AN ANALYSIS OF CHECKING ACCOUNT BALANCES AND

PRICES TO DETERMINE THE EXISTENCE AND

MAINTENANCE OF AN OPTIMUM BALANCE

THAT MINIMIZES CHECKING

ACCOUNT COSTS

By

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Title of Study: AN ANALYSIS OF CHECKING ACCOUNT BALANCES AND PRICES
                 TO DETERMINE THE EXISTENCE AND MAINTENANCE OF AN
                 OPTIMUM BALANCE THAT MINIMIZES CHECKING ACCOUNT COSTS

Pages in Study: 41   Candidate for Degree of Master
                                         of Business Administration

Major Field: Business Administration

Scope and Method of Study: This study was undertaken to determine the
     relationship between the number of checks written and the account
     balance maintained. The effects of price changes was also ob-
     served. An optimal balance was calculated based upon the price
     schedule and the number of checks written. A particular account
     was placed in the appropriate optimum balance based upon the
     number of checks written. The accounts were sampled in such a
     way that the exact same account was not chosen each month, but
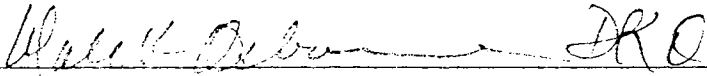   the same general group was sampled.

Findings and Conclusions: There was no relationship found between
     the number of checks written and the balance maintained. When
     the optimum balance was zero during period one, the R^2 was 0.007,
     when the optimum balance was 200 dollars the R^2 was 0.001. The
     only optimum balance during period two was 200 dollars and the
     R^2 was zero. When the optimum balance was zero during period
     three the R^2 was 0.0092, when the optimum balance was 500 the R^2
     was 0.0007. During period one and period three when the optimum
     balance was zero the balance maintained was 526.55 and 575.40
     dollars. During period one and two when the optimum balance
     was 200 dollars the balance maintained was 479.90 and 467.00
     dollars. During period three when the optimum balance was 500
     dollars the balance maintained was 805.63 dollars. The price
     changes at the beginning of period two and three affected the
     average number of checks significantly ($P < .01$). The average
     number of checks dropped from 34.06 during period one to 22.46
     during period two and rose to 31.62 during period three.
     Throughout this study depositors were not purchasing and main-
     taining the correct balance. When the correct balance was
     zero only 5.7 and 3.87 percent purchased and maintained that
     balance during period one and three. When the optimum balance
     was 200 dollars during period one and two only 23.65 and 33.44
     percent purchased and maintained that balance. When the opti-
     mum balance was 500 dollars 22.28 percent of the depositors
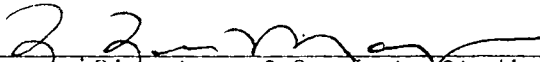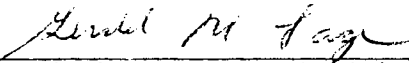   purchased and maintained that balance.

ADVISER'S APPROVAL _____

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PRICES TO DETERMINE THE EXISTENCE AND

MAINTENANCE OF AN OPTIMUM BALNCE

THAT MINIMIZES CHECKING

ACCOUNT COSTS

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ACKNOWLEDGEMENTS

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CHAPTER I

INTRODUCTION

During the past years research has focused on the competition in
banking. One facet of this research has focused on the concept of
am implicit interest rate on demand deposits. Generally this implicit
rate is created by not charging the full cost of a checking account
to the banking customer.

However, "free" checking accounts generally are not provided to
all customers of a bank. Usually the "free" account is contingent on
a bank's customer either maintaining a specified balance in a checking
or savings account. Close examination of this arrangement reveals
that the "free" account is not free. There is a cost associated with
maintaining the positive balance. This is especially obvious when
the required balance is maintained in a non-interest bearing checking
account. The cost associated with this arrangement is the lost income
that could be earned if the balance was invested in an asset providing
a higher return.

Another factor that must be considered is the number of checks
drawn on each account. If many checks are written a "free" account
would possibly be best. However, if few checks are written this
type of account could be expensive and an alternative account should
be considered.

The combination of the implicit cost of the "free" accounts and

the number of checks written suggests that an optimum balance exists

for bank customers purchasing checking accounts. It is the intent

of this paper to explore the existance of an optimal balance and what

influence price changes might have on this balance and the number of

checks written.

CHAPTER II

LITERATURE REVIEW

Since enactment of the Banking Act of 1933, which specified that banks could not pay interest on any demand deposit, banks have been devising methods to pay an "implicit" interest rate on these same deposits [1]. However, banks must attract funds from the same sources as other financial institutions that are authorized to pay an explicit rate. Because banks cannot pay an explicit interest rate, competition for these funds cannot take the form of an explicit interest rate and therefore alternatives must be found. The usual alternative selected is partial or complete remission of the service charges in accordance with account balances [1,2,3]. The implicit interest reported in several articles surveyed by Michael Klein encompassing 1960 to 1968 ranged from 1.72 to 3.74 percent. This "implicit" interest rate is an expense of the banks. What expense does the depositor have?

Obviously if the depositor must leave a positive balance in his checking account there is an opportunity cost. This cost is measured by the rate of return on some alternative asset; that is, the marginal rate of return on money is implicitly taken to be zero [1,2]. There is also an implicit cost of holding money due to inflation. As the inflation rate increases the cost of holding money balances increases. Therefore, the implicit cost of the checking account also increases.

The most obvious expense associated with a checking account is the direct cost of using the account. It was found in a study conducted in Texas that these costs differ considerably from town to town and, with one or two exceptions, from bank to bank within a town [4]. Moreover, prices tended to be more variable in towns where their average was higher. This suggests that the depositor has much to gain from shopping.

CHAPTER III

THEORY AND RESEARCH DESIGN

The price of a checking account is, by definition, the minimum amount the depositor must pay for it. If a bank offers two checking account plans, charging 10 cents per check in one plan and 15 cents per check in the other, the bank's price is 10 cents per check [4]. Because banks offer several checking account plans the price of a checking account should not be thought of as "the" price but a schedule of prices. Given this schedule of prices, the depositors cost of writing checks will usually vary from one depositor to the other. The major determinant of this cost will be the number of checks written. Therefore, a plan that is cheapest for a depositor who writes five checks might not be the same for a depositor writing 15 checks.

Most bank price schedules include accounts with fixed maintenance costs, charges per check written and some free checking accounts— charges are remitted when a certain positive balance is maintained. Associated with the latter is an implicit cost of maintaining the positive balance. This cost is usually represented by the monthly rate of interest on investments comparable in risk and liquidity to checking accounts times the positive unused balance in the account. This implicit cost is also calculated using the lowest balance associated with the explicit charges.

If the above is true, then an optimal balance exists that would

minimize the cost of writing checks. In the following example assuming an opportunity cost of six percent annually to maintain a $600 balance, the cheapest way to write less than 10 checks is plan one. To write more than 10 checks plan two would be used. The respective balance that minimizes cost is zero for plan one and $600 for plan two. Maintaining any other balance would increase the cost of writing checks.

Plan 1: $1 per month for account maintenance plus 20¢ for each check written.

$$1 + .20n = 600(.005)$$

$$n = 10$$

Plan 2: Free if minimum balance of $600 is maintained. If the minimum balance is not maintained the charge is $5.

If depositors maintain balances that minimize the cost of writing checks there should be no correlation between the number of checks written and the balance maintained. That is, depositors who write 25 checks should maintain the same balance as depositors who write 100. However, this balance would not be the same for a depositor who writes a small number of checks. This latter group of depositors would also have a certain balance to maintain based on the number of checks written but it would be different from the balance maintained by a depositor writing a large number of checks. Moreover, the balances should approximate the calculated minimum balance that minimizes the cost of writing n checks. It is the intent of this paper to explore these relationships between the number of checks written and the balance maintained in the checking accounts.

The data for this study was obtained from a local bank and includes a period of 13 months. During this period the price schedule was changed three times. Data was obtained from old and current price schedules and the Monthly Service Charge Report.

The price schedules at the bank during this study are described in Table I. Plan A and B were included in the current study. Plan C was excluded because the price included free checks, cashiers checks and money orders, and travelers checks. It was felt that the price of these other services could not be adequately removed and would therefore confound the data.

The schedule of minimum costs for each of the three periods was as follows:

Period	Number of Checks	Price per Month
1	less than 10 checks	$0.10n
	10 or more	1.00
2	any number of checks	1.00
3	less than 8 checks	1.00 + .20n
	8 or more checks	2.50

n = the number of checks written

The price schedule for each period is plotted in Figure 1.

The relevant balance to minimize cost in period one is zero when less than ten checks are written and $200 when more than ten are written. During period two the relevant balance is always $200. This situation occurs because there is a fixed one dollar charge for plan A during period two. The relevant balance during period three is zero when less than eight checks are written and $500 when eight or more are written.

TABLE I

MONTHLY SERVICE CHARGES AT THE FIRST NATIONAL BANK
(NOV., 1978 THRU NOV., 1979)

Period	Date	Plan	Unused Balance	Implicit Cost	Fixed Service Charge	Number of Free Checks	Charge per Check
1[a]	Nov., 1978 Thru Dec., 1979	A	0	0	0	0	.10
		B	200	1.00	0	Unlimited	--
			100 to 199	.50	.50	0	--
			If 1 to 5 checks were written				
			100 to 199	.50	1.00	0	--
			If 6 to 10 checks were written				
			100 to 199	.50	2.00	0	--
			If more than 10 checks were written				
			Less than $100	0	3.00	Unlimited	--
2[a]		C	0	0	2.50	Unlimited	--
2[a]	Jan. 1, 1979 Thru Aug. 5, 1979	A	0	0	1.00	0	.15
		B	200 or more	1.00	0	Unlimited	--
			100 to 199	.50	2.00	Unlimited	--
			Less than $100	0	4.00	Unlimited	--
		C	0	0	3.50	Unlimited	--
3[b]	Aug. 15, 1979 Thru Current	A	0	0	1.00	0	.20
		B	500	2.50	0	Unlimited	--
			Less than $500	0	5.00	Unlimited	--
		C	0	0	5.00	Unlimited	--

[a]Balances maintained during this period are minimum balances.

[b]Balances maintained during this period are average balances.
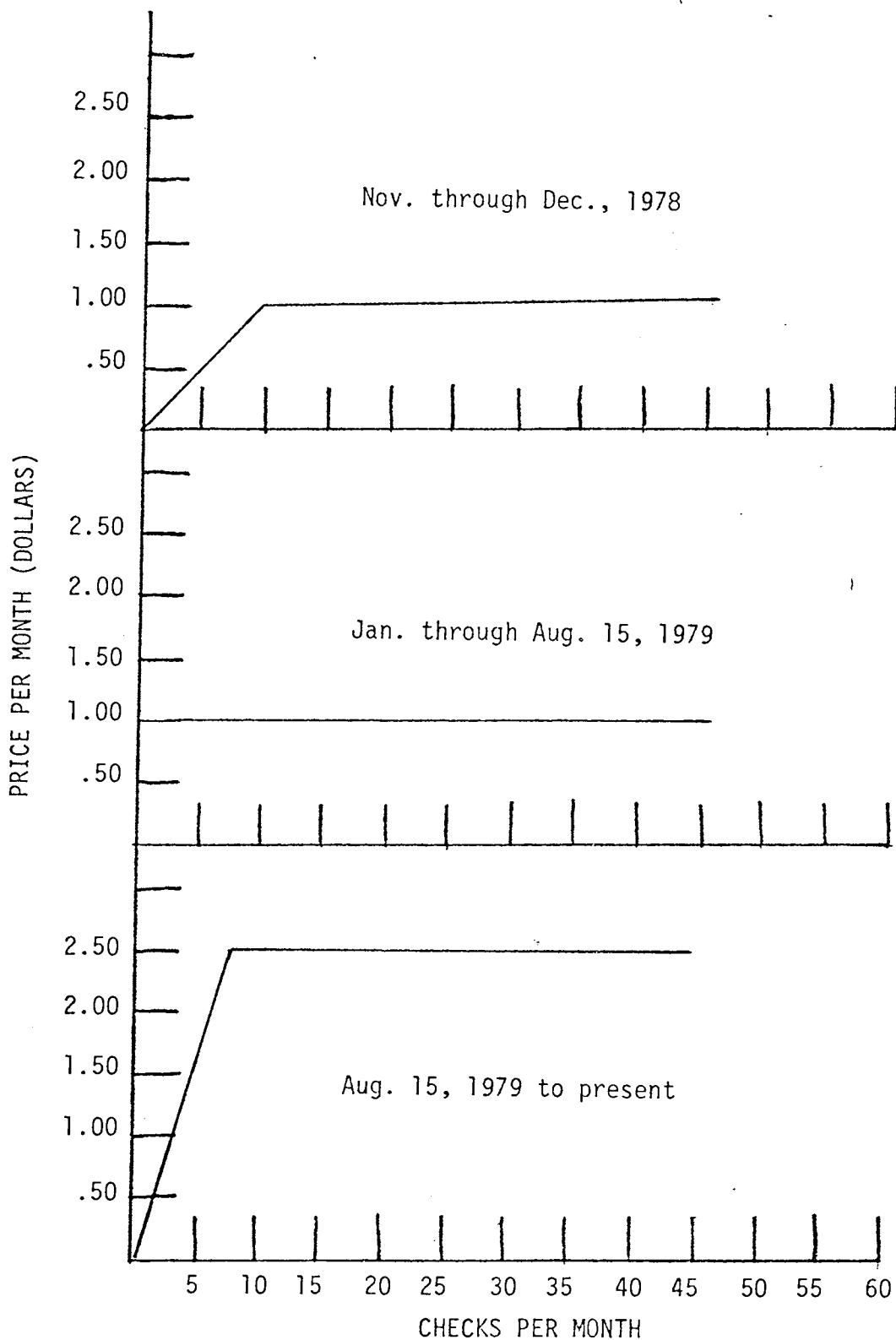
Figure 1. Schedule of Minimum Prices at the First
National Bank; November, 1978 through
November, 1979

The accounts used for the study were selected by generating account numbers using a table of random digits. Using the list of account numbers thus generated samples were obtained from the Monthly Service Charge Report. When no matching account number was found the account number closest to the generated account number was selected.

This sampling procedure was carried out for each month so that all accounts had an equal chance of being included in the sample for every month studied.

No commercial accounts were used nor were personal accounts when the service charge was waived. The accounts thus selected were not exactly the same each month, but essentially the same group of accounts was used throughout the study. The sampled accounts were placed into the appropriate optimal balance group based on the number of checks written.

CHAPTER IV

RESULTS AND DISCUSSION

Throughout the results and discussion three periods will be con-
sidered as described previously in Figure 1. Several different bal-
ances will also be mentioned, some that have previously been intro-
duced. When optimum balances are mentioned these are balances that
the banking customer should have purchased and maintained. The bal-
ance purchased is simply the balance the customer should maintain given
the plan he purchased. During most of the study the relevant balance
is a minimum balance (the account balance can never drop below a stated
amount if free checking is to be maintained). From August 15, 1979
the relevant balance is an average balance, i.e., the balance
could drop to zero or less, provided the average balance was 500
dollars.

For the periods studied it is obvious that checking account custo-
mers do not maintain optimal balances (Tables II through V). During
period one when less than 10 checks were written, and the optimum
balance was zero the average actual balance was $526.55 (Tables II & V).
During period three when the optimum balance was also zero when less
than eight checks were written the average actual balance was $575.40
(Tables (II & V). The range of balances for this particular group
of accounts was large with a maximum balance of $8,760 and a minimum
of zero. The low R^2 indicates that very little of the variation in

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TABLE II

CHECKING ACCOUNT ACTIVITY BY MONTH FROM NOV. 1, 1978 THROUGH JAN., 1979 AND
AUG. 15, 1979 THROUGH NOV., 1979; OPTIMUM BALANCE IS 0

	Period 1			Period 3			
Month	Nov.	Dec.	Jan.	Aug.	Sept.	Oct.	Nov.
No. of Observations	39	38	39	40	36	51	42
Av. Actual Bal.	558.97	553.42	467.94	444.75	698.14	468.24	724.76
Min. Bal.	0	0	0	-110	- 20	-140	-150
Max. Bal.	4470.00	4830.00	5690.00	3600.00	8760.00	5570.00	5230.00
Av. No. of Checks	2.9	3.2	2.4	1.6	2.5	1.8	2.6
β	25.11	18.299	-34.388	-6.9820	25.914	94.4432	42.432
R Square	0.0070	0.0031	0.0064	0.0004	0.0015	0.0331	0.0077

the account balances can be explained by the number of checks written.

During period one for those accounts that optimized cost with an optimum minimum balance of $200 the average minimum balance was $479.90 (Tables III & V). The average minimum balance also varied considerably for this group of accounts, but not nearly as much as the zero balance accounts.

A new price schedule became effective in February and eliminated the optimum zero balance. During this period (period two), which ended August 15 when still another price schedule went into effect, the only optimum balance was a $200 minimum. This result came about because a fixed minimum charge was applied to plan A accounts which resulted in a minimum cost of one dollar if no checks were written. When no checks were written both accounts had equal cost. However, when checks were written on plan A the cost increased by the number of checks written times the per check charge. Alternatively, when more checks were written on plan B the price of the account remained the same.

The average minimum balance during this period was $467.00 (Tables III & V), nearly identical to the average minimum balance of plan B in the previous period. Thus the price change had little influence on the account balance. Inspection of Table I reveals why this is so. When the price schedule was changed plan B was e-sentially left intact. The only change made in B was the elimination of the complicating exceptions. The R^2 for both periods was very low which again indicates little relationship between the number of checks written and the average minimum account balance (Tables III & V). Figure 2 graphically represents the relationship between the number of checks written and

TABLE III

CHECKING ACCOUNT ACTIVITY BY MONTH FROM NOV., 1978 THROUGH AUG., 1979;
OPTIMUM BALANCE IS 200 DOLLARS

| Month	Period 1			Period 2					
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	June	July	Aug.
No. of Obser-vations	76	73	87	99	100	107	121	117	87
Av. Actual Bal.	479.34	431.73	497.13	496.46	427.50	462.62	504.46	432.65	484.39
Min. Bal.	0	0	0	0	0	0	-130.00	-110	0
Max. Bal.	3680.00	3490.00	3330.00	5820.00	3670.00	3540.00	5820.00	3030.00	2740
Av. No. of Checks	30.9	33.8	37.2	22.9	24.0	23.3	21.9	19.4	24.3
Max. No. of Checks	66	72	98	107	66	78	77	76	64
β	0.863	- 2.80	- 2.31	- 2.42	- 3.47	1.409	-0.15	- 1.30	2.53
R Square	0.0004	0.0064	0.0047	0.0027	0.0126	0.0016	0.0000	0.0014	0.0066
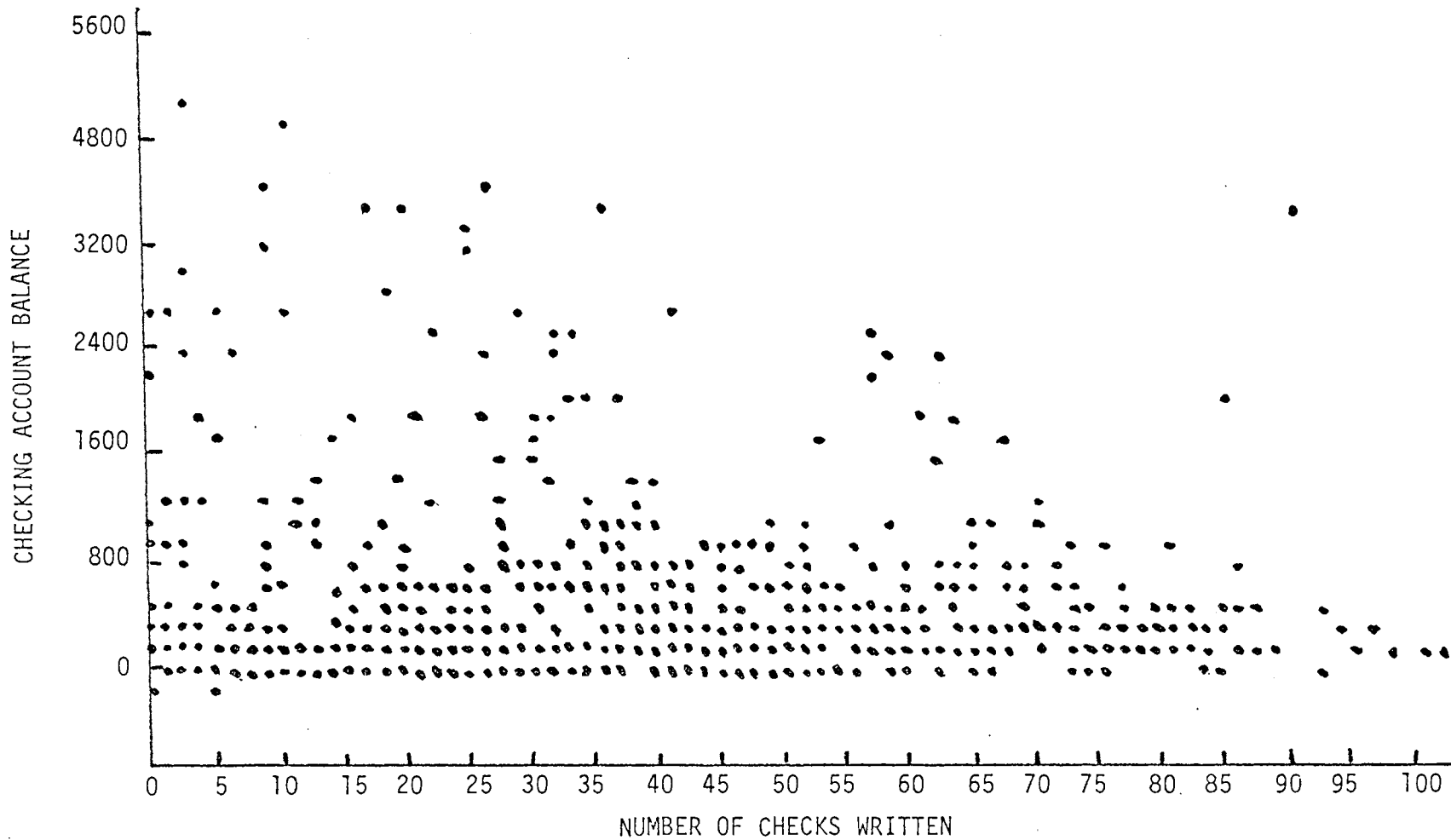
Figure 2.   Balance Maintained in Relation to the Number of Checks Written for November, 1978 through August 14, 1979; Optimum Balance is 200 Dollars

the account balance. It is obvious from examination of this graph why the R^2 is low. Most of the activity is concentrated between zero and $800. Outside this band the number of checks written was greatly scattered. It is also interesting to note how little the average minimum balance changed for these two periods (Table III and Fig. 3). It had a high of $504.46 in June and a low of $431.73 in December. Some cyclical behavior is also demonstrated in the balances maintained.

During August a significant change was instituted in the price structure. The relevant balance was no longer a minimum but an average daily balance. Balances now could drop to zero as long as the average daily balance was above $500. This of course raised the relevant balance considerably, but when the average minimum balance was extended for this same period there was not much change. There continued to be little relationship (Tables IV & V) between the number of checks written, with an R^2 approaching zero as in previous periods, and the account balance maintained. Figure 4 graphically represents the relationship between the number of checks written and the account balance. Again, it can be seen that the majority of the balances are grouped within a rather narrow range and a considerable number of checks are written by depositors in this range. The number of checks written this band exhibits considerable variation. As few as eight checks are written on up to over 80. There simply is no visible relationship between the number of checks written and the account balance. This is the case whether the balance is a minimum or an average.

The price changes in the schedules had a greater influence on the number of checks written (Figure 5) than on the balance maintained when the optimum balance was a minimum of $200 or an average daily
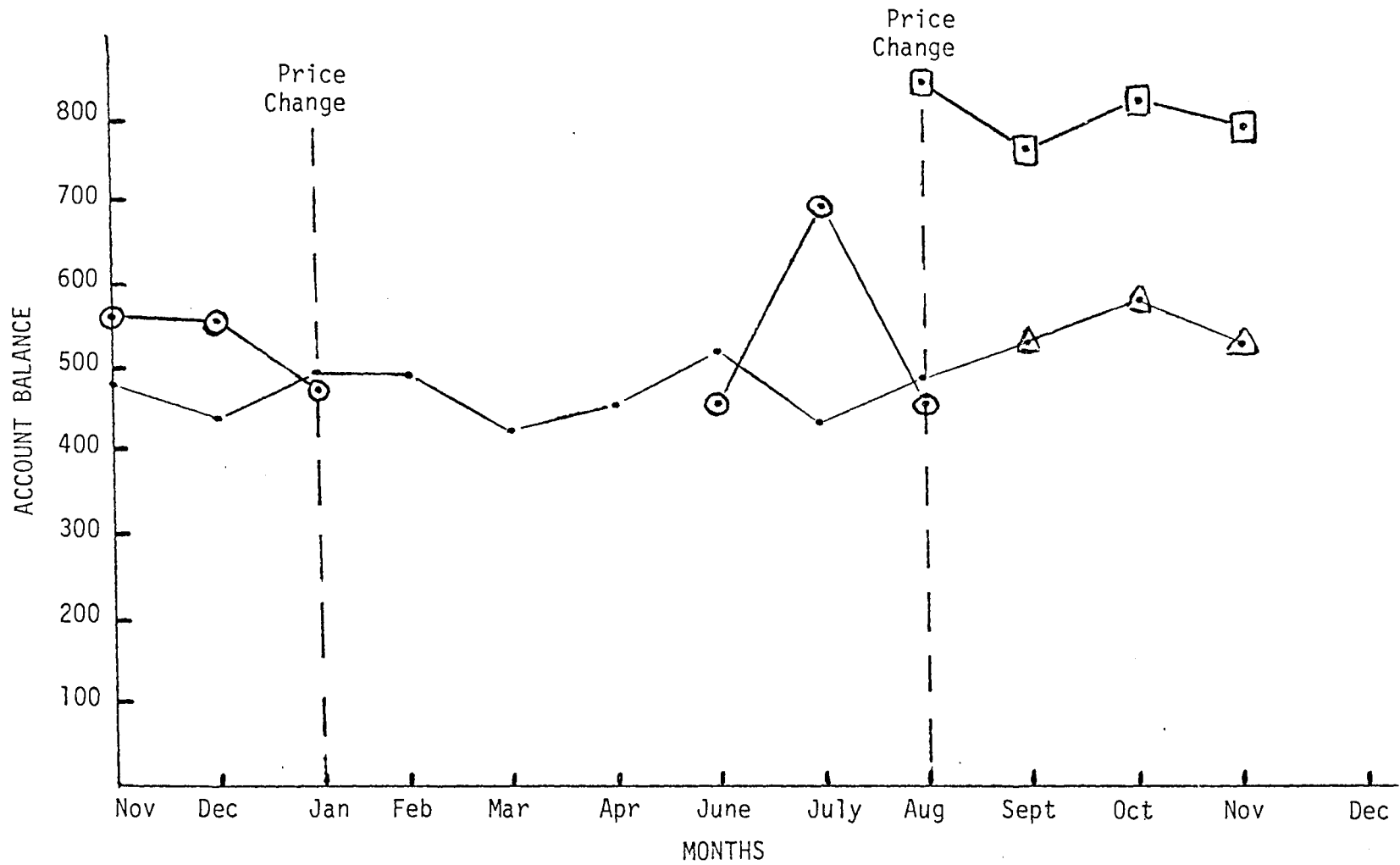
Figure 3.   Checking Account Balance by Month from November, 1978 through November, 1979
When the Optimum Balance is 0(⊙—⊙, av. min. bal.), 200 (•——• , av. min.
bal.), and 500 (△—△, av. min. bal. and⊡—⊡, av. bal.)

TABLE IV

CHECKING ACCOUNT ACTIVITY BY MONTH FROM AUG. 15, 1979
THROUGH NOV. 1979; OPTIMUM BALANCE IS 500 DOLLARS

Month	Period 3			
	Aug.	Sept.	Oct.	Nov.
No of Obser- vations	69	98	110	98
Av. actual balance	833.91	777.35	821.64	796.02
Min. Bal.	-430.00	- 20.00	10	30
Max. Bal.	7110.00	9760.00	8810.00	6090.00
Av. No. of Checks	31.5	30.34	32.04	32.48
Max. No. of Checks	73	90	78	85
β	- 7.50	0 2.6036	0.138	0.554
R-Square	0.0141	0.0013	0.0000	0.0001

TABLE V

AGGREGATE SUMMARY OF CHECKING ACCOUNT DATA FOR EACH OPTIMUM BALANCE
FROM NOV., 1978 THROUGH NOV., 1979

| Period | Optimum Balance | | | | | |
| | 0 | | 200 | | | 500 |
	1	3	1	2	1&2	3
No. of Observations	116	169	233	636	867	375
Av. Actual Bal.	526.55	575.40	479.90	467.00	468.74	805.63
Min. Bal.	0	-150.00	0	-130.00	-130.00	-430.00
Max. Bal.	5690.00	8760.00	3680.00	5820.00	5820.00	9760.00
Av. No. of Checks	2.8	2.1	34.06	22.46	25.66	31.62
Max. No. of Checks			95	107	107	90
β	9.032	49.11	-1.180*	-0.152	-0.389	-1.787
R Square	0.0007	0.0092	0.0010*	0.0000	0.0001	0.0007

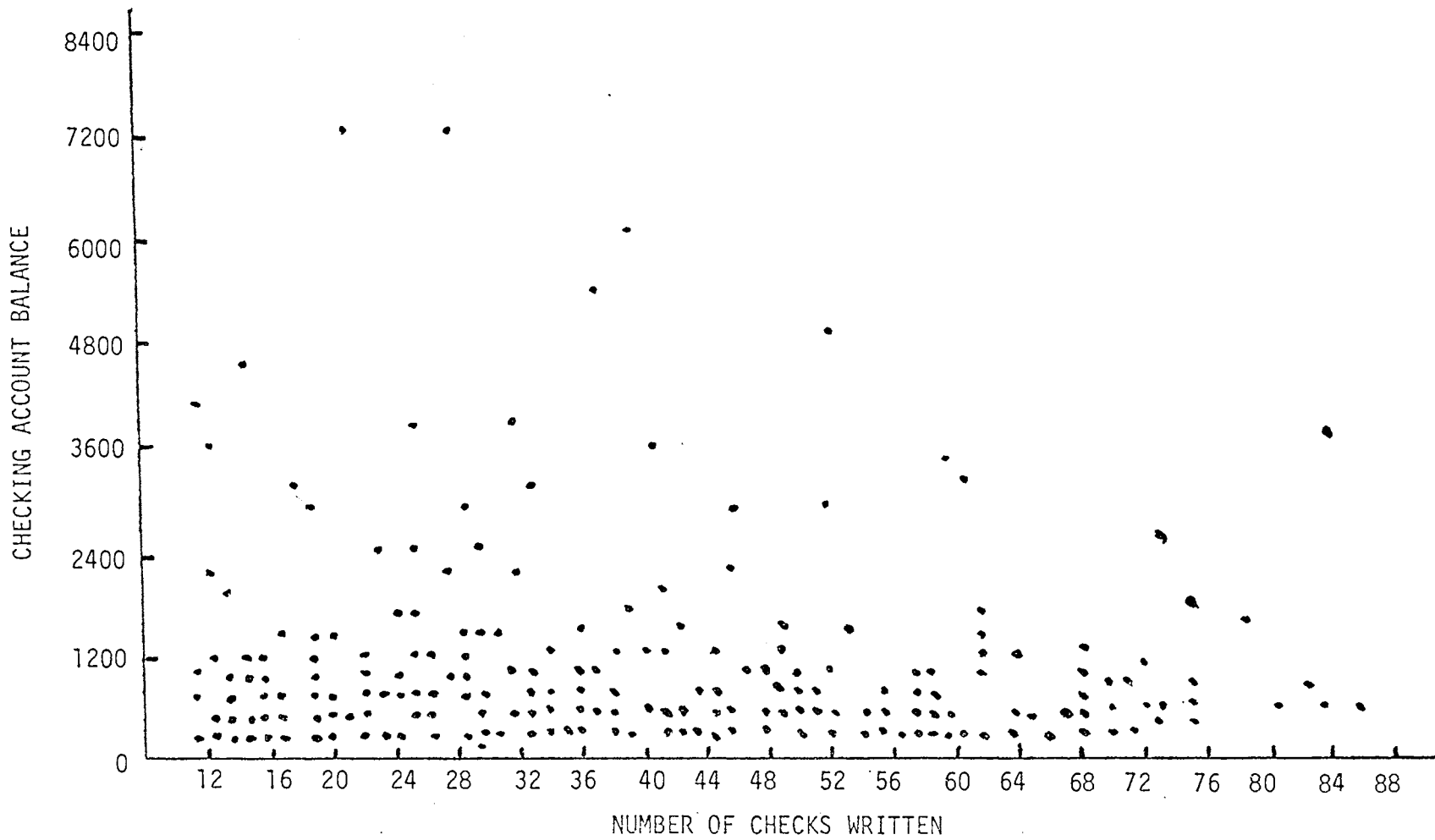*Calculated using 149 observations for Nov. and Dec., 1978.

Figure 4.   Balance Maintained in Relation to the Number of Checks Written; Optimum
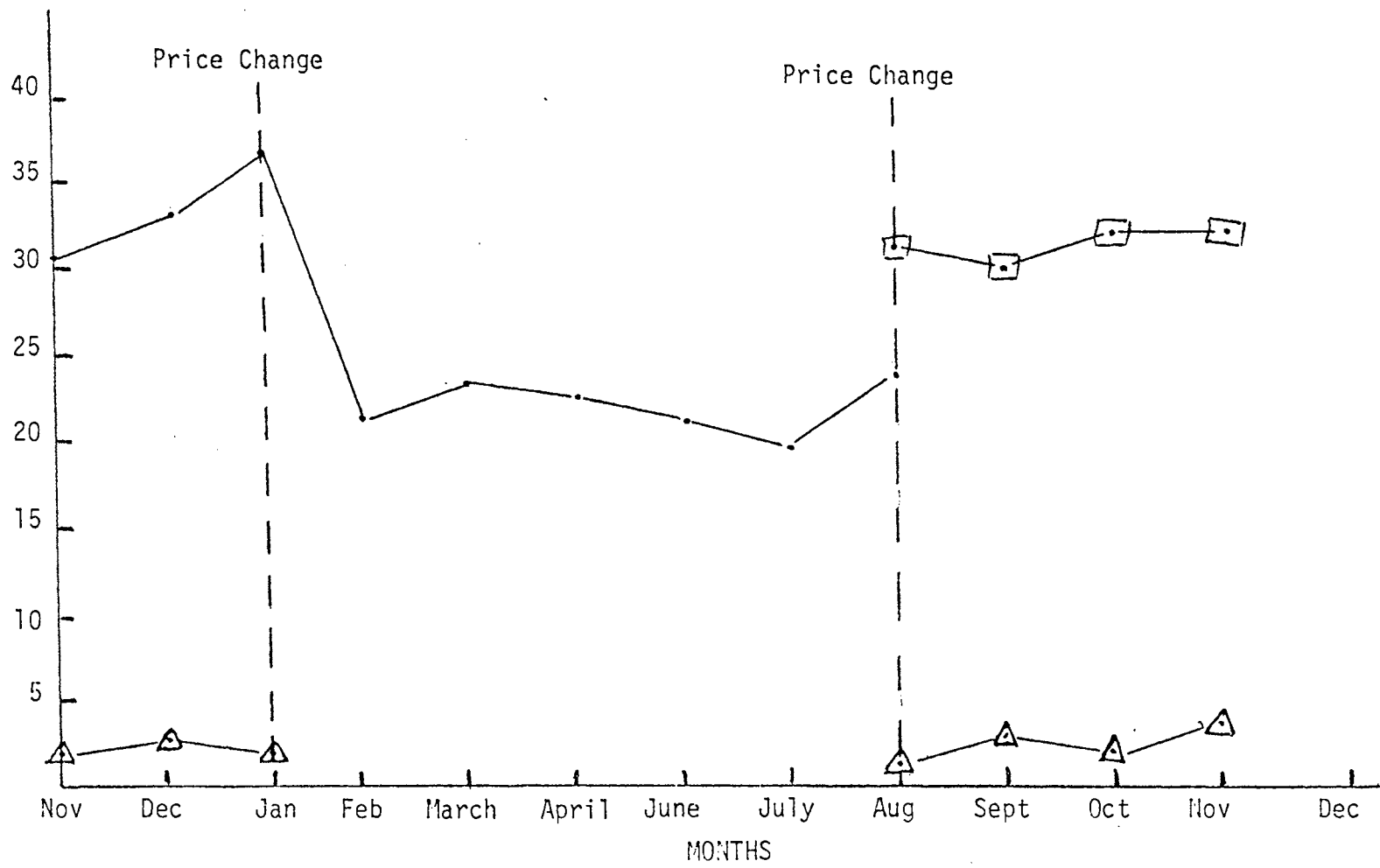Balance is 500 dollars

Figure 5. The Average Number of Checks Written by Month From Nov., 1978 through November, 1979 When the Optimum Balance is 0 (△—△), 200 (•—•), and 500 (◻-◻).

balance of $500. The change in the number of checks written was practically instantaneous in each period. When the new price schedules went into effect in January and August the change in the number of checks written was nearly identical, but in the opposite direction. The average number of checks written during period one was 34.06, during period two it dropped to 22.46 and during period three it rose back 31.62 (Table V). It is interesting to note that the number of checks written in the second period dropped when the price was increased, but rose when the price was increased at the beginning of period three. Analysis of variance indicated a significant difference ($P<.01$) in the number of checks written for each period. The number of checks written for each period also varied considerably. The number of checks written was as low as the minimum to qualify for a particular group up to 95 checks written during period one, 107 checks during period two and 90 checks during period three.

The number of zero balance accounts observed was small and because of this the data suffers. However, the average number of checks written during period two was 2.8 and during period three it was 2.1.

The foregoing results raises several questions. First, why are such high balances maintained, whether a minimum or an average or average daily. Second, what is the distribution of balances among each plan and what if any is the relationship to the number of checks written? Third, why did the number of checks written drop when prices were increased during one period and increase during the next when prices were increased again. And lastly, did depositors react differently to the change in prices?

The zero balance accounts were not greatly influenced by the price changes. The distribution of account balances (Figure 6) remained essentially unchanged. A large percentage, about 45% to 48% maintained a balance less than 100 dollars. The average minimum balance maintained for accounts averaging less than 100 dollars during period one was $22.78; during period three it was $20.65. The rest of the accounts had balances higher than 100 dollars. During period one the average minimum balance when the account was above 100 dollars was $965.32; during 1979 it was $1,086.02. It was these latter accounts that caused the average balance in the zero balance accounts to be as high as it was.

The implicit average cost of the accounts with balances maintained above 100 dollars was $4.83 and $5.43 respectively. When the one dollar maintenance fee is included the cost of these accounts is $5.83 and $6.43, respectively before any checks are written.

The depositors using plan B in all periods must be aware of the minimum balance that must be maintained to avoid the penalty of not maintaining that balance. During period one approximately 37 percent of the accounts had balances below 200 dollars; during period two 41 percent of the accounts were below 200 dollars (Figure 7). The average balance when the 200 dollar minimum was not maintained was $89.18 and $70.96 for period one and two. When the balance was maintained above 200 dollars the average balance for period one and two was $701.95 and $764.23. During period three when plan B required an average daily balance of 500 dollars, only 45 percent of the accounts were maintained above 500 dollars. The average daily balance when the account was maintained above 500 dollars was $1,478.07 and when the
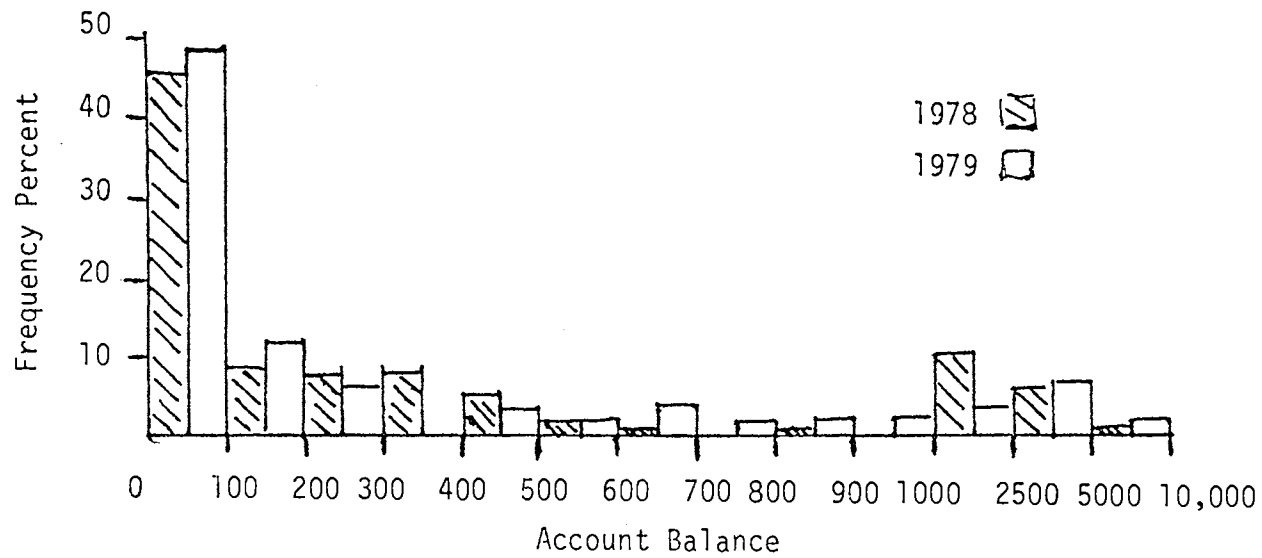
Figure 6. The Frequency of Account Balance When the Optimum
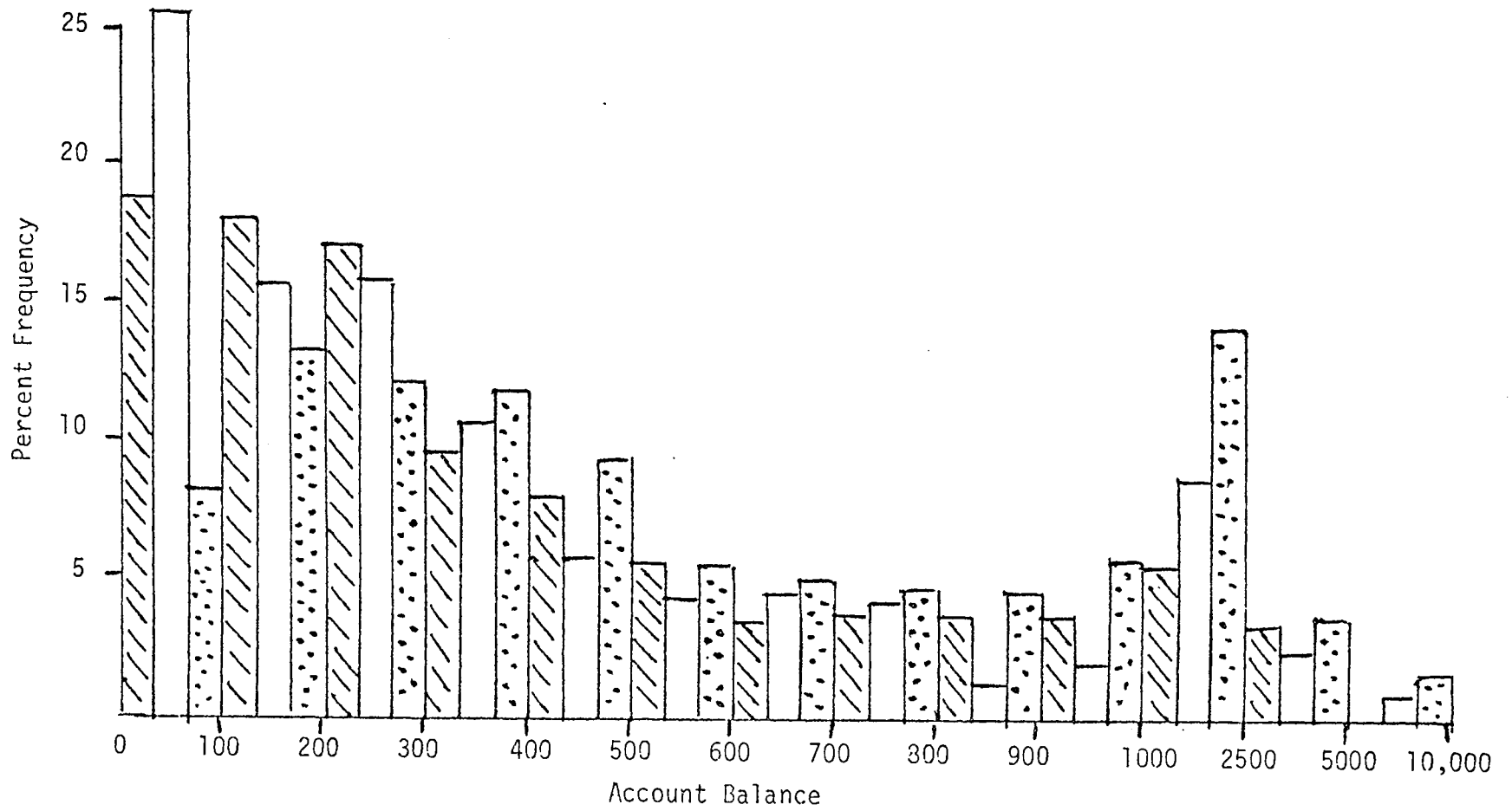Balance is Zero for Nov., 1978 through Jan., 1979
and Feb., 1979 through Aug. 15, 1979.

Figure 7. The Frequency of Account Balances for Nov., 1978 through Jan., 1979 (optimum = 200), ◰ ; Jan., 1979 through Aug. 15, 1979 (optimum = 200), ▢ ; and Aug. 15, 1979 through Nov., 1979 (optimum = 500), ▣ .

account was maintained below $500 the average daily balance was $242.00.

If depositors attempted to minimize cost it would be expected that a high frequency of accounts would be found in proximity to the minimum balance required to avoid the penalty cost. However, this does not happen in the current study. During period one and two, plan B account balance should have a high frequency in the 200 to 300 dollar balance range. The frequency of accounts in this range was only 17 percent for period one and 16 percent for period two. During period three when the required balance was an average daily balance of 500 dollars, less than 10 percent of the account balances fell within the 500 to 600 dollar range. In fact the highest frequency balance was 100 to 200 dollars at 13 percent.

The check writing activity for the minimum balance accounts is described in Figures 8 through 10. Figure 8 is frequency distribution of the number of checks written and it can be seen that no particular group of activity dominates within each period. The price increases had approximately the same influence on all groups of activity in each period. In period two the frequencies decreased across all activity, in period three the frequencies increased, and in many cases approximated the activity of the first period.

The behavior of these frequencies can be explained somewhat by the price structure and the sampling procedure. When the exceptions to the penalty in plan B were removed depositors maintaining the balance listed in the exceptions and writing the number of checks allowed had this alternative removed. During period two they had to
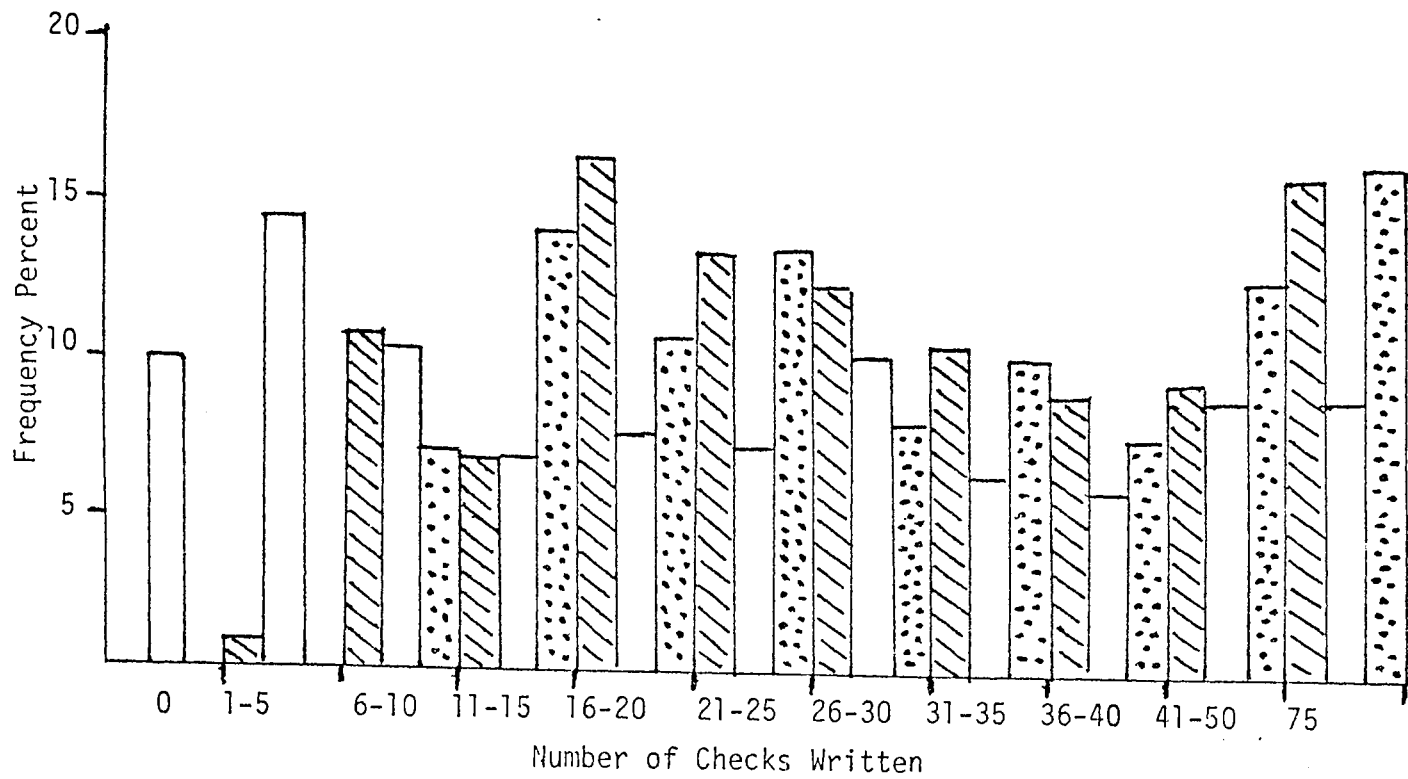
Figure 8. The Frequency Distribution of Checks Written by Account Balances
for Nov., 1978 through Jan., 1979 (optimum = 200), ▨ ; Jan.,
1979 through Aug. 15, 1979 (optimum = 200), ▢ ; and Aug. 15,
1979 through Nov., 1979 (optimum = 500), ▣ .

maintain the minimum balance regardless of the number of checks written. Their alternatives were to switch to plan A and continue writing a low number of checks or maintain a balance above 200 dollars. Probably the greatest factor in altering the frequencies was the 50 percent increase, from 10 cents to 15 cents, in the per check charge and the addition of the one dollar maintenance fee. Depositors simply refused to pay 15 cents per check and the only method available was to reduce the number of checks written, thus the large increase in the frequency of checks written in the zero to six range and the decrease most of the others.

When the price was increased to 20 cents per check in period three the maintenance fee remained the same and check writing activity increased. At this time the bank was advertising that the least expensive way to write n number of checks was to write checks until the cost reached the penalty fee of plan B, which was five dollars. When this cost was attained the customer was told the best plan was B. Therefore the bank was saying that the cheapest way to write up to 25 checks was plan A, when in fact plan A should have been used only up to eight checks.

The sampling procedure influenced the frequencies because the accounts were placed into an optimum balance based on the number of checks written. When the optimality of plan A was removed because of the fixed fee making plan B the only optimal account, zero balances appeared in plan B data as well as check writing activity ranging down to zero. This happened only during period two and thus the balances and activity in these lower ranges must be viewed with caution when

comparing each period.

The average number of checks written per balance (Figure 9) shows little variation within each period. Generally the average number of checks written for each balance within a specific period does not vary by more then six checks when the balance maintained is greater than 100 dollars. However, during period one those accounts with balances between 300 and 400 dollars and 900 and 1,000 dollars wrote an average of 44 and 40 checks respectively. When the number of checks written decreased during period two, the decrease occurred in all balances except two. In the 500 to 600 dollar group the number of checks actually increased and in the 800 to 900 dollar group the average number of checks written remained the same. During period three the average number of checks written per balance did not quite reach the level of period one. However, in a few balance groups the average number of checks written did excede period one. In the 500 to 600 dollar group the average number of checks written continued to increase as the price of the accounts continued their increase.

The percent of the total checks written by each balance group remained essentially unchanged during period one and two (Figure 10). This was due to the average number of checks written decreasing at the same time the frequency of the account balances were also chang-ing. The best example of this was the group of balances between zero and one hundred dollars where the average number of checks drop-ped from period one to period two but at the same time the frequency of this balance group increased. In period three there was a substan-tial shift in the distribution of the total number of checks written.
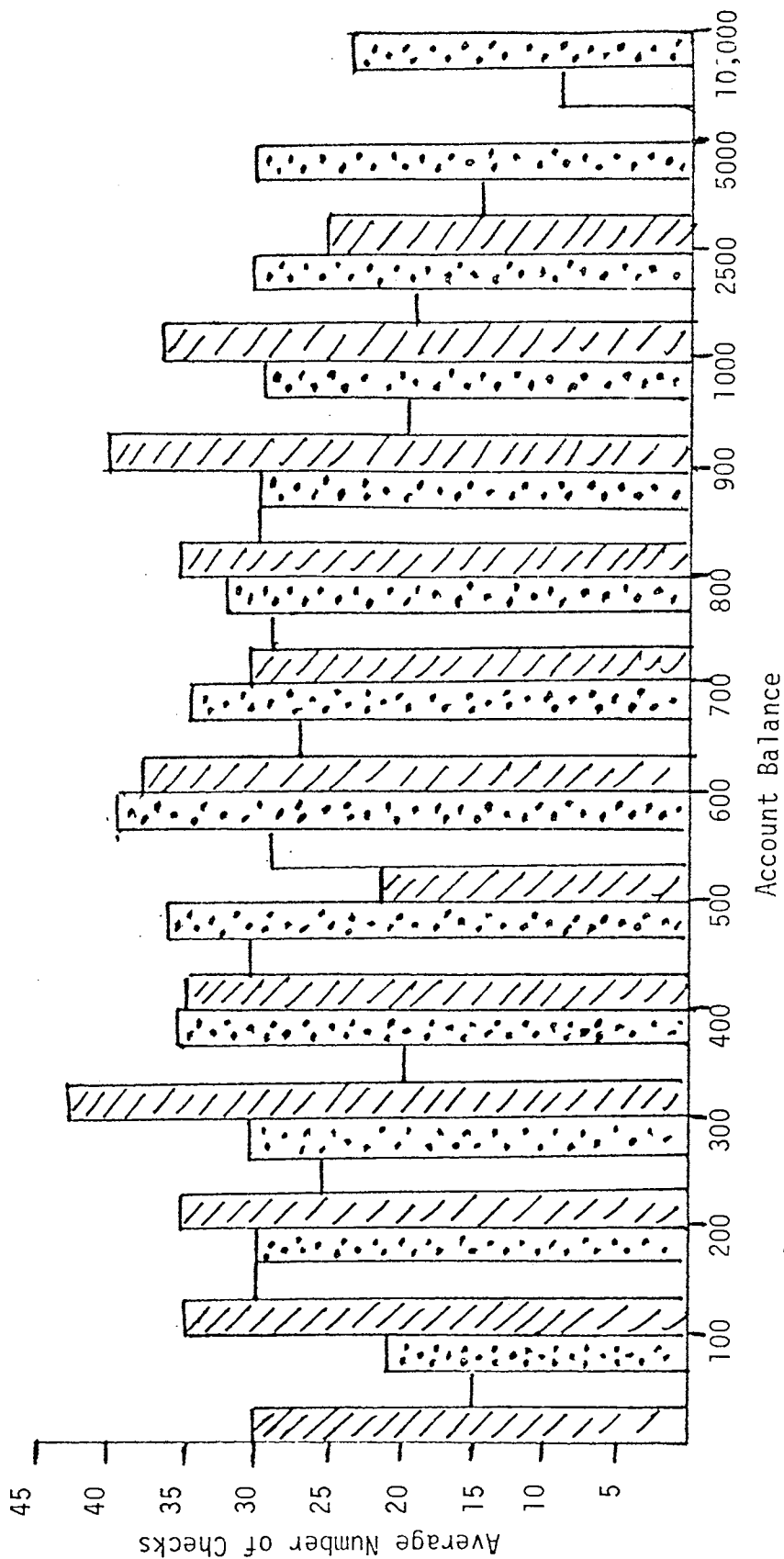
Figure 9. The Average Number of Checks Written by Account Balances for Nov., 1978 through Jan., 1979 (optimum = 200), ▨ ; Jan., 1979 through Aug. 15, 1979 (optimum = 200), ☐ ; and Aug. 15, 1979 through Nov., 1979 (optimum = 500), ▦ .

Figure 10. The Distribution of Total Checks Written by Account Balances for Nov., 1978 through Jan., 1979 (optimum = 200), ▨ ; Jan., 1979 through Aug. 15, 1979 (optimum = 200), ▢ ; and Aug. 15, 1979 through Nov., 1979 (optimum = 500), ▨ .

Those accounts with balances below 300 dollars accounted for fewer checks written than in the previous periods. Most of this shift was due to the frequency of these balances decreasing (Figure 7), because the average number of checks written did not change that much or in the required direction.
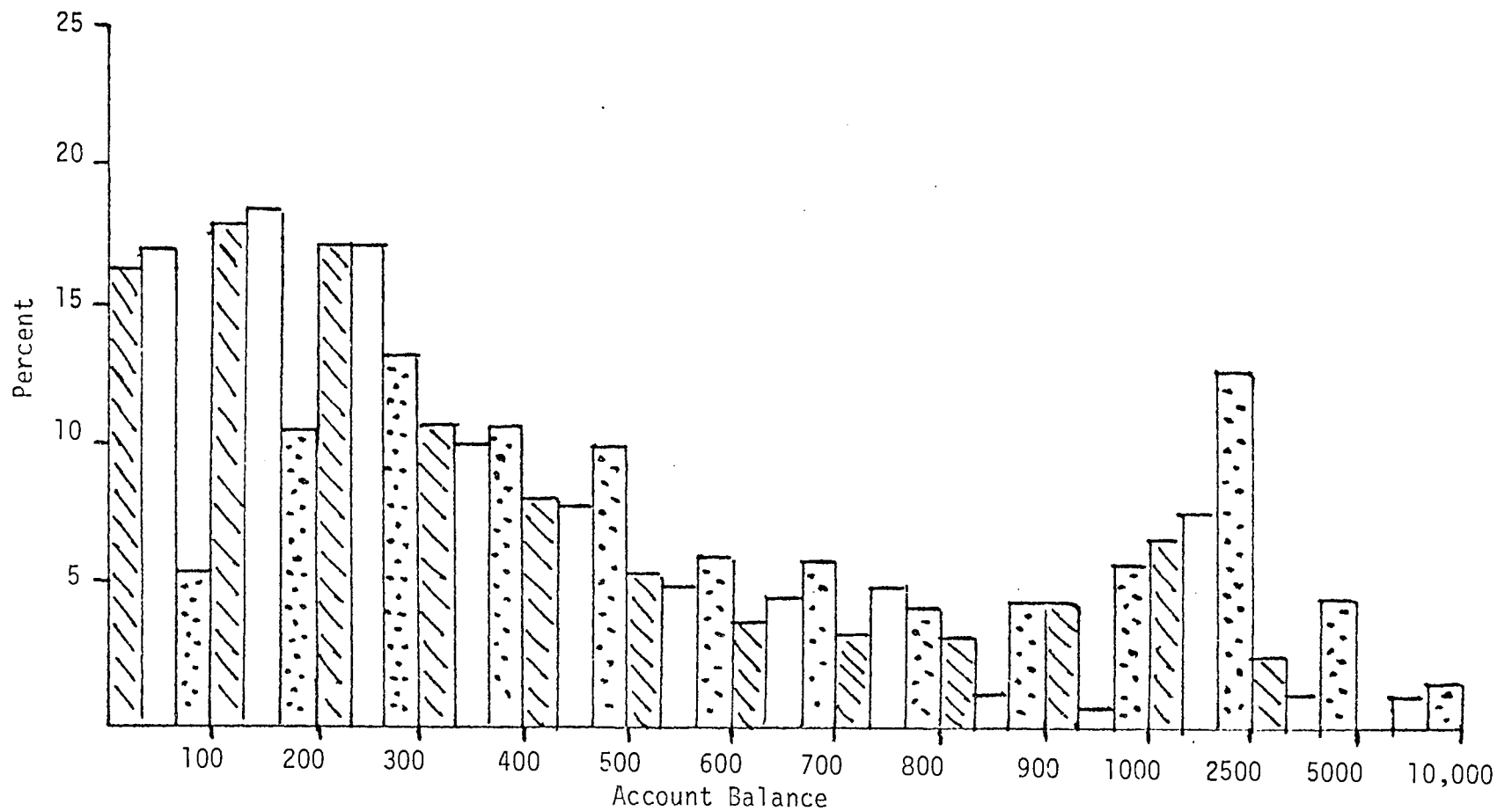
When examining the data to determine why optimal balances are not maintained it could prove useful to examine the accounts that were purchased in light of what should have been purchased. In the discussion three balances will be discussed; the balance maintained in the account, the balance purchased, which represents the balance the customer should have maintained when a specific checking account plan was purchased (Plan A = 0, Plan B = 200 in period one and two, and 500 in period three), and the optimal balance which for this discussion will be those accounts maintained at or above the minimum to avoid the penalty fee.

During period one there was a choice; either a zero balance or a 200 dollar balance could be purchased. During this period approximately one half of the accounts purchased were divided between zero and 200 dollar balance accounts. However, based upon the number of checks written approximately 34 percent of the accounts purchased should have been zero optimum balance accounts and 66 percent should have been 200 dollar optimum balance accounts (Table VI). When the optimum balance was zero, only 5.7 percent purchased and maintained that balance. When the optimum balance was 200 dollars, 41.88 percent of the customers maintained that balance, however only 23.65 percent purchased and at the same time maintained a balance greater

TABLE VI

THE RELATIONSHIP BETWEEN THE BALANCE
PURCHASED, THE BALANCE MAINTAINED,
AND THE OPTIMUM BALANCE FOR
NOV., 1978 THRU JAN.,
1979

	Frequency Percent	Balance Purchased		Total
		0	200	
Optimum = 0	Balance Maintained was 0	20 5.7	1 0.28	21 5.98
Optimum = 0	Balance Maintained > 0	40 11.40	57 16.24	97 27.64
Optimum = 200	Balance Maintained > 199	64 18.23	83 23.65	147 41.88
Optimum = 200	Balance Maintained < 200	50 18.23	36 10.26	86
Total		174 49.57	177 50.43	351 100.00

Optimum Balance that Should be Purchased

than 200 dollars.

Period two presented only one optimum balance but there was still a choice of balances to purchase, zero and 200 dollars. During this period 46.25 percent purchased the zero balance and 63.45 purchased the 200 dollar balance (Table VII). Approximately 58 percent maintained a balance greater than 200 dollars, however, only 33.44 purchased and, simultaneously maintained a balance greater than 200 dollars. This compares to 23.65 for the previous period which is an improvement but still lower than expected.

In period three two optimum balances were available, 0 and 500 dollars. In this period 53.04 percent of the accounts purchased were zero balance accounts and 46.96 percent were 500 dollar balance accounts (Table VIII). However, 69.06 percent of the accounts purchased should have been 500 dollar balance accounts and the rest should have been zero balance accounts. During the period only 3.87 percent purchased and maintained a zero balance account and 22.28 purchased and maintained a 500 dollar balance account.

Many of the depositors in all the periods that buy the 200 or 500 dollar balance account probably do not intend to maintain that balance all the time, but it would be difficult to ascertain their motives. Unknowingly they are buying the account that optimizes their cost, although it is not a minimum. The average number of checks written for those accounts represented by the 200 dollar balance accounts was 34.06 during period one and 22.46 during period two. If the balance was maintained below 200 dollars during period one and two the bank would charge the penalty fee of $3.00 and $4,00 respectively. The cost of writing the same number of checks and using plan A

TABLE VII

THE RELATIONSHIP BETWEEN THE BALANCE PURCHASED,
THE BALANCE MAINTAINED, AND THE OPTI-
MUM BALANCE FOR FEB., 1979 THRU
AUG., 15, 1979

Frequency Percent		Balance Purchased		
		0	200	Total
Optimum = 200	Balance Maintained > 199	155 24.22	214 33.44	369 57.66
	Balance Maintained < 200	141 22.03	130 20.31	271 42.34
Total		296 46.25	344 53.45	640 100.00

TABLE VIII

THE RELATIONSHIP BETWEEN THE BALANCE PURCHASED,
THE BALANCE MAINTAINED, AND THE OPTI-
MUM BALANCE FOR AUG. 15, 1979
THRU NOV., 1979

	Frequency Percent	Balance Purchased		Total
		0	500	
Optimum = 0 / Balance Maintained was 0		21 3.87	5 0.92	26 4.79
Optimum = 0 / Balance Maintained > 0		75 13.81	67 22.28	142 26.15
Optimum = 500 / Balance Maintained > 499		50 9.21	121 22.28	171 31.49
Optimum = 500 / Balance Maintained < 500		142 26.15	62 11.42	204 37.57
Total		288 53.04	255 46.96	543 100.00

Optimum balance that should be Purchased

Therefore, if the depositor wrote 30 checks in period one and 20

checks in period two and maintained a balance close to zero his

costs could be minimized, but not optimized. In period one when

depositors purchased the 200 dollar balance account and maintained

a balance less than 200 dollars the average balance was $70.60

and the average number of checks was 34.7. During period two for

the same situation the average balance was $63.54 and the average

number of checks was 21.4. For period three up to 20 checks could

be written if the 500 dollar balance was not maintained. The

average balance for those accounts below 500 dollars was $258.20

and the average number of checks written was 25.8. Therefore,

although costs are not optimized, they are minimized.

CHAPTER V

SUMMARY AND CONCLUSIONS

Checking account data from one of the local banks was used for this study, and was obtained by sampling the Monthly Service Charge Report. Data was obtained from November, 1978 through November, 1979. During this time the price schedules at the bank were changed twice; at the end of January, 1979 and August 15, 1979.

At this bank for all periods studied there was no relationship between the number of checks written and the account balance maintained. From November, 1978 through January, 1979, when the optimum balance was 200 dollars, the R^2 was 0.0010, from February, 1979 through August 15, 1979, when there was only one optimum balance of 200 dollars, the R^2 was zero. When the data for these two periods are combined the R^2 was 0.0001. From August 15, 1979 through November, 1979, when the optimum balance was 500 dollars, the R^2 was 0.107. For those accounts that should have maintained a zero optimum balance during November, 1978 through January, 1979 and August 15, 1979 through November, 1979 the R^2 was 0.0007 and 0.0092.

During none of the periods studied did the average balance maintained approach the optimum. When the optimum balance was a minimum of 200 dollars during the first and second periods the average balance maintained was $479.90 and $467.00. When the optimum balance was an average daily balance of 500 dollars the average balance maintained

was $805.63. During periods one and three when there was an optimum balance of zero the balance maintained was $526.55 and $575.40 respectively.

During period one and three when the optimum balance was zero 33.62 and 30.94 percent of the depositors should have purchased a zero balance account. However 49.57 and 53.04 percent purchased the zero balance account, but only 5.7 and 3.87 percent maintained the zero balance.

When the optimum balance was 200 dollars during period one and two 46.38 and 100 percent should have purchased the 200 dollar balance accounts. During period one and two 50.43 and 53.45 percent purchased the correct account. However only 23.65 and 33.44 percent maintained the correct balance.

In period three when the optimum balance was 500 dollars 69.06 percent of the depositors should have purchased this account. Approximately 47 percent purchased this account, but only 22.28 percent maintained a balance greater than 500 dollars.

The price increase effected the number of checks written differently during each period. When prices were first increased the number of checks written dropped from 34.06 to 22.46 and when the prices were raised the second time the number of checks written increased to 31.62.

Several conclusions can be derived about account behavior at this bank. First, there is no relationship between the number of checks written and the balance maintained. Second, the balances maintained are generally higher than the optimum whether it is a

minimum or an average daily balance. Third, there is also some

cyclical behavior in the account balances. Fourth, the changes in

the price schedule probably had a greater influence on the average

number of checks written than on the account balance.

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