLATE = inflation rate, measured as the monthly annual percentage change in the consumer price index, U.S. Department of Commerce, *Business Statistics;*

UNEMP = civil unemployment rate, seasonally adjusted. U.S. Department of Commerce. *Business Statistics;*

LASSET = total assets of life insurers, in billions of dollars, lagged one period. *Federal Reserve Bulletin;*

CHGASSET = monthly net change in insurer assets, in billions of dollars, *Federal Reserve Bulletin.*

There is reason to suspect that the data are not stable over the entire 20-year period of this study, especially given the trends in policy loan demand as shown in Figure 1. Beginning in 1980, a growing proportion of policy loan interest rates became sensitive to market conditions. By March 1983, 37 states had adopted the *Model Bill.* The ratio of premiums for nontraditional insurance policies to premiums for traditional policies grew from 1 percent in 1980 to 19 percent in 1983.[6] However, a distinct point where the demand for policy loans changed is not apparent. Thus, a transition or phase-in period was chosen. One would expect a phase-in

[6] If the ratio of cash value available to support policy loans for nontraditional policies to available cash value for traditional policies could be calculated on a monthly basis, it might improve the proportion of variance explained by the model, especially for the 1984-1989 subperiod.

period to begin in 1980, with the introduction of the *Model Bill*. In light of this expectation, separate regressions were run for the subperiods 1970 through 1979, 1980 through 1983, and 1984 through 1989. The subperiod from 1980 through 1983 was chosen as an omitted period since it represents a reasonable transition time for a substantial percentage of policies to incorporate a variable loan rate, or an increased loan rate, subsequent to introduction of the *Model Bill* and other market changes.[7]

The dependent variable CHGLOAN is the monthly net change in total policy loans and is hypothesized to be related to several variables, as discussed in this section. AMOODY is Moody's Composite Yield on seasoned corporate bonds minus the actual inflation rate (INFLATE), and thus represents an inflation-adjusted interest rate. Subtracting the inflation rate from the Moody's rate avoids the problem of double counting the effects of inflation, as discussed in Kamerschen (1979). Because policy loan interest rates for new policies became tied to Moody's yield beginning in the early 1980s, AMOODY is included in the model. Prior to the *Model Bill*'s adoption in 1980, AMOODY is expected to reflect arbitrage opportunities, driven by the spread between AMOODY and policy loan interest rates. Thus, as AMOODY increases, the demand for policy loans is expected to increase. After 1980, the level of policy loans is expected to be less associated with AMOODY, as arbitrage potential associated with this yield decreases.

ATBILL3 is the auction average three-month T-bill rate minus the actual inflation rate (INFLATE), and thus represents an inflation-adjusted interest rate. ATBILL3 is included in the model to reflect short-term market yields that policyowners may have considered for arbitrage purposes prior to the adoption of the *Model Bill*. If T-bill rates are sufficiently higher than policy loan interest rates, an arbitrage-induced demand for policy loans could be expected.

In addition to representing arbitrage potential, ATBILL3 may reflect demand for policy loans relative to the cost of alternative funds. If the interest cost of borrowing from within a life insurance policy is similar to the interest cost of alternative sources (more likely in the latter time period), then demand for policy loans may reflect the relative availability of alternative funds. Further, because of the relative ease of obtaining and flexibility in repaying policy loans, the significance of ATBILL3 may indicate a preference for policy loans over alternative sources of credit, given roughly equivalent interest costs. As the cost of alternative funds increases, demand for policy loans is expected to increase. A short-term rate such as ATBILL3 was included along with the long-term rate AMOODY to

[7] Empirical specifications yield consistently similar results using at least a four-year phase-in period. That is, omitting years 1980-1983, 1980-1984, or 1980-1985 produces similar results. In the interest of obtaining the largest possible sample size and for other reasons discussed in the text, the 1980-1983 period was selected as the omitted period.

reflect investor preferences for short- and long-term yields and to reflect yield curve differences over time.[8]

INFLATE is the inflation rate, measured as the annualized change in the consumer price index for a given month. This variable is calculated and included for two reasons. First, subtracting the inflation rate from the Moody's and the T-bill rates avoids double counting the effects of inflation. Second, including INFLATE provides a test for the rising prices/inflation hypothesis. If this hypothesis is correct, the effect of INFLATE is expected to be positive throughout the estimation period.[9]

UNEMP is the civil unemployment rate and is included in the model primarily to test the emergency fund hypothesis. Unemployment is expected to be positively related to changes in policy loans since, as the unemployment rate increases, it becomes more likely that the policy loan option will be utilized to substitute for lost wages. UNEMP is expected to affect policy loans positively both before and after the introduction of variable policy loan rates. However, if unemployment results in policy surrender (and the repayment of policy loans) rather than exercise of the policy loan option, then UNEMP could be negatively related to policy loan demand.[10]

LASSET is total assets of life insurance companies, lagged one period. CHGASSET is the monthly net change in insurer assets. Policyowners may adjust their life insurance portfolio by using policy loans to reduce their amount of insurance coverage, which leads to the adoption of a familiar representation of the portfolio adjustment process known as the stock adjustment model.[11] Although it would have been preferable to use life insurance reserves rather than assets (since life insurance reserves are a better measure of loanable funds with respect to life insurance policies) these data were not available on a monthly basis. The correlation of life insurance reserves and assets on an annual basis is 0.98 over the sample period, so insurer assets appears to be a reasonable proxy.

A dummy variable was employed in an attempt to capture the effects of changes in the tax law regarding the deductibility of personal interest, and

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[8] TBILL6 also was initially placed in the model, but did not achieve the level of significance that TBILL3 did.

[9] The real rate of return on an asset equals the difference between the nominal rate and anticipated inflation. Actual inflation rates are used in favor of anticipated inflation for two reasons: The rising prices/inflation hypothesis is concerned with actual inflation, and the primary purpose of deriving adjusted interest rates is to avoid double counting the effects of inflation. Anticipated inflation rates also were estimated and tested in the model using a distributed lag model as described in Outreville (1985). Results are essentially equivalent to those using the actual inflation rate.

[10] CHGUNEMP also was considered for the model. However, demand for policy loans is likely to be more sensitive to changes in unemployment at relatively high rather than low levels of unemployment. This feature of the data would be lost if the data were first-differenced. Empirical results show that CHGUNEMP was insignificant for both subperiods as well.

[11] For a discussion of the stock adjustment model, see Brainard and Tobin (1968) and Friedman (1977).

although several specifications were tested, the t-statistic was never significant. Finally, ε_t is a disturbance term. The data are summarized in Table 1.

Table 1

Summary Statistics for 1970-1979, 1980-1983, and 1984-1989

	1970-1979		1980-1983		1984-1989	
Variable	Mean[a]	Coefficient of Variation %	Mean	Coefficient of Variation %	Mean	Coefficient of Variation %
CHGLOAN[b]	174.40	58.87	401.15	66.28	40.79	448.12
AMOODY	1.57	334.18	6.85	81.03	7.17	39.56
ATBILL3	- .83	-586.43	4.27	105.56	3.62	74.11
INFLATE	7.06	74.45	6.99	77.18	3.66	68.93
UNEMP	6.22	18.71	8.53	15.31	6.44	13.72
LASSET[c]	284.40	23.12	529.04	12.33	936.79	20.51
CHGASSET[c]	1.96	60.72	4.66	48.31	9.01	50.64

[a] Means are stated in percent unless otherwise specified.
[b] Millions of dollars.
[c] Billions of dollars.

Empirical Results

Estimates of the equation obtained using ordinary least squares on monthly time series data from 1970 through 1989 are presented in Table 2. As in all econometric analyses of time series data, autocorrelation and collinearity are potential problems. The Durbin-Watson statistic indicated that autocorrelation was present for the time periods of 1970 through 1979 and 1980 through 1983. Estimating the equation using a maximum likelihood procedure to correct for autocorrelation (Judge et al., 1988, chapter 9) produced results essentially equivalent to those using the two-step full transformation method and the nonlinear least squares method (Judge et al., 1988). Further, variance inflation factors suggest that collinearity was not a problem for this data set.

Empirical Results for 1970 through 1979

Results of the first subperiod, 1970 through 1979, reinforce the finding of previous studies that interest rates are significant factors in determining changes in the demand for policy loans. In fact, all coefficients except LASSET and CHGASSET are significant for the first subperiod. Coefficients on AMOODY and on ATBILL3 are positive, supporting the arbitrage hypothesis.[12]

[12] The model also was tested using nonseasonally adjusted CHGLOAN as the dependent variable. Results were roughly similar to those reported here. The interest rate on long-term government bonds also was tested as an alternative to the Moody's rate. The correlation among

Changes in policy loans are significantly negatively related to UNEMP, providing evidence against the emergency fund hypothesis consistent with Cummins (1973). A possible explanation for this finding is that a rise in unemployment is associated not with an increase in loans but with an increase in policy surrenders, which results in any outstanding loans being repaid. Thus, the total amount of outstanding policy loans could decrease if unemployment leads to policy surrender rather than utilization of the policy loan option. Outreville (1990) finds that, during this subperiod, lapse rates tend to be significantly higher during periods of high unemployment.

Table 2
Estimation Results for Policy Loan Demand

Variable	Expected Sign	1970-1979[a] (n = 118)	t-stat	1980-1983[a] (n = 48)	t-stat	1984-1989 (n = 72)	t-stat
		-358.52	(4.73)***	-812.21	(1.46)	-895.57	(.60)
AMOODY	+	62.68	(3.85)***	27.76	(.85)	-34.41	(.79)
ATBILL3	+	20.07	(2.72)***	32.92	(1.44)	90.95	(3.48)***
INFLATE	+	83.17	(7.21)***	61.69	(2.45)**	53.64	(2.24)**
UNEMP	±	-33.34	(3.36)***	-12.56	(.27)	30.40	(.30)
LASSET	+	.22	(1.42)	-1.99**	(2.27)	.44	(.71)
CHGASSET	+	1.94	(.44)	3.02	(.32)	5.41	(1.27)
Adjusted R^2		.69		.53		.43	

Note: Values in parentheses are ratios of the coefficients to their estimated standard errors.

[a] Corrected for the presence of autocorrelation.

*** significant at .01
** significant at .05
* significant at .10

Support for the rising prices/inflation hypothesis is evident, as the coefficient on INFLATE is positive and significant. This finding is consistent with that of Day and Hendershott (1977). The stock adjustment model variables, LASSET and CHGASSET, are insignificant for the first subperiod.[13]

Since the period from 1980 through 1983 is viewed as a transition period the results are presented only for completeness; no attempt was made to interpret them.

the two interest rates is .96 over the sample period. However, since the Moody's rate is of particular interest after 1980, the Moody's interest rate was retained.

[13] Policy loans would be expected to increase with assets. Therefore, the model also was tested with ASSET alone as a control variable, and it was significant at the .10 level for both subperiods. However, for conceptual reasons, the stock adjustment model variables, LASSET and CHGASSET, are preferred.

Empirical Results for 1984 through 1989

Results for the subperiod 1984 through 1989 indicate that AMOODY is no longer a significant variable in the model. This finding is consistent with a reduced potential for policy loan arbitrage following the introduction of variable policy loan interest rates and less loan-tolerant policies. ATBILL3 remains positive and significant, however. Since the yield curve was upward sloping over this period (that is, T-bill rates were lower than Moody's rate), arbitrage would not be a reasonable explanation for the significance of this variable during this time period. The significance of ATBILL3 may reflect a preference for policy loans over alternative sources of funds.

Similar to the results of the first subperiod, the findings for 1984 through 1989 also support the rising prices/inflation hypothesis. But in contrast to previous periods, support for the emergency fund hypothesis is not present from 1984 through 1989, as the coefficient on UNEMP is insignificant.[14] Possible explanations for this shift are the increased proportion of flexible-premium policies since 1980 and the generally lower levels of unemployment since 1983. As in the first subperiod, the coefficients on the stock adjustment model variables, LASSET and CHGASSET, are insignificant.

Empirical Test for Structural Change

With the introduction of interest-sensitive policy loan rates and the introduction of policies that are less loan tolerant, it appears that the demand structure for policy loans has shifted since the early 1980s. To test more rigorously for such a change, the Chow test was applied to separate equations for the 1970 through 1979 and 1984 through 1989 subperiods. The test confirms the existence of a statistically significant change in the structural relationship[15] and suggests that the structure for policy loan demand has changed since the early 1980s.

Conclusions

With the introduction of the *Model Policy Loan Interest Rate Bill* of 1980 life insurers began to charge variable interest rates on life insurance policy loans. The intent of variable policy loan interest rates was not to minimize the level of policy loans, but rather to minimize the opportunity cost associated with lending at below market interest rates. In addition to variable loan rates, alterations in life insurance policy design and transformations in financial markets are likely to have impacted the demand for life insurance policy loans.

[14] Outreville (1990) did not examine the relationship of policy surrender and unemployment for the post-1983 period.

[15] The test statistic, distributed as F(7,176) equals 7.00 and is significant at the 0.01 level.

Observed changes in policy loan demand since the introduction of variable loan rates as discussed in this article indicate that demand for policy loans that is associated with arbitrage potential and the associated opportunity cost has been reduced. Inflation remains significantly and positively related to changes in policy loans throughout the estimation period, supporting the rising prices/inflation hypothesis. Also, the relationship between policy loan demand and unemployment has changed from significantly negative to insignificant. These findings suggest that the demand for life insurance policy loans has changed significantly since the introduction of variable policy loan interest rates and the redesign of life insurance policies in the early 1980s.

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