

HRS

HEALTH AND RETIREMENT STUDY
A Longitudinal Study of Health, Retirement, and Aging
Sponsored by the National Institute on Aging

Pension Estimation Program Users Guide

User Guide

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INTRODUCTION

Background

Since its inception, an important goal of the Health and Retirement Study (HRS) project has been to assist researchers who are interested in estimating pension wealth and predicting future income from pensions. To this end, the project has implemented a process for obtaining and analyzing pension information. Periodically, the HRS obtains pension Summary Plan Descriptions (SPDs) and similar documents that describe pension plan provisions from the employers of study respondents¹. These documents are then analyzed and coded, and the plan description data, along with specific data from the respondents, are analyzed using a software product known as the Pension Estimation Program. This program is designed to estimate the pension entitlements held by respondents of the HRS, based on the plan formulas and benefit provisions obtained from the linked sample of pension providers. The Pension Estimation Program uses systems of equations to represent each of the pension plans, including all benefit formulas and payment provisions. These equations, in turn, use as input work and income histories of the respondents. For a given set of assumptions, the program calculates the appropriate pension entitlements, and generates output data files for subsequent analysis.

Current Pension Estimation Software

Overview

Pension entitlements estimated by the new Pension Estimation Program can be expressed as cash flows, present values or both. The pension data and related respondent information are contained in Microsoft Access database files entitled *HRS92.mdb*², *HRS98.mdb*³, *HRS04.mdb*, and *HRS10.mdb*, corresponding to the coded pension plans collected for 1992, 1998 and 2004 HRS respondents. The Pension Estimation Program is free to registered users; the data required by the program are available to researchers who have negotiated a Restricted Data Agreement with the HRS.⁴ The user interface of the Pension Estimation Program is organized as a tabbed dialog. The application allows the researcher to modify many of the assumptions used in calculating pension benefits. The user can also specify the outputs required and the filenames to be used for output and log files.

¹ As a part of HRS surveys conducted in 2004, and 2006, in addition to asking employers to send pension documents, HRS respondents themselves were asked to provide SPDs by requesting them from their employers. In 2010, most private sector pension documents were obtained from attachments to Form 5500 filings with the Department of Labor, and most government sector documents were SPDs downloaded from employer websites.² Tables in *HRS92.mdb* were created from the 1992 HRS pension data (stored in ASCII form) used by the PASCAL version of the Pension Estimation Program.

² Tables in *HRS92.mdb* were created from the 1992 HRS pension data (stored in ASCII form) used by the PASCAL version of the Pension Estimation Program.

³ Tables in *HRS98.mdb*, *HRS04.mdb*, and *HRS10.mdb* were created by using *Pension Analyst*, an HRS software product designed for coding pension plan information.

⁴ See Appendix A for information on how to obtain a copy of the Pension Estimation Program and the restricted data it requires.

Notes

Testing in April 2016 revealed a bug in the program's ability to produce estimates for simulated respondents for study years prior to 2010. This is corrected in the current version.

New features

- *Government and Private Sector selection:* In the 2010 data, users can select government or private sector employees separately.
- *File location:* Users can specify separate locations for the pension calculator program, the databases, and the log and output files.
- *Mortality estimation:* Mortality rates are from 2010 version of the gender-specific cohort life table provided by the Social Security Administration. Estimates for people born later than 1989 can now be computed.

TYPES OF PLANS

Defined Benefit vs. Defined Contribution

A *defined benefit* plan represents a promise by the employer to provide a specific monetary benefit to the employee at retirement. The firm contributes money to a separate fund dedicated to paying future pension claims. The employer retains actuaries who look at factors such as the expected timing and amount of future benefits and expected returns on investments. From these factors, actuaries estimate the amount presently required in the fund to meet future obligations. In any given year, the defined benefit fund may or may not have sufficient funds to meet all future pension claims.

A *defined contribution* plan only defines the level of funding for the plan in each plan year. In a defined contribution plan, the company contributes the money to individual accounts held in the employee's own name. In this type of plan, there is no promise with respect to the ultimate value of the pension annuity. For the employer, a defined contribution plan is simpler and does not require actuarial calculations because it can never be under-funded. The employer simply makes contributions to the account, and the employee bears all investment risk.

Combination Plans

Occasionally, a plan is a hybrid of a defined benefit and a defined contribution plan. For instance, in the middle of a defined contribution plan, a paragraph may read: "In no event will the annuity from this defined contribution plan be less than \$10 per month for each year of service the participant accrues." So the guaranteed minimum is a defined benefit, and the value to the respondent is the maximum of the benefit provided by the defined benefit or the benefit provided by the defined contribution plan. This type of plan is coded as a combination plan. Combination plans per se are unusual, but in 2010 many plans are coded as combination plans. Many of these plans are frozen defined benefit plans that were followed by the establishment of a cash balance plan. Others are purely cash balance plans. Because cash balance plans are structured like DC plans in terms of their contributions, our team codes them as DC plans. But because cash balance plans are legally defined benefit plans, we incorporated this wealth into the DB stream of benefits in the 2010 data

Major Categories of Defined Benefit Plans

Generally defined benefit plans define a formula based on years of service and end-of-career pay. For example, a plan may provide a lifetime annuity equal to 1.5% of end-of-career pay times years of service. Less frequently, a benefit is defined as a specific dollar amount multiplied by years of service.

Recently, a newer kind of defined benefit plan has gained popularity among companies. These newer “cash balance” plans are in many ways very similar to a defined contribution plan. Money is allocated each year to an account for each employee. The reason this is not a defined contribution account is because the account is a *hypothetical* account. The firm may or may not have actually set aside the money documented through the bookkeeping. There is a guaranteed rate of interest on the balance, although the guaranteed rate can be variable. For instance, the plan may guarantee interest at a rate equal to the one-year Treasury note. Although these plans are legally defined benefit plans, their features and accumulation are so similar to defined contribution plans that they were coded as defined contribution plans in through 2004. In 2010, they are coded as the defined benefit plans they legally are.

Major Categories of Defined Contribution Plans

Money Purchase Plans

In this type of plan, the employer's annual contribution is determined by a specific formula, often a percentage of compensation. Less frequently a flat dollar amount is contributed regardless of pay. This formula may provide a variable rate that varies with service years, age, or pay. The plan may also provide a different contribution level for amounts of pay below the Social Security Wage Base and amounts of pay above the Social Security Wage Base.

Profit Sharing Plan

A profit sharing plan bases its contributions on some measure of company performance, such as gross profits, net profits, or sales. There may be a specific formula for deriving the aggregate contribution or the contribution may be discretionary, with no definite formula cited. The aggregate contribution is then allocated to participant accounts, usually on the basis of salary or wages. Forfeitures from profit sharing plans are either used to reduce the subsequent year employer contribution or are reallocated to the remaining employees.

401-k Plans

These plans are sometimes referred to as cash or deferred arrangements (CODAs). Under these plans, an employee can elect to have his compensation reduced. The amount of the reduction is placed in an account for the employee. The income forgone is not reportable for federal tax purposes until the employee receives a distribution from the plan. The tax advantage provides employees an incentive to save for retirement. Companies sometimes enhance that incentive by matching all or part of the money employees agree to save. These plans were originally designed

for use by for profit organizations. Non-profits and governmental organizations have similar plans, defined in sections 403-b plans and 457 of the Internal Revenue Code. Notice that these plans may be linked to profit sharing plans in for-profit organizations. For instance, plan provisions may state that the board of directors at the end of the year may match some percentage of employees' contributions, depending on the profitability of the firm.

Employee Stock Ownership Plans

Employee stock ownership plans (ESOPs or LESOPs) allow the employer to purchase or issue the firm's shares and distribute these shares to its employees. The firm generally contributes these shares to employees' accounts over a number of years.

Note on Discontinued Plan Provisions

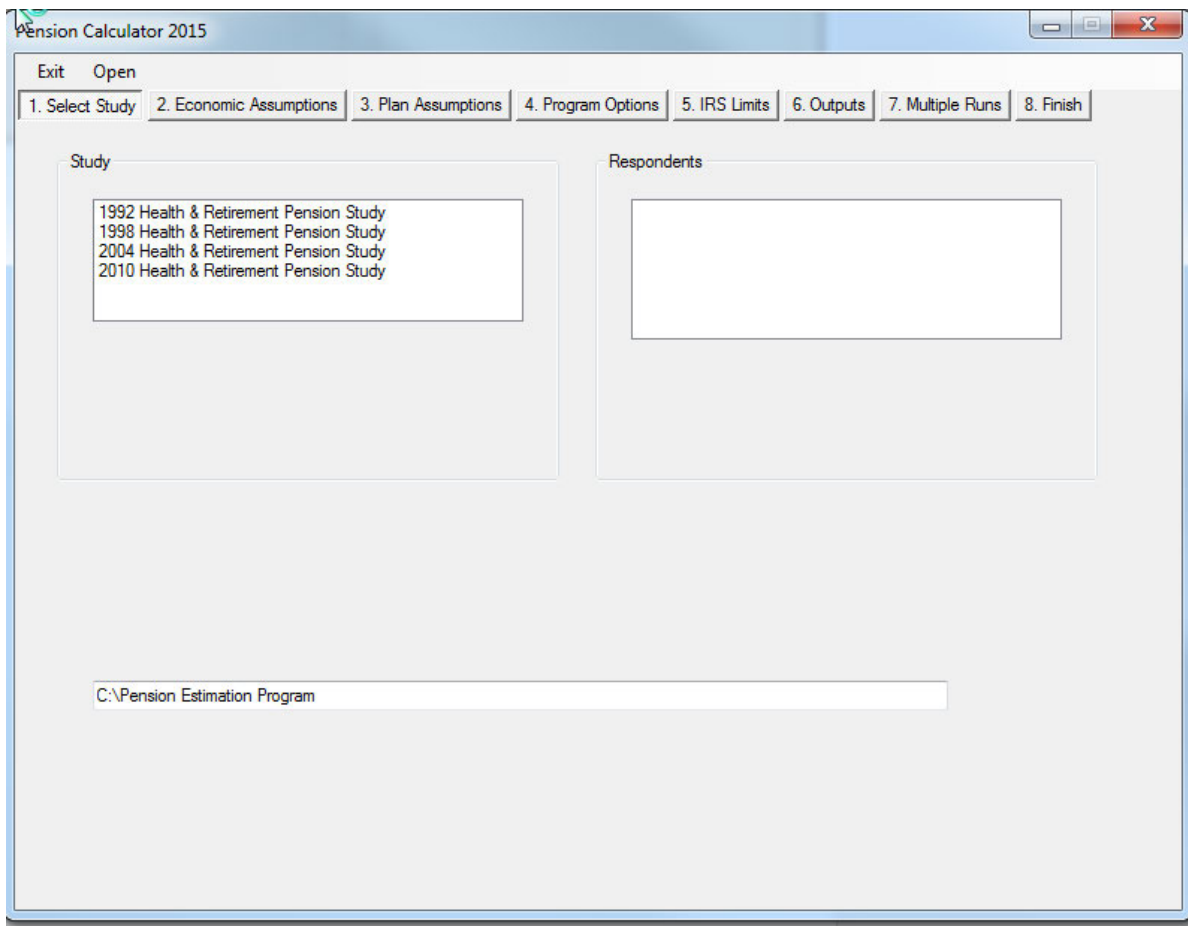
Sometimes, plan provisions that are no longer in force affect the benefits that plan participants will eventually receive. For example, an SPD may state that the current plan replaces an old plan that was ended several years ago. The SPD may guarantee that participants in the current plan will receive benefits that are not less than they would have received under the old plan. In principle, all plan provisions, current or discontinued, that potentially affect benefits paid are coded to the extent possible. In the 1998 HRS study, though, there were several cash balance plans whose beginning balance depended on previously effective defined benefit plans, and these plans were not provided. By the 2010 HRS study, the impact of the Pension Protection Act of 2006 could be seen, as conversions to cash balance plans typically froze the DB benefit and started the cash balance account from zero. In this study, if details of the plan provisions for the frozen DB plan were not known, a default set of provisions was applied based on the most common provisions observed.

TAB GUIDE

The application is organized as a tabbed dialog. Users who want to save selections for a given tab should press the “Save Current Values as Program Defaults” button. Subsequently, when the user starts the program, the saved values will appear as the defaults for that tab. The original default values can be restored for an individual tab by pressing the “Restore Original Program Default Values” button at the bottom left of the page.

Tab 1 – Study Specification

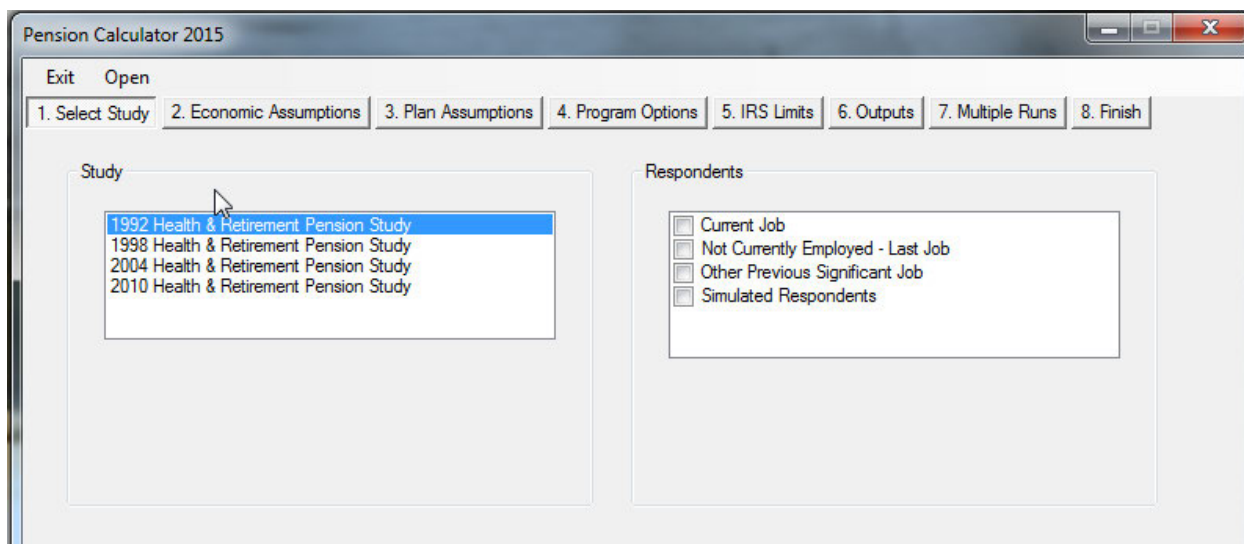
Study



The user interface contains certain user-specified or default assumptions that are stored with the data for each study. For that reason, no other tab can be selected until a study in the left-hand text box is specified. If only one study appears in the Study box, only data for that study are installed in the application directory of your machine. If no studies appear in the Study window, you have no data installed in the application directory of your machine. The application will not be useful until you have at least one study’s data in the application directory. Appendix A contains information on how to obtain restricted pension data from the Health and Retirement Study.

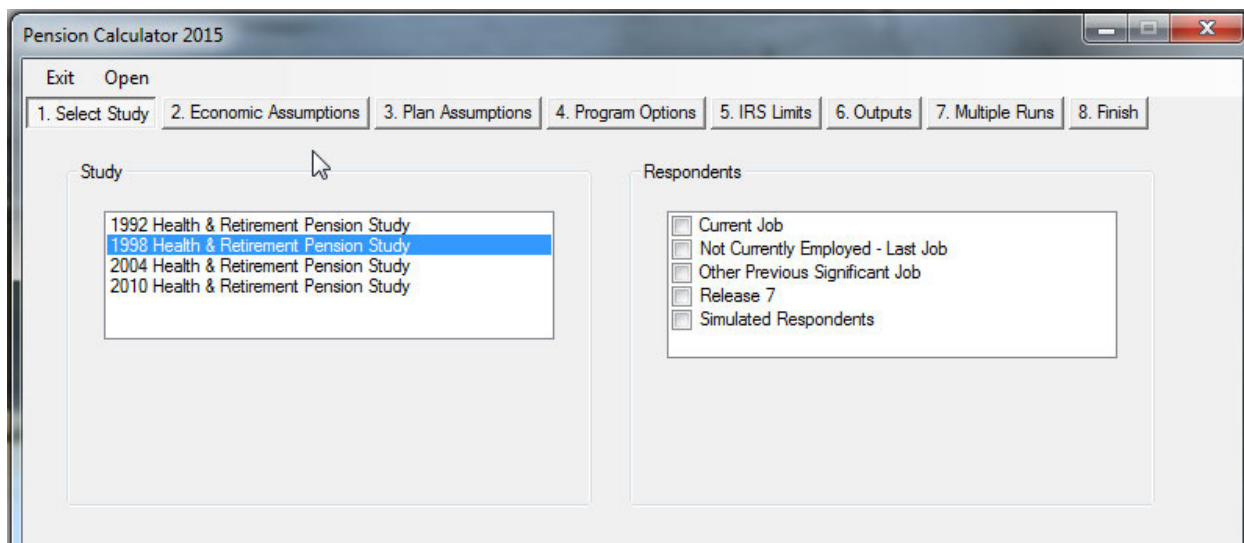
Respondents

These options allow the researcher to specify the pensions of interest. For example, if the 1992 data option is selected, “Current job” refers to the pension entitlement from the current job. “Not Currently Employed – Last Job” refers to the last job held by people not currently employed. “Other Previous Significant Job” refers to the most significant job held prior to the two types of jobs above.



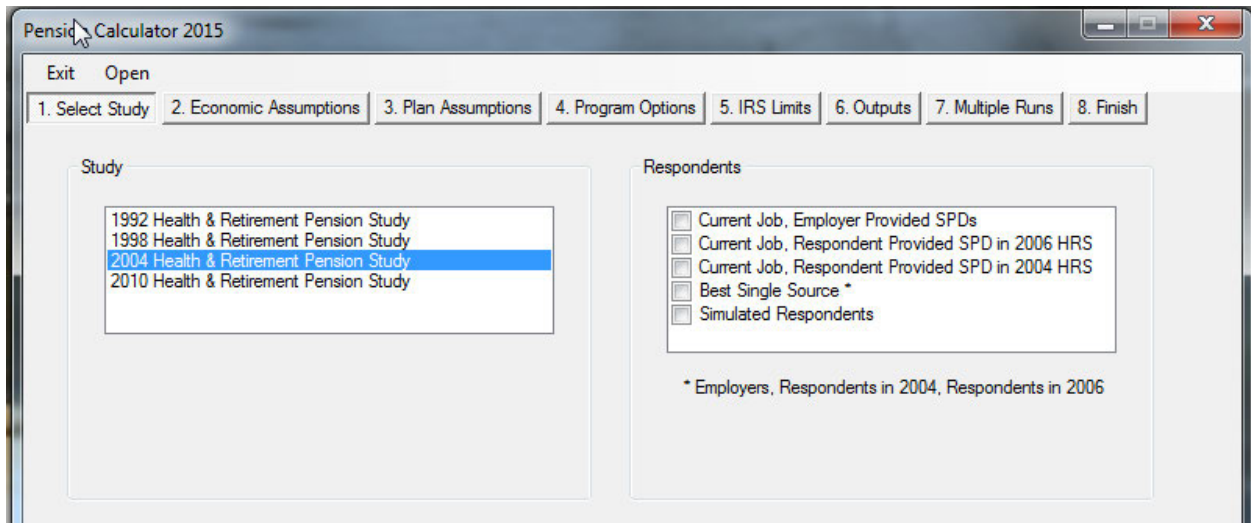
For the HRS 1998 data, an additional category of jobs called “Release 7” was added to the database. These are jobs held by respondents who:

- had a pension in 1992
- were still with that employer in 1994 or, if not interviewed in 1994, were still with that employer in 1996
- were NOT with that employer in 1998.

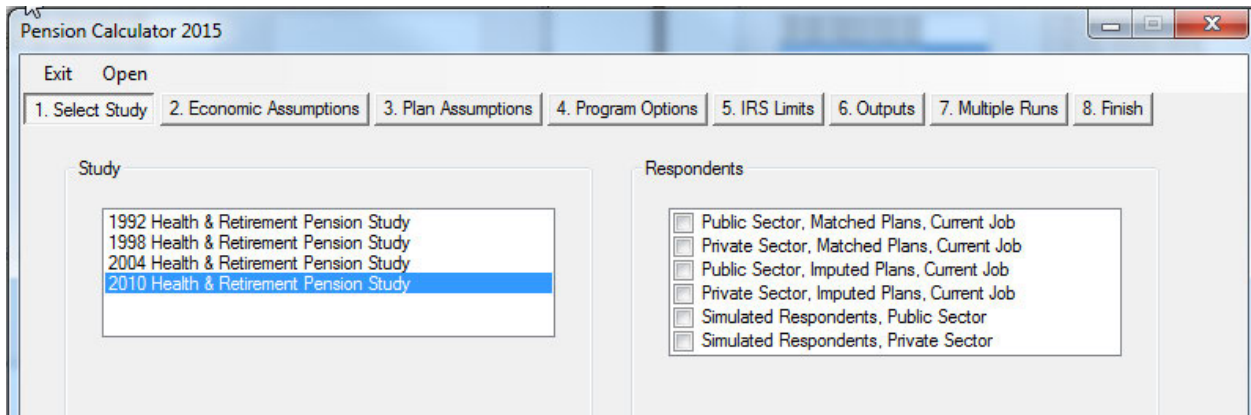


With respect to the 2004 data, pension estimates can be calculated for the current job only, however the researcher has the option of viewing information derived from employer- or respondent-provided SPDs separately. In cases where materials were obtained from multiple sources (for example, both respondent and his/her employer sent us SPDs), the “Best Single Source” option allows users to estimate pension benefits from a single source that, for a given respondent, is considered to be the best. As of now, the best source is defined as follows:

- employer-provided SPD, if present, otherwise:
- 2004 respondent-provided SPD, if present, otherwise:
- 2006 respondent-provided SPD



For the 2010 data, pension estimates can be calculated separately for government and private sector employees. In addition, because pension wealth imputation was done in 2010 by imputing a DB plan for respondents who reported a DB but for whom no DB was found, the user can decide whether to include these imputed person-plan links in the pension estimate calculations.



Simulated Respondents

For any of the studies, a researcher can also select the “Simulated respondents” checkbox, in which case estimations are performed with the data for a synthetic respondent and with the parameters, such as economic assumptions, that are specific to that study. For the 2010 data, a researcher can select a simulated respondent in the public sector, the private sector, or both. The Microsoft Access databases distributed with the application each contain a query called “*UpdateSimulatedRespondent*” which allows the user to change characteristics of the synthetic individual in the individual study. In *HRS10.mdb*, there are two such queries depending on whether the user wants to change the characteristics of either government or private sector respondents. This type of estimation cannot be combined with that for any other types of respondents

Tab 2 – Economic Assumptions

The screenshot shows the 'Pension Calculator 2015' application window. At the top, there is a menu bar with 'Exit' and 'Open' options. Below the menu bar is a navigation pane with eight tabs: '1. Select Study', '2. Economic Assumptions', '3. Plan Assumptions', '4. Program Options', '5. IRS Limits', '6. Outputs', '7. Multiple Runs', and '8. Finish'. The '2. Economic Assumptions' tab is currently selected. The main area is divided into two panels. The left panel, titled 'Economic Assumptions', contains three input fields: 'Inflation Rate' set to 2.8%, 'Real Interest Rate' set to 2.9%, and 'Real Salary Wage Growth' set to 1.2%. The right panel, titled 'Social Security Wage Base', contains a 'Real Social Security Wage Base Growth' input field set to 0%. Below this are two radio button options: 'Use Actual Wagebase History and Calculate Future Growth Based on Entered Assumptions (Real SS Wage Base Growth and Inflation Rate)' (which is selected) and 'Calculate Wagebase History and Future Growth Using the Growth Assumptions Above Assuming the Wagebase is:'. The second option has two input fields for 'in' and '0'. At the bottom of the window, there are two buttons: 'Save Current Settings as Program Defaults' and 'Restore Original Program Default Values'.

Economic Assumptions

Various interest rates are displayed; each has its ordinary economic meaning. The Inflation Rate is combined with the real rates to arrive at nominal rates.. We use the intermediate economics assumptions in SSA’s *2010 OASDI Trustee Report*.

Social Security Wage Base

These options allow the researcher to specify how Social Security Wage Base will be calculated. The real Social Security wage base growth is combined with inflation to arrive at nominal growth in Social Security wage base. The next two options determine how the program calculates the wage base for historical years. The first option uses the actual historical wage base limits set by the government. The second option takes a wage base for a specific year, and extrapolates the entire wage base series, future and historical, based on the growth rate specified.

Tab 3 – Plan Assumptions

Because some plan contributions are discretionary or unspecified, the researcher must specify a rate to use when these situations arise. There are several areas requiring attention.

The screenshot shows the 'Pension Calculator 2015' application window. The '3. Plan Assumptions' tab is selected. The interface is divided into several sections:

- Profit Sharing, Forfeitures & QNEs:** A table with three columns: Profit, Forfeitures, and Qualified. It lists three contributions (Contribution 1, 2, and 3) with values of 5%, 0.5%, and 0.5% respectively for each category.
- Voluntary Contribution Bounds:** A section for Deferrals with Minimum and Maximum values set to 0% and 25%.
- Vesting Schedule:** Three radio button options: 'Use the vesting schedule defined in the pension plans' (selected), 'Use cliff vesting of 0 years unless actual plan vesting schedule is more generous', and 'Use cliff vesting of 0 years regardless of the actual plan vesting schedule'.
- Discretionary Matching Contribution:** Three radio button options for Contribution 1, 2, and 3, all set to 50%.
- Mandatory Contributions:** A section for 'Amount of Mandatory Contributions When No Amount is Specified' set to 5%.

At the bottom, there are two buttons: 'Save Current Settings as Program Defaults' and 'Restore Original Program Default Values'.

Profit Sharing, Forfeitures and Qualified Non-Elective Contributions (QNEs)

These are grouped together because they are coded in the same section of the instrument. To understand this group, it's important to have a basic understanding of the structure of the instrument in this area. There are three possible contributions in this section and each contribution can be denoted as profit sharing, forfeiture or QNE. Profit sharing contributions are always coded before either forfeitures or QNEs. For instance, if there is a profit sharing contribution and a forfeiture, the profit sharing contribution will always be defined as contribution one. If there are two profit sharing contributions and a forfeiture, the profit sharing contributions will always be contributions one and two.

Researchers generally assume contributions for profit sharing, forfeitures and QNEs are constant across the three contributions. The application allows different assumptions for the second and third contributions to be consistent with the pre-2003 PASCAL system

Forfeitures occur when participants leave the firm, and the departing participant is not fully vested. The firm can reduce their contributions in future years by the amount of these forfeitures or they can allocate them back to the remaining participants. If forfeitures are allocated back to the remaining participants, a forfeiture is coded in the plan instrument.

Qualified Non-elective contributions arise in top-heavy plans. There are two ways to resolve a top-heavy situation. The plan can refund some contributions made by highly compensated employees, or the firm can make additional contributions to non-highly-compensated employees. If the plan states that the only way a top-heavy condition is resolved is through additional contributions to non-highly-compensated employees, a QNE is coded.

Vesting Schedule

Vesting Schedule options allow the researcher to test the effect of different vesting periods. The first option here is to simply use the vesting schedule described in the plan. You may find vesting schedules in plans that do not conform to ERISA requirements (e.g., 10 year cliff vesting). Keep in mind that not all plans are governed by ERISA requirements. Government-sponsored plans and plans sponsored by certain non-profit organizations are not governed by ERISA, and need not conform to ERISA's minimum vesting periods. The second option allows the user to specify a cliff-vesting period. The application will use the user-specified parameter unless the actual vesting schedule is more generous. The last option allows the user to specify a cliff-vesting period, and the application uses the new cliff-vesting period regardless of whether the actual vesting schedule is more generous. In addition, some users may want to be aware that when a plan with traditional DB and cash balance features specified different vesting periods for the two portions of the plan, the plan vesting was coded to be immediate so that different vesting criteria could be properly applied at the provision level.

Voluntary Contribution Bounds

Voluntary Contribution Bounds options allow the user to specify the valid range for voluntary contributions. A researcher may want to understand what account balances would be if people who contribute nothing instead contribute 5%. The researcher could set the minimum to 5% to test this.

Discretionary Matching Contributions

The Discretionary Matching Contribution is coded in the matching contribution section of the instrument, and there are three possible matching contributions corresponding to the three possible Voluntary contributions. Generally matching contributions are fixed, but sometimes matching contributions depend on profitability, or the extent to which the organization has met non-financial goals. The researcher should specify the assumed matching rate to use in such situations. This assumption is expressed as a percentage of the voluntary contribution. So if the voluntary contribution is 6% of pay, and the assumed discretionary matching contribution is 50%, the discretionary matching contribution will be 50% of 6%, or 3%.

Mandatory Contributions

Occasionally, Mandatory Contributions are mentioned in the plan, but the plan fails to specify a contribution rate. The researcher can state his/her assumption here for the percentage of pay contributed when a mandatory contribution rate is missing.

Tab 4 – Program Options

Pension Calculator 2015

Exit Open

1. Select Study | 2. Economic Assumptions | 3. Plan Assumptions | 4. Program Options | 5. IRS Limits | 6. Outputs | 7. Multiple Runs | 8. Finish

Maximum Retirement Age

Enforce Plans' Maximum Retirement Age

Cost of Living Adjustments

Include COLA for plans not specifying a COLA Percent of CPI

Adjust Dollar Amounts in Formulas for Inflation

Present Values

Calculate Present Values as of the Termination Date

Calculate Present Values as of Ignore Benefits Paid Before Present Value Date

Dates/Ages for Output

Perform Calculations Only for the Quit Date Specified in the Input File

Perform Calculations for Ages: to

and Dates: to

Save Current Settings as Program Defaults Restore Original Program Default Values

Maximum Retirement Age

Plans infrequently specify a Maximum Retirement Age. This generally occurs in plans covering specific occupations such as active-duty police or airline pilots. If the researcher does not want the maximum retirement age provisions enforced, this box should not be checked.

Cost of Living Adjustments

Some defined benefit and combination plans provide an automatic Cost of Living Adjustment (COLA) to the initial annuity entitlement. So retirees' annuities are adjusted annually, much the way Social Security benefits are adjusted, although sometimes at only a fraction of the inflation rate. Such provisions are captured in the plan coding and appropriate adjustments are made to the annuities and present values. Some plans mention that they will review inflation from time to time, and make adjustments if and when they are deemed necessary. Since these changes are not automatic, they are not captured in the coding of the plan. Many plans make no mention of COLAs at all. If the researcher wants annuities to be adjusted for inflation in all circumstances,

he can check the “Include COLA for plans not specifying a COLA” checkbox, and include the percentage of inflation that should be used to escalate benefits.

Some defined benefit and combination plans defined benefits as a specific dollar amount times years of service. Provisions in such a plan might read, “If you retired between January 1990 and December 1992, your monthly benefit would be your years of service times \$120. If you retired between January 1993 and December 1996, your benefit would be your years of service times \$130. If you retired after December 1996, your benefit would be your years of service times \$140. If the “Adjust Dollar Amounts in Formulas for Inflation” checkbox is checked, the \$120 and \$130 amounts above would be unaffected, but the \$140 amount would be adjusted for after the survey date. “Inflation” is a misnomer here, and this flag is only labeled as such to be consistent with the old PASCAL application. The amounts are actually adjusted by the nominal growth in wages. This is true of the old PASCAL application as well.

Present Values

These options allow the researcher to specify a present value date. The first option calculates present values as of the date of termination. The second option discounts to a specific date, regardless of the date of termination. If this second option is selected, an issue arises with respect to how payments made before the present value date should be handled. For instance, if a benefit started in 1995 and the present value date is 2000, should the present value reflect the future value of the payments made from 1995 to 1999, or not? If the researcher checks the “Ignore Benefits Paid Before Present Value Date” checkbox, only payments after the present value date will be included in the present value. If unchecked, the assumption is that the amounts paid before the present value date were saved and invested.

Dates/Ages for Output

These options allow the researcher to specify multiple possible termination dates for respondents. Because specifying additional ages significantly impacts application performance, minimizing the age range is desirable. In calculating Social Security benefits, we use the Social Security Administration’s estimation program *AnyPIA*. This application is capable of calculating benefits only through 2075, so Pension Calculator allows the user to specify a prior termination date.

Tab 5 – IRS Limits

This tab allows the researcher to limit benefits to certain IRS-specified limits. Not all IRS limits are included, and IRS limits are generally applicable only to individuals with high incomes. By selecting the “Impose no limits ...” selections on this tab, the researcher is not assuming limits do not exist. Rather, he is assuming that companies sponsor non-qualified plans for these high-income individuals that are substantially similar to the qualified plans.

PensCalc 2015

Exit Open

1. Select Study 2. Economic Assumptions 3. Plan Assumptions 4. Program Options 5. IRS Limits 6. Outputs 7. Multiple Runs 8. Finish

Defined Benefit Limits

Limit Benefit Amounts and Pay That Can be Used In the Calculation of Benefits

Maximum Pay Used to Calculate Benefits \$195,000 in 2010 Index to Inflation

Maximum Benefit Limited To Lesser of 100% of Pay or \$195,000 in 2010 Index to Inflation

Impose No Limits On Defined Benefit Plans

Defined Contribution Limits

Total Pay Used as Basis of Non-elective Contributions: \$245,000 in 2010 Index to Inflation

and total pre-tax voluntary contributions cannot exceed: \$16,500 in 2010 Index to Inflation

Impose No Limits on Defined Contribution Plans

Save Current Settings as Program Defaults Restore Original Program Default Values

Defined Benefit Limits

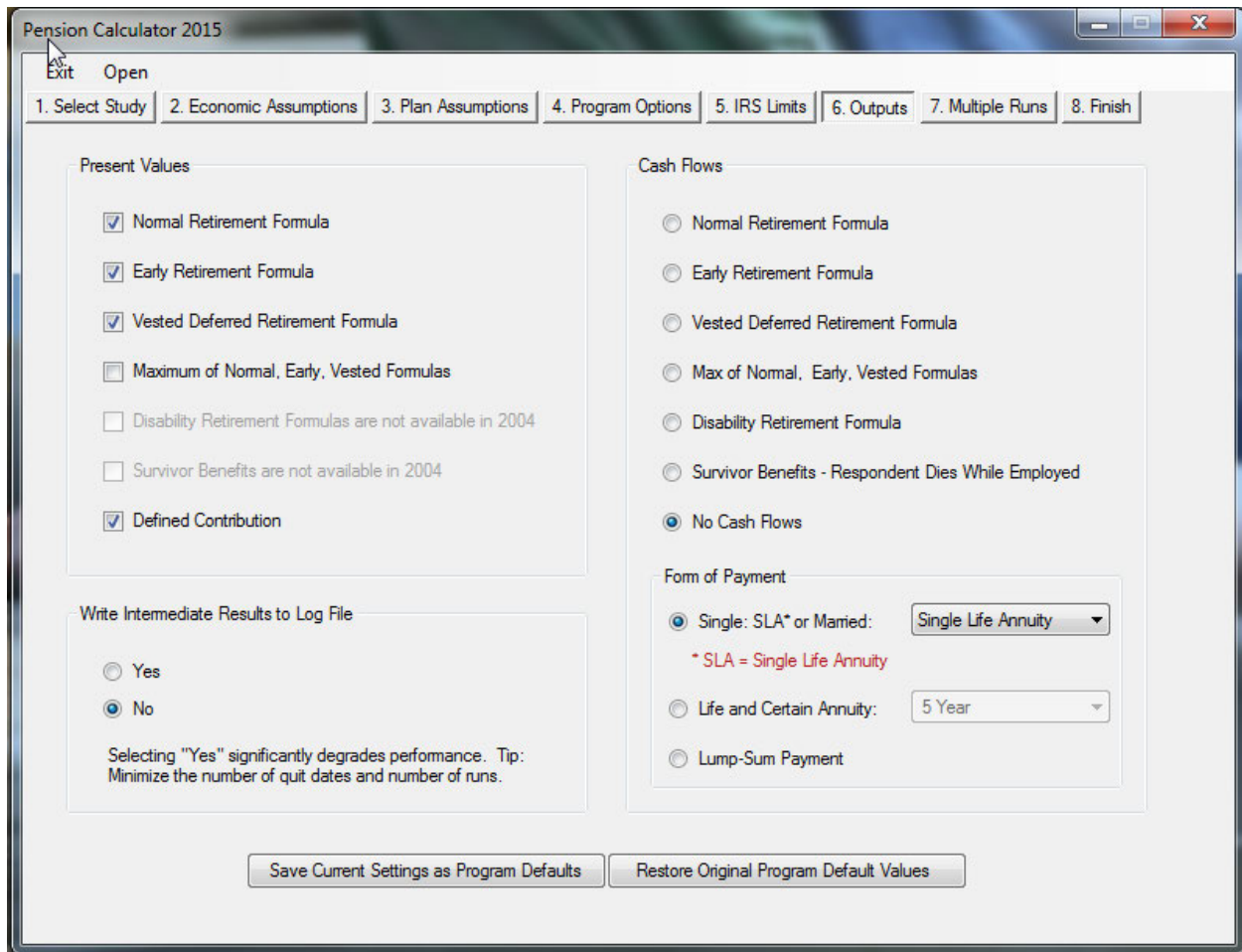
These options allow the researcher to limit the maximum pay used in the calculation of benefits as well as the maximum benefit paid. The researcher can specify the amount of the maximum and the year in which the limit is effective. If the “Index to Inflation” checkbox is checked, the amount is indexed to inflation for years before and after the amount year.

Defined Contribution Limits

These options allow the researcher to limit the pay used as a basis of contributions and the amount of pre-tax voluntary contributions. If the Index to Inflation checkbox is checked, the amount is indexed to inflation for years before and after the amount year.

Tab 6 – Outputs

The Outputs tab allows the researcher to produce customized output. Simply check the outputs required, and those outputs will be written to the output file.



Present Values

The options listed under this heading allow the user to specify multiple present values for output; however, only one cash flow vector can be selected in the Cash Flows window.

Cash Flows

The cash flow vector is a vector of payments starting at the date of separation and ending at age 119. A user who is only interested in Defined Contribution plans and corresponding cash flows needs to select “Defined Contribution” in a Present Values window and check any type of cash flow in a Cash Flow window. It is recommended that users who are not interested in cash flows select “No Cash Flows” options since having any other cash flows option checked slows the application .

Form of Payment

The options listed under this heading determine the payment form of the cash flow vector. The first option provides a single life annuity for unmarried respondents and several joint and survivor options for married respondents. A joint and survivor option provides a benefit to the spouse after a respondent dies. So, if a 50% joint and survivor option is selected, the payment to a spouse after the death of the respondent would be 50% of the amount of the annuity paid while both respondent and spouse were alive.

The second option provides life and certain options. These payment methods guarantee a certain number of payments, but last for life if the retiree lives beyond the guarantee period. For example, a 10 year certain and life annuity provides monthly payments to the retiree for 10 years. Should the retiree die before the end of 10 years, the remaining payments are paid to the retiree's beneficiary. Should the retiree live beyond 10 years, the amount of the annuity remains unchanged and continues to be paid to the retiree for the remainder of his life.

The third option assumes that a single payment was made at the date an annuity would begin. A corresponding cash flow vector would result in all zeroes except a single lump sum payment at the date of the first annuity payments. The lump sum represents a present value calculated as of the date an annuity would begin.

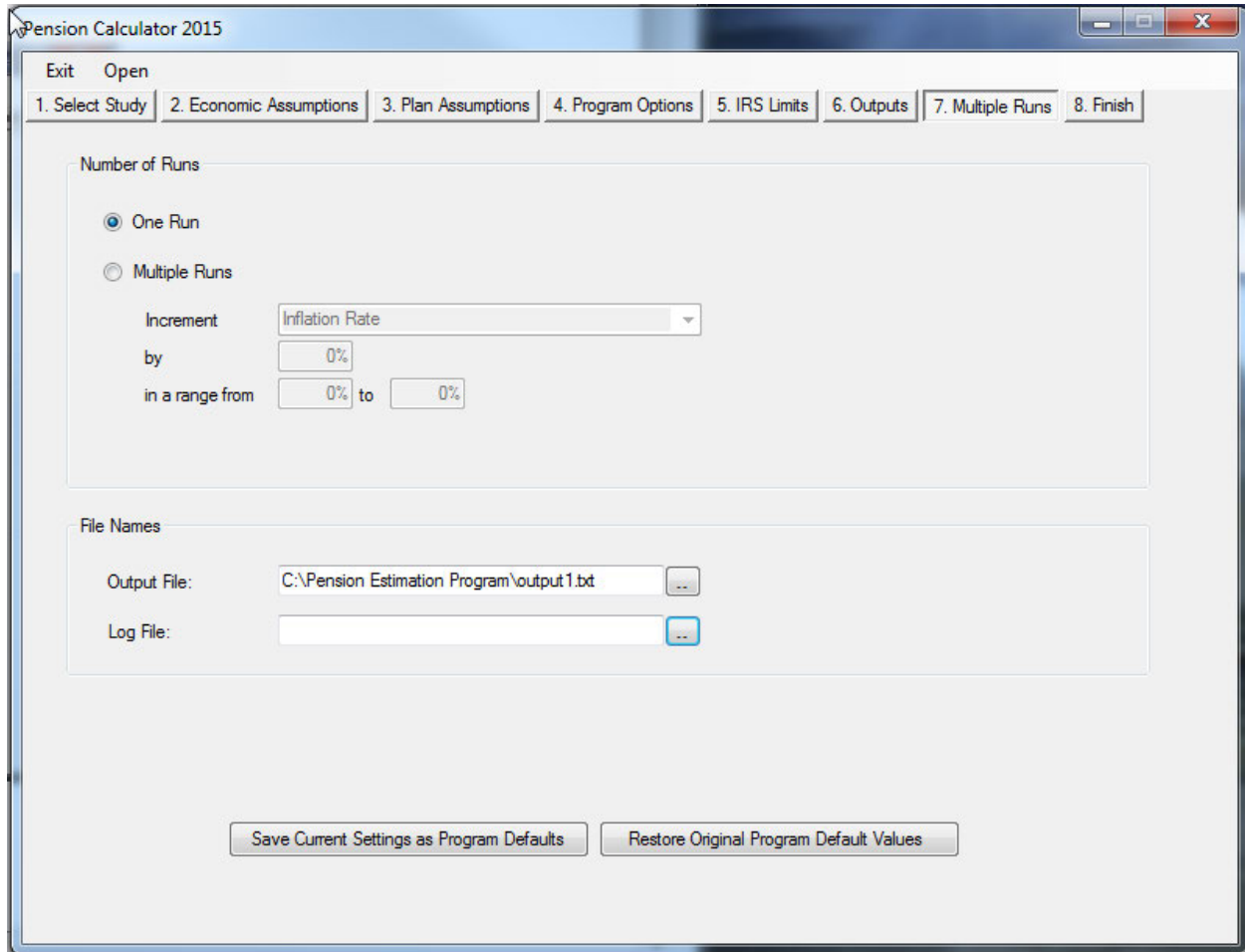
Note that the options in this window do not affect the present values, only the cash flows.

Write Intermediate Results to Log File

Selecting this option allows the user to see the details of how the results in the output file were derived. Since this option substantially impairs application performance, use this option only when it is absolutely necessary.

Tab 7 – Multiple Runs

The Multiple Runs tab enables users to queue several runs.



Number of Runs

Selecting the Multiple Runs option allows the user to specify a range for several rates. For example, if Multiple Runs were set to increment the inflation rate by .5% in a range from 2% to 4%, five runs would result for inflation rates of 2%, 2.5%, 3%, 3.5% and 4%.

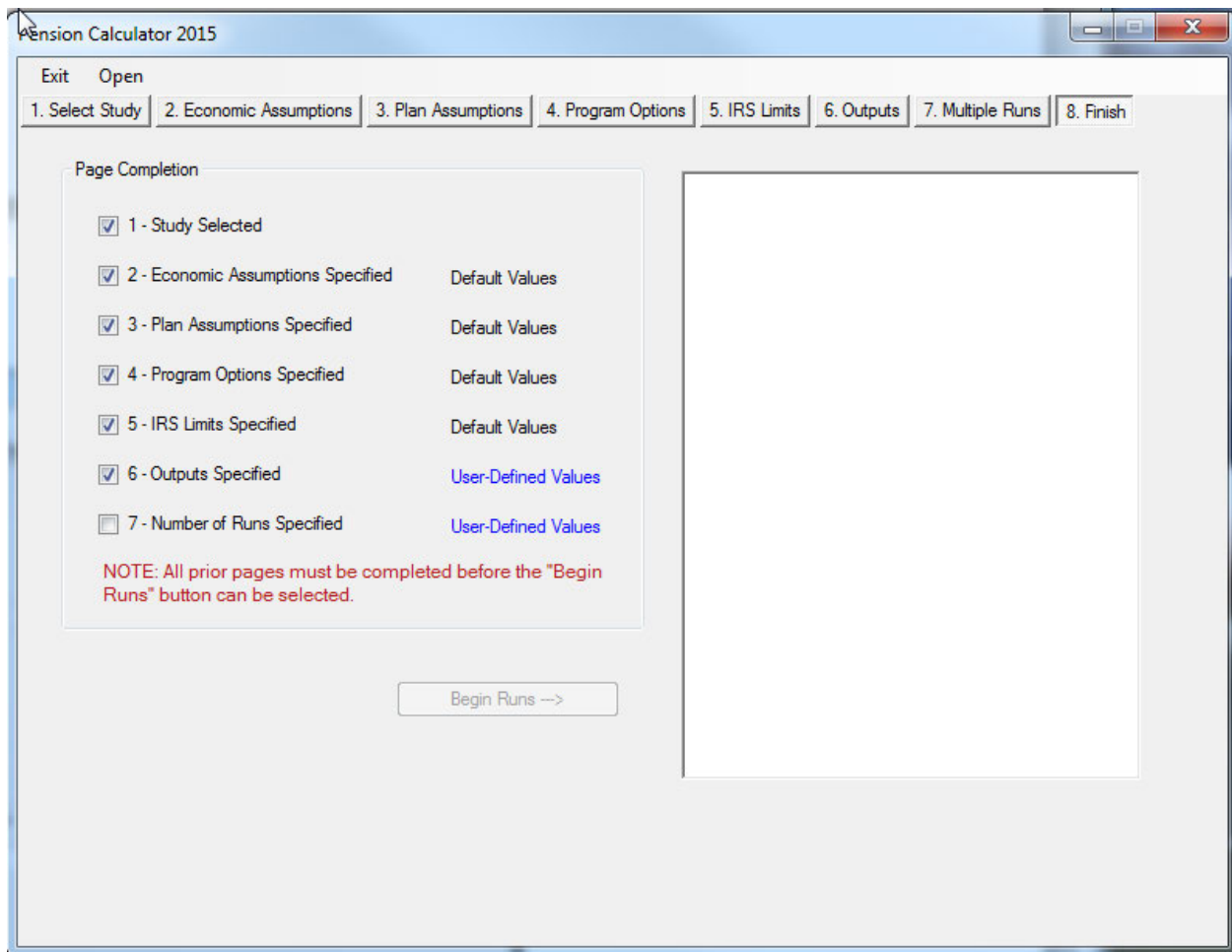
File Names

This feature allows the user to specify the name and location of the output and log files. File names have no default values so the user must specify these before the application can be run. The path provided must be valid, although the files need not exist – if a user specifies a nonexistent file name in a valid path, the file is created automatically. If the files do exist, they will be overwritten. If “Multiple Runs” is selected in the Number of Runs box, a wildcard format is adopted for the file names. For example, if the Multiple Runs option were selected in

the sample form above, the file names would automatically be modified to “C:\data\Out_??”txt”. Thus for the inflation rate example in the paragraph above, the file names used would be:

C:\Data\Out_1.txt	C:\Data\Log_1.txt	Inflation Rate = 2%
C:\Data\Out_2.txt	C:\Data\Log_2.txt	Inflation Rate = 2.5%
C:\Data\Out_3.txt	C:\Data\Log_3.txt	Inflation Rate = 3%
C:\Data\Out_4.txt	C:\Data\Log_4.txt	Inflation Rate = 3.5%
C;\Data\Out_5.txt	C:\Data\Log_5.txt	Inflation Rate = 4%

Tab 8 – Finish



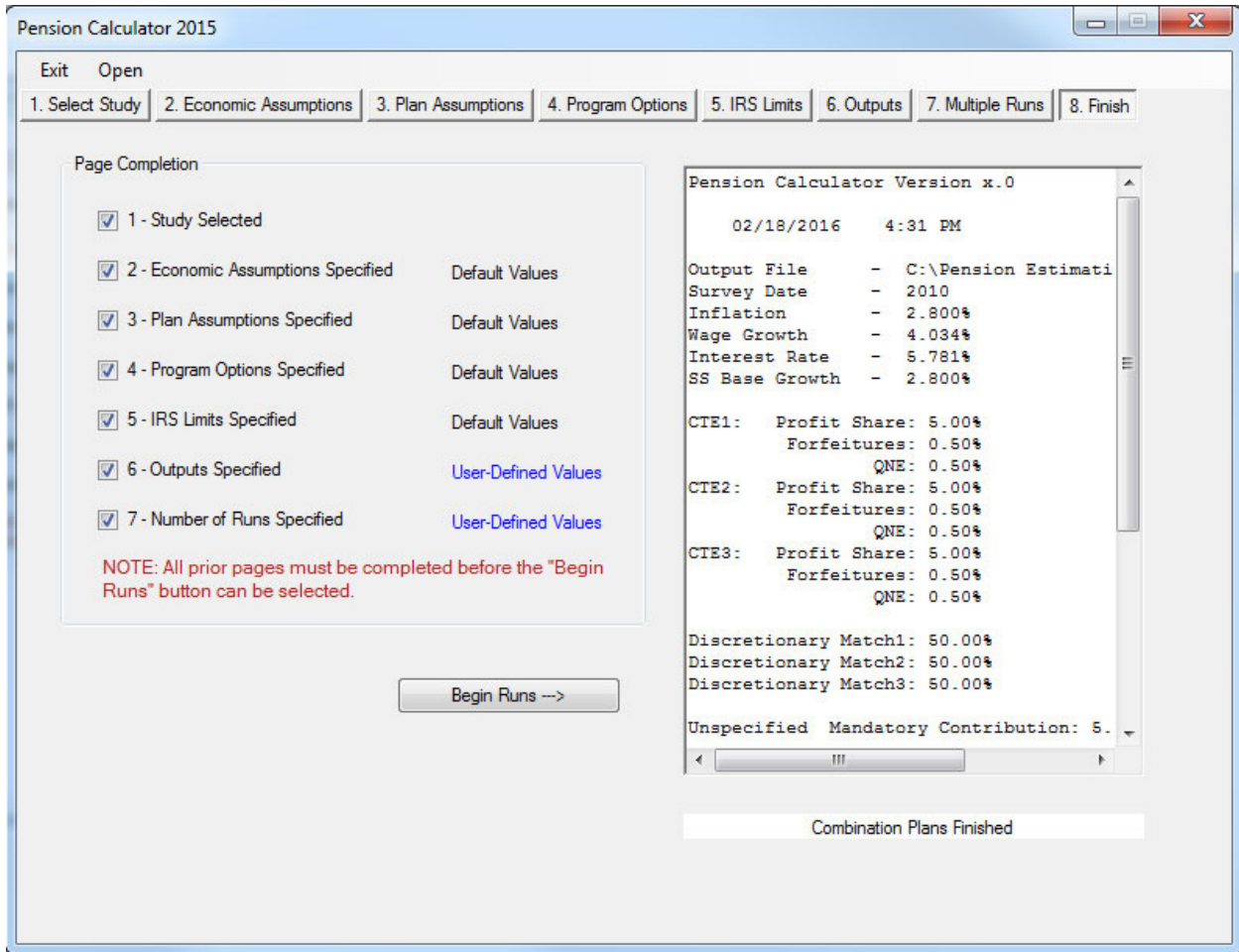
Page Completion

Provides a checklist of items that must have been completed before a run can be initiated by the user. If the default values have been modified in any of the preceding tabs, that fact is documented here. If the user has provided insufficient information, the “Begin Runs” button is disabled. If this is the case, look for unchecked boxes and review the status of the corresponding tab. For example, the graphic above indicates insufficient information on Tab 7 – Number of Runs Specified

Begin Runs

Once the “Begin Runs” button is enabled, the user can start the calculations. The window on the right will display a list of the assumptions used in the current run as well as the number of each plan as it is processed by the application. The program processes each defined benefit plan and then each combination plan (if any); when calculations are complete, the message ‘plans finished’, as shown below, will be displayed. Once a run has started, the Begin Runs button changes to “Cancel Runs”. If desired, the current run can be canceled at any time in order to

allow the user to make changes in assumptions. Restart the run by clicking the “Begin Runs” button.



PROGRAM ATTRIBUTES

The Output File

A line of output can be thought of as three concatenated vectors. The first is a vector of respondent information which always appears regardless of which output has been selected. These fields include:

- Respondent Identifier
- Spouse's birth year if married
- Respondent's birth year
- Date Hired
- Sex (1=male, 2=female)
- Respondent's stated voluntary contribution as a percent of pay
- Pension Plan Identifier (CodingID)
- Separation Date
- Respondent's wage at date of separation
- Age at separation
- Years of service at separation

The second vector is user-defined and consists of the present values selected on Tab 6 – Outputs. It may consist of 1 to 5 values for defined benefit plans or one value for defined contribution plans. Some combination plans might have positive values for defined benefit and defined contribution parts of the plan.

The third vector is the cash flow vector and is only produced if a cash flow option is selected on Tab 6 – Outputs. The first value in the cash flow vector is the amount received in the year of separation, adjusted for partial year. The last value in the cash flow vector is the amount received at age 119.

The Log File

The log file provides information about the options selected through the application for the related results in the output file. It also logs the progress of the application in processing the individual pension plans. If the “Write Intermediate Results to Log File” option is checked on the Tab 6 – Outputs, the intermediate results are written to this file. The defined contribution plans are fairly self-evident. The intermediate results simply document the balance accumulated for each component of the defined contribution plan. For example:

$$\begin{aligned} \text{CNRT} &= \text{VOL1} + \text{MVOL1} + \text{CTE1} + \text{CTE2} \\ &= 450949.317 + 30909.529 + 150316.439 + 150316.439 \\ &= 782491.724 \end{aligned}$$

The intermediate results output from a defined benefit plan might require a more detailed explanation:

$$\begin{aligned} \text{NR1} &= \text{FAP1} * \text{ASY1} * 1.515\% \\ &= 40000.000 * 30.000 * 1.515\% \\ &= 18180 \text{ and } \text{PV}(\text{NR1}) = 252445 \end{aligned}$$

$$\begin{aligned} \text{NR2} &= \text{FAP1} * \text{ASY1} * 0.152\% \\ &= 40000.000 * 30.000 * 0.152\% \\ &= 0 \end{aligned}$$

Begins at Age: 65
Ends at Age: 65

$$\begin{aligned} \text{NRT} &= \text{NR}\#1 + \text{NR}\#2 \\ &= 18180.000 + 0 \\ &= 18180 \text{ and } \text{PV}(\text{NRT}) = 252445 \end{aligned}$$

The respondent in the example above is retiring at age 65. Although the respondent is qualified for both formulas, the second formula defines an annuity that ends at age 65. That is why the value is zeroed at the result stage. The final value for each formula is expressed as both an initial cash flow and as the present value of all future cash flows. Because the first value represents the first year cash flow, it is possible that the initial value will be zero, and the present value will be positive. This could occur in a vested deferred formula if the benefit annuity actually begins at a later date.

There might be several adjustments made to the total cash flow vector that would affect its present value. These adjustments may include late retirement, vesting and cost of living and adjustments as well as adjustment for alternative present value date. In case an adjustment was made, a note would be added to the log file describing this adjustment. For example, if a user specifies cost of living adjustment on Tab 4 – Program Options, a note “Total adjusted for user-specified COLA” would appear below each total formula in the log file.

Table Descriptions

Respondents

Microsoft Access databases *HRS92.mdb*, *HRS98.mdb*, *HRS04.mdb*, and *HRS10.mdb* (distributed as restricted data, see below) provide tables with respondent characteristics generated from HRS public data. The table called *Respondents* provides information about the respondent’s age, sex, date of birth, hire and quit dates, marital status, spousal age if married, and amount of voluntary contributions. A unit of observation in this table is *Respondent – Pension Plan – Job Type* since a respondent can be covered by multiple pension plans or have multiple job types (for job type descriptions, see Tab 1 – Study Specification in TAB GUIDE)

Common fields in *Respondents* tables of *HRS92.mdb*, *HRS98.mdb*, *HRS04.mdb*, and *HRS10.mdb*:

- **RespondentID**: autonumber, a primary key for this table
- **RespondentNumber**: for 1992 data, CASE ID: WAVE 1 was used. For 1998 data, it is a combination of HRS Household Identifier, *HHID*, and Person Number, *PN* constructed as following: $HHID*1000 + PN$. In the data, this number does not have to be unique since a respondent can be covered by multiple plans or have multiple job types (for example, plans from both current and last jobs can be present in the data)⁵
- **CodingID**: this field contains Pension Plan Identifier. *CodingID* that is less than 3000 indicates a defined benefit plan. *CodingID* that is greater than 3000 and less than 5000 indicates a defined contribution plan. *CodingID* greater than 5000 indicated a combination plan. The record in this field is not unique since multiple respondents in the sample can be covered by the same plan.
- **BirthDate**: respondent's birth date with birth month converted into birth year fractions.
- **SpouseBirthDate**: marital status and, if married, spouse birth date. Zero in this field indicates that respondent is not married at the time of the survey.
- **Sex**: 1 = male , 2 = female
- **HireDate**: date of hire at the firm for the current spell of work
- **QuitDate**: date the worker separates or retires from the firm
- **WorkHours**: number of hours that the participant works in a year.
- **VoluntaryContribution**: annual amount of voluntary contribution expressed as a percent of salary
- **DifferentialWageGrowth**: individual-specific nominal wage growth rate. See *Wage Growth Model* for definition. Note that this value is a percentage, so that 2% would be written in the file as 2.0, not 0.02.
- **NonLinearWageBeta1**: individual-specific linear wage growth coefficient (β_1). See *Wage Growth Model* for definition
- **NonLinearWageBeta2**: individual-specific quadratic wage growth coefficient (β_2). See *Wage Growth Model* for definition
- **JobType**: indicates respondent's job type as described below for each study.
- **RespCodingIDNumber**: this variable counts the number of unique respondents for a given *CodingID*

In *HRS98.mdb*, *HRS04.mdb*, and *HRS10.mdb*, the *Respondents* table contains additional fields that flag whether or not records in the underlying HRS dataset(s) have enough information to compute a value for the corresponding field in *Respondents*. When a value could not be calculated or brought forward from previous waves, a value was imputed and the observation was flagged. Further explanation of the methods used to fill or impute these values for *HRS10.mdb* can be found in the documentation of the 2010 pension wealth estimates file, available from the HRS website.

⁵ In *HRS04.mdb* and *HRS10.mdb*, only current jobs' pension plans are available.

Missing data flag variables in the *HRS98.mdb*, *HRS04.mdb* and *HRS10.mdb* versions of *Respondents* are:

- MissingHireDate
- MissingQuitDate
- MissingHoursWorked
- MissingWage
- MissingVoluntaryContributions

Important note on 2004 data

In HRS surveys conducted in 2004 and 2006, in addition to asking employers, HRS respondents were asked to provide SPDs by requesting them from their employers. The current version of the database contains coded data from 2004 and 2006 respondent-provided SPDs. Users can identify the source of a pension plan by referring to the variable *Source* in tables *Respondents* and *PlanInformation*

1. Employers of HRS respondents who provided pension documents in the 2005 Employer Pension Provider Survey (EPPS).
2. HRS respondents who provided SPDs in 2006.
3. HRS respondents who provided SPDs in 2004.

Sources of 2010 data

The enormous increase in information available from government sources on the web led to a change in the method of document retrieval for 2010 data. For government sector employers, SPDs were obtained by downloading SPDs from the government employer website. For private sector employers, Form 5500 filings were downloaded from the United States Department of Labor Employee Benefits Security Administration Form 5500 ERISA Filing Acceptance System, which provides a searchable database of Form 5500 filings and their attachments. The attachments for defined benefit plans include plan provision descriptions that are comparable to those provided in an SPD. The source of the data used for coding each plan, whether SPD, Form 5500, or some other document can be found in the *HRS10.mdb* table *PlanInformation*.

Wages

This table, included in each study, is designed to provide wage histories for HRS respondents. A unit of observation in this table is *Respondent Number – Job Type – Observation Year*. The table has the following fields:

- **WageID:** autonumber, primary key for this table
- **RespondentNumber:** a combination of HRS Household Identifier, *HHID*, and Person Number, *PN* constructed as following: $HHID * 1000 + PN$. This number does not have to be unique since, in the wage table, multiple observation year can be provided

- **Wage:** annual wage or salary amount in observation year
- **ObservationYear**
- **JobType:**In 1992 and 1998,this field indicates respondent’s job type: 1 – current job, 2 – last job (if not currently employed), 3 – previous significant job, 4 – Release 7 job.In 2004, this field was used to produce the ‘best source’ feature, and in 2010 this field was used to produce the respondent groups 1= government matched, 2=private matched, 3=government imputed, 4=private imputed.

Wage amounts are constructed from the employment section of HRS dataset. For current jobs, observation years are either the wave year (1992, 1998, 2004 or 2010) depending on the study. For other job types, observation year is a year of termination (quit year). However, it is possible for the user to provide a wage history for every respondent in the sample.

Simulated Respondents

The table called “*Simulated Respondents*” contains one respondent’s record for every plan in the study. The user can change characteristics of this respondent by editing the “*UpdateSimulatedRespondents*” query in Design View or SQL View. Running that query will update the “*SimulatedRespondents*” table. In *HRS10.mdb*, this table contains two simulated respondents; one for the government sector, who is linked to government sector plans, and one for the private sector who is linked to private sector plans. Users who would like to change characteristics for one or the other of the simulated respondents can use the queries *UpdateSimulatedRespondents_govt* and *UpdateSimulatedRespondents_private*.

Simulated Wages

The table called “*Simulated Wages*” contains wage history for a simulated respondent. The user can change *Wage* and *ObservationYear* by editing data in those fields. The users can provide more than one observation year for this simulated respondent. As was true for the table *Simulated Respondents*, in *HRS10.mdb* the *Simulated Wages* table contains two records, one for a government sector employee (*JobType*=1) and one for a private sector employee (*JobType*=2). See *Providing Wage Histories* for details.

Providing Wage Histories

At least one observation year and wage amount in that year has to be provided for any given *Respondent Number – Job Type* pair in *Wages*. In case a respondent is covered by multiple plans for a given job type, the user doesn’t have to provide a separate observation for the wage table. On the other hand, if a respondent has multiple job types, a separate wage observation has to be provided for every type.

For a given job type, the user can also provide multiple observation years and wage amounts in those years, creating respondent’s wage history. There is no upper limit on the number of years provided. The number of years can vary with every respondent in the sample. A wage history can be shorter than actual work tenure. In that case, the values for the remaining years are going to be

obtained from the wage growth model using first provided wage year as a base year when extrapolating backward and the last provided wage year when extrapolating forward. The only requirement is that the wage history contains *no gaps*. In other words, if wage amounts provided for observation years 1993 and 1995, it is necessary to provide a wage observation for year 1994 as well.

Death and Disability Formulas⁶

Care should be exercised in the interpretation of death and disability benefits. Death and disability are less likely reasons for separation from service. Consequently, summary plan descriptions sometimes provide insufficient information to code these benefits. A zero result for a death or disability benefit cannot be interpreted as meaning there is no death or disability benefit provided by the plan; it may mean there was insufficient information to code those benefits. Coders have noted benefits for which there was insufficient information in the comments section of the *PlanInformation* table⁷.

Further, even when disability benefits are clear, these define the benefits paid only from the pension plan. The firm may have other long-term disability plans, and these are not analyzed in arriving at the stated disability benefit. So the total amount paid for disability could be considerably more than the disability pension benefit.

Mortality Tables

Microsoft Access database *Mortality.mdb*, distributed with the application, copies information from SSA's gender-specific cohort life tables.⁸ *LiveTable* describes the number of people still living at a given age assuming a population of 100,000 at birth. *DeathTable* describes life expectancy for a person reaching a given age. These tables differ by birth cohort and gender.

Key Algorithms

Present Value Calculations

General formula used for computing present values of retirement benefits:

$$PV(QuitDate) = \sum_{t=Age_{Quit}}^{119} {}_tP_{Age_{Quit}} * \left[\frac{1 + COLA}{1 + i_{nom}} \right]^{t-Age_{Quit}} * B(QuitDate, t)$$

$$i_{nom} = (1 + Inflation\ Rate / 100)(1 + Real\ Interest\ Rate / 100) - 1$$

where :

⁶ Not available in 2004 or 2010 data.

⁷ These comments are only present in the HRS pension study conducted in 1998.

⁸ SSA updates the life tables each year. In this release, the 2010 life tables are used.

$${}_tP_{AgeQuit} = \frac{NumberAlive(QuitDate + t, Sex, BirthCohort)}{NumberAlive(QuitDate, Sex, BirthCohort)}$$

probability of surviving for t years after quitting conditional on being alive at quit date, computed using sex- and birth cohort-specific mortality tables.

NumberAlive = the number of people still living at a given date assuming a population of 100,000 at birth.

COLA = plan-specific or user-provided annual growth rate of nominal payment

i_{nom} = nominal interest rate

$B(QuitDate, t)$ = pension benefit in year t after the quit date

Wage Equation

The program uses the following wage growth model :

$$\ln(Wage(t)) = Wage(BaseYear) + (\alpha_m * YearCount) + \beta_1(Age) + \beta_2(Age)^2$$

where

$$\alpha_m = \frac{\text{Exp}(\text{Log}(1 + \text{Real Wage Growth Rate} / 100) + \text{Log}(1 + \text{Inflation Rate} / 100) + \text{Log}(1 + \text{Differential Wage Growth} / 100)) - 1}{}$$

$Wage(t)$ = annual earnings in year t .

$Wage(BaseYear)$ = earnings in observation year .

α_m = overall nominal wage growth of the economy with individual wage growth component

YearCount = number of years since the base year

Age = respondent's age in year t

β_1, β_2 = user defined coefficients for age terms.

DifferentialWageGrowth = user defined individual-specific nominal wage growth rate

Joint and Survivor Annuity

To adjust a cash flow vector for $N\%$ Joint and Survivor option, each cash flow of that vector need to be multiplied by *AdjustmentFactor* which is computed as following:

$$AdjustmentFactor = PVSLA(BenefitDate)/PVJ\&S(BenefitDate)$$

where *PVJ&S* is a present value of N -percent Joint and Survivor Annuity given by:

$$PVJ\&S(Benefit\ Date) = \sum_{t=Age_B}^{119} \left[{}^oP_{tAge_B} + \frac{N}{100} {}^sP_{tAge_B} - \frac{N}{100} {}^oP_{tAge_B} {}^sP_{tAge_B} \right] * \left[\frac{1 + COLA}{1 + i_{nom}} \right]^{t-Age_B} * BJ\&S(QuitDate, t)$$

and *PVSLA* is a present value of single life annuity given by

$$PVSLA(Benefit\ Date) = \sum_{t=Age_B}^{119} {}^oP_{tAge_B} * \left[\frac{1 + COLA}{1 + i_{nom}} \right]^{t-Age_B} * BSLA(QuitDate, t)$$

Age_B	=	age at the benefit date
${}^oP_{tAge_B}$	=	survival probability of respondent
${}^sP_{tAge_B}$	=	survival probability of spouse
$BJ\&S(QuitDate, t)$	=	pension benefit in year t after the quit date with joint and survivor option
$BSLA(QuitDate, t)$	=	pension benefit in year t after the quit date with single life annuity option

Alternative Present Value Date

The program gives users an option to provide an alternative date for present value calculations. In addition, it allows users to either ignore or include benefits paid before present value date in calculations. The latter option only becomes relevant when alternative present value date is after the quit date.

The new present value is given by:

$$\sum_{t=Age_0}^{119} {}^oP_{tAge_0} * \left[\frac{1 + COLA}{1 + i_{nom}} \right]^{t-Age_0} * B(QuitDate, t)$$

In this equation, Age_0 is defined as the age of the earlier date between *PVDate* and *QuitDate*. Note that, for the years before the *QuitDate*, $B(QuitDate, t)$, could be zero if the benefits already paid were excluded from the calculation or in the years before the benefits were vested.

APPENDIX A: HOW TO OBTAIN PENSION ESTIMATION PROGRAM AND DATA

Obtaining the Program and Data

This version of the Pension Estimation Program is distributed as part of a package that includes the input databases together with required auxiliary files.

Current Traditional License Users

If you are a traditional license user of a previous version of the Pension Estimation Program, submit an electronic mail request to HRS Restricted Data Applications Processing (hrrdaapplication@umich.edu) stating that you wish to receive the updated Pension Estimation Program and data. A CD-ROM containing an encrypted version of the data will be sent to you via courier. The decryption pass-phrase will be sent separately.

New Users

If you are not a currently registered restricted data user, you may obtain access to the program and datasets developed for the new version by submitting an application for restricted data. HRS Restricted Data Applications Processing (hrrdaapplication@umich.edu)⁹

If you do not meet the traditional license requirements for obtaining restricted data from HRS, you may apply for access to the new Pension Estimation Program and its accompanying data through the *Data Enclave* at the Michigan Center on the Demography of Aging.¹⁰ This is the recommended approach.

⁹ Visit the HRS Restricted Data Web site (<http://hrsonline.isr.umich.edu/rda>) for details on how to apply.

¹⁰ Visit the MiCDA Web site (<http://micda.psc.isr.umich.edu/enclave>) for more information.

APPENDIX B: INSTALLATION

Minimum System Requirements

Processor: Intel Atom 1.6GHz or equivalent

Operating System: Windows 7 (64-bit) or higher

Memory: Minimum 2GB of RAM

HDD: 2 MB of available space required on system drive

Display: 1024 x 600 or higher-resolution display

Mouse: Microsoft Mouse or compatible pointing device

Installation instructions

1. Copy PenEst2010.zip (program files and Access 2010 databases) from the CDROM to a temporary folder (e.g., *c:\temp*)
2. Use file compression software (e.g., WinZip) to extract *databases.zip*, *documentation.zip*, and *software.zip*
3. Unzip contents *software.zip* to *c:\temp\software* (no password required). Click on *setup.exe* to install software. The software installation routines will install all necessary files in *C:\Program Files (x86)\University of Michigan\Pension Estimation Program* and create a desktop icon that points to the executable.
4. Unzip the contents of *documentation.zip* to any convenient location (no password required).
5. Unzip contents of *databases.zip* to *c:\temp\databases* (password required).
6. Move all database files to a folder for which you have full (read/write/execute) access (e.g., *C:\Pensions*)
- 7.

Security Issues

Data inputs for the Pension Estimation Program are stored in folder that contains Microsoft Access databases (*HRS92.mdb*, *HRS98.mdb*, *HRS04.mdb* and *HRS10.mdb*), as well as ancillary run-time files. In order to meet the data protection plan requirement that restricted data be encrypted when not in use, we recommend that this folder be encrypted.

Contact Information

Please contact HRS at hrsquestions@umich.edu with any questions about installing, running, or modifying this software or regarding any error message you encounter.