RISK AND INSURANCE STUDENT INSTRUCTION OF DEFRA'S LIFE EXPECTANCY FOR INSTALLMENT-TYPE DISTRIBUTIONS EASED BY USING LOTUS 1-2-3

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INTRODUCTION

The study of "Employee Benefits" has always been aided by using financial algorithms. During recent semesters, the Lotus 1-2-3 package (Lotus) has been introduced to students in the School of Business and Economics at North Carolina Agricultural and Technical State University due to the explosion of its use in the business community. Lotus is now being introduced into our basic Risk and Insurance classes to enhance the instruction and student understanding of Risk and Insurance Mathematics especially in the area of employee benefits.

"Retirees may find cause for rejoicing in obscure DEFRA rule" titled the lead story in the TPF&C Letter from Towers, Perrin, Forster & Crosby International Management Consultants on November 27, 1984. DEFRA, the Deficit Reduction Act of 1984, may have been a law that almost nobody wanted, but buried in it was one small section that revolutionized the delivery of payments from tax-sheltered plans to many retirees.

Prior to the 1985 DEFRA rules, retirees could receive benefits as a lump sum causing tax problems, as a life annuity which they could not outlive but offered no protection against inflation, or as installment payments which offered some relief from inflation but may run out before the retiree dies.

Beginning in 1985 "Life expectancy may, for installment-type distributions, be redetermined annually." This meant that installments would never run out, inflation protection would be provided, and the installments should increase in amount over most of the retirees life if interest yields remain high.

This paper will show how our students use Lotus to design a spreadsheet for computing minimum annual distributions from tax-sheltered plans. Columns are constructed to show the change in retirement assets from the beginning to the end of each retirement year. Expectation of Life values from the IRS

Publication 939 are stored and exhibited. Students may then vary input for retirement assets and projected yields on these assets to determine minimum annual withdrawals from the funds.

LOTUS BRIEF OVERVIEW

"Lotus 1-2-3 is one of the most widely used and most powerful software products on the market today. It combines a superior spreadsheet with excellent graphics and an efficient database. Its power and flexibility have made it an industry standard." These sentences begin the Preface of The Student Edition of Lotus 1-2-3 Release 2.2 by Timothy J. and Linda I. O'Leary as published by Addison-Wesley Publishing Company in 1990.

Lotus meets the standards set for fourth-generation languages as the user issues commands for software already written for generic problems; the generic problem involves all spreadsheet use. It is more natural for users as the spreadsheet is familiar to business students. It is a nonprocedural language as the sequence of commands required is not important. It is also user friendly due to the use of menus and the wide variety of Help Screens available.

We introduced this software package to our Management Information Systems classes in the Fall of 1990. All sophomore business students are required to take this first management information systems course. Familiarity with the IBM Personal Computer is achieved, and students are then ready to proceed rapidly into the use of this fourth-generation language.

STUDENTS REPORT VALUE

Enthusiastic students return from internships and interviews with positive reports of Lotus use in potential full-time employment. One intern from our Fall of 1990 class had planned to only learn at his initial internship; however, he felt pride in the large amount of time he spent teaching Lotus to employees of Marathon Oil Company.

An interviewer with Turner Construction Company reported that instead of using popular prewritten software for specific functions such as estimation of costs and scheduling, Lotus has been used so that this global company can have unique confidential solving of all major computerized problems.

ALGORITHM INTRODUCTION

During the course of our "Employee Benefits" study, LEDEFRA.341, see Appendix A, is presented to our students. After a thorough discussion and summary, our students begin their spreadsheet

design; many new ideas result from their creativity.

MICKEY.341, see Appendix B, is then presented for class discussion and actual spreadsheet design by each student. Upon completion of MICKEY.341, each student completes LEDEFRA.341.

In order to solve the algorithm for MICKEY.341 using the IBM Personal Computer, each student accesses Lotus in one of our campus computer labs. The spreadsheet appears showing 8 of the 256 columns labeled A through H of 9 positions each and 20 of the 8192 rows labeled 1 through 20. Using our case example as a guide, the following steps may be taken:

1- Set Column Widths: (transfer case example to printer layout)

2- Key Headings:

Move Cursor To	then Enter
A1	'MOUSE BALANCE EXPECTATION PAYMENT INTEREST BALANCE
A2	' AGE BEG.YR. OF LIFE BEG.YR. FOR YR. END YR.

3- Key Input:

   a- Beginning Year Balance for first distribution age (cell B4),

   b- Expectation of Life for all ages shown (cells C4..C6), and

   c- Anticipated Interest Yield (cell G1).

4- Key Formulas to Complete Spreadsheet: (Goofy explains these in case.)

5- Set Decimal Places and Currency Notation: (based on student design)

6- Save File: (to use for LEDEFRA.341)

7- Print Current Spreadsheet:

   a- Print rectangle with upper-left-most cell = A1 and lower-right-most cell = G6.

   b- Resulting spreadsheet is shown in Appendix C.

Following success with MICKEY.341, our LEDEFRA.341 algorithm is similarly designed based on data and instructions shown in Appendix A. The resulting spreadsheet is shown in Appendix D.

CONCLUSION

Use of the Lotus 1-2-3 package in creating "Employee Benefits" algorithms has enhanced the instruction and student understanding of Risk and Insurance Mathematics. Additional algorithms are currently being researched in the areas of commutation functions, premiums, nonforfeiture values, actuarial reserves, universal life, simulation, and forecasting.

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Jordan, Chester Wallace, Jr., Life Contingencies, Society of Actuaries, Illinois, 1952.

Martin, Edward G. and Parker, Charles S., Mastering Today's Software (Second Edition), The Dryden Press, Orlando, Florida, 1994.

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APPENDIX A LEDEFRA.341

"Retirees may find cause for rejoicing in obscure DEFRA rule" titled the lead story in the TPF&C Letter from Towers, Perrin, Forster & Crosby International Management Consultants on November 27, 1984. DEFRA, the Deficit Reduction Act of 1984, may have been a law that almost nobody wanted, but buried in it was one small section that revolutionized the delivery of payments from tax-sheltered plans to many retirees.

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Sam Stobbs with extraordinary business and LOTUS skills as a NCA&T graduate plans to amass $1,000,000 in a tax-sheltered plan by age 71 when he will be required by the government to begin receiving at least minimal annual payments to avoid tax problems (see ***). Sam produces a LOTUS spreadsheet for ages 71 through 90 showing the changes in the beginning of age fund to the ending of age fund with payments and interest for the ages using the expectation of life method. He assumes an 8% interest rate and mortality of the Single Life Expectancy Table as provided in IRS Publication 939 with needed values as follows:

AGE	Expectation of Life	AGE	Expectation of Life	AGE	Expectation of Life
71	15.3	78	10.6	85	6.9
72	14.6	79	10.0	86	6.5
73	13.9	80	9.5	87	6.1
74	13.2	81	8.9	88	5.7
75	12.5	82	8.4	89	5.3
76	11.9	83	7.9	90	5.0
77	11.2	84	7.4		

Turn in your spreadsheet similar to MICKEY.341 and a listing of keyed items using your name in a title line such as:

RETIREMENT PAYMENTS USING EXPECTATION OF LIFE METHOD
FOR SAM STOBBS

*** Since the first annual calculation is made as of December 31 of the year following age 70.5, assume the $1,000,000 balance is available at the beginning of year when Sam is age 71.

APPENDIX B MICKEY.341

Mickey Mouse retires at age 3 with $30,000 cash. Given his expectation of life at age 3 to be 2 years, at age 4 to be 1.5 years, and at age 5 to be 1 year along with a 6% annual interest yield, complete the following LOTUS spreadsheet when estimating minimum payments by the expectation of life method.

MOUSE AGE	BALANCE BEG.YR.	EXPECTATION OF LIFE	PAYMENT BEG.YR.	INTEREST FOR YR.	BALANCE END YR.
3					
4					
5					

Mickey's financial advisor, Goofy, has explained that:

1- Mickey can key in the beginning year balance of $30,000 for age 3 as well as the values for expectation of life.

2- The retirement payment to Mickey at the beginning of any year is the beginning year balance divided by the expectation of life.

3- Interest earned for the year will be 6% applied to the beginning year balance after deducting the year's retirement payment.

4- The beginning year balance for ages after the retirement age is the previous year-end balance which was calculated by adding interest for the year to the amount to which the interest rate was applied.

APPENDIX C

MOUSE AGE	BALANCE BEG.YR.	EXPECTATION OF LIFE	PAYMENT BEG.YR.	INTEREST FOR YR.	BALANCE END YR.	.06
3	$30,000	2.0	$15,000	$900	$15,900	
4	$15,900	1.5	$10,600	$318	$5,618	
5	$5,618	1.0	$5,618	$0	$0	

APPENDIX D

RETIREMENT PAYMENTS USING EXPECTATION OF LIFE METHOD
FOR SAM STOBBS

AGE	BALANCE BEG.YR.	EXPECTATION OF LIFE	PAYMENT BEG.YR.	INTEREST FOR YR.	BALANCE END YR.	.08
71	$1,000,000	15.3	$65,359	$74,771	$1,009,412	
72	$1,009,412	14.6	$69,138	$75,222	$1,015,496	
73	$1,015,496	13.9	$73,057	$75,395	$1,017,834	
74	$1,017,834	13.2	$77,109	$75,258	$1,015,983	
75	$1,015,983	12.5	$81,279	$74,776	$1,009,481	
76	$1,009,481	11.9	$84,830	$73,972	$998,623	
77	$998,623	11.2	$89,163	$72,757	$982,217	
78	$982,217	10.6	$92,662	$71,164	$960,719	
79	$960,719	10.0	$96,072	$69,172	$933,819	
80	$933,819	9.5	$98,297	$66,842	$902,364	
81	$902,364	8.9	$101,389	$64,078	$865,053	
82	$865,053	8.4	$102,982	$60,966	$823,036	
83	$823,036	7.9	$104,182	$57,508	$776,362	
84	$776,362	7.4	$104,914	$53,716	$725,164	
85	$725,164	6.9	$105,096	$49,605	$669,674	
86	$669,674	6.5	$103,027	$45,332	$611,979	
87	$611,979	6.1	$100,324	$40,932	$552,587	
88	$552,587	5.7	$96,945	$36,451	$492,093	
89	$492,093	5.3	$92,848	$31,940	$431,185	
90	$431,185	5.0	$86,237	$27,596	$372,544	