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An Agricultural Law Research Article

An Evaluation of Equity Redemption Alternatives in Centralized Cooperatives

by

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Evaluations of five basic equity redemption alternatives are made for the distinct patron-cooperative economic relationship found in both regional and local centralized cooperatives. The five alternatives are the estate settlement, age-of-patron, revolving fund, percentage pool, and base capital plans. An empirically estimated economic life cycle is used to determine the pattern of patronage and investment by patrons. Redemptions are determined for several programs, each using estate settlement alone or in combination with another plan. Performance is measured using three criteria: flexibility, proportionality, and cash flow. Results vary significantly among alternatives.

Equity redemption is one facet of equity management, a multifaceted and complex decision problem for agricultural cooperatives. Equity redemption decisions should be coordinated with equity and financial management decisions to optimize the financial objectives of the cooperative business. These objectives should reflect the financial objectives of the member-patron.

Given a decision on the total amount of allocated equity the cooperative needs to maintain, the cooperative must determine the amount of equity to be invested and redeemed each period. The cooperative also must determine the total amount of equity each individual patron should have invested at any point in time and the amount the patron should invest and receive in cash redemption each year.

Objective

The objective of this study is to evaluate five basic equity redemption alternatives using three primary criteria and the patron-cooperative patronage relationship common to centralized cooperatives. The five alternatives are: (1) the estate settlement, (2) age-of-patron, (3) revolving fund, (4) percentage pool, and (5) base capital plans. For convenience, we sometimes will use the mnemonic abbreviations ES, AP, RF, PP, and BC when referring to these alternatives. The three primary evaluation criteria are

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flexibility, proportionality, and cash flow. A patron economic life cycle is empirically estimated and used to represent the patronage relationship. Our evaluation provides a simple, powerful building block for use in constructing realistic, effective equity management programs for both regional and local centralized cooperatives.

Relationship to Previous Work

Several descriptive studies have reviewed the status of equity management, especially equity redemption. Two of the earliest were conducted by Manuel and based on 1950 conditions in Kansas. Newman revisited the Kansas situation in 1981 and concluded that Kansas cooperatives had made important progress in developing equity redemption programs that keep equity in the hands of active users. Newman also compared the financial strength of cooperatives using estate settlement alone and in combination with age-of-patron and revolving fund plans. He concluded that cooperatives using only estate settlement plans were the weakest, followed by those using age-of-patron plans. Cooperatives using revolving funds were the strongest.

Brown and Volkin undertook a national study of equity redemption practices using 1974 data. They classified cooperatives on their use of different equity redemption plans and analyzed them according to financial characteristics. They concluded that "*some* sort of program can be adopted by practically all cooperatives if there exists a determination to plan and budget for equity redemption [italics in original]" (p. 30).

Cobia et al. conducted a comprehensive, descriptive review of equity redemption issues and alternatives. They described the method of calculation for each plan, evaluated its advantages and disadvantages, and made general recommendations.

The Royer and Cobia study is the one most similar to this article. It evaluated the performance of the revolving fund, percentage pool (percentage-of-all-equities), and special plans. The special plan analyzed by Royer and Cobia most closely represents the estate settlement plan in our analysis. In general, the special plan may include any lump sum redemption made when a special condition qualifying for redemption exists according to the cooperative's policy. In addition to estates, redemptions in a special plan may occur when a patron reaches a specified age, moves from the cooperative's service area, or suffers a hardship (such as a bankruptcy or setoff). Royer and Cobia did not explicitly evaluate two alternatives we evaluate, the age-of-patron and base capital plans.

Royer and Cobia studied five hypothetical patron investment scenarios. One of their scenarios resembles the patron economic life cycle of this article. However, our patron life cycle is empirically estimated from actual farm operator economic data and significantly different in length and pattern.

Royer and Cobia did not evaluate the base capital plan because of its similarity to the revolving fund plan. As our analysis shows, these two plans are more similar to each other than to other plans. However, they are two distinctly different plans with different patterns of investment and redemption for individual patrons. They produce different proportionality and cash flow results over the patron's life cycle.

The primary evaluation criterion used by Royer and Cobia was the proportionality of investment by the patron over the patron's history. They constructed a disparity index that "measures the difference between actual equity financing of a cooperative and financing in proportion to current patronage" (p. 106).

Hodges evaluated seven equity redemption plans for a representative Oklahoma local cooperative, including variations of the estate settlement, revolving fund, and age-of-patron plans. He constructed a representative patron equity investment structure and a business activity pattern. He did not use a specific patron life cycle. Instead, patron activity was modified according to estimates of patron entry and exit, including mortality, retirement from farming, switching to a competitor, moving, or quitting business. Trends in volume of business were estimated by age. Except for mortality rates, Hodges used estimates of patron economic activity made by cooperative management rather than using empirical analyses. Hodges also developed a computerized simulator to assist managers in evaluating the seven types of plans in a realistic situation.

Assumptions

Assumptions fall in five categories and are described in the following subsections: (1) patron economic life cycle, (2) steady-state cooperative, (3) equity redemption plans, (4) equity redemption programs and cooperative capital targets, and (5) evaluation criteria.

Patron Economic Life Cycle

The majority of patrons in a centralized regional or local cooperative are individuals. An estimate was made of an individual patron's economic life cycle using the economic performance data contained in Kansas State University's K-MAR 105 database of more than 2,200 farms for 1986. Cash receipts for crops and livestock from each farm were accumulated by age of farm operator. Sales by age group were used to statistically estimate a quadratic equation of the form $y = ax^2 + bx + c$ where y is sales and x is age. The estimated pattern of economic activity by age of operator is $y = -12,206.72x^2 + 1,214,289.46x - 20,575,617.06$ ($R^2 = .80$). The percentage cooperative business done by each age group is assumed to equal the percentage sales for the group, which is determined by dividing estimated sales for the group by estimated total sales for all groups.

The sales data and the life cycle relationship are illustrated in figure 1. The intercepts on the operator age axis are 21.66 and 77.82. We use 22 and 78 as the beginning and ending ages in our discussion. The exact values are used in the empirical analysis.

Steady-State Cooperative

We assume there is a steady-state cooperative business in which $100,000 of allocated capital is invested each year from operations and $100,000 is redeemed.[1] We further assume complete flexibility in the rate of profitability, financial structure, distribution of earnings as patronage refunds (cash and retained) and other uses (taxes, dividends, and unallocated earnings),

Figure 1.—Cash Receipts by Operator Age and Estimated Economic Life Cycle
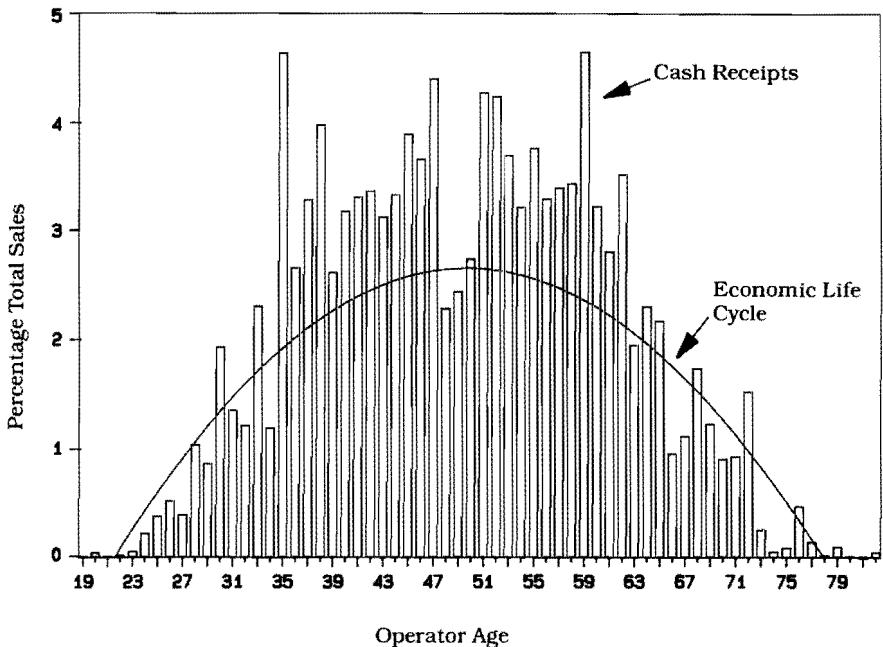
per-unit capital retains, working capital, and other cash flows as long as they provide $100,000 of investment and redemption.

Equity Redemption Plans

The five basic equity redemption plans and the method of calculation used for each are described in detail by Cobia et al. A brief description is given here. Because some plans have several variations, the variation we use is noted. Each plan requires two calculations: one for determining the redemption for an individual patron or patron group and one for the cooperative business as a whole.

Under the estate settlement plan, the cooperative redeems the allocated equity of a deceased patron to the estate. We assume the redemption is made one year after the end of the life cycle, at age 79. In the age-of-patron plan, the cooperative redeems a patron's equity when the individual reaches a specified age, such as 65 or 70. We assume the cooperative accumulates all investment made after the age-of-patron redemption and redeems the cumulative balance as an estate settlement. With a revolving fund plan, the cooperative redeems allocated equity on a first-in/first-out basis. In other words, it redeems equity when the equity reaches a certain age, such as 5 or 10 years. Under the percentage pool plan, the cooperative redeems a

specified percentage of allocated equity, such as 5 or 10 percent. The age of the patron or equity is not considered.

In a base capital plan, the cooperative redeems all allocated equity above the base capital target for the business. Our steady-state assumption implies a $100,000 investment and redemption are made each year. An individual patron's redemption is determined by comparing the patron's level of investment to the patron's capital target. If the investment is less than the target, the patron is underinvested and receives no redemption. If the investment is greater than the target, the patron is overinvested and receives redemption of part or all of the overinvestment.

The proportion of a patron's overinvestment to be redeemed depends on two factors: (1) the total amount of patron underinvestment and (2) the method of allocating cooperative overinvestment among overinvested patrons. Cooperative overinvestment can be allocated to overinvested patrons several ways, including paying an equal amount such as $100 to all patrons (up to each patron's overinvestment), making payments to only the most over-invested patrons, or paying a percentage such as 10 percent of total over-invested equity capital. We use the last method, called the "all overinvested members" approach by Cobia et al. (p. 32).

Calculation of the patron's capital target is based on the principle of investment in proportion to patronage. In our analysis, individual patrons are grouped by age and the business done by a patron age group is not constant but follows the life cycle. Thus the patron capital target changes depending on the age of the patron. We use a one-year moving average of patronage to calculate the patron capital target. Often in practice, a longer moving average, usually three to five years, is employed to smooth out variations that commonly occur in individual patron business. Our one-year moving average provides the maximum rate of adjustment in the capital target over the life cycle. It seems to be a reasonable assumption when patrons are grouped by ages.

Equity Redemption Programs and Cooperative Capital Targets

The equity redemption programs consist of the estate settlement plan alone or in combination with one of the other four plans. Programs consisting of the estate settlement plan and another plan are used to evaluate the other plan. The estate settlement plan is used to close the equity accounts of individual patrons at the end of the economic life cycle.

The five basic redemption plans are evaluated for six selected cooperative equity targets, designated A through F. Each target was determined by constructing a base redemption program and calculating the equilibrium or steady-state level of equity capital generated by the program. Other programs were constructed for each capital target by using other redemption plans whenever reasonable and feasible.

A shorthand notation form is used to specify capital targets and programs for convenience and clarity. The base program for target A is A:RF5 + ES79, where A designates the capital target, RF5 designates the primary plan evaluated (a five-year revolving fund plan), and ES79 indicates the redemption of estates (i.e., the net investment remaining) at age 79. The parameters for the programs are listed in table 1. To simplify the expression of

Table 1.—Parameters Used to Evaluate Redemption Plans

	Capital Target					
	A	B	C	D	E	F
Plan:				Years		
ES: Estate Settlement[a]	79[b]	79[b]	79[b]	79[b]	79[b]	89[b]
AP: Age-of-Patron	c	c	d	65[b]	e	e
RF: Revolving Fund	5[b]	10[b]	20[b]	18.3	e	e
				Percent		
PP: Percentage Pool	19.54	8.97	3.16	3.71	e	e
				Million dollars		
BC: Base Capital	0.50	0.98	1.82	1.70	e	e
Other Parameters:						
Total Equity Capital	0.50	0.98	1.82	1.70	2.93	3.93
				Percent		
Turnover	20.07	10.20	5.48	5.89	3.42	2.55

[a]For each of the capital targets A through E, an estate settlement is made at age 79, one year after the end of the life cycle. For capital target F, the estate settlement is made at age 89, ten years afterwards.
[b]Plans composing base program on which capital target for this column is based.
[c]Unrealistic to redeem equity using age-of-patron plan because patron age for redemption would be significantly lower than 65.
[d]Results for age-of-patron plan are not calculated because they would require a fractional age, such as 68.1, an infeasible parameter for the simulator.
[e]Plan is infeasible because only one redemption, an estate settlement, could be made under these parameters.

programs, the numeric parameters are not always included. For example, the base program for capital target B is B:RF10 + ES79 in regular form and B:RF + ES in simplified form.

Programs A:RF + ES, A:PP + ES, and A:BC + ES all can be used with capital target A, as noted in table 1. Base program A:RF + ES consists of a five-year revolving fund and an estate settlement at age 79, one year after the end of the life cycle, and results in a steady-state capital level of $500,000. Program A:PP + ES uses a percentage pool rate of 19.54 percent and A:BC + ES uses the base capital method to achieve a capital level of $500,000 given an estate settlement at age 79. Because the only difference in the three programs is the primary redemption plan used, these three alternatives can be compared directly at this capital target.

For a given capital target, the financial situation of the cooperative business is identical for each of the redemption programs. Thus the issue of interest is determining the program that is the most beneficial to patrons. This requires making a choice according to the proportionality and cash flow criteria.

Evaluation Criteria

The evaluation of redemption alternatives is based on flexibility, proportionality, and cash flow. Flexibility concerns the cooperative's ability to achieve its equity capital target. Proportionality concerns the degree to

which the equity investments of individual patrons or patron groups are proportional to their patronage. The cash flow criterion concerns the present value to patrons of the cash flow from redemption. Flexibility is a cooperative-level criterion whereas proportionality and cash flow are patron-level criteria between which a trade-off exists. In general, a cooperative must choose how heavily to weight each in its decision making.

Flexibility is subjectively measured by determining the range of capital targets that can be met by each plan. The number of programs and range of parameters for each plan shown in table 1 are the primary indicators of flexibility.

Proportionality is measured by a proportionality index equal to one minus the Royer and Cobia disparity index. The proportionality index is a measure of a patron's average proportionality of investment during the economic life cycle or, equivalently, the proportionality of investment of all patrons at a given point in time.

The investment target for a particular patron group equals the group's percentage of business times the cooperative's equity capital target. Figure 2 depicts the investment targets for individual patron age groups given capital targets A through F. If a redemption program is to maintain investment perfectly in proportion to patronage for patron age groups, the net investment patterns must coincide with these proportional capital targets. As we will show, none of the redemption plans can maintain perfect proportionality, but some are better than others. Even the plans best at maintaining proportional investment have periods in the life cycle when patron

Figure 2.—Capital Target Patterns for Equity Investment Proportional to Patronage, Six Base Programs
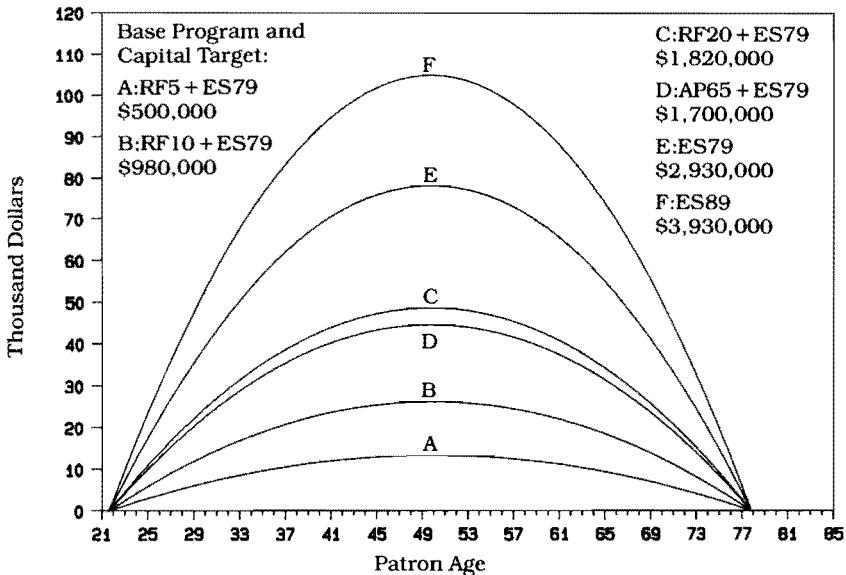
groups are underinvested and overinvested. The objective of proportional investment is to minimize under- and overinvestment.

An important point is that underinvestment always equals overinvestment given our assumptions. In other words, total investment in the cooperative always equals the target value, but the investments of individual patrons or patron groups may not equal their targets. This occurs because we assume the cooperative is in a steady-state situation but each patron is always changing according to the life cycle. The cooperative is not able to adjust the patron's equity investment fast enough to maintain complete proportionality because of the mechanics of the particular redemption plan and the fact that investment comes from retention of earnings or per-unit capital retains tied to patronage volume.

A discount rate of 10 percent is used to determine the present value to patrons of the cash flow from redemption. It represents a conservative estimate of the opportunity cost of capital for patrons who borrow from agricultural lenders such as the Farm Credit System. The critical factor is the timing of the cash flow for each equity redemption plan. The investment cash flow does not vary by redemption plan so is ignored.

Evaluation of Redemption Plans

First we review the pattern of net investment for each plan in graphic form. A knowledge of these patterns is important in understanding the performance of the plans. Then we present an evaluation of the plans according to the three criteria: flexibility, proportionality, and cash flow. We introduce a new measure, equity turnover rate, and evaluate the plans on the proportionality and cash flow criteria for the turnover rates associated with each capital target.

Net Investment Patterns

Each basic redemption plan results in a distinctive pattern of net equity investment during the time horizon, which begins with the first year of the life cycle and ends with the last year of redemption. In our analysis, the time horizon begins at age 22 and ends at age 79 for all programs except F:ES89, which ends at age 89. Estates are paid out at age 79, one year after the end of the life cycle, except for program F:ES89. Each year, the ending balance of net investment equals the previous year's net investment plus added investment for the year minus redemption for the year. Added investment is determined by the life cycle relationship and is independent of the redemption plan. Redemption is determined by the plan.

Estate Settlement Plan

Our analysis includes two estate settlement programs, E:ES and F:ES. These programs represent the infamous condition, "You have to die to get it." The net investment pattern from estate settlement is illustrated by program E:ES in figure 3, which also shows the patron net investment target for cooperative capital target E.

Programs utilizing only the estate settlement plan have a single redemption of $100,000 at the end of the time horizon. Thus they accumulate net

investment at the maximum rate and provide the highest level of capital for the steady-state cooperative and the patron at any point in time. Capital level E, $2.93 million, is higher than for any other program ending at age 79.

The distance between the net investment and capital target in figure 3 represents the deviation from complete proportionality. When net investment is below the capital target, the patron is underinvested. Note the pattern of underinvestment followed by overinvestment as the patron progresses through the time horizon.

Age-of-Patron Plan

Our analysis includes only one age-of-patron program, D:AP65 + ES79, in which each patron receives two redemptions, one at age 65 and an estate settlement at age 79. Figure 4 depicts the pattern of net investment for the age-of-patron program given capital target D, as well as for a revolving fund, percentage pool, and base capital program. The pattern for the age-of-patron program follows the same path as the estate settlement programs, E:ES79 and F:ES89, until the redemption at age 65. A patron's equity investment accumulates at the maximum rate. After age 65, this program accumulates all further equity investment until it is redeemed as an estate settlement.

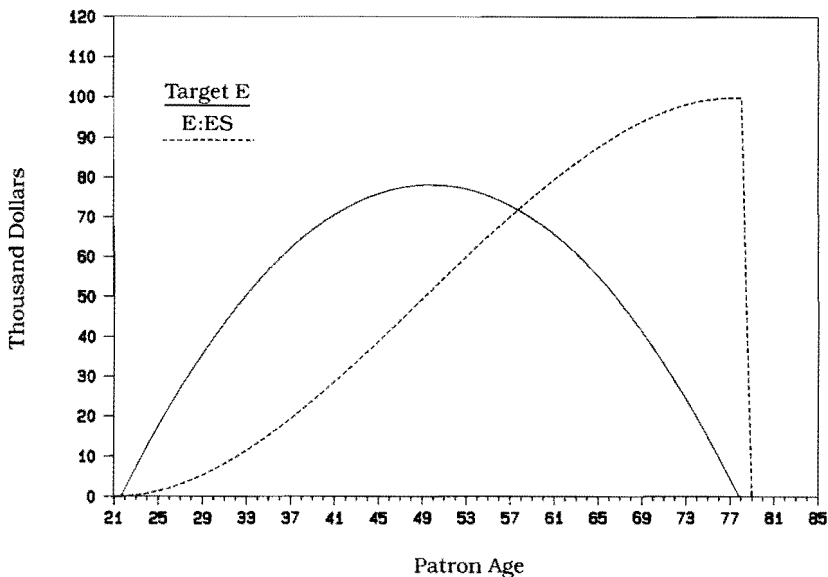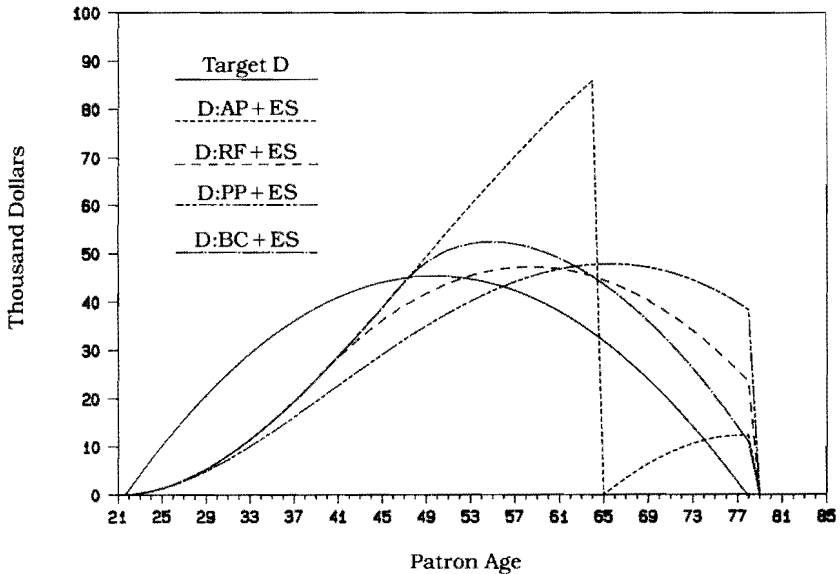**Figure 3.—Capital Target E and Net Investment Pattern for Program E:ES**

Figure 4.—Capital Target D and Net Investment Patterns for Four Redemption Programs

The program begins with a period of underinvestment followed by a period of overinvestment, as true for all programs. However, these periods are followed by additional periods of underinvestment and overinvestment because of the redemption of all equity at age 65 and the subsequent accumulation. This "seesaw" pattern is characteristic of any program using the age-of-patron plan.

Revolving Fund Plan

Our analysis includes several revolving fund, percentage pool, and base capital programs. Program D:RF18.3 + ES79 is illustrated in figure 4. A revolving fund 18.3 years in length in combination with an estate settlement at age 79 achieves capital target D. Redemptions begin 18.3 years after the beginning of the time horizon.

Percentage Pool Plan

Percentage pool program D:PP3.71 + ES79 is illustrated in figure 4. A redemption of 3.71 percent each year in combination with an estate settlement achieves capital target D. Redemptions are paid throughout the time horizon, causing net investment to increase more slowly than under other programs during the early stages of the life cycle. The curve for D:PP + ES in figure 4 is below all other curves for most of the life cycle.

Base Capital Plan

Base capital program D:BC1.7 + ES79 is illustrated in figure 4. A base capital target of $1.7 million is maintained until an estate settlement of outstanding equity is made at age 79. The base capital plan is designed to keep individual patron investment close to proportionality. Redemptions are not paid until a patron's net investment exceeds the patron capital target. Thus the pattern of net investment follows the curve representing maximum accumulation until it reaches the curve representing the patron capital target. It then begins to follow the patron capital target curve as closely as possible given that total overinvestment must equal total underinvestment.

Summary

Each plan has a distinctive net investment pattern. The estate settlement and age-of-patron plans, which are special or nonsystematic plans, have similar patterns. They both represent a strategy of maximum accumulation until a special event initiates redemption of all of a patron's equity. The estate settlement plan has only one redemption of $100,000. Programs using the age-of-patron plan have two scheduled redemptions totaling $100,000, one at a specified age followed by an estate settlement.

The three systematic plans, the revolving fund, percentage pool, and base capital plans, are similar to each other in that all begin making systematic, annual redemptions before the estate settlement plan. But the results of the systematic plans are dissimilar in many respects. The percentage pool plan begins redeeming the earliest (at age 22), and the base capital plan begins redeeming the latest (at age 47). The base capital plan achieves the highest net investment level by individual patrons whereas the revolving fund plan achieves the lowest. However, the difference of about $5,000 or 10 percent for capital level D is not substantial, and this relative difference declines with smaller capital targets. The percentage pool plan results in the largest estate settlement whereas the base capital plan results in the smallest, representing a significant difference.

The revolving fund plan falls between the percentage pool and base capital plans. It might be viewed as a compromise between the two. This will become clearer when we evaluate the plans according to the proportionality and cash flow criteria.

Performance

All three criteria, flexibility, proportionality, and cash flow, are used to evaluate the performance of the plans.

Flexibility

Estate settlement is the least flexible plan because it requires only one redemption. The lowest capital target that can be achieved in the steady-state situation is E, or $2.93 million. Higher capital targets are achievable by delaying the estate settlement beyond age 79. For example, program F:ES89 delays the redemption 10 years and achieves a capital target of

$3.93 million. The patron's net investment is at the maximum at the end of the life cycle, a total of $100,000, regardless of when the estate is redeemed.

The age-of-patron plan is more flexible because any of a range of ages can be selected for redemption. We assumed 65 is the lowest age reasonable for redeeming a patron's equity. The base program D:AP65 + ES79 defines the lowest capital target achievable under these assumptions, $1.70 million.

Another way to evaluate the flexibility of the age-of-patron plan is to consider the parameters obtained for the revolving fund and percentage pool programs that achieve the same capital level. The revolving fund program is D:RF18.3 + ES79 and the percentage pool program is D:PP3.71 + ES79 (table 1). Thus the age-of-patron plan with an age of 65 or higher is equivalent to a revolving fund plan with a revolving period of 18.3 years or more or a percentage pool plan with a redemption rate of 3.71 percent or less. This indicates limited flexibility.

The three systematic plans are almost totally flexible in theory. Any capital target can be achieved with a revolving fund, percentage pool, or base capital plan. The recommended approach to equity management is to select a cooperative capital target first and then determine the appropriate investment and redemption policy, much as was done in the analysis reported in table 1 for capital levels A through D. The base capital plan is naturally suited to this approach and therefore is the most flexible.

The percentage pool plan is the second most flexible. It easily permits calculating the percentage redemption that achieves the desired capital target. However, cooperatives sometimes introduce inflexibility into its use by selecting percentages like 5 or 10 percent. The use of any percentage, including fractional percentages such as the 3.71 percent used in program D:PP + ES, is simple and straightforward.

The revolving fund plan is the third most flexible. In theory, any length, including fractional years, can be specified. However, redemption of multiple or fractional years is not common in practice. The computations for managing cooperative equity are more difficult than for base capital and percentage pool plans in a steady-state cooperative. They are even more difficult in practice because of the uneven pattern of investments over time due to variations in past years' volume and earnings.

We used a subjective approach to measure the flexibility of the five plans. On a scale of zero to five, with five the best, we scored the plans as follows: estate settlement, 1 (very poor); age-of-patron, 2 (poor); revolving fund, 4 (good); percentage pool, 4–5 (good to very good); and base capital, 5 (very good).

Proportionality

The proportionality index is calculated for patrons as a group and represents an average proportionality. Proportional investment by all patrons would result in a value of 1.0. Actual values always will be less than 1.0 because some patrons are underinvested while others are overinvested.

Proportionality index values were calculated for all programs in table 1 and are reported in table 2. Comparisons of different plans generally are limited to those with the same capital target. Other comparisons were made using the same plan but different feasible capital targets. This comparison

Table 2.—Proportionality Index Values for Redemption Programs

Program	Capital Target					
	A	B	C	D	E	F
ES					.6496	.5431
AP + ES				.7269		
RF + ES	.9482	.8895	.7894	.8043		
PP + ES	.9058	.8208	.7245	.7360		
BC + ES	.9809	.9267	.8017	.8207		

demonstrates the effect of different capital targets or equity turnover rates on the proportionality and cash flow performance of the plan.

Equity turnover measures the rate at which allocated equity is redeemed. The turnover ratio is equal to total allocated equity divided by redemption during the year. Allocated equity is equal to the capital target, and redemption is $100,000 a year in our steady-state analysis. If the capital target is A, allocated equity is $500,000 and the turnover rate is 20 percent. There is a one-to-one correspondence between capital targets and turnover rates because of our steady-state assumption. The turnover rates for all targets are reported in table 1.

Equity turnover is useful in evaluating equity management performance because it summarizes the relationship between allocated equity and redemption. Comparisons between cooperatives with different amounts of equity and redemption are made more easily using this measure. Equity turnover also is useful because it is a proxy for profitability in a steady-state situation. This is because investment and redemption are equal and investment comes from operations in the form of retained patronage refunds or per-unit retains.

A logical line of inquiry concerns the impact of profitability on equity management, including redemption performance. Cooperatives attempting to improve equity management performance should consider ways to improve profitability in addition to which equity redemption plan to use.

If we use turnover rates as a proxy for profitability, we can make some inferences about various capital targets. For example, capital targets A, B, and C have turnover rates of 20.7, 10.20, and 5.48 percent. In a sense, they represent high-, moderate-, and low-profit situations.

Programs using only the estate settlement plan have the lowest proportionality. Cooperatives that rely on such programs have a very high capital target relative to the annual level of investment and redemption. This results in a long period of substantial underinvestment, followed by a long period of substantial overinvestment, as illustrated in figure 3. The proportionality index values for programs E:ES and F:ES are .6496 and .5431.

The results for capital target D provide the best evaluation of the relative performance of the other four alternatives (age-of-patron, revolving fund, percentage pool, and base capital plans) according to the proportionality criterion. This is the only situation in which all four plans are used to achieve the same capital target. The base capital plan is designed to achieve

proportional investment and, as expected, has the highest proportionality, followed by the revolving fund, percentage pool, and age-of-patron plans (table 2).

There is a positive relationship between equity turnover and proportionality. The higher the turnover rate, the higher is the proportionality of investment. Or equivalently, the lower the capital target in our steady-state cooperative, the higher is the proportionality. This relationship is visually evident in the net investment patterns for capital targets A and C in figures 5 and 6. The net investment patterns are much closer to the patron capital target for cooperative target A, which has a turnover rate of 20.04 percent, than for cooperative target C, which has a turnover rate of only 5.48 percent.

This positive relationship also is evident in figure 7. The proportionality index values (from table 2) and corresponding turnover rates (from table 1) are plotted for each redemption alternative. Because the age-of-patron and estate settlement plans are very similar, the three points associated with them (programs D:AP + ES, E:ES, and F:ES) are connected. A consistent rank order of performance exists for all alternatives at each turnover rate, indicated by the fact the lines do not intersect.

The ordinal ranking of the proportionality performance of the three systematic plans is the same for capital targets A, B, and C as it is for capital target D. The nonsystematic alternatives have a lower ranking. The rank order from best to worst is base capital, revolving fund, percentage pool,

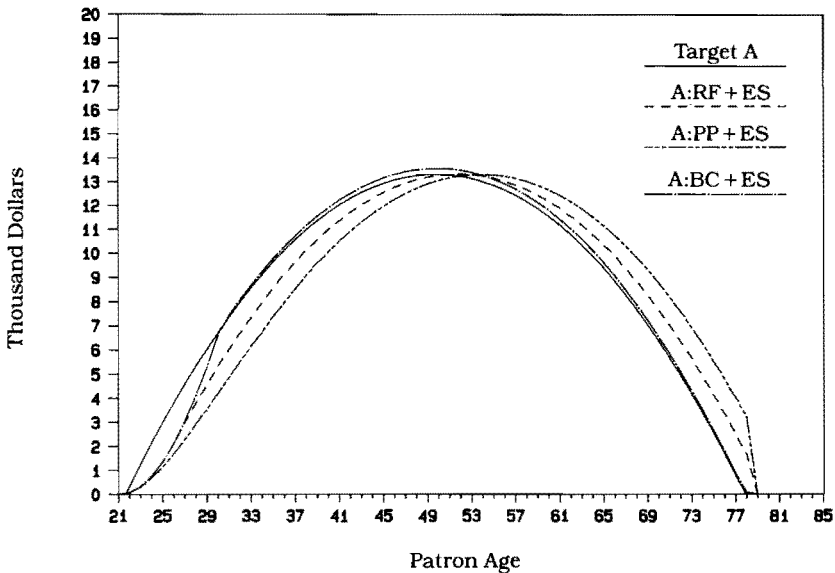**Figure 5.—Capital Target A and Net Investment Patterns for Three Redemption Programs**

Figure 6.—Capital Target C and Net Investment Patterns for Three Redemption Programs
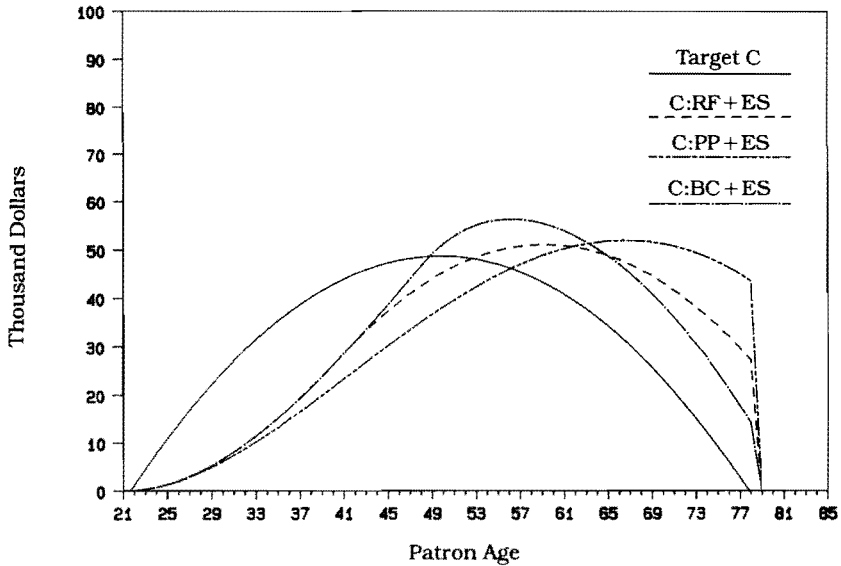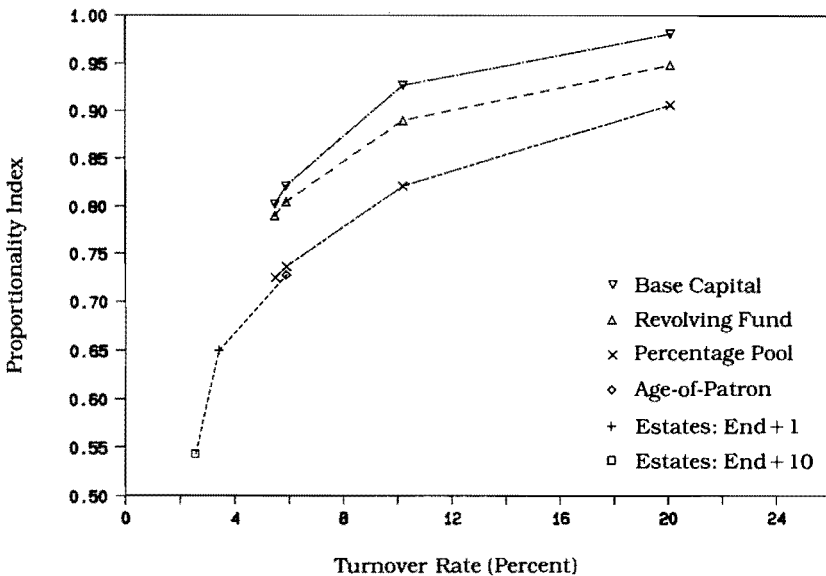

Patron Age

Figure 7.—Relationship of Turnover and Proportionality for Selected Redemption Plans

Turnover Rate (Percent)

age-of-patron, and estate settlement. We subjectively scored the plans (using the same scale used for the flexibility criterion) as follows: estate settlement, 1 (very poor); age-of-patron, 2 (poor); percentage pool, 3 (fair); revolving fund, 4–5 (good to very good); and base capital, 5 (very good).

Cash Flow

In our analysis, nominal cash flow from redemption is the same for all plans. It totals $100,000 for each patron age group over the time horizon. The present value of cash flow is different for each plan because the timing of redemptions vary.

Present values were calculated for all programs in table 1 and are reported in table 3. Cash flow comparisons between different capital targets are restricted to the same plans as they were in our discussion of proportionality. The interpretation of the results is clarified by calculating a present value index. The index for a program is equal to the program's present value divided by the value for program E:ES. These values also are reported in table 3. The estate settlement program E:ES has a present value of only $397.40 although $100,000 is redeemed at the end of the time horizon. The relative performance of the other four alternatives is most clearly illustrated by the present values for capital level D.

The best cash flow performance is by the percentage pool plan, followed by the revolving fund, base capital, and age-of-patron plans. The percentage pool plan begins paying redemptions sooner than the other plans, thereby increasing the present value to patrons. The percentage pool plan also pays the highest estate settlement, at the end of the time horizon, but the earlier redemption payments more than offset this disadvantage compared with the other plans.

Table 3.—Present Value of $100,000 Cash Flow from Redemption

| Program | Capital Target | | | | | |
	A	B	C	D	E	F
	Present Value (Dollars)					
ES					397.40	153.21
AP + ES				1,372.22		
RF + ES	7,731.24	4,806.30	1,894.81	2,204.21		
PP + ES	8,239.69	5,911.65	3,117.74	3,477.75		
BC + ES	7,302.43	4,119.07	1,565.32	1,799.24		
	Present Value Index[a]					
ES					1.00	0.39
AP + ES				3.45		
RF + ES	19.45	12.09	4.77	5.55		
PP + ES	20.73	14.88	7.85	8.75		
BC + ES	18.38	10.37	3.94	4.53		

[a]Base for calculating index is program E:ES.

   The relative order for the three systematic plans (percentage pool, revolving fund, and base capital) remains the same for capital targets A, B, and C. The percentage differences decrease for the capital targets smaller than D, namely A and B. We believe capital target D provides the most useful comparison of the plans because it is the only capital target used to analyze four different plans.

   The present value of the cash flow from redemption is positively related to the turnover rate. A graph of these values from tables 1 and 3 clearly illustrates this relationship (figure 8). The order of performance of the alternatives evaluated for each capital target does not change as the turnover rate changes (i.e., as we evaluate alternatives achieving different capital targets), indicated by the fact the lines do not intersect. We connected the age-of-patron (D:AP65 + ES79) and estate settlement (E:ES79) programs in the graph because E:ES79 can be viewed as equivalent to redeeming by age of patron at age 79.

   The rank order from best to worst according to the cash flow criterion is percentage pool, revolving fund, base capital, age-of-patron, and estate settlement. Using the present value index as a guideline, we subjectively score the five alternatives (using the scale used for flexibility and proportionality) as follows: estate settlement, 1 (very poor); age-of-patron, 2 (poor); base capital, 3 (fair); revolving fund, 3–4 (fair to good); and percentage pool, 5 (very good).

Figure 8.—Relationship of Turnover and Present Value of Cash Flow for Selected Redemption Plans
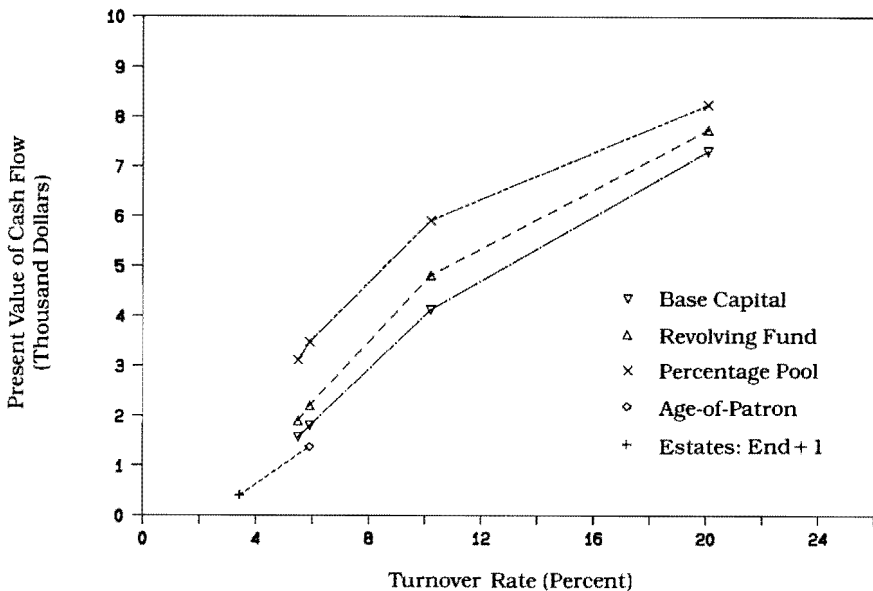
Conclusions

The performance of a cooperative's equity management program is determined largely by its choice of an equity redemption plan. Our analysis demonstrates that the redemption plan determines the equity capital investment level in the steady-state cooperative.

The performance criteria we used are flexibility, proportionality, and cash flow. An overall evaluation of the five basic equity redemption plans conducted using these criteria is presented in table 4. This evaluation represents our subjective judgment of performance given our empirical results and knowledge of cooperatives.

The flexibility of redemption programs in achieving selected capital targets varies. The most flexible programs are those using the base capital, percentage pool, and revolving fund plans. The age-of-patron and estate settlement plans are relatively inflexible.

The plan achieving the highest level of proportionality is the base capital plan, closely followed by the revolving fund plan. The revolving fund plan is closer to the base capital plan's performance at lower turnover rates than higher rates, but the differences are not substantial. The percentage pool plan achieves a significantly lower level of proportionality than the base capital and revolving fund plans. The gap narrows at very high turnover rates but still is significant. The percentage pool plan is not much better than the age-of-patron plan at the low turnover rates often associated with programs based on the age-of-patron plan.

Our results concerning proportionality are consistent with those reported by Royer and Cobia. Higher turnover rates resulted in higher proportionality, and the revolving fund plan had the highest proportionality of those plans evaluated in both studies.

The program resulting in the highest present value of cash flow from redemption is one based on the percentage pool plan. That plan is substantially better than any other alternative. Although the differences between it and the revolving fund and base capital plans decline at higher turnover rates, they still are significant. The age-of-patron and estate settlement plans provide a much lower present value of cash flow from redemption.

No clear first choice among plans exists when all three criteria are considered. It is clear that the base capital, percentage pool, and revolving fund

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Table 4.—Subjective Evaluation of Equity Redemption Plans

Plan	Criterion			
	Flexibility	Proportionality	Cash Flow	Average Score
Estate Settlement	1	1	1	1.0
Age-of-Patron	2	2	2	2.0
Revolving Fund	4	4–5	3–4	4.0
Percentage Pool	4–5	3	5	4.2
Base Capital	5	5	3	4.3

Note: 1 = very poor, 2 = poor, 3 = fair, 4 = good, and 5 = very good.

plans all are better choices than the age-of-patron and estate settlement plans, which consistently rank lower.

The choice among the top three plans will depend on the relative importance of each of the criteria to a cooperative decision maker. The flexibility of the plans probably is adequate for most situations and so may not be a significant factor in the decision. Proportionality favors the base capital plan whereas cash flow favors the percentage pool plan. The revolving fund plan represents a convenient middle ground. Proportionality has a strong conceptual appeal, especially to theoreticians. However, we believe patrons generally will choose cash flow as more important. Higher cash flow performance is especially attractive to young or new patrons. This suggests the percentage pool plan may be an important component in a cooperative's marketing strategy.

Other criteria also are important to decision makers. They include: (1) efficiency and simplicity and (2) compatibility with other plans. The percentage pool plan is by far the most efficient (least costly) and simplest to administer. It also is the most compatible with other plans. The revolving fund plan rates somewhat lower on these criteria. The base capital plan is by far the most complex. Although computerized patronage accounting systems increase the efficiency of using the base capital plan, the plan's complexity is a major stumbling block in educating patrons and employees.

Many cooperatives use the age-of-patron plan, which rates poorly according to our criteria, but are hesitant to discontinue its use because of the expectations of older patrons. A program consisting of an age-of-patron plan in combination with another plan may be useful as a transition strategy. There is a significant cost to switching to a new redemption plan. If the cooperative has been using one of the three highest rated plans, the revolving fund, percentage pool, or base capital plan, the cooperative may not gain much from switching to another plan.

Turnover rate and profitability are logically linked, and a positive relationship exists between the turnover rate and two of our criteria, proportionality and cash flow. This implies that one important strategy for a cooperative is to increase profitability if it wants to improve its equity management performance. This is the bottom line in equity management.

Note

1. Allocated equity capital may include classes of equity, such as membership stock or certificates, that are not redeemed except under special circumstances such as an estate settlement. We do not evaluate the redemption of this type of permanent, nonrevolving equity.

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