

# Staff Papers Series

Staff Paper No. P91-36

September 1991

**A User's Guide**

**For**

**PVBUDGET**

**Earl Fuller**



**Department of Agricultural and Applied Economics**

University of Minnesota  
Institute of Agriculture, Forestry and Home Economics  
St. Paul, Minnesota 55108

**A USER'S GUIDE  
FOR  
PVBUDGET**

by

Earl Fuller  
Department of Agricultural and Applied Economics  
University of Minnesota

# TABLE OF CONTENTS

Introduction: Uses and Purposes	1
Part I - Uses of Net Present Value Budgeting Or Analysis	3
Part II - Analysis Options in PVBUDGET	7
Part III - Data Input Procedures	9
Part IV - Interpreting the Resulting Analysis	18
Part V - Some Comments About Situations Where PVBUDGET Can Be A Useful Tool	34
Appendix A: Files Distributed As Part Of PVBUDGET And Installation	
Appendix B: PVBUDGET Data Questionnaire	

# A USER'S GUIDE FOR PVBUDGET

by  
Earl Fuller

## USES AND PURPOSES

PVBUDGET adds a time dimension to a partial budgeting analysis of many kinds of financial investment projects. It compares both the profitability and the feasibility of one or more alternative investments. Alternative investments often have different cash flow and income tax characteristics. Some assets wear out sooner than others. Some are more risky than others. PVBUDGET takes such time characteristics into account. It evaluates the benefits in comparison to the detriments--recognizing when in the future each cash flow event associated with those benefits and detriments will occur.

This manual presumes that the user is familiar with these fundamental ideas of partial budgeting.<sup>1</sup> The key addition to partial budgeting found in PVBUDGET is that future cash flows are discounted to equivalent present values and then summed to compare the detriments with the benefits. The results are used to compare contemplated investment related projects.

---

The author appreciates the review efforts of Bill Lazarus and Glen Pederson, but most of all wants to recognize the work of Dale Nordquist who was a co-designer and author of an earlier timeshare version of PVBUDGET in the 1970's. Several research assistants have also contributed to this system by programming or testing it over the years.

---

Contribution to Minnesota Agricultural Experiment Station Project 14-036, Management Information Systems for Minnesota Farm Firms.

---

<sup>1</sup> For further discussion, see Thomas, K., Hawkins, R., Luening, R., & Weigle, R., Managing Your Farm Financial Future, NCR 34, University of Wisconsin-Madison, January 1973, pp. 35-38.

PVBUDGET can be thought of as a combination of five decision aid options. The user can select the appropriate one(s) to do a specific analysis. Some of the choices are actually combinations of the other more simple analyses. Comparisons of alternative investments require at least two PVBUDGET analyses.

PVBUDGET does net present value (NPV) analysis. Net present value analysis is generally acknowledged by the business professions to be the most correct for ordering alternative investment projects; more correct than "years to pay back", "rate of return", etc. It is equally correct to the discounted "internal rate of return" (or IRR) approach.<sup>2</sup> Its superiority over other procedures is due to its ability to handle the likely differences in tax, credit and cash flow characteristics over time.

In net present value analysis, future cash flows are generally adjusted by (1) the marginal income tax rates before being discounted by (2) the opportunity cost rate for the use of money. This is done to reflect the impact on net worth to the firm or persons involved. Thus, these two parameters are critical to the analysis.

Objectives of the User's Guide: There are two main objectives: (1) to assist the user who is unfamiliar with present value procedures to understand net present value analysis, and to see where it can be useful and (2) to help the user make good use of PVBUDGET and to interpret the specific analysis that results from use.

---

<sup>2</sup> While NPV computes the present value equivalent of a project given a capital reservation rate or opportunity cost for equity capital, IRR estimates the rate at which the NPV would be zero.

The user's guide is divided into five parts. Part I offers an overview of net present value analysis and how it can be used to analyze capital investment projects. Part II describes the five options available within PVBUDGET. Part III illustrates PVBUDGET data entry procedures by showing the computer screens. Part IV describes the resulting analyses and how they can be used as an aid to making investment decisions or comparing investment alternatives. Part V suggests some of the investment and financially related problematic situations where the use of PVBUDGET holds promise.

## PART I

### USES OF NET PRESENT VALUE BUDGETING OR ANALYSIS

The basic idea of present value budgeting is that a dollar received today is worth more than a dollar received at a later date. This is true whenever the dollar received today can be reinvested to earn more money in the future.

For instance, if you sold a commodity worth \$1,000 today, you could put that money in a savings account at 6% interest and it would be worth \$1,060 in one year. If you did not sell that commodity for a year, it would be worth only \$1,000 to you a year from now, assuming constant commodity prices and no inflation. You would have missed the opportunity to earn \$60 by investing the \$1,000 for one year.

Turning this analysis around, what is today's value (present value) of the \$1,000 you receive a year from now if you do not sell until then? Table 1 shows the present value of \$1 at the end of a given number of years and at various opportunity cost (interest or discount) rates. At a 6% opportunity

cost rate, \$1 received at the end of one year would be worth about \$.94 (.94340) today. So \$1,000 received a year from now is worth \$1,000 x .94340 or \$943.40.

To the extent that the price of the commodity or the purchasing value of money changes (due to inflation) or shrinkage in the commodity presents other risks to you, these should be considered either as an explicit cost in NPV analysis or as an adjustment in the opportunity cost or discount rate used.

Table 1. Present Value Of One Dollar Due At The End Of n Years\*

<u>n</u>	<u>6%</u>	<u>7%</u>	<u>8%</u>	<u>9%</u>	<u>10%</u>
1	.94340	.93458	.92593	.91743	.90909
2	.89000	.87344	.85734	.84168	.82645
3	.83962	.81630	.79383	.77218	.75131
4	.79209	.76290	.73503	.70843	.68301
5	.74726	.71299	.68058	.64993	.62092
6	.70496	.66634	.63017	.59627	.56447
7	.66506	.62275	.58349	.54703	.51316
8	.62741	.58201	.54027	.50187	.46651
9	.59190	.54393	.50025	.46043	.42410
10	.55839	.50835	.46319	.42241	.38554

$$* PV = \frac{1}{(1+d)^n}$$

In the business world available funds are often not invested in a savings account but would, instead, be reinvested elsewhere in the firm. Then the appropriate present value discount rate would be either (1) the rate of return that your next best alternative investment could earn in your business operation, or (2) the minimal acceptable rate, considering other opportunities and risk. In financial circles, this rate is often referred to as the "cost of capital". A more appropriate term would be the "opportunity cost of capital at the margin", recognizing that a new investment project may change

the leverage ratio and hence the financial risk exposure of the firm and its owners.<sup>3</sup> (For more discussion of the rationale for choosing the proper discount rate, see Part III of this user's guide.)

In analyzing farm or other business capital investment alternatives there are a number of questions where net present value analysis can be used to provide an analytic answer.

1. Tax Depreciation: If an investment alternative includes a depreciable asset, the tax savings from depreciation is a benefit of ownership. Tax savings result in an equivalent cash flow benefit of ownership. From a present value standpoint, the value of depreciation taken in the early years of the asset's life is greater than that of later years (given constant marginal tax rates and opportunity cost rates over time). The economics of alternative depreciation options depends upon cash flow and tax consequences.
2. Resale (Actual Salvage) Value: What is the present value of the after-tax proceeds you expect to receive from selling the asset at the end of its useful life?
3. Loan Payment Schedule: If you borrow money to finance the project, what is the present value (cost) of the principal and interest payments you

---

<sup>3</sup> It follows from this argument that the use of the "weighted average cost of capital" suggested in many sources is incorrect even though future credit cost effects on future interest rates need to be recognized. Further projects usually require investment of management and labor time in their development and execution. It is difficult to account for the opportunity cost of a specific investment except as an additional increment added to the reservation price placed upon the project.



will have to make in the future? Whenever the opportunity cost rate exceeds the loan interest rate the present value of the future loan payments will be less than the value of the principal borrowed, giving the incurred debt a positive present value to you.<sup>4</sup>

4. Cash Flows: What is the present value of the incremental future net cash flows (added returns over added costs) generated from a proposed investment project?<sup>5</sup>
  
5. Entire Investment Project: What is the total present valued effects of one, two, three and four above?
  
6. Leasing Versus Purchasing An Asset: Or given a previous decision to acquire control of an asset, what is the net present value of future lease payments compared to ownership and debt payment effects if you lease the asset instead of purchasing it? These and similar questions relate directly to the analysis options discussed in Part II.

---

<sup>4</sup> There is some disagreement among analysts who use this approach as to whether these loan effects should be included when measuring investment returns or profitability. Some argue that the value of the loan should not be attributed to a single investment since it may affect the ability of the firm to obtain future credit. Therefore, other investments may have to be made from equity funds or other more costly sources. The argument is that any given investment should share in the costs of all financing. PVBUDGET allows the inclusion of loan effects but can also be used without considering associated financing. If liquidity or leverage is a concern, loan cash flows are important.

<sup>5</sup> A companion computer decision aid, TIMEVALU, is available to do basic compounding and discounting analysis plus calculate loan schedules, true interest rates and cash discount economics.

## PART II

### ANALYSIS OPTIONS IN PVBUDGET

This section describes each of the options available in PVBUDGET.

#### Option #1: OWNER

OWNER evaluates alternative ownership and tax depreciation strategies. It determines the actual and present valued tax savings from ownership of an asset or asset group.<sup>6</sup> The effects of a selected depreciation (MACRS) option, if allowed, and after tax resale value at the end of the asset's life are considered.<sup>7</sup>

#### Option #2: LOAN

LOAN evaluates "credit instruments or arrangements". This option analyzes the cash flow and present valued effects of a given set of loan conditions. Multiple runs will analyze different types of loans (amortized versus equal principal payments, etc.). Output includes annual principal and interest payments, the tax effects of the interest payment tax deduction, and the present valued cash outflow of the repayment schedule. If the actual interest rate is different from the quoted rate, the true annual (effective) interest rate is calculated.

---

<sup>6</sup> Many investment projects include the purchase of more than one asset. For the purposes of PVBUDGET, generally any group of assets that consists of the same type of property (personal versus real) with the same tax life and depreciation or cost recovery method may be treated as a single asset. In this guide, the term "asset" also refers to such asset groups.

<sup>7</sup> Computer Decision Aid MACRS89 compare alternative depreciation options to show which option offers the greatest present valued tax savings.

Option #3: CASHFLOW

CASHFLOW analyzes a set of periodic net cash flows (returns less costs) by discounting future flows to present value. Input accepts flows associated with time, value, size, or quantity per time period.

Option #4: INVEST

By linking the OWNER, LOAN and CASHFLOW options together, INVEST does an analysis of a proposed capital investment project. INVEST analyzes an investment from both a liquidity (actual cash flows by periods) and profitability (present valued cash flows) standpoint. The liquidity analysis answers such questions as: "Will the returns cover operating costs and debt payments in the early years of the project?" The profitability analysis answers such questions as: "Will this investment add to the long-range profits of my business?" and "Will it add more than my other investment alternatives?"

Often an investment project includes the purchase of more than one type of asset or asset group and/or requires more than one loan. This option handles these situations even if delayed acquisitions are part of the project. All investments need not be made at the start of the project. Up to ten asset groups under the OWNER and/or up to ten loans under the LOAN procedure may be included. The analysis summarizes all cash flow consequences of the entire project.

INVEST also includes two tables of sensitivity analysis to the major assumptions made. In addition, a traditional text book display of the cash flows is presented.

### Option #5: LEASE

The LEASE option is designed to help answer the question, "Should I purchase or lease a required capital asset?" It links the OWNER and LOAN options already discussed with a procedure that analyzes the comparative cash flow effects of purchasing versus leasing. The output is much like that of the INVEST option, showing both liquidity and profitability effects.

## PART III

### DATA INPUT PROCEDURES

This section shows the computer screens as they are displayed during data entry of the example data set PVEXAMPL.PVB. This is a data set for the INVEST option. It represents an \$11,000 project with a 10 economic year life. The asset is depreciable. Five thousand dollars (\$5,000) will be borrowed to do the project. A routine cash flow of \$1,500 is projected on a semi-annual basis.<sup>8</sup>

For a quite thorough treatment of the considerations touched on in this paper see: Stermole & Stermole, Economic Evaluation and Investment Decision Methods, Investment Evaluation Corporation, Golden, Colorado, ISBN 1-878 740008.

---

<sup>8</sup> The user may want to try the set of data stored as PVEXAMPL.PVB by typing in key number 2 on the main menu screen to retrieve this file. Change the marginal tax rate to 34% to represent the typical self-employed owner of a Minnesota business. In that case, the current capital gain rate should also be change to 15 + 6 or 21%. Once these two changes are made, pressing the F10 key will bypass all further data entry or F9 will allow a review of the data screen by screen without the need to re-key or validate other entries.

1991 TOTAL MARGINAL TAX RATES

FOR THE SELF EMPLOYED

Federal Taxable Income <sup>9</sup> Up To:	Federal Income Tax Rate	Net Self Employment Rate <sup>10</sup>	Minnesota State Income Tax Rate	Total Marginal Tax Rate For The Self Employed
-----Percent-----				
\$19,000	15%	13.1%	6%	34.1%
\$30,950	15%	13.1%	8%	36.1%
\$42,000 <sup>11</sup>	28%	12.3%	8%	48.3%
\$75,000	31.8%	2.5%	8%	41.5%
\$130,000 approx.	31%		8%	33.5%
Excess Over	31.9%		8%	39.9%

The data entry screens are usually displayed in the same order shown on the following pages. They are distinguished from the explanatory text by italics. Actual data is enclosed in squared brackets [ ]. When an input screen is presented, an entry of a "?" or an "F1" or the word Help will display further explanation of the specific question being asked before actual entry occurs. After all entry is accomplished, the user may return to any specific screen for correction or modification.

<sup>9</sup> Assumes joint filing and note that values are federal taxable income at the upper limits to which these rates apply.

<sup>10</sup> Self-employment tax rate is stated as equal to the total of the social security tax rates of 7.65% for both employer and employee; for a total of 15.3%. The employee's share a tax deductible business expense. The self-employment rate is actually 92.35% of 1990 earned income with one half income tax deductible.

<sup>11</sup> Equals \$55,550 earned income less \$14,050 deductions and exemptions, one income source and joint filing. Unearned income is not taxed for social security purposes. Maximum earned income that is taxed increased to \$58,988 in 1991. The Medicare component of 1.45% x 2 x .9235 will continue in 1991 until earned income reaches \$125,000 of self employed income.

## First or Introduction Screen

*PVBUDGET Net Present Valued  
Investment Project Analysis or  
Present Valued Partial Budgeting  
With IRR & Key Value Sensitivity*

*Designed/Developed by  
Earl I. Fuller, et. al.  
Contact and Programmer(s)  
A Farm Management Decision Aid*

*4-4-91*

*Version 2.2 MS*

## Second or Main Menu Screen

<i>Key-No.</i>	<i>PVBUDGET Options &amp; Action Description</i>
<i>0</i>	<i>Stop The Analysis - Return to Disk Menu</i>
<i>1</i>	<i>Enter a New Problem Data Set For Analysis</i>
<i>2</i>	<i>Get an Existing Data File For Analysis</i>
<i>3</i>	<i>See Some Further Instructions &amp; Notes</i>
<i>4</i>	<i>Print Out an Input Guide &amp; Questionnaire</i>
<i>5</i>	<i>Print Out a User's Instructional Guide</i>

*Key-in The Selected Option (0-5) or Alternatively  
Move Cursor to The Proper line With The Up & Down  
Arrows And Press <RETURN> to Make A Selection.*

**Main Menu Screen**  
**After Option 2 (Get A File) Has Been Selected:**

- Key-No.      *PVBUDGET Options & Action Description*
- [2] *Stop The Analysis - Return to Disk Menu*
  - 1    *Enter a New Problem Data Set For Analysis*
  - 2    *Get an Existing Data File For Analysis*
  - 3    *See Some Further Instructions & Notes*
  - 4    *Print Out an Input Guide & Questionnaire*
  - 5    *Print Out a User's Instructional Guide*

*Key-in The Selected Option (0-5) or Alternatively  
Move Cursor to The Proper line With The Up & Down  
The file is to be found on which Disk Drive ? (A or B, etc.  
(The colon is added automatically) or (Esc> - Skip It)  
The Current Data Drive is C:\      ( - <ENTER> ) ?[ ]*

**Third Or Data File Selection Following Main Option 2**

*Existing C:\TEMP data file code numbers:*

- 0 - *Return to the menu instead of selecting one.*
- 1 - *ARNOLD*                      2 - *ARNOLD1*                      3 - *HOG*
- 4 - *HOG1*                        5 - *HOG2*                        6 - *LEASE1*
- 7 - *LEASE12*                    8 - *LEASE2*                    9 - *LEASETST*
- 10 - *PVEXAMPL*                  11 - *TEST*                        12 - *TEST150*
- 13 - *TEST1507*                  14 - *TEST150C*                  15 - *TEST150E*
- 16 - *TESTPV*

*Type the corresponding number from (0 to 16  
or <Esc> to skip it) ? [10]*

*The data file to be found is [C:\PVEXAMPL.PVB]*

**Next Prompt After Successful Retrieval  
Of The Data File PVEXAMPL.PVB**

```

                Want to see PVBUDGET file data? (Y or N)? [y]

Screen Display of the Data File:

Ole Olson
Lake Woebegon
Test INVEST Project Analysis $11000 Purchase 10 year Cash Flow
PCTOPP 10      34          21          10          1  1
PRICE (1) 11000          1000          0          2
EXPOUT (1) 1000          7          0
LOANTPE (1) 1          5000          10          1  5
FIRSTC 0      100          0          2          20  3

* * PAUSE..Press any key to continue * *
    
```

**Screen Images Presented To The User  
Prompted Project Data Entry**

Duplicates of several of these screens will appear as required in multiple asset or loan situations.

```

First Input Screen, Project Assumptions & Characteristics
To accept the existing data just press <RETURN> or up and
down arrows work

Person or Project Name for this Analysis ..... [Ole Olson]

Address or Location for This Project Analysis .... [Lake Woebegon]
Type a 70 Space Description of this Project or Analysis ....
[Test INVEST Project Analysis $11000 Purchase 10 year Cash Flow]

The after tax opportunity cost or discount rate (risk adjusted (%)) [10]

The marginal income tax rate (fed. & state & self employment (%)) [34]

The tax rate for capital gain sales (no self employment ..... (%)) [21]

The economic or planning span life of the project in .... (years) [10]

If an OWNER analysis, number of asset tax groups (default - 0 ) [1]

For OWNER, no. of loans or debt instruments involved ( 0 to 10) [1]

F1 HELP          F3 SKIP Screen          F9 MENU          F10 QUIT
    
```





## LOAN or Debt Instrument Questions

To accept the existing data just press <RETURN> or use up & down arrows

Loan type; 1=int. on unpaid bal. 2=equal prin.pymts. 3=single pymt [1]

Amount borrowed; Principal of loan or debt instrument ..... (\$)[5000]

Quoted annual interest rate ..... (%) [10]

Repayment schedule for loan ( number of payments made per year) .. [1]

Total number of payments to repay the loan ..... [5]

Initial finder or loan fees and points paid in dollars ..... (\$) [0]

F1 HELP

F3 SKIP Screen

F9 MENU

F10 QUIT

## CASHFLOW Characteristics and Projection Data

To accept the existing data just press <RETURN> or use up & down arrows

Project operating capital tied up for the planning span .....(\$) [0]

Added ANNUAL overhead (ownership) expense due to project .....(\$) [100]

Annual inflation rate for overhead expense & other cash flows (%) [0]

Cash flow accounting periods per year (12 - monthly ; 1 - yearly) [2]

Total number of cash flow accounting periods for the project .... [20]

Projected / OPERATING UNIT cash returns less operating expense (\$)[3]

The questions at this point are intended to reduce required calculations before data entry. Several options exist. If Projected PER OPERATING UNIT (net) cash returns or per unit gross margins or even the number of operating units (amount of output) is a constant, enter the value or quantity here. Then enter the (varying?) number of unit or values on the next screen. Otherwise, just enter a "1" here and the period cash flow on the next screen.

F1 HELP

F3 SKIP Screen

F9 MENU

F10 QUIT

To accept the existing data just press <RETURN> or use up and down arrows. If remaining values are the same as the last entry, a -999 will signal that.

Periodic Operating Units / Cashflows / Lease Payments

Units or \$ in	1	[500]
Units or \$ in	2	[500]
Units or \$ in	3	[-999]

F1 HELP

F3 SKIP Screen

F9 MENU

F10 QUIT

In the example data \$1,500 semi-annually is represented by 3 (dollars per unit) times 500 units for each and every one of the 20 semi-annual cash flow periods. Note how discounting may be on a monthly basis if required and now more than 120 periods are called for.

At this point all data has been entered but still may be modified before analysis begins. The options numbers are dependent upon the project under consideration and its complexity.

Options to Modify or Correct the Current Data Set:

- 0 - Begin the PVBUDGET Analysis - No Corrections Needed.
- 1 - Key Assumptions and Project Characteristics
- 2 - Asset OWNERSHIP Data for Asset Group no. 1
- 3 - MACRS Cost Recovery
- 4 - LOAN or Debt Instrument Questions
- 5 - CASHFLOW Characteristics and Projection Data
- 6 - CASHFLOW Data by Periods

Select the Data Sub-Set to See or Modify - Type a 0 to a 6 ? [0]

Entry of a zero response begins the analysis. The system is instructed to save the current data set and begin the analysis. Note that by pressing <ESC> the re-saving of an existing data file is avoided.

The file is to be saved on which Disk Drive ? (A or B etc...  
(The colon is added automatically) or (Esc> - Skip It)  
The Current Data Drive is C:.\ ( - <ENTER> ) ? [C]

### Pre-Analysis Data Saving Options

C:\TEMP

Existing C:\TEMP data file code numbers:

0 - Return to the menu instead of selecting one.

1 - ARNOLD	2 - ARNOLD1	3 - HOG
4 - HOG1	5 - HOG2	6 - LEASE1
7 - LEASE12	8 - LEASE2	9 - LEASETST
10 - PVEAMPL	11 - TEST	12 - TEST150
13 - TEST1507	14 - TEST150C	15 - TEST150E
16 - TESTPV		

Type the corresponding number from (0 to 16 or <Esc> to skip it)  
Or type (up to 8 character) name of the data file to be  
saved ? [10]

At this juncture, control in the current version is shifted from the PVBUDGET module by chaining to the module PVSOLVE>. A single module version will replace this version as development time permits.

## PART IV

### INTERPRETING THE RESULTING ANALYSIS

The output for PVBUDGET varies with the option used. Detailed output consists of screen displayed and printed or disk file tables which correspond to the options OWNER, LOAN, CASHFLOW, INVEST and LEASE. With the INVEST and LEASE options you have the option of getting the appropriate combination of OWNER, LOAN, and CASHFLOW tables, linked together, followed by a summary table.

Otherwise, only the summary is presented. The detail choice may be useful for teaching. It also allows the user to check all steps in the calculations.

The summary only choice reduces the "noise" and gets to the core of the analysis. Option names and the output tables corresponding to them are listed below:

<u>Option Number</u>	<u>Option Names</u>	<u>Output Tables</u>
1	OWNER	OWNER
2	LOAN	LOAN
3	CASHFLOW	CASHFLOW
4	INVEST	OWNER, LOAN CASHFLOW, INVEST summary
5	LEASE	OWNER, LOAN LEASE summary

#### Example Result Header Displayed For All PVBUDGET Analyses

Shows Name, Address, Date, Data File Name and Type or Option Name:

*Computer Decision Aids  
Extension Farm Management  
Minn. Extension Service  
University of Minnesota*

*Agricultural Economics Program:  
Net Present Value Analysis  
Results for: Ole Olson  
12-20-1990 Lake Wobegon*

**\*\* An Investment Project Analysis \*\***

A short discussion of each analysis table follows:

OWNER (ownership analysis)

The output for OWNER shows the present value of three major effects of asset ownership for each asset (group) required by a project.

1. It shows the tax procedures used including whether or not first year expensing was used.
2. After calculating the complete depreciation schedule, it shows the present value of the tax savings available through expensing and depreciation.
3. It computes the present value of the proceeds from resale of the asset at the end of the planning span.

**Example NPV Effects Of Asset(s) Owner Depreciation Schedule**

<i>Present Valued Analysis Of Investment Tax Savings and Salvage Value</i>				
<i>This investment has a 7 yr. life and is 150% declining balance</i>				
<i>Purchase Price - \$11,000      Resale Value - \$1,000 in 10 years</i>				
<i>And \$1,000 is claimed as a tax expense item in project year 0</i>				
<i>Plan Year</i>	<i>Scheduled Depreciation</i>	<i>Tax Savings At 34.0%</i>	<i>Present Value At 10.0%</i>	<i>Year End Tax Basis</i>
<i>(Dollars)</i>				
1	1,071.	364.14	331.04	8,929
2	1,913.	650.42	537.54	7,016
3	1,503.	511.02	383.94	5,513
4	1,225.	416.50	284.48	4,288
5.	1,225.	416.50	258.61	3,063
6	1,225.	416.50	235.10	1,838
7	1,225.	416.50	213.73	613
8	613.	208.42	97.23	0
<b>TOTALS</b>	<b>\$10,000.</b>	<b>3,400.</b>	<b>2,342.</b>	
 <i>*** Present Valued Tax Shelter Effects of Asset Ownership ***</i>				
	<i>Tax Expensing \$1,000 in Project Year 1 ..</i>		<i>\$309</i>	
	<i>Cost Recovery (Depreciation Tax Shelter) is</i>		<i>\$2,342</i>	
	<i>After Tax Resale Value of \$790 is ...</i>		<i>\$305</i>	
 <i>Net Present Cost (Value) of Asset Ownership Effects is \$8,045</i>				

If expensing is used, the actual amount is shown in the table heading. This value is then present valued to the end of the first year, assuming that this amount is not actually a savings until the year when income taxes are paid.

The complete depreciation schedule for the asset is shown in the second column of the table. Under the modified declining balance methods of depreciation (MACRS), the program automatically switches to the straight line method when the allowable straight line amount per year is greater than the declining balance amount.

The next column headed "Taxable Savings" is calculated by multiplying the scheduled depreciation by the tax rate. This amount is then present valued to the end of the given year in the fourth column to yield the present value of tax savings from depreciation.

The last column shows the book value (adjusted basis) of the asset at the end of the year, calculated by subtracting the scheduled depreciation from the book value of the previous year.

Following the table, the proceeds gained from resale of the asset at the end of the planning span are evaluated. The resale is the actual salvage value minus the amount of these proceeds which is taxed as capital gains, if any. Next, the present value of these proceeds at the end of the planning period is calculated. Finally, the summation of all the ownership investment present values is shown.

LOAN (financing or liquidity effects analysis)

The LOAN output table shows the actual and discounted (to present value) cash flow effects of the net of any finder fees amount of the loan. The second column of the table is the total of actual principal payments due by years. The third column shows the interest due by years. The fourth column headed "ACTUAL NET CASH OUT-FLOW" is calculated by deducting the tax savings from interest payments from the interest column and then adding the principal payments to get the amount by years. Each payment is then discounted to obtain the present values of the cash outflows in the last column. Finally, the summed present values of the after-tax cash outflows are subtracted from the initial loan principal less fees, etc. to obtain the net present value (of the cash flow effects) of the loan.

**Example Of NPV Effects Of Loan Related Changes In Liquidity**

<i>Present Value of the Cash Flow or Leverage Effects of the Loan</i>				
<i>Initial Principal = \$5,000. Equal Payment Loan</i>				
<i>Interest Rate - 10.0% with payments made annually</i>				
<i>Loan Year</i>	<i>Principal Payment</i>	<i>Interest Payment</i>	<i>After Tax Cash Flow Actual Net Cash Out-Flow</i>	<i>Present Cost at 10.0%</i>
<i>(Dollars)</i>				
1	818.99	500.00	-1,148.99	-1,044.53
2	900.89	418.10	-1,176.83	-972.59
3	990.97	328.01	-1,207.46	-907.18
4	1,090.07	228.92	-1,241.16	-847.73
5	1,199.08	119.91	-1,278.22	-793.67
<b>TOTALS</b>	<b>\$5,000.00</b>	<b>1,595.00</b>	<b>-6,053.00</b>	<b>-4,566.00</b>
<i>Each Periodic Loan Payment =</i>		<i>\$1,318.99</i>		
<i>Before Tax Cash Out-Flow/Year =</i>		<i>\$1,318.99</i>		
<i>Initial Loan Principal (less fees if any) is \$5,000.00</i>				
<i>Total Present After Tax Cost of Loan Payments is <u>-\$4,565.71</u></i>				
<i>Net Present Value Effects of the Added Leverage is \$434.29</i>				



CASHFLOW Due To Time And Changes In Operations:

CASHFLOW evaluates the effects of the periodic costs and returns (including inflation adjustments) that are generated by an investment project. The second column of the table shows net cash flows by years over the planning span. Cash flows in year zero (today) include any initial operating capital which will be tied up over the entire planning period. It is assumed that such capital (cash) will be recoverable (by liquidation) at the end of the planning period. The third column headed Tax Share shows how much of the cash flow in Column 2 will be taxed away (when positive) or saved in reduced taxes (when negative). Column 4, "AFTER TAX CASH FLOW", is column 2 minus column 3. Finally, column 5 shows the present value of the after-tax cash flow. These values are then totaled and the total present value is displayed in the totals row.

**Example NPV Effects Of The Project's Projected Cashflows**

<i>Present Value of Periodic Costs and Returns by Years (Net Cash Flows)</i>				
<i>Years</i>	<i>Actual Net Cash Flows</i>	<i>Tax Share</i>	<i>After Tax Cash Flow</i>	<i>Present Value At 10.0%</i>
			(Dollars)	
1	2,400	-816	1,584	1,475
2	2,400	-816	1,584	1,341
3	2,400	-816	1,584	1,219
4	2,400	-816	1,584	1,108
5	2,400	-816	1,584	1,008
6	2,400	-816	1,584	916
7	2,400	-816	1,584	833
8	2,400	-816	1,584	757
9	2,400	-816	1,584	688
10	2,400	-816	1,584	626
<b>TOTALS</b>	<b>24,000</b>	<b>-8,160</b>	<b>15,840</b>	<b>9,971</b>
<b>Net Total Present Value of the Cash Flow Effects - \$9,971</b>				

Summary For An INVEST Analysis:

Before receiving output, the user of the INVEST option has a choice of detailed output or just a summary. When the detailed output is chosen, the summary follows the detailed output discussed above.

The INVEST summary lists and then sums the present values of all the cash flows (those generated in OWNER, LOAN and CASHFLOW analyses) to obtain the "Net Present Value of the Total Project. A zero net present value means that the project has a rate of return equal to the stated opportunity cost of capital rate. If the NVP is positive, the project shows a rate of return greater than the opportunity rate. If the NVP is negative, the project earns less than the stated opportunity cost rate.

**Example NPV Effects Summary For An Entire Investment Project**

Note that the first line of the analysis displays the project or analysis description entered as a response to query number 3 to any or all uses of PVBUDGET. It thereby provides a descriptive record of what was done.

<i>Test INVEST Project Analysis \$11,000 Purchase 10 Year Cash Flow</i>		
<i>Analysis Summary: The Opportunity Cost or Discount Rate used is 10.0%</i>		
<i>The Project Planning Span is 10 years</i>		
<i>The Marginal Tax Rate is 34.0%</i>		
<i>The True Loan Interest Rate is 10.0%</i>		
<i>Total Project Effects</i>	<i>Actual After Tax Cash Flow</i>	<i>Present Valued at 10.0%</i>
<i>Initial Investment (Cash Out-Flow)</i>	<i>-\$11,000</i>	<i>-\$11,000</i>
<i>Tax Savings Due to Cost Recovery and Expensing</i>	<i>3,740</i>	<i>2,651</i>
<i>Net Asset Value After Taxes at End of project</i>	<i>790</i>	<i>305</i>
<i>Principal Of Loan (Net Initial Cash In-Flow)</i>	<i>5,000</i>	<i>5,000</i>
<i>Cash Outflow of Principal and Interest Payments</i>	<i>-6,053</i>	<i>-4,566</i>
<i>Net Annual Operating Cash Flows</i>	<i>15,840</i>	<i><u>9,971</u></i>
<i>Net Present Value of the Total Project (Net Present Value Excluding Leverage Effects - \$1,926)</i>		<i>\$2,360</i>

The last line in this section shows a recalculated NPV in a traditional fashion excluding the leverage and liquidity effects of any LOAN specification when borrowing is part of the project.

Following the net present value summation, a table of the "After Tax Net Cash Flows by Years" is printed. The user can use the "Actual Cash Flows" to judge the liquidity effects of the project. It shows the summation of all cash flows involved in the project for each year of the planning span. Negative net cash flows indicate years in which the projected actual after-tax cash outflow exceeds the in-flows. Projects where this occurs are only feasible if other funds can be found to maintain the business. This table includes the amount of the investment over the amount borrowed (equity invested). It also notes any operating capital that is tied up during the planning span but recoverable at the end of the planning span.

The same table also shows the present valued net cash flows by years. This table shows the profitability effect of the investment. The sum of these values equals the "Net Present Value of the Total Project" shown in the beginning part of the summary--it verifies the earlier result.

Next, the equivalent annual return is printed. This is an annuity value which, if received each year of the planning span, would have a present value equal to the computed net present value of the project.

Next, a "Present Value Index" for the project is printed. This is the ratio of the present values of all inflows divided by the present values of all outflows.

Example Of The "Text Book" Display Of NPV For An INVEST Project

After Tax Net Cash Flows by Years (Liquidity Effects)  
 (Negative Values = Net Cash Outflows in that Year)  
 Changes in Liquidity Due to Project

Project Cash Flows				Present Valued Cash Flows			
Year	Amount	Year	Amount	Year	Amount	Year	Amount
0	-6,000	5	722	0	-6,000	5	472
1	1,479	6	2,001	1	1,071	6	1,151
2	1,058	7	2,001	2	906	7	1,046
3	888	8	1,792	3	696	8	854
4	759	9	1,584	4	545	9	688
		10	2,374			10	<u>930</u>
TOTAL							\$2,360

(Year 10 cash flow includes \$790 in asset sale value.)

(Year 0 Cash Flow Equals the Initial Net Outflow in the Investment Over Borrowing Plus any Other Initial Capital Requirements)

A Net Present Value of \$2,360 is equivalent to an annual net return over the 10 year planning span of \$384.

Present Value Index (Pv of Inflows/Pv of Outflows = 1.15

This value can be used to compare alternative investments with unequal planning spans, or with different cash flow characteristics. The higher the index, the more beneficial the investment.<sup>12</sup>

Two rate sensitivity tables are printed after the calculation of the present value index. The first table ranges the opportunity cost rates against percentage changes in the projected annual net cash flows. The results indicate how sensitive the analysis is to changes in these two important items of input data.

<sup>12</sup> Thomas, et al, op. cit., p. 1.

## Example Display Of The Sensitivity To Major Assumptions

Note that these tables center on the original values stated when it is feasible to do so. Otherwise, they center on logical points which permit the analysis to continue. The internal rate of return is an alternative centering value.

Analysis of Sensitivity to Major Assumptions: Test INVEST project analysis \$11,000 purchase 10 year cash flow						
Effect of Variation in Annual Cash Flows and Opportunity Cost Rates On Project Net Present Value						
Change In Annual Cash Flows Percent	Opportunity Cost or Cut Off Rate of Return					
	6.0%	8.0%	10.0%	12.0%	14.0%	
	Net Present Value					
	-----Dollars-----					
-20.0% -	1,927	1,086	366	-253	-788	
-10.0% -	3,121	2,175	1,363	644	59	
0.0% -	4,315	3,263	2,360	1,581	905	
10.0% -	5,510	4,352	3,357	2,498	1,752	
20.0% -	6,704	5,441	4,354	3,414	2,598	
(Based on a Marginal Tax Rate of 34%)						
Effect of Variation in the Marginal Tax and in the Minimum Risk Adjusted After Tax Opportunity Cost Rates						
Marginal Income Tax Rate	Opportunity Cost or Cut Off Rate of Return					Approximate Internal Rate of Return
	6.0%	8.0%	10.0%	12.0%	14.0%	With Projected Cash Flows
	-----Dollars of Net Present Value-----					
24.0% -	5,099	3,950	2,963	2,113	1,377	17.7%
29.0% -	4,707	3,607	2,662	1,847	2,141	17.2%
34.0% -	4,315	3,263	2,360	1,581	905	16.7%
39.0% -	3,923	2,920	2,058	1,314	669	16.1%
44.0% -	3,532	2,577	1,757	1,048	433	15.4%
The internal rate of return is estimated by interpolation between the smallest positive and first negative value in each row where possible.						

The second sensitivity table shows the effects of variation in the marginal tax rate and the opportunity cost rate. As long as the net present value is positive, the IRR rate of return is above the indicated opportunity cost rate. By interpolating these tables, particularly the second one, one can determine the opportunity cost rate which yields a zero net present value. This is the internal rate of return (IRR) for the project--that is, it is a rate of return earned by all capital and any other resources invested in the project, but which may not be explicitly acknowledged as such.

### **Example Data Set Used In Illustrating This Investment Analysis**

This display below becomes part of the printed results if the user requests it. The questions displayed are the same as what appears on the screen during data entry and may also be obtained prior to data entry and to assist in data accumulation by using the Print Questionnaire Option selected from the main menu. When that is done, the set of data entry help screens and messages are also printed. Instructions are provided concerning the parts of the questionnaire to complete for OWNER, LOAN, CASHFLOW, INVEST and LEASE type analyses.

- - - - -

#### *Project Assumptions and Characteristics*

*Person or project name for this analysis.....Ole Olson*  
*Address or location for this project analysis.....Lake Wobegon*  
*Description of this project or analysis.....Test INVEST project*  
*analysis \$11,000 purchase 10 year cash flow*

(Continued)

The after tax opportunity cost or discount rate (risk adjusted (%))	10
The marginal income tax rate (federal, state and self-employment (%))	34
The tax rate for capital gain sales (no self employment (%))	21
The economic or planning span life of the project in (years)	10
If an OWNER analysis, number of asset tax groups (default - 0)	1
For OWNER, no. of loans or debt instruments involved (0 to 10)	1

Asset OWNERSHIP Data

Purchase price for this asset tax class or investment group (\$)	11,000
Projected sale value at the end of the 10 year planning span (\$)	1,000
Planning span year of purchase (project starts in year zero)	0
Tax depreciation class; 0=none; 1=S.L.; 2=150%; 3=200% MACRS D.B.	2

Tax Cost Recovery Characteristics

Amount to expense out in year of purchase (up to \$10,000 total)	1,000
No. of years of tax (book) life according to MACRS rules	7
Tax quarter (personal prop. - 0 = midyear) or month (real prop.)	0

LOAN or Debt Instrument Questions

Loan type; 1=int. on unpaid balance; 2=equal principal payments; 3=single payment	1
Amount borrowed; principal of loan or debt instrument (\$)	5,000
Quoted annual interest rate (%)	10
Repayment schedule (payments made per year)	1
Total number of payments to repay the entire loan	5
Initial finder or loan fees and points paid in dollars (\$)	0

CASHFLOW Characteristics and Projection Data

Project operating capital tied up for the planning span (\$)	0
Added ANNUAL overhead (ownership) expense due to project (\$)	100
Annual inflation rate for overhead expense & other cash flows (%)	0
Cash flow accounting periods per year (12=monthly; 1=yearly)	2
Total number of cash flow accounting periods for the project	20
Projected gross margin (\$) OPERATING UNIT or number of units	2.5

Period and Projected Periodic Units / Cashflow / Lease Payments

1	500	2	500	3	500	4	500	5	500
6	500	7	500	8	500	9	500	10	500
11	500	12	500	13	500	14	500	15	500
16	500	17	500	18	500	19	500	20	500

Note how all periodic cash flows are printed out here as compared to just the first two in the illustration of data entry procedures.

## LEASE

As discussed earlier, the detailed output for LEASE (the purchase versus lease analysis) consists of the OWNER and LOAN tables previously discussed plus the LEASE table. Since the purchase versus lease decision deals with the difference between the two alternative ways of getting control of an asset, the LEASE output table deals only with cash flows that will vary between the two choices. These differences are of the two types: (1) the expense of lease payments if the asset is leased, and (2) the added cash operating expenses if the asset is purchased.

A detailed LEASE Analysis includes similar detail to an INVEST and follows the same basic sequence of a title, one OWNER and one LOAN table. The detailed LEASE table is shown below.

<u>Present Value Of LEASE Effects By Years (Cash Out-Flows)</u>				
Year	Payments Made On Lease	Tax Savings	After Tax Cash Flow	Present Cost at 10.0%
0	100	34	-66	-66
1	500	170	-330	-300
2	500	170	-330	-273
3	500	170	-330	-248
4	500	170	-330	-225
5	500	170	-330	-205
6	500	170	-330	-186
7	500	170	-330	-169
8	500	170	-330	-154
9	500	170	-330	-140
10	500	170	-330	127
<b>TOTALS</b>	<b>\$5,100</b>	<b>1,734</b>	<b>-3,366</b>	
<p><i>Total present cost of lease payments - \$2,094.</i>  <i>Total present cost of \$1320 in added expenses when assets are purchased instead of leased - \$811.</i></p>				



The actual yearly lease payments are included in the second column of the detailed lease table. Since these payments are tax deductible, the result is a tax savings--the third column of the table. The fourth column, "After Tax Cash Flow", is column 2 minus column 3. These cash flows are then present valued to the beginning of each lease period (to the end of the period if payments are not made at the beginning of the period) in column 5. Column 5 is then summed to get the "Total Present Cost of Lease Payments".

The "Total Present Cost of Added Expenses if Assets are Purchased Instead of Leased" is calculated by multiplying the projected annual amount (adjusted for inflation) by the tax rate and then discounting to present value for each year of the lease.

#### Summary For A LEASE Analysis

The LEASE summary is similar to the summary for INVEST discussed earlier. The user has the choice of receiving the detailed output discussed above or just the summary.

#### **Summary Results Of A LEASE Option Analysis**

This display is similar to the one for INVEST. It shows a lease analysis title and one specific to the option under consideration. The verbiage changes depending upon whether purchasing or leasing is the preferred alternative from a present valued cost standpoint.

Computer Decision Aids            Agricultural Economics Program:  
 Extension Farm Management      Net Present Value Analysis  
 Minn. Extension Service        Results for: Lars Nordstrom  
 University of Minnesota        12-20-1990    Lake Wobegon  
 (Data File Name is C:\LEASETST.PVB

\*\*\* An Asset Lease Versus Purchase Analysis \*\*\*

Test LEASE project analysis \$11,000 purchase 10 year cash flow

Analysis Summary: The opportunity cost or discount rate used is 10.0%  
 The project planning span is 10 years  
 The marginal tax rate is 34.0%  
 The true loan interest rate is 12.0%

	Actual After Tax Cash Flow	Present Valued at 10.0%
Initial investment (cash out-flow)	-\$11,000	-\$11,000
Tax savings due to cost recovery and expensing	3,740	2,651
Net asset value after taxes at end of project	790	305
Principal of loan (net initial cash in-flow)	5,000	5,000
Cash outflow of principal and interest payments	-6,277	-4,732
If purchased, savings in lease payments	3,366	2,094
Added expense if asset is purchased, not leased	-1,320	<u>-811</u>
Net present value of leasing over purchase		\$6,494

The lease summary begins by listing the component parts and summing the present values of all the flows involved in the project. This summing is done by using purchase as the "defender option" so that the cash flows that are net outflows are "costs" to the decision to purchase the asset. These are then listed as negatives. The total is then listed as the "Net Present Value of Purchase Over Leasing" if the sum is positive or "Net Present Value of Leasing Over Purchase" if the sum is negative (The absolute value is printed on this the last line.).

The second section, AFTER-TAX NET CASH FLOWS BY YEARS--as in INVEST-- summarizes the actual cash flows that occur in each year of the planning span.

This table is also calculated from the purchase standpoint. Years showing a positive net cash flow favors purchase over leasing from a cash flow perspective. A negative value means that the advantage goes to leasing in that year. Year zero cash outflows are the added equity invested above the amount borrowed to buy rather than lease.

The "Present Valued After-Tax Net Cash Flows" as shown carries a sign. It shows the present valued advantage to purchase by years. A negative value indicates a net advantage to leasing. This is the algebraic equivalent to the "NET PRESENT VALUE OF PURCHASE (Leasing) OVER LEASING (Purchases)" discussed above as dependent upon that sign.

#### **LEASE Project Data Assumptions And Characteristics**

The data used in the example LEASE analysis is shown below. This is a ten year annual payment lease. Note that, because it has one asset group and one loan, no data entry is required to state that. The LEASE section follows similar procedures to CASHFLOW but requires answering a different set of questions.

## LEASE Project Assumptions And Characteristics

- - - - -

Person or project name for this analysis Lars Nordstrom  
 Address or location for this project analysis Lake Wobegon  
 Description of this project or analysis  
     Test LEASE project analysis \$11,000 purchase 10 year cash flow

The after tax opportunity cost or discount rate (risk adjusted) (%) 10  
 The marginal income tax rate (federal, state & self employment) (%) 34  
 The tax rate for capital gain sales (no self employment) (%) 21  
 The economic or planning span life of the project in (years) 10

Asset OWNERSHIP Data

Purchase price for this asset tax class or investment group (\$) 11,000  
 Projected sale value at the end of the 10 year planning span (\$) 1,000  
 Planning span year of purchase (project starts in year zero) 0  
 Tax depreciation class; 0=none; 1=S.L.; 2=150%; 3=200% MACRS D.B. 2

Tax Cost Recovery Characteristics

Amount to expense out in year of purchase (up to \$10,000 total) 1,000  
 No. of years of tax (book) life according to MACRS rules 7  
 Tax quarter (personal prop. - 0=midyear) or month (real prop.) 0

LOAN or Debt Instrument Questions

Loan type; 1=int. on unpaid bal.; 2=equal prin. payments;  
     3=single payment 1

Amount borrowed; principal of loan or debt instrument (\$) 5,000  
 Quoted annual interest rate (%) 12  
 Repayment schedule (Payments made per year) 1  
 Total number of payments to repay the entire loan 5  
 Initial finder of loan fees and points paid in dollars (\$) 0

LEASEing Conditions Data

Annual savings in cash expense if asset is leased; not bought (\$) 200  
 Are lease payments made at beginning of accounting period? 1=yes 0  
 Initial cost to arrange the lease (\$) 100  
 No. of lease payments made / year - 12-monthly; 1=annually 1  
 Total no. of lease payments made in the planning span 10  
 Annual inflation rate for ownership related cash expenses (%) 0  
 Period & Projected Periodic Units / Cashflow / Lease Payments

1	500	2	500	3	500	4	500	5	500
6	500	7	500	8	500	9	500	10	500

- - - - -

A contingency note seems appropriate. If an annually renewable lease is involved, LEASE is technically inappropriate. It assumes financial commitments under the lease for the period expressed as the planning span. It still may be used, however, assuming a continuing rental of the property.

Under these circumstances, the user may want to consider the use of the computer decision aid FARBID instead. Under complex circumstances or after using PVBUDGET to reduce the complexity of many alternatives, the FINPACK system, specifically FINLRB and FINTRAN, offers a complete budgeting alternative which should be considered. FairRent offers calculations of the "dickering range" for annual land rents.

## **PART V**

### **SOME COMMENTS ABOUT SITUATIONS WHERE PVBUDGET CAN BE A USEFUL TOOL**

As indicated above, other computer decision aids such as MINNAIDS, TIMEVALU and MACRS89 do much of what OWNER, LOAN and CASHFLOW do as individual analyses. PVBUDGET becomes the tool of choice to compare the profitability of capital investment alternatives. This is particularly true when the alternatives have dissimilar economic lives and net cash flows by time period within the planning span. It is also the best choice for evaluating leasing versus asset purchase.

PVBUDGET is a versatile tool for evaluating many kinds of investment alternatives. It can be used to order the profitability and feasibility of various choices. It can be used for both business and personal investments. It can do public sector benefit-cost or non-profit situation analysis provided

the marginal tax rates are stated to be zero. It applies to all forms of legal organization.

So long as the objectives are clearly understood, whether the investments are to diversify, to spread risk, to make better use of fixed assets or to capture a marketing opportunity makes little difference. Nor does the size of the firm make a difference. So long as there are differing combinations of capital, labor, management, tax considerations, obsolescence characteristics, or operating cash flows through time, this is a sound way to proceed. Even if a complete forward budget will be required in order to evaluate alternative overall strategies, PVBUDGET can select between component investments before something like the FINPACK system is used to complete the analysis.

From a farm management viewpoint, the area of interest of this author, the following types of analyses are of interest:

1. Should I add to my grain storage and or handling facilities?
2. Which type of silage storage facilities should I build?
3. Given expected herd size through time, which milking parlor - with how much mechanization - makes the most sense?
4. Should I lease or buy more animals for the breeding herd?
5. Should I custom hire or invest in equipment to do my own grain harvest?
6. Given the volume and time needs to handle manure, should I invest in a liquid or in a (semi-)solid manure system?
7. Which size planter makes the most sense?

These are but examples of questions which, if clarified, suggest uses for this type of analysis. The challenge is in the clarification and acquiring appropriate data.

## Appendix A: Files Distributed As Part Of PVBUDGET

PVSOLVE.EXE - The solving module for all PVBUDGET options.  
PVBUDGET.EXE - The data preparation and controlling module.  
PV\*.SCN - The FIRST, LAST and description screens for PVBUDGET.  
\*.PVB - All PVBUDGET data files have the extension .PVB .  
PVHELPS.RDM - Input questionnaire help file.  
PVQUESTI.ONS - Input questionnaire file.  
CRITIQUE.FRM - Adds a critique and comment form to the questionnaire.  
PV\*.DOC - Available documentation files.  
PVREAD.ME - This file, describing the files & options in installing them.  
SKELSET.UP - Printer, color & default data location parameter file.  
MENUFILE.TXT - MENU list of available options, may be edited.

### The Files Listed Below Are General Purpose Utilities

BRUN10.EXE - Required Quick Basic module to run PVBUDGET or TIMEVALU.  
BT.COM - Displays files on screen; must be accessible to PVSOLVE.  
CBT.EXE - Used to see or edit data (.PUB) files.  
DR.COM - A file management utility (will list, delete or move files).  
Also runs an .EXE or .COM file if Ctrl-<ENTER> is pressed.  
GO.BAT - Starts system; calls MENU (optional, cuts out 2 keystrokes).  
MENU.EXE - Controls menu of options defined in MENUFILE.TXT.  
SDIR.COM - List or prints a sorted directory listing DR sorts it too).  
TED.COM - An editor useful in data file modification or in adding  
further explanatory notes to a resulting analysis file  
if the file output option is selected..  
TIMEVALU.EXE - General purpose future, present & loan analysis tools.

An operating floppy disk should be labeled PVBUDGETING

### Installation of PVBUDGET

This disk is self contained for use on a floppy drive system. It may be installed in a directory (\PV) on a hard drive as well. However, there are a number of the files which are basically utilities and may be copied into a utility directory (\UTIL). If they are, that directory should be PATHed in the AUTOEXEC.BAT file in the root directory. Memory requirements are less than 256k of RAM.

The utilities which may be handled this way follow the PVBUDGET and TIMEVALU files in the above list. Further detail on these and other useful utilities is available in FARM MANAGEMENT RELATED SOFTWARE. A copy may be obtained from the author as well as the various computer decision aid software (MINN\_AIDS) discussed there in.

### Starting the System

Typing GO accesses MENU and provides a list of available programs to run. Typing MENU will do the same thing. Typing PVBUDGET will start that program directly. TIMEVALU works the same way.

## Documentation for the Above Mentioned Utilities:

### BT.COM - A Better Type Screen Displayer:

BT.COM - A Better Type Screen Displayer - Replaces TYPE (and ST - Super Typer)  
BT presents 24 line paged screen file displays under user control.

To Use - Type Either: (Assumes BT.COM is in the path)  
BT filename.ext or BT filename.ext /W if it is a WORDSTAR file.  
The filename may contain drive and path specifications.

#### Controlling Key Stroke Commands:

Page Up - PGUP	One Line Up - UP Arrow	Top of File - HOME
Page Down - PGDN	One Line Down - DOWN Arrow	End of file - END

#### Horizontal Movement For Lines Over 80 Characters:

Scroll Right 8 Characters Right Arrow once for each 8 characters,  
Scroll back to the left 8 Characters - type the Left Arrow once

Escape back to DOS and the Screen as it was when you activated BT by Typing: ESC  
(or Ctrl Break ?)

Error Messages - (1) File Not Found,  
(2) Unsupported Graphics Mode if DOS is in a graphics mode.

#### Notes:

Version 2 displays the above instructions on line 25 in inverse video. Requires 33k , 2.0 + to run. Small left arrows represent EOF marks. BT is EGA aware and works with color adapters, but some snow will appear. Under WINDOWS or TOPVIEW (interrupt @ 23h) - Writes directly to Screen. Source: BROWSE.COM in PC Magazine 3/25/1986 & PC Mag DOS POWER TOOLS 2nd ed.

## Documentation for MENU - A Program Executing Program:

MENU.EXE offers a simple, uncomplicated presentation of selected program analysis options available to a user. It presents the user with selected sets of available options. It permits the person setting up the system to specify appropriate sets of options through drive and directory designation. These selected groupings are each specified in MENUFILE.TXT files by name and a short description of each program or option.

MENU works with a single directory and/or with a set of subdirectories each of which contains its own MENUFILE.TXT file. If subdirectories exist, the user must select between them when they are displayed. Then the set of options that one contains is displayed. The user may then make a choice. Subdirectory features are ignored if they were not specified as part of the system.

The user can also change default drives and thus the related subdirectories. The actual programs are SHELLED under MENU. At completion, the system will once again display the options available.



**Notes:**

BRUN10.EXE must also be available to the 13K version. Both versions allow drive changes. MENUFILE.TXT files must follow certain rules in preparation. Preparation may be done from the system command prompt as follows: Type COPY CON MENUFILE.TXT <cr>. Then (without a prompt) type "a description of the set of choices (a title) of less than 45 spaces", again followed by a carriage return <cr>.

Then for each option or choice type a "FILENAME" (followed by) "a (up to) 65 character description of that FILENAME; (program or option)". Up to 15 similar lines may represent other options (all to be in .EXE, .BAT or .COM form). If less than 10 are used the display will be double spaced and easier to read. Note how quotes are used in the file to include the name and description data (which includes spaces). The last line should be typed as: "END OF FILES", and "END OF FILES".

When COPY CON is being used to prepare a MENUFILE.TXT, finally type F6 to do a COPY it to a disk file and a <CR> will produce the system prompt.

A text editor (TED) can also be used to develop or modify a MENUFILE.TXT.

Display of the MENUFILE.TXT file for this distribution:

Executable Programs on this PVBUDGET disk:

```
"CBT.EXE"          "Displays and screen edits text files"
"DR.COM"           "See and or Delete PVBUDGET Data Files (.PVB files)."
```

"PVBUDGET"	"Present Valued Partial Budgeting with Sensitivity Analysis."
"TIMEVALU"	"General Purpose Set of Future and Present and Loan Tools."
"END OF FILES"	"END OF FILES"

Another example from Minnesota Computer Decision Aids (MINNAIDS):

```
"BUSINESS & FINANCE"
"MACRS87 "        "1989-?? Depreciation calculations with present values."
"FARMBID "        "Determines the Maximum Bid Price for Land or a Farm."
"DEBTCAP "        "Determines the Maximum Debt Carrying Capacity of a Farm."
"QUICKLOOK"       "A Quick and Dirty Farm Business Analysis Based On Limited Data."
"TIMEVALU"        "A Set of Present & Future Value Analyses for Loans & Cash flow."
"USERDOCS"        "Explains How to Make Hard Copy Documentation of MINNAIDS."
"END OF FILES"    "END OF FILES"
```

**Note concerning the 58K version compiled with BCOM10.LIB:**

For use with .COM files, and any compiled .EXE files, a second version exists. The SHELL command is involved. Consequently .BAT files can also be accessed. The user is referred to programs like HDM or AUTOMENU for such applications.

### Note on the utilization of MENU:

It has been widely observed that intellect or psychology limits exist in software use. Seven + or - 2 applications seems to be a practical limit for most people. Shells and menuing software systems are techniques to assist users to go beyond word processing, spread sheets, data base managers and communication applications. MENU offers a similar potential to combine applications into a software system by bundling applications into a "tree" structure. This structures the choices a user has to make by "bundling" them.

### **TED.COM - A Text Editor:**

Call the ASCII file editor TED.COM as follows:

```
[path\]TED [path\]name-of or to-be-given.ext the ASCII file <ENTER>
```

The 1st. 24 lines of the file, if it exists, will appear on the screen. The 25th line provides key documentation of how the function keys are used to control the editor. The directional arrows and page up or down, home (start of line), end (of line), backspace, insert and delete work as to be expected in most programs. The normal mode is insert not type over. <ESC> will let you change your mind after a function key has been typed.

Find or replace options do not exist. Line count is not displayed. If you type lines over 80 characters you cannot see what you wrote. To remedy back space to less than 80 spaces, <ENTER> and move the rest to a new line.

This is an easy to use editor particularly for simple tasks like building or editing autoexec.bat or documentation files. It will also serve as a note recorder or even a memo writer. It is quick to get into and easy to get out of. F1 (ABORT) does not save the file, while F7 (EXIT) allows you to rename it if needed and requires you to save it in order to get out.

### **SDIR.COM (Sorted DIRectory):**

SDIR replaces the DIR command. It is self-documenting. This is version 2.6 and is better in some ways than V-5.0. DR.COM does provide some useful features that SDIR does not, but the SDIR write to printer option is useful.

### **DR.COM - File Manager:**

DR.COM has name changing and file deletion features. It also displays text files on the screen and runs .EXE, .COM and .BAT files with a Ctrl-ENTER key stroke.

These are all in the public domain, so copy them as you see fit.

## Appendix B: PVBUDGET Data Questionnaire

\*Each question is followed by a short clarification of it. Note that certain sections are not used with certain applications while others must be filled out for each asset group or loan required. The actual questionnaire is printed by key number 4 from the main menu. It contains 4 columns of input blanks.

### Complete For All Type Of Applications

1 Person or Project Name for this Analysis ..... \_\_\_\_\_  
\* Used to label the problem or the person or firm who has the problem. Maximum of 20 characters.

2 Address or Location for This Project Analysis ..... \_\_\_\_\_  
\* Labels problem or address of person or firm. Only 1 line of 20 Characters is allowed.

3 Type a 70 Space Description of this Project or Analysis .....

---

\* Describe the key assumptions, the alternative and/or the situation under analysis.

4 The after tax opportunity cost or discount rate (risk adjusted) (%) \_\_\_\_\_  
\* The minimal acceptable rate given alternative investment profitability, and liquidity projections, along with total business risk exposure.

5 The marginal income tax rate (fed. & state & self employment) (%) \_\_\_\_\_  
\* The projected total marginal rate for individuals or corporations for the planning span. Self employment does not apply to corporations.

6 The tax rate for capital gain sales (no self employment) ..... (%) \_\_\_\_\_  
\* The current (1989) rate is the same as the summed federal and state tax rate in Minnesota. Other states may follow different rules.

7 The economic or planning span life of the project in .... (years) \_\_\_\_\_  
\* The planning horizon for the project - usually the years of economic life until assets are salvaged out or cash flows cease (maximum of 30 allowed).

Skip to Page B-2, question 10 unless this data set is for an INVEST analysis.

8 If an OWNER analysis, number of asset tax groups (default = 0) \_\_\_\_\_  
\* Up to 10 asset groups are characterized by tax depreciation rules, planning span year of purchase and replacement if worn out before end of project.

9 For OWNER, no. of loans or debt instruments involved (0 to 10) \_\_\_\_\_  
\* Up to 10 loans or other financing instruments characterized by interest rate, number and frequency of payments are acceptable.

Complete for INVEST, each asset group in OWNER and LEASE applications.

Asset group number \_\_\_\_\_

- 10 Purchase price for this asset tax class or investment group .. (\$) \_\_\_\_\_  
 \* Net cash outlay, for depreciable assets the amount to be expensed and depreciated. Include sales tax, delivery and set up charges.
- 11 Projected sale value at the end of the ## year planning span . (\$) \_\_\_\_\_  
 \* Projected salvage value in current dollars upon which capital gains would have to be paid at the end of the planning span.
- 12 Planning span year of purchase ( Project starts in year zero ) ... \_\_\_\_\_  
 \* The default is zero representing the start of the project.  
 If an asset group is to be purchased later, indicate the year in the planning span.
- 13 Tax depreciation class; 0=none; 1=S.L.; 2=150% ; 3=200% MACRS D.B. \_\_\_\_\_  
 \* If the asset isn't depreciable enter a zero. If taxes are currently due, D.B.is best but only 150% is allowed for farm P.P. & real property.

Skip to Page A-3 if the asset class in this column is not depreciable.

- 14 Amount to expense out in year of purchase (up to \$10000 total) ... \_\_\_\_\_  
 \* No more than \$10,000 of depreciable assets may be expensed in the year of purchase for all groups (1989). Related ordinary expense can also be.
- 15 No. of years of tax (book) life according to MACRS rules ..... \_\_\_\_\_  
 \* Read the explanation in the tax book life note (1988 rules).  
 If questions remain consult related I.R.S. rules & publications.

\* \* Tax Book Life Note \* \*

Swine has a 3 yr.; autos, trucks, sheep & cattle a 5 year; machinery 7 years, but because of MRA-88, 'single purpose agricultural structures', bins, silos & fences now have a 12 yr.class life except they're 8 years if used for poultry. Office fixtures have a 7 yr. life; Drainage facilities have a 15 year life. General purpose farm buildings a 20 year life (15 years for mobile homes.) There are longer alternative life options for each class which are the class life mid-points. The straight line option also requires a longer recovery.

MACRS Years	Specified Class Life Mid-points	MACRS Years	Specified Class Life Mid-points
3	3,4,5,10	5	5,6,7,12
7	7,10,12,15	8 (MRA-88)	8
10	12,13	12 (MRA-88)	12

- 16 Tax quarter (personal prop. - 0 = midyear) or month (real prop.) . \_\_\_\_\_  
 \* Normally personal property is coded '0' for the half year convention and real property by the month made ready for use.  
 See the tax schedule note.

\* \* Tax Schedule Start Note \* \*

Schedules ordinarily start at mid-year for personal property (coded as a '0'). If over 40% is put in service in the 4th quarter, separate groups by quarter (coded 1 to 4). Real property with 15+ year lives is coded by months.

Complete for LOAN, and for each loan in INVEST, if liquidity is a concern, and LEASE.

Loannumber \_\_\_\_\_

- 17 Loan type; 1=int. on unpaid bal. 2=equal prin.pymts. 3=single pymt \_\_\_\_\_  
\* The '1' response implies equal total payments, '2' implies declining total payments. Open accounts or irregular payments must be approximated.
- 18 Amount borrowed; Principal of loan or debt instrument ..... (\$) \_\_\_\_\_  
\* The face value of the debt instrument as quoted in the loan or mortgage or contract.
- 19 Quoted annual interest rate ..... (%) \_\_\_\_\_  
\* Use TIMEVALUE or other similar financial analysis if the true annual interest rate is not readily available.
- 20 Repayment schedule (payments made per year) ..... \_\_\_\_\_  
\* A '1' = an annual payment, a '12' = monthly payments, etc.
- 21 Total number of payments to repay the entire loan ..... \_\_\_\_\_  
\* A maximum of 120 (10 yrs. x 12) payments are allowed. If more are needed convert to annual payments.
- 22 Initial finder or loan fees and points paid in dollars ..... (\$) \_\_\_\_\_  
\* Broker fees or any other up front fees required to get the loan should be included.

**Complete for CASHFLOW and OWNER applications.**

- 23 Project operating capital tied up for the planning span ..... (\$) \_\_\_\_\_  
 \* Any added operating funds, perhaps tied up in inventory etc., but released at the end of the project should be included.
- 24 Added ANNUAL overhead (ownership) expense due to project ..... (\$) \_\_\_\_\_  
 \* Any added annually recurring ownership expense such as real estate taxes, base electricity or phone, or property insurance should be included.
- 25 Annual inflation rate for overhead expense & other cash flows (%) \_\_\_\_\_  
 \* The projected inflation rate by which net cash flows are expected to increase and allowing the re-payment of obligations with cheaper dollars (may = 0).
- 26 Cash flow accounting periods per year (12 = monthly ; 1 = yearly) \_\_\_\_\_  
 \* A '1' implies annual discounting of the cash flows while a '12' implies monthly projections and discounting (a '4' = quarterly).
- 27 Total number of cash flow accounting periods for the project ..... \_\_\_\_\_  
 \* A maximum of 120 (10 yrs. x 12) periods are allowed. If over 10 years convert to quarterly or annual payments.

\* \* Special Data Entry Note \* \*

The questions at this point are intended to reduce required calculations before data entry. Several options exist. If Projected PER OPERATING UNIT (net) cash returns or per unit gross margins or even the number of operating units (amount of output) is a constant, enter the value or quantity here. Then enter the (varying?) number of units or (\$) \*unit on the next screen. Otherwise enter a '1' below and each period's net cash flow on the next screen.

- 28 Projected gross margin (\$) OPERATING UNIT or number of units ... \_\_\_\_\_  
 \* Read the data entry note. The units entered here is multiplied by the value per unit by periods. Also note the "-999" shortcut to the next query.
- 29 Units or (\$) units - by periods \_\_\_\_\_  
 \* Read the data entry note. If the units were entered as a '1' to the last query ,then is equal to the periodic net cash flows due to operations (note "-999")

Add entries as necessary (-999 when the rest are equal) for period:

1. _____	2. _____	3. _____	4. _____
5. _____	6. _____	7. _____	8. _____
9. _____	10. _____	11. _____	12. _____

**Complete for LEASE applications only.**

- 30 Annual savings in cash expense if asset is leased; not bought (\$) \_\_\_\_\_  
 \* Savings in repairs, insurance, etc, and any other ownership and operating expense if covered by the leaser as part of the lease.
- 31 Are lease payments made at beginning of accounting period? 1 = Yes. \_\_\_\_\_  
 \* Effects present value calculation; payments are usually made at beginning or the accounting periods used while tax savings come at the end.
- 32 Initial cost to arrange the lease ..... (\$) \_\_\_\_\_  
 \* Finder fees, legal fees, credit checks, etc. should be included.
- 33 No. of lease payments made \* year - 12 = monthly & 1 = annually . \_\_\_\_\_  
 \* A maximum of 120 (10 yrs. x 12) payments are allowed. If more periods are needed translate data entry to quarters or years.
- 34 Total no. of lease payments made in the planning span ..... \_\_\_\_\_  
 \* Total lease payments equals payments per year times years (& fractions).
- 35 Annual inflation rate for ownership related cash expenses .... (%) \_\_\_\_\_  
 \* If ownership expenses are expected to increase over time, enter an inflation rate greater than zero.
- 36 Lease payment for by period) \_\_\_\_\_  
 \* Enter lease payments by payment period. If all equal enter the first one and then enter -999 to so indicate for the next entry.

Add entries as necessary (-999 when the rest are equal) for period:

- |          |           |           |           |
|----------|-----------|-----------|-----------|
| 1. _____ | 2. _____  | 3. _____  | 4. _____  |
| 5. _____ | 6. _____  | 7. _____  | 8. _____  |
| 9. _____ | 10. _____ | 11. _____ | 12. _____ |

**Critique and Suggested Enhancements or Modifications for:**

PVBUDGET MS-DOS Version, dated 1990

Send to: Earl I. Fuller  
Extension Farm Mgt., 249 COB, Univ. of Minn.  
Saint Paul Mn. 55108

Critique score categories . . . .	Poor	Fair	Ok	Good	Superior
Equivalent numerical scores . . .	1	2	3	4	5
	(circle)				
How logical is the screen sequences ? . . . . .	1	2	3	4	5
How clear are the screen prompts for input ? . . . . .	1	2	3	4	5
How adequate are the "helps" or input footnotes ? . . .	1	2	3	4	5
How clear and practical are the input requirements ? . .	1	2	3	4	5
How clear is the resulting analysis ? . . . . .	1	2	3	4	5
How useful would the analysis be to help someone ? . . .	1	2	3	4	5
How adequate is the explanation screen (Option 3) ? . . .	1	2	3	4	5
How useful is the example run (data & form) ? . . . . .	1	2	3	4	5
How meaningful is the approach to the problem ? . . . .	1	2	3	4	5
how important is the problem this program addresses ? . .	1	2	3	4	5
How easy is this program to use ? . . . . .	1	2	3	4	5