AN EVALUATION OF THREE BOCES

BOND PAYMENT ALTERNATIVES

By

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Preface

This evaluation of BOCES bond payment alternatives was performed at the request of the Tompkins-Seneca-Tioga BOCES District. No attempt was made to perform a comprehensive analysis of the complete range of alternative ways to finance capital construction. Instead, three groups of alternatives were developed in conjunction with BOCES personnel and, from these groups, three specific alternatives were identified for complete evaluation.

The procedures developed in this report were designed to facilitate computation and presentation of a basic set of information upon which decisions may be based. Emphasis is placed upon determination of the costs and present value figures relevant to an economic evaluation of the alternatives. However, certain non-economic factors, such as the preferences of participating school districts, are also considered. The procedures developed in this evaluation may be generalized to analyze additional alternatives or adapted to similar problems in other districts.

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Introduction

The construction of Boards of Cooperative Educational Services (BOCES) centers is generally approved in a referendum by the voters within the BOCES district. On April 17, 1968, voters in the nine participating school districts which compose the Tompkins-Seneca-Tioga BOCES District went to the polls and approved a $3.5 million bond issue to finance construction of a BOCES center to serve students in those districts.[1/] Construction began during 1968, the center was opened for students during January, 1971, and it was dedicated in April, 1971.

Construction of the BOCES center was finance by the New York State Dormitory Authority. A total of $518,000 in federal funds reduced local obligations to $2,982,000. Of this total, only about $8,000 has not been spent or obligated by the Dormitory Authority. Interest on the $2,982,000 debt has been accumulating and by the Fall of 1973, when the Dormitory Authority expects to sell the bonds, the total obligation of the BOCES district will approximate $3.5 million.

During the 1969-70 school year, the BOCES district began to collect revenue from each participating school district. Approximately $200,000

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* Assistant Professors of Agricultural Economics at Cornell University. The helpful comments of Robert S. Smith and Bernard F. Stanton are gratefully acknowledged.

1/ Participating school districts include Candor in Tioga County, South Seneca in Seneca County, and Dryden, George Junior, Groton, Ithaca, Lansing, Newfield and Trumansburg in Tompkins County.

had been collected through the 1972-73 fiscal year and an additional $81,000 will be collected during the 1973-74 fiscal year.

The Problem

The problem is to evaluate a number of alternative ways in which the $3.5 million bond issue may be retired. Although there are a number of state and local restrictions, the BOCES district does have considerable flexibility in designing the repayment schedule. The existence of state aid and the $200,000 reserve increase the number of options open to the district. Before discussing the repayment alternatives one must, however, understand the constraints to which repayment must conform. State and local requirements and assumptions include the following:

1. The maximum bond issue authorized by the voters is $3.5 million, and accumulated interest will necessitate a $3.5 million bond sale by the Dormitory Authority in late 1973.
2. For the purposes of this analysis, a $6\frac{1}{2}$ percent interest rate was utilized. This rate was thought to represent an upper limit, given current conditions in the money market.
3. The Local Finance Law requires that the maximum principal payment not be greater than 1.5 times the minimum principal payment.
4. The state pays aid averaging $.48 per dollar for each dollar spent either in prepayment of principal prior to the bond issue, or in payment of principal and interest after the bonds are sold. This state aid figure is based on an average of the aid ratios of the participating school districts in the BOCES district and the percent of the bond issue approved for aid purposes.

5. Assuming that the bonds are sold during late 1973, a half-year interest payment on the bond amount will be due during the 1973-74 fiscal year.

In addition, local preferences and assumptions include the following:

1. Participating school districts would prefer that school costs increase gradually over time, rising at about $10,000 per year.
2. The BOCES district may be able to borrow up to $180,000 to reduce the face value of the bond issue. For the purposes of this analysis, a $6\frac{1}{2}$ percent interest rate was assumed.
3. An annual interest rate of $5\frac{1}{2}$ percent on the current bank deposits of the BOCES district was assumed for this analysis.
4. The $81,000 to be collected from participating school districts during 1973 may be used to make the half-year interest payment during fiscal year 1973-74.

Alternatives

A wide range of alternatives is available to a BOCES district facing decision regarding the financing of a new facility. Of major importance are questions regarding short-term versus long-term financing, the impact of alternative interest rates and the effects of inflation on ease of repayment. Because of the state and local restrictions and constraints, this analysis considers a fairly narrow range of the existing alternatives.

Three groups of alternatives were identified as feasible by the BOCES district. One group of alternatives includes using the $200,000 to reduce the contributions (current school costs) of participating school districts in the short-run, assuming no prepayment of principal. A second group of

alternatives would utilize part or all of the $200,000 in order to reduce the face amount of the bond issue. In addition to prepaying the entire $200,000 reserve, a third group of alternatives involves current borrowing of up to $180,000 to further reduce the face amount of the bond issue. From among these groups, the following three specific alternatives were identified for intensive evaluation:

1. No prepayment. The $200,000 currently on deposit is used to smooth out annual school costs and reduce school district contributions during the initial years of the bond issue.
2. Maximum prepayment without borrowing. The $200,000 currently on deposit is paid to the State Dormitory Authority prior to the sale of the bonds to reduce the face amount of the bond issue to $3.3 million.
3. Maximum prepayment with maximum borrowing. The $200,000 currently on deposit, plus $180,000 in short-term borrowing, are paid to the Dormitory Authority prior to the sale of the bonds. The bond amount is thus reduced to $3,120,000. The $180,000 is repaid in three months out of state aid received on the prepayment.

Evaluation of Alternatives

The evaluation of alternatives is divided into three component parts. First, the district obligation is determined for each of the 30 years over which the bond issue will be repaid. Second, the district obligation is adjusted to reflect current school costs. Current school costs may be defined as the amount of revenue that must be collected each year from the participating school districts to repay the bond issue over the 30 year period. Third, the streams of principal and interest payments and current school costs

are discounted to their present values at 6 and 12 percent interest rates. A comparison of the present values allows introduction of the time value of money into the analysis and decision making process. These procedures are explained in detail for Alternative 1 (no prepayment) in the following paragraphs. Then, the results of a similar evaluation of Alternatives 2 and 3 are presented in tabular form. Finally, the three alternatives are summarized and compared.

Alternative 1: No Prepayment

The amount of the bond issue under Alternative 1, assuming no prepayment of principal, is $3.5 million. The schedule of payments, state aid and school costs for this alternative are presented in Table 1. No principal payment is required during 1973-74, however, a half-year interest payment must be made. One year's interest (6½ percent of $3,500,000) is $227,500, half of which is $113,750. Since no principal payment is required, the total principal and interest required during 1973-74 is $113,750. The aid ratio of .48 indicates that, on the average, $.48 is returned to the local BOCES district for each $1 paid in principal and interest. State aid on the interest payment thus amounts to $54,600 (.48 x $113,750). The district obligation of $59,150 is determined by subtracting state aid from principal and interest ($113,750 - $54,600 = $59,150). Determination of current school cost is discussed later.

During 1974-75, the first principal payment must be made. The State Dormitory Authority requires that the maximum principal payment not be greater than 1.5 times the minimum principal payment. A constant principal payment for each of the 30 years is possible. However, because of the desire to keep current school costs down in the short run, a two-level repayment schedule

Table 1. Evaluation of Alternative 1 - No Prepayment

Fiscal Year	Bond Amount	Principal	Interest	Principal and Interest	State Aid	District Obligation	Current School Cost
1973-74	$3,500,000	$ 0	$113,750	$113,750	$ 54,600	$ 59,150	$ 81,000
1974-75	3,500,000	87,500	227,500	315,000	151,200	163,800	90,000
1975-76	3,412,500	87,500	221,812	309,312	148,470	160,842	100,000
1976-77	3,325,000	87,500	216,125	303,625	145,740	157,885	110,000
1977-78	3,237,500	87,500	210,438	297,938	143,010	154,928	120,000
1978-79	3,150,000	87,500	204,750	292,250	140,280	151,970	130,000
1979-80	3,062,500	87,500	199,063	286,563	137,550	149,013	147,289
1980-81	2,975,000	87,500	193,375	280,875	134,820	146,055	146,055
1981-82	2,887,500	87,500	187,688	275,188	132,090	143,098	143,098
1982-83	2,800,000	87,500	182,000	269,500	129,360	140,140	140,140
1983-84	2,712,500	87,500	176,313	263,813	126,630	137,183	137,183
1984-85	2,625,000	131,250	170,625	301,875	144,900	156,975	156,975
1985-86	2,493,750	131,250	162,094	293,344	140,805	152,539	152,539
1986-87	2,362,500	131,250	153,563	284,813	136,710	148,103	148,103
1987-88	2,231,250	131,250	145,031	276,281	132,615	143,666	143,666
1988-89	2,100,000	131,250	136,500	267,750	128,520	139,230	139,230
1989-90	1,968,750	131,250	127,969	259,219	124,425	134,794	134,794
1990-91	1,837,500	131,250	119,438	250,688	120,330	130,358	130,358
1991-92	1,706,250	131,250	110,906	242,156	116,235	125,921	125,921
1992-93	1,575,000	131,250	102,375	233,625	112,140	121,485	121,485
1993-94	1,443,750	131,250	93,844	225,094	108,045	117,049	117,049
1994-95	1,312,500	131,250	85,313	216,563	103,950	112,613	112,613
1995-96	1,181,250	131,250	76,781	208,031	99,855	108,176	108,176
1996-97	1,050,000	131,250	68,250	199,500	95,760	103,740	103,740
1997-98	918,750	131,250	59,719	190,969	91,665	99,304	99,304
1998-99	787,500	131,250	51,188	182,438	87,570	94,868	94,868
1999-00	656,250	131,250	42,656	173,906	83,475	90,431	90,431
2000-01	525,000	131,250	34,125	165,375	79,380	85,995	85,995
2001-02	393,750	131,250	25,594	156,844	75,285	81,559	81,559
2002-03	262,500	131,250	17,063	148,313	71,190	77,123	77,123
2003-04	131,250	131,250	8,531	139,781	67,095	72,686	72,686
Totals		3,500,000	3,924,379	7,424,379	3,563,700	3,860,679	3,641,380
Present Value at 6%				3,668,038			1,698,104
Present Value at 12%				2,267,133			944,892

was devised.[2/] A minimum principal payment of $87,500 for 10 years, and a maximum payment of $131,250 for the final 20 years was utilized for Alternative 1. Multi-level repayment schedules could be devised in a similar fashion.

Once the district obligation has been calculated for each of 30 years, an adjustment is made so that current school costs reflect the dollar amount that must be collected from the participating school districts each year. These adjustments for Alternative 1 are presented, and explained in detail, in Table 2. The adjustment process simply utilizes the $200,000 currently in reserve to permit gradual increases of only $10,000 per year in current school costs for the first 5 years. In this case, current school costs rise from $81,000 in fiscal 1973-74 to $130,000 in fiscal 1978-79. From fiscal year 1980-81 until the end of the 30-year period, the district obligation and current school costs are equal.

The $200,000 reserve could be used to even out the increase in current school cost over a shorter or longer period of time by adjusting the yearly contributions of participating school districts. However, small changes are

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2/ The following set of equations may be utilized to determine alternative payment schedules that satisfy the Dormitory Authority's requirement:

$$(1) \quad X\,Y + 1.5\,X\,Z = BI$$

$$(2) \quad Y + Z = BL$$

where

X = the minimum principal payment
Y = the number of years the minimum payment will be made
Z = the number of years the maximum payment will be made
BI = the amount of the bond issue
BL = the number of years over which the bond issue will be repaid.

Under Alternative 1, if we assume that Y = 10 and BL = 30, then Z = 20. Thus, for the $3.5 million bond issue, Equation (1) may be written as

$$10\,X + (1.5)(20)\,X = \$3,500,000$$

or

$$40\,X = \$3,500,000.$$

Thus, X = $87,500 and 1.5 X = $131,250.

Table 2. Computation of Current School Costs for Alternative 1 - No Prepayment

Fiscal Year	District Obligation	Current School Cost[a/]	Change in Reserves	Remaining Reserves	Interest on Reserves	Ending Balance
1973-74	$ 59,150	$ 81,000	$ +21,850	$221,850	$ 12,202	$233,052
1974-75	163,800	90,000	-73,800	149,252	8,209	157,461
1975-76	160,842	100,000	-60,842	96,619	5,314	101,933
1976-77	157,885	110,000	-47,885	54,314	2,987	57,301
1977-78	154,928	120,000	-34,928	22,373	1,231	23,604
1978-79	151,970	130,000	-21,970	1,634	90	1,724
1979-80	149,013	147,289	- 1,724	0	0	0

a/ Current school costs are based on the district obligations, which were transformed from Table 1. During 1973-74, the district obligation equals $59,150, however, a total of $81,000 will be collected from participating school districts. Thus, $21,850 may be added to the $200,000 currently on deposit ($81,000 - $59,150 = $21,850). This reserve of $221,850, if left to draw interest at 5½ percent, will grow to about $233,052 by the time the 1974-75 principal and interest payment is due. The district obligation equals $163,800 during 1974-75. If we assume that the participating school districts wish to hold current school costs down to $90,000, then $73,800 must be withdrawn from the reserve in order to make the payment ($163,800 - $90,000 = $73,800). The remaining reserve of $149,252 will earn interest of $8,209 during the year, leaving an ending balance at the time of the 1975-76 payment of $157,461. These computations are repeated, with current school costs increasing by $10,000 per year, through 1978-79. During 1979-80, the reserve will be depleted. School costs for 1979-80 are $149,013, however, the reserve is only $1,724. By depleting the reserve, current school costs are only reduced to $147,289. From 1981-82 until the bonds are retired, the district obligation and current school costs are equal.

not likely to significantly alter the implications of this analysis.

Alternative 2: Maximum Prepayment Without Borrowing

An evaluation of Alternative 2, the prepayment of the $200,000 currently on reserve to reduce the bond issue to $3.2 million, is presented in Table 3. The schedule of principal payments was determined using Equations (1) and (2). Interest, principal and interest, state aid and the district obligation were determined exactly as previously described for Alternative 1. The computation of current school costs differs slightly, however, and is described in Table 4.

Current school costs under this alternative can be reduced for only three years after the bond sale through management of the state aid and the surplus of 1973-74 receipts over the district obligation. Under Alternative 1, current school costs can be held to a level below the district obligation, through management of the $200,000 reserve, for six years after the bonds are sold. Alternative 1 thus offers considerably more flexibility for a gradual increase in current school costs than Alternative 2.

Alternative 3: Maximum Prepayment With Maximum Borrowing

Alternative 3 involves prepayment of the entire $200,000 currently on deposit plus an additional $180,000 secured through current borrowing. This alternative might have been rejected at the outset were it not for state aid. The BOCES district indicated that $180,000 represents the maximum amount that can be repaid immediately using the state aid received on the $380,000 prepayment. An evaluation of Alternative 3 is presented in Table 5. Prepayment of $380,000 reduces the bond amount to $3,120,000 and yeilds $182,400 in state aid. The schedule of principal payments was established through the use of Equations (1) and (2). Interest, principal and interest, state aid and the district obligation are calculated as previously explained for Alternative 1.

Table 3, Evaluation of Alternative 2 - Maximum Prepayment Without Borrowing

Fiscal Year	Bond Amount	Principal	Interest	Principal and Interest	State Aid	District Obligation	Current School Cost
1973-74	$3,300,000	$ 0	$107,250	$107,250	$ 51,480	$ 55,770	$ 81,000
1974-75	3,300,000	82,500	214,500	297,000	142,560	154,440	90,000
1975-76	3,217,500	82,500	209,138	291,638	139,986	151,652	100,000
1976-77	3,135,000	82,500	203,775	286,275	137,412	148,863	132,726
1977-78	3,052,500	82,500	198,413	280,913	134,838	146,075	146,075
1978-79	2,970,000	82,500	193,050	275,550	132,264	143,286	143,286
1979-80	2,887,500	82,500	187,688	270,188	129,690	140,498	140,498
1980-81	2,805,000	82,500	182,325	264,825	127,116	137,709	137,709
1981-82	2,722,500	82,500	176,963	259,463	124,542	134,921	134,921
1982-83	2,640,000	82,500	171,600	254,100	121,968	132,132	132,132
1983-84	2,557,500	82,500	166,238	248,738	119,394	129,344	129,344
1984-85	2,475,000	123,750	160,875	284,625	136,620	148,005	148,005
1985-86	2,351,250	123,750	152,831	276,581	132,759	143,822	143,822
1986-87	2,227,500	123,750	144,788	268,538	128,898	139,640	139,640
1987-88	2,103,750	123,750	136,744	260,494	125,037	135,457	135,457
1988-89	1,980,000	123,750	128,700	252,450	121,176	131,274	131,274
1989-90	1,856,250	123,750	120,656	244,406	117,315	127,091	127,091
1990-91	1,732,500	123,750	112,613	236,363	113,454	122,909	122,909
1991-92	1,608,750	123,750	104,569	228,319	109,593	118,726	118,726
1992-93	1,485,000	123,750	96,525	220,275	105,732	114,543	114,543
1993-94	1,361,250	123,750	88,481	212,231	101,871	110,360	110,360
1994-95	1,237,500	123,750	80,438	204,188	98,010	106,178	106,178
1995-96	1,113,750	123,750	72,394	196,144	94,149	101,995	101,995
1996-97	990,000	123,750	64,350	188,100	90,288	97,812	97,812
1997-98	866,250	123,750	56,306	180,056	86,427	93,629	93,629
1998-99	742,500	123,750	48,263	172,013	82,566	89,447	89,447
1999-00	618,750	123,750	40,219	163,969	78,705	85,264	85,264
2000-01	495,000	123,750	32,175	155,925	74,844	81,081	81,081
2001-02	371,250	123,750	24,131	147,881	70,983	76,898	76,898
2002-03	247,500	123,750	16,088	139,838	67,122	72,716	72,716
2003-04	123,750	123,750	8,044	131,794	63,261	68,533	68,533
Subtotals		3,300,000	3,700,130	7,000,130	3,360,060	3,640,070	3,533,071
Prepayment		200,000		200,000	96,000	104,000	
Total		3,500,000	3,700,130	7,200,130	3,456,060	3,744,070	3,533,071
Present Value at 6%				3,458,438			1,678,080
Present Value at 12%				2,137,584			1,001,345

Table 4. Computation of Current School Costs for Alternative 2 - Maximum Prepayment Without Borrowing

Fiscal Year	District Obligation	Current School Cost[a/]	Change in Reserves	Remaining Reserves	Interest on Reserves	Ending Balance
1973-74	$ 55,770	$ 81,000	$ +25,230	$121,230	$ 6,668	$127,898
1974-75	154,440	90,000	-64,440	63,458	3,490	66,948
1975-76	151,652	100,000	-51,652	15,296	841	16,137
1976-77	148,863	132,726	-16,137	0	0	0

a/ The district obligation for 1973-74 is $55,770 (Table 3). It has already been decided that $81,000 will be collected from the participating school districts during 1973-74, leaving a surplus of $25,230 to be placed on deposit in reserve ($81,000 - $55,770 = $25,230). It should be noted that the prepayment of $200,000 results in receipt of $96,000 in state aid to the BOCES district ($200,000 x .48 = $96,000). The addition of $96,000 in state aid to the $25,230 surplus results in a reserve of $121,230. The reserve earns $6,668 in interest during the year so that $127,898 is available by the time the 1974-75 payment is due. This reserve is available to even out the increase in current school costs, however, is depleted during the 1976-77 fiscal year. From 1978-79 until the bonds are retired, the district obligation and current school cost are equal.

Table 5. Evaluation of Alternative 3 - Maximum Prepayment With Maximum Borrowing

Fiscal Year	Bond Amount	Principal	Interest	Principal and Interest	State Aid	District Obligation	Current School Cost
1973-74	$3,120,000	$ 0	$101,400	$101,400	$ 48,672	$ 52,728	$ 81,000
1974-75	3,120,000	78,000	202,800	280,800	134,784	146,016	116,743
1975-76	3,042,000	78,000	197,730	275,730	132,350	143,380	143,380
1976-77	2,964,000	78,000	192,600	270,660	129,917	140,743	140,743
1977-78	2,886,000	78,000	187,590	265,590	127,483	138,107	138,107
1978-79	2,808,000	78,000	182,520	260,520	125,050	135,470	135,470
1979-80	2,730,000	78,000	177,450	255,450	122,616	132,834	132,834
1980-81	2,652,000	78,000	172,380	250,380	120,182	130,198	130,198
1981-82	2,574,000	78,000	167,310	245,310	117,749	127,561	127,561
1982-83	2,496,000	78,000	162,240	240,240	115,315	124,925	124,925
1983-84	2,418,000	78,000	157,170	235,170	112,882	122,288	122,288
1984-85	2,340,000	117,000	152,100	269,100	129,168	139,932	139,932
1985-86	2,223,000	117,000	144,495	261,495	125,518	135,977	135,977
1986-87	2,106,000	117,000	136,890	253,890	121,867	132,023	132,023
1987-88	1,989,000	117,000	129,285	246,285	118,217	128,068	128,068
1988-89	1,872,000	117,000	121,680	238,680	114,566	124,114	124,114
1989-90	1,755,000	117,000	114,075	231,075	110,916	120,159	120,159
1990-91	1,638,000	117,000	106,470	223,470	107,266	116,204	116,204
1991-92	1,521,000	117,000	98,865	215,865	103,615	112,250	112,250
1992-93	1,404,000	117,000	91,260	208,260	99,965	108,295	108,295
1993-94	1,287,000	117,000	83,655	200,655	96,314	104,341	104,341
1994-95	1,170,000	117,000	76,050	193,050	92,664	100,386	100,386
1995-96	1,053,000	117,000	68,445	185,445	89,014	96,431	96,431
1996-97	936,000	117,000	60,840	177,840	85,363	92,477	92,477
1997-98	819,000	117,000	53,235	170,235	81,713	88,522	88,522
1998-99	702,000	117,000	45,630	162,630	78,062	84,568	84,568
1999-00	585,000	117,000	38,025	155,025	74,412	80,613	80,613
2000-01	468,000	117,000	30,420	147,420	70,762	76,658	76,658
2001-02	351,000	117,000	22,815	139,815	67,111	72,704	72,704
2002-03	234,000	117,000	15,210	132,210	63,461	68,749	68,749
2003-04	117,000	117,000	7,605	124,605	59,810	64,795	64,795
Subtotals		3,120,000	3,498,300	6,618,300	3,176,784	3,441,516	3,440,515
Prepayment plus borrowing		380,000	2,925	382,925	182,400	200,525	
Totals		3,500,000	3,501,225	7,001,225	3,359,184	3,642,041	3,440,515
Present Value at 6%				3,269,794			1,672,679
Present Value at 12%				2,020,984			1,024,779

Computation of current school cost for Alternative 3 is summarized in Table 6.

Alternative 3 provides less flexibility than either Alternatives 1 or 2. Current school costs can be reduced below the district obligation for only one year following the sale of the bonds. Alternative 2 (maximum prepayment without borrowing) permits the BOCES district to maintain current school costs below the district obligation for three years after the bonds are sold. Alternative 1 (no prepayment) permits maximum flexibility. The BOCES district can manage the $200,000 to insure that current school costs are less than the district obligation for six years after the bonds are sold.

Alternatives which include short-term borrowing would be more attractive if the loans could be repaid over a long period of time. That is, repayment of the $180,000 in current borrowing beginning in year 20 of the repayment process would permit the use of state aid on the prepayment to reduce current school cost in the short run, yet push repayment of the loan into the future. The feasibility of this series of alternatives was not evaluated in this report.

Additional Economic Considerations

Previous sections of this report emphasized the rate of increase in current school costs as a criteria of considerable importance in the decision making process. However, there are other economic factors to be considered in addition to the time path of current school costs.

Total Bond Costs

A number of summary statistics which permit comparisons of the bond payment alternatives are presented in Tables 1, 3 and 5, but, have not been discussed. These summary statistics are presented in Table 7. The bond amounts under Alternatives 1, 2 and 3 are $3.5, $3.3 and $3.12 million, respectively.

Table 6. Computation of Current School Costs for Alternative 3 - Maximum Prepayment With Maximum Borrowing

Fiscal Year	District Obligation	Loan Payment	Total School Cost	Current School Cost[a/]	Change in Reserves	Interest on Reserves	Ending Balance
1973-74	$ 52,728	$182,925	$235,653	$ 81,000	$ +27,747	$ 1,526	$29,273
1974-75	146,016	0	146,016	116,743	-29,273	0	0

a/ The district obligation during 1973-74 amounts to $52,728. The $180,000 in current borrowing is to be repaid during 1973-74, in addition to the interest on the entire amount for three months, which equals $2,925. Thus, school costs for 1973-74 total $235,653 ($52,728 + $180,000 + $2,925 = $235,653). A total of $182,400 is reimbursed as state aid on the $380,000 prepayment of principal. The addition of state aid to the $81,000 contributed by participating school districts during 1973-74 gives the district $236,400 with which to pay the district obligation. Thus, a net addition to reserves of $27,747 is possible ($263,400 - $235,653 = $27,747). The interest that accumulates on this reserve during the year ($1,526) leaves an ending balance of $29,273 to be used to reduce the district obligation during 1974-75. Use of the entire reserve only reduces current school costs to $116,743 during 1974-75. From 1976-77 until the bonds are retired, the district obligation and current school costs are equal.

Table 7. Summary of Bond Payment Alternatives

	Alternative 1	Alternative 2	Alternative 3
	No Prepayment	Maximum Prepayment Without Borrowing	Maximum Prepayment with Maximum Borrowing
Bond Amount	$3,500,000	$3,300,000	$3,120,000
Total Interest on Bonds	3,924,000	3,700,130	3,498,300
Total Interest Payments	3,924,000	3,700,130	3,501,225
Total Principal and Interest on Bond Issue	7,424,379	7,000,130	6,618,300
Total Payments	7,424,379	7,200,130	7,001,225
State Aid on Bonds	3,563,700	3,360,060	3,176,784
Total State Aid	3,563,700	3,456,060	3,359,184
District Obligation	3,860,679	3,744,070	3,642,041
Current School Cost	3,641,380	3,533,071	3,440,515
Present Value of Principal and Interest at 6%	3,668,038	3,458,438	3,269,794
Present Value of Current School Cost at 6%	1,698,104	1,678,080	1,672,679
Present Value of Principal and Interest at 12%	2,267,133	2,137,584	2,020,984
Present Value of Current School Cost at 12%	994,892	1,001,345	1,024,779

Interest on the bonds is greater for Alternative 1, followed by Alternatives 2 and 3. The addition of interest on current borrowing to the interest on the bonds under Alternative 3 does not change these relationships.

Total principal and interest on the bond issue amounts to $7.424 million under Alternative 1, $7.000 million under Alternative 2 and $6.618 million under Alternative 3. These figures exclude prepayment of principal prior to the sale of the bonds. When prepayment of the current reserve and prepayment of the current reserve plus current borrowing are added, the differences among the alternatives is narrowed substantially. Total payments equal $7.424 million, $7.200 million and $7.001 million for Alternative 1, 2 and 3, respectively.

A greater amount of state aid on the bonds is received under Alternative 1, followed by Alternatives 2 and 3. With the addition of state aid on the total amount of bond payment, total state aid for the three alternatives differs by only about $205,000. The range is from $3.564 million for Alternative 1 to $3.359 million for Alternative 3.

The disparity in total district obligations is relatively small. The district obligation totals $3.861 million under Alternative 1, $3.744 million under Alternative 2 and $3.642 million under Alternative 3. Similarly, the range in current school costs is only about $200,000 across alternatives. Current school costs total $3.644 million, $3.533 million and $3.441 million under Alternatives 1, 2 and 3, respectively. There is greater disparity among bond amounts than among total current school costs. This phenomenon may be attributed almost entirely to state aid. Since state aid is received on every dollar prepaid, as well as on principal and interest payments, it tends to equalize the district obligations and current school costs. The differences in total current school costs among alternatives amounts to only about

$3,000 per year over the 30 year period. Thus, the time path of payments may be greater importance than the differences in total current school costs.

Interest Rates

The interest rate at which the bonds are sold is of considerable importance to the BOCES district. For example, if under Alternative 1 the bonds were to carry a 5½ percent interest rate, rather than the anticipated 6½ percent rate, interest costs alone would be reduced by over $600,000 during the 30 year replacement period. The total district obligation would be reduced by over $310,000. Similar reductions would occur under Alternatives 2 and 3. Higher interest rates would push interest costs and district obligations in the opposite direction. The Tompkins-Seneca-Tioga BOCES district has no direct control over the sale of the bonds, however it has much to gain or lose depending upon whether the bonds are sold under favorable or unfavorable market conditions.

Present Values

Present values of the streams of principal and interest payments and current school costs, computed at 6 and 12 percent discount rates, are presented in Table 7 for each alternative. The basic proposition underlying the computation of present values is that a dollar of costs (or benefits) not expected until next year is worth less than a dollar of costs (or benefits) expected today. This simply says that time is important. The value of an item depends upon when one will gain the use of it and the value of an obligation is dependent upon when one must pay it. The computation of present values allows us to compare the value of alternative payment schedules

at the same point in time - the present.[3/]

Present values were computed using 6 and 12 percent discount rates.[4/] The present value of principal and interest payments discounted at 6 percent ranges from $3.668 million under Alternative 1 to $3.458 million under Alternative 2 to $3.270 million under Alternative 3. Differences between present values of current school costs, discounted at 6 percent, are much smaller. The present values of current school costs are $1.698 million, $1.678 million and $1.673 million for Alternatives 1, 2 and 3, respectively. Decision makers, where benefits are assumed constant across alternatives, usually wish to minimize the present value of the stream of costs. On this basis, Alternative 3 may be preferred to Alternative 1, however, the difference between present values of current school cost for Alternatives 1 and 3 is quite small (about $25,000).

Discounting the stream of principal and interest payments at 12 percent does not alter this conclusion. However, use of the 12 percent discount rate to compute the present value of current school costs may alter the conclusion.

3/ The formula used to compute the present value of schedules of principal and interest payments and current school costs is as follows:

$$PV = \sum_{t=1}^{30} \frac{C_t}{(1+r)^t}$$

where

PV = present value of the stream of costs
C_t = cost, year t
r = the discount rate

4/ The choice of an "appropriate" discount rate is one of the most controversial topics in present value analysis. The controversy centers around whether the "appropriate" discount rate, where public money is involved, should be the cost of borrowing money or the rate of return in the private sector. From the economists standpoint, the discount rate should reflect the opportunity cost of the money. The opportunity cost of the money is reflected by what it could earn in its best alternative use. Thus, the discount rate should be large enough to reflect the rate of return of the funds in their best alternative use. Since the rate of return is likely to fall between 6 and 12 percent, these two discount rates were used to establish an upper and lower bound on the present values.

At the higher discount rate, present values are $0.995 million for Alternative 1, $1.001 million for Alternative 2 and $1.025 million for Alternative 3. Under Alternative 1, current school costs are maintained below the district obligation for twice as long as under Alternative 2, and for six times as long as under Alternative 3. In addition, for the final 25 years, current school costs are larger each year under Alternative 1 than under Alternatives 2 and 3. Since a larger proportion of current school costs are pushed into the future under Alternative 1, and the higher discount rate acts to emphasize the importance of the first few years of the repayment process, the present value of current school costs is lower for Alternative 1. Thus, at the 12 percent discount rate, decision makers would generally prefer Alternative 1 to Alternatives 2 or 3.

Summary

The purpose of this report is to evaluate a narrow range of alternative ways in which an anticipated $3.5 million bond issue may be retired. The existence of state aid, a $200,000 reserve and short-term borrowing capacity give the Tompkins-Seneca-Tioga BOCES district considerable flexibility in designing a repayment schedule.

Three specific alternatives were evaluated. Alternative 1 consists of no prepayment of principal. The $200,000 currently on deposit would be used to smooth out increases in current school costs. Alternative 2 includes a maximum prepayment of the $200,000 without current borrowing. Alternative 3 consists of prepayment of the $200,000 reserve plus $180,000 in short-term borrowing.

Analysis of these alternatives revealed that, because of the restrictions on maximum and minimum principal payments and the stabilizing influence of interest payments and state aid, the three alternatives do not differ

substantially. The bond amount, total interest payments, total payments, state aid and current school costs are greater under Alternative 1, followed by Alternatives 2 and 3. However, the range in current school cost ($3.641 million, $3.533 million and $3.441 million for Alternatives 1, 2 and 3, respectively) is quite small.

Present values of the streams of principal and interest payments and current school costs, were computed at 6 and 12 percent discount rates. If decision makers wish to minimize the present value of the stream of current school costs, they may prefer Alternative 3 at the 6 percent discount rate, but Alternative 1 at the 12 percent discount rate. That is, at the 6 percent discount rate, the present value of current school costs is lower under Alternative 3 than under Alternative 1. At the 12 percent discount rate, the opposite is true.

It is difficult to put dollar values on the desire of local school districts to increase current school costs gradually over time. However, the effect of each alternative payment schedule on the rate of increase in current school costs is analyzed. Results of the analysis indicate that Alternative 1, no prepayment, would permit the BOCES district to increase current school costs by $10,000 per year, from $81,000 in 1973-74 to $130,000 in 1978-79. Current school costs could be held to a level below the district obligation for six years after the bonds are sold. Alternative 2, maximum prepayment without borrowing, would permit the BOCES district to reduce current school costs for a period of three years after the bonds are sold. Current school costs would increase from $81,000 in 1973-74 to $132,726 in 1976-77, after which current school costs and the district obligation would be equal. Alternative 3, maximum prepayment with maximum borrowing, would reduce current school costs below the district obligation for only one year

following the sale of the bonds. Current school costs would rise from $81,000 in 1973-74 to $116,743 in 1974-75. Current school costs would equal the district obligation ($143,380) in 1975-76, and the two would be equal for the remaining years of the bond repayment schedule.