ABSTRACT

Effective Rate Minimization in Cooperative Financing

by Ken D. Duft

The recent incorporation of large new cooperative borrowers into the U.S. Banks for Cooperatives system has impacted the desired equilibrium of debt to equity capital. Capital program adjustments designed to re-establish equity levels have been implemented without the lenders' determination of their impact on effective interest rates. This paper illustrates that such rates are minimized where the capital revolve period coincides with the length of time required to fully capitalize the new borrowers.

RATE SENSITIVITY TO EQUITY CAPITAL REVOLVE POLICIES
IN THE BANKS FOR COOPERATIVES SYSTEM

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Background

The passage of the 1971 Farm Credit Act constituted a significant
regulatory shift for Federal Land Banks and Federal Intermediate Credit
Banks. Only a small portion of the 1971 and subsequent year's legis-
lation affected operations throughout the Banks for Cooperative System.
The Federal Farm Credit Board had earlier asked Congress to allow each
district Farm Credit Board to set the eligibility requirement necessary
for a cooperative to borrow from the district Bank for Cooperatives.
More specifically, they had asked that the percentage of farmer-members a
cooperative had be set by district Boards at 65-90 percent for borrower
eligibility. Congress responded to this request by setting an 80 percent
requirement for all districts in the 1971 Act. In 1974 and again in 1975,
the Federal Board asked Congress to reduce this eligibility requirement
to 60 percent in those cases where the prospective cooperative borrower is
operating as a public utility, e.g. rural electric and telephone coopera-
tives. Congress approved of a reduction to 70 percent.[2] While some
electricity transmitting cooperatives met the 80 percent eligibility

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[2] W. Gifford Hoag, The Farm Credit System; A History of Financial Self-
Help, the Interstate Printers and Publishers, Inc., Danville, IL
1976, pp. 269-270.

requirement and did borrow from the system prior to the 1975 legislation, the reduction in eligibility requirement enabled several large regional electricity generating and transmitting cooperatives to gain borrower eligibility. These so-called "G&T's" were operationally large compared to the local distribution cooperatives and their term debt requirements had grown to major proportions as each confronted the need to construct new and more expensive power generating facilities to fulfill the rural energy needs forecast for the 1990's. Many such construction projects were envisioned to be joint ventures amongst several regional G&T's and required funding in amounts sometimes reaching $600,000,000. As such, the larger projects exceeded the lending limit of any district bank and the system as a whole.[3] Regardless, the system was now confronted with a group of new prospective cooperative borrowers whose operations differed significantly from those of their traditional borrowers and whose term debt needs in the immediate future were quite extensive.

The Problem

Cooperative philosophy and B.C. system policy have supported the premise that equity within the system should be held by those currently using its resources. Furthermore, such equity ownership should be equitable among all borrowers and proportionate to the level of usage by each cooperative borrower. Ideally, equity held by cooperatives no longer borrowing from the system would be rapidly revolved back to the cooperative, while new borrowers to the system were encouraged to build their

[3] Lending limits for term loans are established for "single credit risks" at 25 percent of net worth of each district bank or 50 percent of the consolidated net worth of all 13 Banks for Cooperatives exclusive of participation sold to outside institutions, see F.C.A. Operating Regulations, Section 4354; Parts i-iii.

equity to an acceptable level as rapidly as was prudent. The speed at which ex-borrower's equity can be revolved was, of course, largely dependent upon the existing length of the district banks equity revolve program. The speed at which new borrowers can become fully capitalized is, of course, a function of each district borrower capitalization program. Because few large system borrowers ever fully discontinued their borrowing from the system and because most new borrowers to the system entered at relatively low outstanding loan balances, equitable and proportionate borrower capitalization throughout the system were not difficult to maintain. However, with the potential new entry of several large G&T's, equity balances within those districts making the loans were threatened.[4]

For example, regulatory controls prohibit any bank from lending to a single borrower an amount of money which exceeds 20 times the borrower's equity in the bank. This prohibition is the indirect result of the system's mandate to sell loan debentures never to exceed at any point in time 20 times the system's total net worth at year end, last.[5] In search of greater financial security, the banks for cooperatives agreed amongst themselves that loan balance to borrower equity should not exceed 12 to 1. Furthermore, because of significant annual variations in a borrower's loan balance, maintaining a maximum of 12 to 1 required that most borrowers

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[4] This imbalance was not the result of G&T's being operationally different from the systems traditional borrowers. Rather, it resulted from the fact that as new borrowers, they had no prior equity capital balance in the district bank and with term loans reaching the district's lending limit a significant impact on that debt-to-equity ratio resulted.

[5] This mandate was set in the 1971 Farm Credit Act where it was raised from 8 to 1; see Martin A. Abrahamsen, Cooperative Business Enterprise, McGraw-Hill Book Co., 1976, p. 331.

maintain an average <u>annual</u> loan balance to equity ratio of 8 to 1.<u>6/</u> Stated

a little differently, an amount of equity approximating 10 to 12 percent

of average annual loan balance outstanding was needed by each borrower to

support system standards. Quite obviously a new borrower seeking, for

example, $200,000,000 in a term loan would be totally unable to quickly

invest $24,000,000 in system equity capital. Conversely, if $50,000,000

of this amount was being held by a district bank (the remainder being in

participation with the Central Bank), the current district borrowers were

being asked to provide the $6,000,000 in equity capital needed to support

the loan to the new borrower. For obvious reasons, each district bank would

have to implement new equity capital policies which would lessen the dis-

proportionate capital burden on its existing borrowers, while allowing

the new G&T borrower a reasonable amount of time to reach the desired 10

to 12 percent level of capital to loan balance. And, in fact, most dis-

tricts have initiated new capital programs within the past year or are

currently in the process of evaluating alternative programs.

My investigations have shown that while each of the newly implemented

capital programs share a common objective and while each contains similar

assessment parameters, the magnitude of each parameter's assessment and

the conditions under which capital assessment terminates differs greatly

from one district bank to another. It can be argued that such inter-

district variations are fully justified by differences in each bank's

loan portfolio and by whether or not a particular bank has historically

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6/ So as not to exceed the 12 to 1 ratio at <u>any point in time</u> and because
seasonal variations in a borrower's loan balance may reach 50 percent,
an 8 to 1 <u>average annual</u> ratio is required by most borrowers. For
those district banks desiring to keep their borrowers at a 10 to 1
debt to net worth ratio a 10 percent equity to loan balance outstanding
is sought.

been over- or under-capitalized.[7]   Regardless, equity capital program

variations abound amongst the twelve district banks. Most importantly,

such <u>assessement variations are being implemented with little or no recog-</u>

<u>nition of their dependency on the established equity capital revolve</u>

<u>period and the resultant and combined impact on the effective interest</u>

<u>rate paid by its borrowers.</u>

Description and Scope

Philosophically at least, and practically at best, all district banks

have supported a shortening of their equity capital revolve period. The

persuasive argument, of course, suggests that borrower equity be retained

within the system only as long, and in amounts as large, as is necessary

to maintain financial integrity. Shortening of the revolve period ex-

plicitly recognizes the time-value relationship of money and better

facilitates the "cashing out" of cooperatives no longer borrowing from the

system. Revolve periods amongst the district banks now vary from 7 to

13 years. In most cases, this does represent a reduction of earlier

revolve periods. Moreover, many districts have expressed an interest in

shortening further their revolve period within the next 2-5 years. Un-

fortunately, few district banks have acknowledged the interdependency

which exists between the decision to adjust the revolve period and the

implementation of new equity capital programs. Moreover, most have

failed to recognize that in combination, equity capital programs and re-

volve periods do have a direct impact on the effective rate of interest

paid by their cooperative borrowers.

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[7]   Those district banks experiencing very rapid growth in their loan
volume in recent years have typically been unable to build their
capital base as rapidly and are, therefore, encouraged to implement
more aggressive capital assessment program. Conversely, an over-
capitalized district bank with no prospective G&T borrowers would have
little reason to make major changes in its capital generating provisions.

Theoretical Assumptions

It has been generally assumed throughout the system that any program which increases either the eiquty capital assessment rate or the required equity to loan balance level will have an adverse impact on effective rate. This presumption holds in so far as the borrower's equity acts much as a compensating balance would impact the true rate of interest paid to a commercial bank. It has also been assumed that a shortening of the re-volve period will favorably affect the true (effective) rate.[8] This presumption holds in so far as the discounted net present value of $1 equity capital increases as the period over which it is retained by the district bank is decreased. While our two theoretical assumptions hold up when considered independently, simultaneous adjustments in each result in a much more complex end-result. In fact this author shall argue that under some equity capital programs now being implemented within the B.C. system, a shortening of the banks equity capital revolve period may actually adversely affect their borrowers, i.e. increase their effective rate.

Objective

The objective of this paper is to test the sensitivity of the effective rate to simultaneous adjustments in a capital revolve period and a district bank capital program. Furthermore, I shall attempt to ascertain that set of capital program and revolve period conditions which would result in absolute minimization of borrower effective rate. Finally, I

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[8] Effective rate is defined to be the true interest rate paid by the borrower after adjusting the variable term contract rate to reflect equity capital assessments of all kinds, reinvestment, equity capital revolves, cash patronage and declining quarterly loan balances out-standing.

shall try to describe those capital program components which contribute most toward rate sensitivity and graphically illustrate the magnitude of such rate sensitivity.

Methodology

As noted earlier, each district bank has chosen to implement a slightly different equity capital program. The capital revolve period established at each bank has always differed within some upper and lower bounds. Finally, one could find little or no similarity between the borrower portfolio of the twelve district banks. Hence any attempt to ascertain "actual" effective rate sensitivity under specific district bank-borrower situations becomes burdened by near endless combinations and per-mutations of capital program components, revolve periods, and borrower loan histories. In light of such complexities, it was decided to test rate sensitivities through the use of a computer-based loan simulation model already developed for and used by the banks for cooperatives system.[9] While a more definitive description of the simulation is provided in Appendix A, its basic composition includes the following:

1) The ability to "simulate" all cash flow transactions between bank and borrower under any specified set of term loan para-meters, e.g. loan amount, advance schedule, variable term rates, repayment schedule, patronage policies, interest-earned record, equity revolve period, and equity capital program (including any complement of advance capital, override, reinvestment, etc.).

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[9] This program was developed in March 1976 by the Central Bank for Coopera-tives and has been used to: 1) simulate large G&T loans, 2) test alterna-tive equity capital programs, and 3) demonstrate fixed-rate loan capabilities in several district banks for cooperatives. The program has been released to this author for use in his cooperative finance research activities at Washington State University. The simulation program has demonstrated the above listed capacities via its use by the district banks in New Orleans, Louisville, St. Louis, Wichita, Omaha, and Spokane.

2) The ability to simulate quarterly changes in the variable term
   rate to duplicate those rate changes actually experienced by the
   district banks over the past five years.

3) The ability to activate and terminate all forms of capital assess-
   ments in accordance with the banks program specifications, e.g.,
   if desired, override can be automatically terminated when the
   level of borrower equity reaches that desired level, reinvestment
   may be automatically activated so as to maintain the desired
   level of borrower equity following override termiantion, etc.

4) The ability to reflect quarterly loan and equity balances as
   they respond to repayment, capital additions, revolves, reinvest-
   ment, etc.

5) The ability to automatically calculate and incorporate a loan
   repayment schedule based either on full amortization or equal
   quarterly payments.

Given these program capabilities listed above, the desire was to con-
struct a hypothetical district bank-borrower situation. Although the
simulation is applicable to all the system's traditional borrowers, it was
originally constructed with reference to prospective G&T borrowers. Hence
our hypothetical borrower shall be a large G&T. As noted earlier, some
variation in district bank capital programs can be found. Hence we shall
attempt to simulate a hypothetical district bank with a rather broadly
designed capital program, i.e. one which could accommodate any of the
component variations actually in existence.[10] Our procedure simply

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[10] While the model can accommodate all variations, I have chosen to
simulate a capital program which I judge to be "most typical" of
those now in use in the district banks. Appendix A describes the
nature of component variations accommodated.

consists of simulating the district bank-borrower loan parameters under
a specific capital program and lenth of revolve period .... then adjusting
the length of the revolve and re-run the program. Observing changes in
the average annual effective rate to adjustments in revolve period will
isolate any sensitivity, if any. Next, plotting the effective rate
changes against revolve period will demonstrate the ability to rate min-
imize, ceteris paribus.

Simulation Components

Because new borrowers with large debt requirements and no prior
equity capital balance are the major contributors to capital inequities,
our simulation program shall rest on such a situation. Our hypothetical
G&T has never before borrowed from the B.C. system but does meet the new
eligibility requirements. It is seeking to construct a new power generating
facility and wishes to secure $100,000,000 from a district B.C. to finance
this project over the next 5 years of construction and 30 years subsequent
operation. In accordance with the expected construction schedule, this
G&T would draw advances over five years in the amounts shown below:

Year	Quarter	($000,000) Advance
01	1	2
	2	2
	3	4
	4	4
02	1	4
	2	4
	3	8
	4	8
03	1	16
	2	16
	3	8
	4	8
04	1	4
	2	4
	3	2
	4	2

Year	Quarter	($000,000) Advance
05	1	1
	2	1
	3	1
	4	1
Total		100

The construction period plus two years shall require interest only payments and the principle will be repaid on a fully amortized schedule beginning in the first quarter of the eighth year. The amortization schedule is written of 112 quarterly payments totalling $105,000,000 (advances plus advance capital) in principle, and set at the variable term rate existing at that time. During the period of advances, loan balance outstanding shall be carried at the seasonal interest rate with the balance converting to a term loan (and variable term rate) at the end of each year. An advance capital charge of 5% is levied against each advance. This amount is loaned to the borrower and is reflected in the loan balance. Advance capital charges terminate with the last advance. The borrower also pays quarterly override charges calculated at 10 percent of total interest due. Advance capital and override are automatically credited to the borrower's equity capital balance. Override charges terminate at such a time as the borrower's equity as a % of loan balance outstanding exceeds 12%. If as a result of an abnormally large capital revolve the borrowers equity drops below this desired 12% level, an equity reinvestment is subsequently activated and reinvests those equities needed to maintain the desired level. Cash patronage in the amount of 20 percent of earnings is paid each year; the remaining 80% is retained for the period of the revolve. B.C. earnings have been running approximately 14 percent of total interest received in recent years and are so reflected in the model. Seasonal and variable term rates reflect those actually charged by the system in the five year period beginning in January 1971.

Not all of the model components described above comprise the equity capital program. Many components represent conditions supplemental to the operational needs of the borrower. For example, the advance schedule reflects the funds flow required to finance the pending construction. The seven-year interest only period represents the time it will take before the new power generating plant will generate revenues adequate to support principal repayment. The lending of advance capital monies reflects the cash-short position of many such firms about to embark on a major expansion.

Finally, it must be acknowledged that while this simulated loan package incorporates specific components, the computer model is capable of assimilating numerous variations. For example, the model can accept: 1) any specified schedule of advances, 2) any cycle of interest rates, 3) any loan term or interest-only period, 4) fully amortized or equal quarterly principal payments, 5) any advance capital or override, 6) various capital assessment begin and termination instructions, 7) any existing cash patronage policy, 8) any interest earnings rate, 9) override expressed as a percent of interest due or as a percent of previous quarter's loan balance outstanding, and, of course, 10) any length of revolve period.

Impirical Results

Those data listed in Table 1 and depicted in Chart 1 are resultant from the sensitivity analysis described above. Given the loan parameters and capital program components just listed, we have allowed the revolve period to take values (odd numbered years) from 3 to 17 years. In so far as the schedule and amount of loan advances remains unchanged, the 5 percent advance capital assessment shows no change. Similarly, total B.C. interest received, interest earnings, cash patronage, patronage retained, and total

Table 1

EFFECTIVE RATE SENSITIVITY TO VARIATIONS IN LENGTH OF EQUITY REVOLVING PERIOD[*]

Standard Components with Revolving Period of: (Years)	Total Advance Captial ($)	Total Override ($)	Aver. % Eqt./ LBO (%)	Tot. B.C. Interest Earned ($)	Total Cash Patronage ($)	Total Interest Paid ($)	Total Variable Term Interest ($)	Total Cash Outflow ($)
3	5,000,000	4,609,781	11.52	25,330,593	5,066,118	180,932,813	157,226,648	257,151,192
5	5,000,000	4,609,781	11.56	25,330,593	5,066,118	180,932,813	157,226,648	257,099,585
7	5,000,000	3,991,553	11.96	25,330,593	5,066,118	180,932,313	157,226,648	256,951,687
9	5,000,000	3,991,553	13.06	25,330,593	5,066,118	180,932,813	157,226,648	257,808,852
11	5,000,000	3,991,553	13.91	25,330,593	5,066,118	180,932,813	157,226,648	258,913,498
13	5,000,000	3,991,553	15.82	25,330,593	5,066,118	180,932,813	157,226,648	259,834,689
15	5,000,000	3,991,553	18.29	25,330,593	5,066,118	180,932,813	157,226,648	261,272,883
17	5,000,000	3,991,553	20.81	25,330,593	5,066,118	180,932,813	157,226,648	262,572,489

Standard Components with Revolving Period of: (Years)	Contract & Effective Rate (%)	Total Patronage Retained ($)	Total Patronage Revolved ($)	Aver. Annual Equity Balance ($)	Total Reinvestment ($)	Total LBO ($)	Net Interest Paid ($)	Equity Bal. Term End ($)
3	7.6/6.605	20,264,475	90,554,404	7,962,639	62,229,122	9,517,792,173	157,151,192	1,548,975
5	7.6/6.602	20,264,475	54,148,915	7,970,309	20,264,475	9,517,792,173	157,099,585	1,497,368
7	7.6/6.596	20,264,475	39,377,082	8,137,511	11,470,523	9,517,792,173	156,951,687	1,349,470
9	7.6/6.632	20,264,475	31,984,498	8,678,549	4,935,103	9,517,792,173	157,808,852	2,206,634
11	7.6/6.679	20,264,475	27,207,665	9,312,090	1,262,917	9,517,792,173	158,913,498	3,311,281
13	7.6/6.717	20,264,475	25,023,556	10,365,677	0	9,517,792,173	159,834,689	4,232,472
15	7.6/6.778	20,264,475	23,585,363	11,745,729	0	9,517,792,173	161,272,883	5,670,665
17	7.6/6.832	20,264,475	22,285,757	13,044,485	0	9,517,792,173	162,572,489	6,970,271

* See Appendix for explanation of terminology used and columnar calculations.

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Chart 1

Effective Rate Response to Varying
Lenths of the Equity Revolve
Period
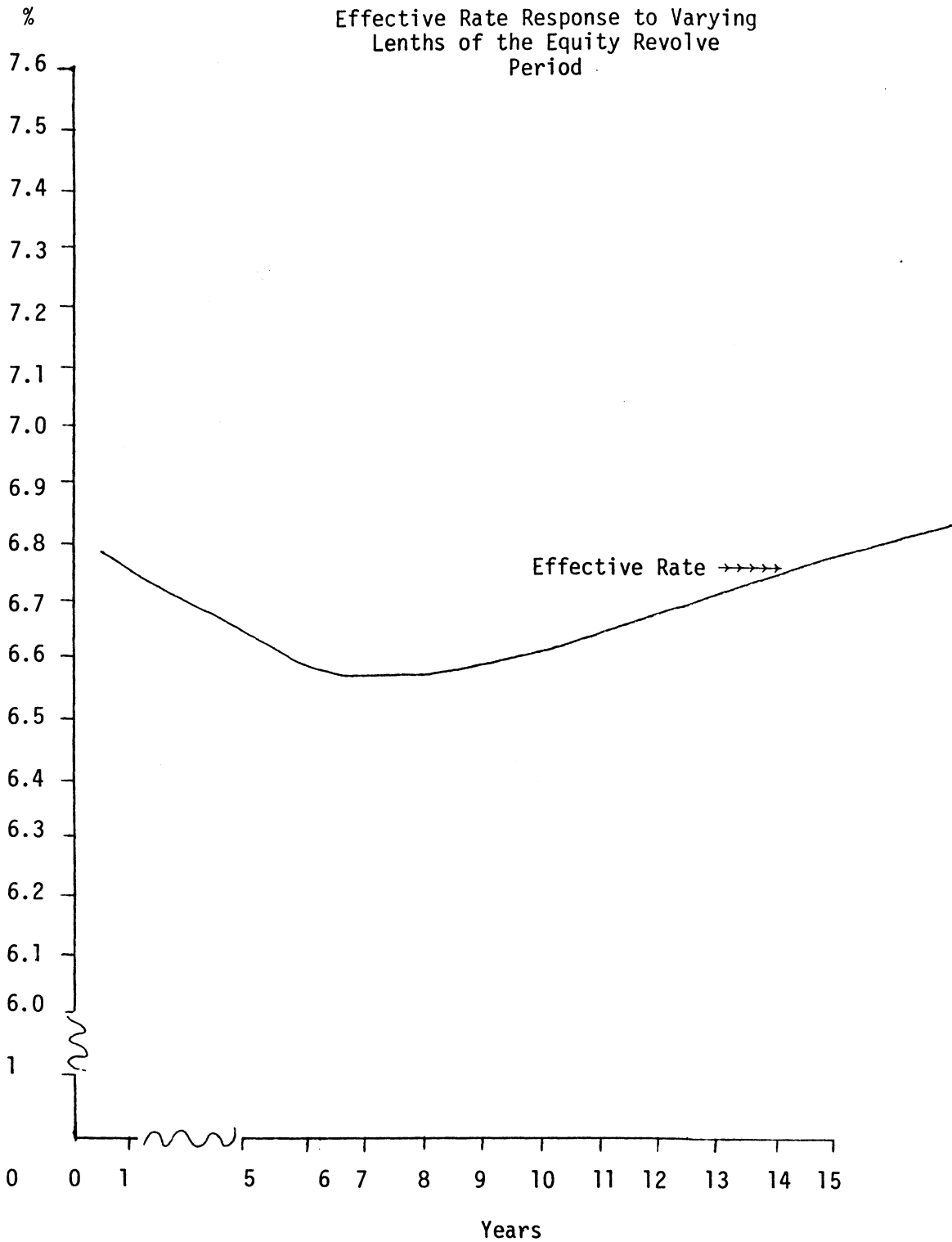
Length of Equity Revolving Period

(or average annual) loan balance outstanding are all unaffected by vari-
ations in revolve period.

Notice, however, that the total override charged a borrower drops for
a revolve period of at least 6 years. With a shorter revolve period, the
borrower builds equity more slowly and reaches the 12 percent override
termination much later in the loan term. The reuslt is an increase in the
total override charged. In all cases, the amount of patronage paid in cash
and retained are identical. However, as the revolve period lengthened,
patronage (equity) revolves in the form of advance capital, override,
reinvestment, or retains is reduced as of the end of the loan term. This
results from the simple fact that equity investments made late in the loan
term under a long revolve period may not be returned to the borrower until
perhaps the 50th year. Because equity is being held longer under a longer
revolve period, the borrowers average annual equity balance increases.
Measured against an unchanged loan balance, equity as a percent of loan
balance outstanding increases from 11.52 percent to just over 20.81 percent.
Our capital program's reinvestment provision is not activated for a revolve
period of at least 12 years. Under shortening revolve periods, reinvest-
ment increases as faster equity revolves provide a more concentrated drain
on the desired 12 equity level. Since net interest paid reflects the
total cash outflow less principal repayment, it is a true measure of the
cost of debt. Effective rate measures this net interest cost against loan
balance. While the variable term (contract) rate averaged 7.6 percent for
the 35 year period, the effective rate was found to have a U-shaped
response to a lengthening of the revolve. Because all cash flows between
borrower and bank are dated, discounting does not affect the analysis, i.e.
discounted net present values of equities revolved would be subject to the

same discount factor as interest, override, principal, and the reinvest-
ment payments made in that same future time period.[11/]   The only funds
flow not measured in this computation are those borrower equities remaining
in the district bank after this loan (and all other loans) have been repaid.[12/]

Observations

All of our findings can be summarized and illustrated in Chart 1. Quite
obviously the effective rate is sensitive to revolve period adjustments.
Moreover, some concept of effective rate minimization is possible in so
far as the sensitivity is trans-directional, i.e. it is both direct and
indirect depending on the values of the independent variable. Having
confirmed my earlier hypothesis, further explanation is now warranted.

Most of the advance capital programs now being used or tested by the
district banks (including our hypothetical program) are designed to en-
courage the new or undercapitalized borrower to reach a desired and
equitable level of capitalization as rapidly as would seem prudent. Further,
most programs through a continuous override or a reinvestment provision,
have the ability to maintain the borrower's equity at the desired level
(perhaps 10 or 12 percent) once it has initially been reached. Hence,
any attempt to revolve equities over a period of time less than that required
by the borrower to reach the desired level of equity creates an unnecessary
financial burden (and a higher effective rate). Any attempt to lengthen
the revolve period beyond that time required to fully capitalize the borrower
also increase the effective rate in that borrower equity is being held
longer than would be needed. Under this description effective rate

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11/   Moreover, it can be shown that the effective rate represents precisely
      that discount factor which if applied against each years net cash
      exchange between borrower and bank will compute a discounted net
      present value exactly equal to the loan's face value of $100,000,000.

12/   Present values of these remaining funds would not be legitimate in so
      far as most are used as equity in support of subsequent loans.

minimization will occur at that point where the bank's revolve period is matched precisely with the time required by a new borrower to become fully capitalized in compliance with the existing advance capital program. Given the variations in capital programs already noted, each district bank would find their ideal revolve period to differ. Table 1 shows that effective rate could be reduced, at most, from 6.82 percent to 6.596 percent if our hypothetical bank reduced its revolve period from 17 to 7 years. Further reductions in revolve period would then increase the rate to 6.605 percent. As shown, the maximum impact would be a saving for the borrower of only 24 basis points. Yet this is not as insignificant as it may first appear. For our hypothetical G&T, for example, it would save them $5,620,802 over the full term of the loan! Surely this amount would make it worthwhile for each district bank to simulate their own capital program so as to identify the period of new borrower capitalization and compare it with their current revolve period.

Summary

When borrower eligibility requirements for rural electric cooperatives were legislatively reduced to 70 percent in 1976, the B.C. system found itself confronted with a type and size of prospective borrower never before a part of its portfolio, i.e. the large regional R.E.C. generating and transmitting cooperative. Because these borrowers (or prospective borrowers) had no prior equity balances in the district banks and because their term debt needs were so large, the system quickly and accurately perceived a pending distortion in their required equity levels and distribution amongst all borrowers. To correct this potential inequity in borrower's capitalization of the district bank, many banks initiated new equity capital

programs. The various district capital programs were similar with regard
to intent and basic operational base, but differed somewhat with regard
to the rate and level of capitalization sought. At the same time, several
district banks expressed the desire to further reduce the length of their
revolve period. Few, if any, of the banks acknowledged any awareness of
the interdependency between these two seemingly unrelated policy changes.
The objective of this paper was to test the existence of such an inter-
dependency and ascertain the nature of effective rate sensitivity to changes
in capital programs and revolve periods. A loan simulation model developed
by the Central Bank for Cooperatives was used to generate all loan data
for a hypothetical district bank - G&T borrower situation. A capital program
typical of that now found throughout the system was used and the revolve
period was allowed to take varying lenths from 3 to 17 years. The results
showed that effective rate was impacted by the interdependency between
equity capital program and revolve period. Moreover, a reduction in
effective rate can be realized by an attempt to match the revolve period
to the length of time required by the new borrower to reach the desired
level of capitalization. While such effective rate reductions were small
(never exceeding 24 basis points), when applied to the relatively large
loan balances of G&T borrowers, substantial dollar savings can be realized
over the entire loan term. This would suggest that those banks implementing
new equity programs should simulate new borrower capitalization rates
under those programs to ascertain the ideal revolve period.

Appendix A

Table 1 Terminology

Total Advance Capital - set at 5 percent of each advance terminating with last advance.

Total Override - set at 10 percent of each quarters interest due, initiated with first advance and terminated when borrower equity as a percent of loan balance outstanding exceeds 12 percent.

Over % Eqt./LBO - average borrower equity as a percent of loan balance outstanding.

Total B.C. Interest Earned - set at 14 percent of total interest paid and represents system's historical earnings record.

Total Cash Patronage - set at 20 percent of B.C. interest earned each quarter and paid annually.

Total Interest Paid - seasonal plus variable interest paid during loan term.

Total Variable Term Interest - variable term interest paid beginning with the first quarter of sixth year.

Total Cash Outflow - represents the net cash exchange between borrower and bank when accounting for interest, advance capital, override, pinciplal, reinvestment, cash patronage, patronage revolved and equity balance at end of loan term.

Contract Rate - average annual variable term rate resultant from a 21 quarterly cycle of historical rates.

Effective Rates - total cash outflow less principal repayment divided by total loan balance outstanding.

Total Patronage Retained - set at 80 percent of B.C. interest earned.

Total Patronage Revolved - total advance capital plus total override plus
total patronage retained plus reinvestment less equity balance at
end of loan term.

Average Annual Equity Balance - average annual balance of borrower's
equity following net additions to or revolves from that fund.

Total Reinvestment - set at that amount of each quarters equity revolve
necessary to maintain at least 12% equity as a percent of loan
balance outstanding;   with point of override termiantion.

Total LBO - loan balance outstanding summed quarterly over 35 years.

Net Interest Paid - total cash outflow less principal repayment divided
by total L.B.O.

Equity Balance Term End - borrower's equity remaining in the bank at the
time loan is repaid; to be revolved to borrower over n years whre n =
revolve period.

Columnar Computations

Effective Rate - [(Net Interest Paid ÷ Total LBO)4] 100

Net Interest Paid = Total Cash Outflow - Principal Repayment

Contract Rate - [(Total Interest Paid ÷ Total LBO)4] 100

Total Advance Capital - 5% (Total Advances)

Total B.C. Interest Earned = 14% (Total Interest Paid)

Total Interest Paid = Total Seasonal + Total Variable Term Interest

Total Cash Patroange = 20% (Total B.C. Interest Earned)

Total B.C. Interest Earned = Total Cash Patronage + Patronage Retained

B.C. Interest Earned - Equity Balance Term End = Total Interest Paid -
Net Interest Paid

Advance Capital + Override + Patronage Ret. + Reinvest - Pat. Revolved = Eqt. Bal. Term End

Total Cash Outflow = (Total Interest Paid + Principal) - (B.C. Interest Earned - Eqt. Bal. Term End)

Total Patronage = 80% (B.C. Interest Earned)

Model Logic

Assigned to the model is a prescribed sequence of loan advances and a 21 quarterly cycle of seasonal and variable term rates. By lagging the capital revolved by t+n where n is the length of the revolve period, the equities and definitions presented above are specified as a set of sequential simultaneous equations with 140 quantity assigned computational periods.