

A COMPREHENSIVE RETIREMENT FINANCIAL PLANNING TOOL

Terrance Jalbert, University of Hawaii Hilo
Jonathan D. Stewart, Abilene Christian University

ABSTRACT

Financial planning makes up an essential element of any retirement plan. Assuring availability of sufficient resources to meet uncertain future needs requires careful planning. Advisors supply assorted tools and advice to assist in this process. This paper presents a comprehensive planning tool to aid potential retirees in developing their financial plan. The tool evaluates the financial picture of individuals annually throughout their retirement years. The analysis goal is accommodating a long retirement, with income that increases at the rate of inflation, achieved by using all assets available and without exhausting the portfolio. The tool provides a starting point for users to responsibly assess their financial future in retirement.

JEL: C60, D10, G17, M41, M50

KEYWORDS: Financial Modelling, Retirement Planning, Personal Financial Planning

INTRODUCTION

Potential retirees must assess many issues in evaluating their post-employment life. Assuring a secure financial life in retirement ranks among the most critical of these issues. Failure to plan properly can lead to an inadequate quality of life and relying on others to support you. Responsible planning affords the retiree financial security and peace of mind throughout a long retirement period.

Potential retirees have access to many available personal financial planning tools. These tools commonly focus on small areas of an individual's financial future. Social Security planning tools do not directly consider other elements of an individual's portfolio. Similarly, optimal Individual Retirement Account (IRA) withdrawal plans do not directly consider potential sales of real estate. Combining various individual plans together to achieve an overall financial picture represents a daunting task for individuals and families. This paper provides a comprehensive financial planning tool that aids individuals in developing appropriate retirement plans. The plan here combines multiple elements of financial planning to present a comprehensive lifetime picture. Users can adjust elements of the plan to accommodate their specific circumstances. The template accommodates stress testing to evaluate the impact of unanticipated circumstances on the overall financial picture. The tool creates a single overall measure to evaluate the plan's strength.

This work complements earlier works that develop tools for forecasting business financial statements requiring users to enter only managerial determined values. The tools automate all other calculations (Jalbert 2020a, 2020b, 2020c, 2019 and 2017). The output is completed pro-forma financial statements for five years along with extensive financial analysis. Similarly, the analysis here requires individuals to enter selected personal financial information. The program then calculates the financial position of the retiree each year until death.

The tool represents a starting place for retirement planning. Modifying certain parameters in the spreadsheet could produce unintended and erroneous results. For this reason, users should only use this spreadsheet in

consultation with a licensed and qualified professional financial advisor who can fully evaluate the results and advise them on such matters.

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The authors encourage users to begin working with the tool independently. Doing so can help them in accumulating necessary information and identifying issues for their consideration to assist the professional financial planner. Preparing this document in advance offers the possibility of reduced financial planning fees and provides the user a better understanding of their own finances. The user should present the completed template to their financial advisor for review and modifications.

The rest of the paper is organized as follows. The next section contains a literature review. The following section shows the model and displays the spreadsheet in tables. The paper closes with concluding comments and suggestions for future research.

LITERATURE REVIEW

Kumar, Shukla and Sharma (2019) identify and rank barriers to retirement planning. They note various barriers including financial literacy, financial dependency, goal clarity, marital status, number of dependents, gender and income level. The research presented here helps resolve goal clarity and financial literacy concerns by creating a model that allows users to adjust their goals to reflect the reality of their financial situation. The tools here also simplify user inputs and automatically performs many calculations, reducing the need for extensive financial literacy in successful financial planning.

Some studies address the extent that individuals use financial planning tools. Hentzen, Hoffmann and Dolan (2021) surveyed 440 Australian pension fund members. Results show that consumers' financial self-efficacy, perceived financial security, future consequence consideration, retirement planning involvement and perceived usefulness directly or indirectly effect their planned engagement with a mobile retirement app. As one would expect, the intent to adopt was stronger for those closer to retirement.

Murphy and Yetmar (2010) surveyed 206 MBA students on personal financial planning attitudes. Most respondents felt that financial planning represents an important endeavor. Further, most were interested in developing a financial plan. However, few felt they had the ability and knowledge to create financial plans. Results showed that only thirteen percent of those surveyed had prepared a comprehensive financial plan.

The benefit of having a financial advisor is well established. Kinniry, Jaconetti, DiJoseph, Walker and Quinn (2022) of Vanguard, estimate that a financial advisor adds about a three percent net annual return. Marsden, Zick & Mayer (2021) examine the value of financial advice around the 2008 market decline. They examine data from a U.S. university with over 10,000 employees and a sample size of more than 3,100 respondents. Their results show that seeking financial advice reflects a function of financial attitudes and knowledge and socio-economic characteristics. Their results further show that collaborating with financial advisors result in several positive activities including goal setting, calculation of retirement needs, investment diversification and accumulation of emergency funds.

Another line of literature examines demographic factors that determine whether an individual uses a professional retirement planner. Kimiyaghalam, Safari and Mansori (2016) supply a review of this literature. Research generally finds that individuals with higher income more frequently seek out financial planners (Joo and Grable, 2001) while individuals with lower income are less likely to seek out financial planners (Miller and Montalto, 2001). Research shows a positive relationship between education and seeking financial planners (Elmerick, Montalto and Fox (2002). Waliszewski and Warchlewska (2021) show that men and those in the 26-35 age group most often use budget management applications. In contrast, Chang (2005) finds a higher propensity to seek financial help by female heads of household than married couples. She further finds that Black families seek help more often than White families. Letkiewicz, Robinson, Domain and Uberceva (2015) find that individuals facing financial stress are more likely to seek financial help.

A recent phenomenon in financial planning involves automated financial advice. Zhang, Pentina and Fan (2021) examine consumer preferences for robot versus human financial advisors. Their results show that consumers prefer humans with an elevated level of expertise over a robot advisor. However, they find no preference differences between a novice human advisor and a robot advisor. Abraham, Schmukler, and Tessada (2019) find that automated advisors or robo-advisors have become increasingly popular as an easily accessible, low-cost alternative to human advisors. They note it is important for clients to understand the limitations of these services in order to achieve their goals. They also highlight the need for proper regulation and supervision by policymakers. Bruggen, Post, and Schmitz (2019) find that online retirement planning tools that require more interaction lead to a higher level of customer interest and involvement in monitoring the progress of their retirement plans. Their results indicate that men preferred the highest level of interactivity while women preferred a medium level. Dorman, Mulholland, Bi, and Evensky (2019) tested a set of 41 online retirement tools that are available to the public for free or a modest fee. They find the majority of these tools to be inaccurate and therefore dangerous to trust when planning for retirement. They attribute the poor performance of inefficient tools to opaque wage replacement rate variables, a lack of customization, and the inclusion of fewer input variables. The model presented in this paper includes a wide range of adjustable parameters and flexible assumptions.

Despite the benefits of having a financial advisor, the literature notes individual resistance to using a financial advisor. Chang 2005 finds that most people prefer not to use a financial advisor. Others note that people prefer to address the issues personally or with advice from friends because of trust and cost issues (Grable, Cantrell and Maddux, 2004). Hesitancy to use financial advisors emphasizes the importance of freely available tools that aid individuals with their financial planning like the one presented in this paper.

THE MODEL

The model presented here provides a comprehensive financial planning tool. It incorporates considerations not commonly found in financial planning templates. Specifically, this tool accommodates a pension that increases by a fixed dollar amount each year, rather than a fixed percentage amount. This fixed dollar amount increase makes the pension susceptible to inflation risk. The template presented here offsets this loss of buying power with a growing annuity. The model also considers potential inheritance which supplies additional retirement income resources. The tool tracks rentals and sales prices of three real estate properties and incorporates them into the overall financial plan. Further, the template accommodates purchase and sale of a retirement item such as a boat or farm.

The model includes fifty-five adjustable parameters allowing users to adapt the spreadsheet to accommodate their needs, as shown in Table 1. Users can vary these parameters to stress test their retirement plans against unexpected contingencies. The spreadsheet includes eight worksheets. Worksheet 'M' includes the model parameters and primary calculations. Worksheet 'P' contains supporting pension calculations. Worksheet 'SS' provides supporting Social Security calculations. Worksheet 'R' produces

supporting property rental figures. Worksheet ‘A’ shows growing annuity calculations. Worksheets ‘F’ and ‘S’ show Federal and State tax computations, respectively. Worksheet ‘O’ supplies miscellaneous calculations. Cell references throughout the discussion show the worksheet name followed by the cell reference within the worksheet.

Table 1: Adjustable Parameters

Parameter	Terms	Place
Retirement Year	Year	M:C12
Life Expectancy Spouse 1	Age	M:C10
Inflation Rate	Annual Percentage	M:C4
Rate of Return Earned on Stock Market Investments	Annual Percentage	M:C5
Rate of Return Earned on Real Estate Investments	Annual Percentage	M:C6
Real Estate Transaction Fees	Percentage of Sales Price	M:C7
Starting Stock Portfolio Value	Current Dollars	M:C18
Desired First Year Draw from Stock Portfolio	Current Dollars	M:C20
Desired First Year Social Security Supplement Payment	Current Dollars	M:C28
Current Age Spouse 1 (S1)	Age	M:C26
Current Age Spouse 2 (S2)	Age	M:C27
Social Security Draw Age (S1)	Age	M:C23
Social Security Draw Age (S2)	Age	M:C24
Second Social Security Draw Age (S2)	Age	M:C25
Current Social Security Statement Amounts S1	Current Dollars	M:C32-C40
Current Social Security Statement Amounts S1	Current Dollars	M:D32-D40
Pension as a portion of final salary at Age 62	Decimal	M:C44
% Pension Increase Per Year of Work	Decimal	M:C45
Pension Red. For Dual Life	Decimal	M:C46
Ann Pens Inc. % First year	Decimal	M:C47
Salary Growth as a percent of Inflation	Annual Percent	M:C50
Salary Information	Future Dollars	M:C53, M:D53
Real Estate 1 (RE1) Current Value	Current Dollars	M:D68
Real Estate 1 (RE1) Sales Year	Year	M:F68
Real Estate 2 (RE2) Current Value	Current Dollars	M:D69
Real Estate 2 (RE2) Sales Year	Year	M:F69
Real Estate 3 (RE3) Current Value	Current Dollars	M:D70
Real Estate 3 (RE3) Sales Year	Year	M:F70
Inheritance 1 (I1) Current Value	Current Dollars	M:D71
Inheritance 1 (I1) Sales Year	Year	M:F71
Inheritance 1 (I1) Received Year	Year	M:C89
Retirement Purchase (RP) Current Value	Current Dollars	M:D72
Retirement Purchase (RP) Sales Year	Year	M:F72
Primary Residence Indicator	1 = Yes, 0 = No	M:C68-C72
Property Basis	Current Dollars	M:E68-E71
Real Estate 1 (RE1) Rental Price 1 and Through Year	Current Dollars	M:C78, M:D78
Real Estate 1 (RE1) Rental Price 2	Current Dollars	M:C79
Real Estate 2 (RE2) Rental Price 1 and Through Year	Current Dollars	M:C80, M:D80
Real Estate 2 (RE2) Rental Price 2	Current Dollars	M:C81
Real Estate 3 (RE3) Rental Price 1 and Through Year	Current Dollars	M:C82, M:D82
Real Estate 3 (RE3) Rental Price 2	Current Dollars	M:C83
Inheritance 1 (I1) Rental Price 1 and Through Year	Current Dollars	M:C84, M:D84
Inheritance 1 (I2) Rental Price 2	Current Dollars	M:C85
Retirement Purchase (RP) Rental Price 1 and Through Year	Current Dollars	M:C86, M:D86
Retirement Purchase (RP) Rental Price 2	Current Dollars	M:C87
Current Spending	Current Dollars	M:C92
Annual Total Spending in Retirement	Current Dollars	M:C93
Proposed Pending Pattern	Current Dollars	M:C97-C105
Current (Pre -Retirement) Annual Savings	Current Dollars	M:C123
Current Cash Balance	Current Dollars	M:C110
Proposed Cash Uses Pre-Retirement	Current Dollars	M:C111-C116
Desired Cash Level	Current Dollars	M:C119
Hawaii Exemptions	Number	M:C129
Tax Filing Status	Code 1-4	M:C136
Current Ordinary Tax Rate on IRA withdrawals	Percentage	M:C132

This table shows changeable model parameters. The first column shows the changeable parameter. The second column shows the units of entry for the parameter and the third column shows the location of the parameter in the spreadsheet. All references noted in Column 3 appear on Worksheet ‘M’ of the spreadsheet.

Table 1 shows adjustable variables included in the model. The first column shows the changeable parameter. The second column shows the units of entry for the parameter and the third column shows the location of the parameter in the spreadsheet. All references noted in Column 3 appear on Worksheet M of the spreadsheet.

The presentation continues with a model description and discussion of model parameters as shown in Tables 2-4. Users change bolded parameters to reflect their financial condition. The spreadsheet automatically incorporates changes to bolded items throughout the rest of the spreadsheet. Only advanced users should change unbolded items and should do so with the expectation of unexpected results and errors.

Table 2, contained in Worksheet M, shows assumptions and input variables. The model design reflects investors earning some rate of return beyond inflation. Users enter their estimate of inflation in cell M:C4. Next, users enter their expected stock market return and real estate investments return in cells M:C5 and M:C6, respectively. Users enter a percentage real estate transaction fee in cell M:C7.

Next, users enter the life expectancy for Spouse 1 (S1) in cell M:C11. The model assumes a Spouse 2 (S2) age of two years lower than Spouse 1. Advanced users might change this assumption, but changes may require programming changes throughout the model. Users enter the planned year of retirement and current year in cells M:C12 and M:C13, respectively. Retirement year indicates when the couple will stop working. This date may differ from the Social Security draw date.

Users enter the current value of their retirement portfolio in cell M:C18. As designed these portfolio balances exist in pre-tax accounts such as IRAs. As such, the model calculates taxes due on all withdrawals from the account. Cell M:C19 shows the portfolio beta goal. This figure, while not bolded may be changed by the user. However, the figure does not affect other calculations in the model. Users should evaluate their stock return assumptions to assure consistency with portfolio risk taken. Cell C20 indicates the first-year desired portfolio withdrawal amount. This figure adjusts via a growing annuity pattern in following years as discussed later in the paper.

The section titled Social Security requires users to input the initial draw date from Social Security. As noted earlier this date may differ from the retirement date noted in cell M:C12. Cells M:C23 and M:C24 show the Social Security draw ages for Spouse 1 and Spouse 2, respectively. The model accommodates a second state pension SS2 for Spouse 2. Such a scenario might exist for individuals who work and earn a pension in multiple countries. Cell M:C25 indicates the initial draw age for the second pension.

Cells M:C26 and M:C27 show the current age of each spouse. Only advanced users should change these figures as doing so may necessitate other template changes. Next, users enter the 1st year Social Security supplement payment. This amount supplements spendable funds in years between retirement and drawing Social Security. A segregated part of the investment portfolio funds these withdrawals.

In the area titled Current SS amounts, users enter annual Social Security retirement amounts, in the case of U.S. retirees, as shown on their Social Security statement. To access U.S. Social Security statement amounts, individuals create an account with the U.S. Social Security Administration at www.ssa.gov.

The model accommodates a pension for Spouse 1. Pension calculations equal a percentage of the workers highest three-year average salary. Cell M:C44 reports the percentage of earnings payable to the retiree in each retirement year if the employee retires at age 62. The spreadsheet design assumes an initial pension payment draw date equal to the retirement date. For delayed retirement beyond age 62, pension amounts increase. Cell M:C45 shows the annual percentage pension increase for each year of added work.

Some pensions offer joint survivor benefits. Joint survivor benefits continue pension payments through the death of both spouses. Obtaining this feature often requires a reduction in the initial pension. Cell M:C46 indicates the percentage reduction in the pension required to obtain the dual survivor feature. Users not needing, or desiring, dual survivor benefits should set the entry to '0'.

Table 2: Model Parameters and Assumptions

	A	B	C	D	E	F
1	ASSUMPTIONS					
2						
3	<u>Market Returns and Inflation</u>					
4	Inflation		0.05			
5	Earned on Stock Mat. Invest.		0.07			
6	Return on Real Estate Invest.		0.05			
7	Real Estate Transaction Fees		0.06			
8						
9	<u>Life Expectancies</u>			S1 Age	S2 Age	
10	Life Expectancy S1		92			
11	Life Expectancy S2		90			
12	Retirement Year		2023	62	59	
13	*Current Year		2022	61	58	
14	* Current Year must be less than or equal to retirement year					
15						
16	<u>Investment Portfolio</u>					
17						
18	Starting Portfolio Value		600,000			
19	Target Portolio Beta		0.5			
20	Desired 1st Year Draw (\$2022)		18,000			
21						
22	<u>Social Security</u>					
23	S1 Draw Age		67	2028		
24	S2 SS1 Draw Age		65	2029		
25	S2 SS2 Draw Age		65	2029		
26	S1 Current Age		61			
27	S2 Current Age		59			
28	First Yr. SS Sup. Pmt (\$2022)		20,000			
29						
30	<u>Curr. SS Stat. Amts.</u>					
31	Retirement Year	S1 Age	S1 SS	S2 SS	S2 SS2	
32		2023	62	20,000	15,000	1,000
33		2024	63	21,600	16,200	1,050
34		2025	64	23,328	17,496	1,103
35		2026	65	25,194	18,895	1,158
36		2027	66	27,209	20,407	1,216
37		2028	67	29,385	22,040	1,276
38		2029	68	31,736	23,803	1,340
39		2030	69	34,275	25,707	1,407
40		2031	70	37,015	27,763	1,477
41						
42	<u>Pension</u>					
43						
44	Pension Age 62 Percent		0.44			
45	% Pens. Inc. Per Yr of Work		0.02			
46	Pens. Red. for Dual Life		0.15			
47	Ann Pens. Inc. %		0.03			

This table shows input variables and preliminary calculations for the model. Presented in Worksheet 'M'.

Table 3: Model Parameters and Assumptions (Continued)

	A	B	C	D	E	F	G	H	I	J	K
49	S1 Salary										
50	Growth as % of Inflation		0.75								
51											
52	Year		Age	Salary							
53	2021		60	80,000							
54	2022		61	83,000							
55	2023		62	86,113							
56	2024		63	89,342							
57	2025		64	92,692							
58	2026		65	96,168							
59	2027		66	99,774							
60	2028		67	103,516							
61	2029		68	107,398							
62	2030		69	111,425							
63	2031		70	115,604							
64											
65	Real Estate										
66											
67	<u>Current Values</u>		PR*	Value	Basis	Sale Yr.	S1 Age	S2 Age	Sale Price	Exclusion	Gain on Sale
68	Current RE1 Value		1	250,000	200,000	2060	99	96	1,500,587	500,000	800,587
69	Current RE2 Value		0	100,000	80,000	2045	84	81	288,723	0	208,723
70	Current RE3 Value		0	80,000	70,000	2051	90	87	309,533	0	239,533
71	Current II Value		0	50,000	50,000	2056	95	92	246,907	0	196,907
72	Current RP Value		0	20,000	20,000	2029	68	65	26,453	0	6,453
73											
74	* PR 1= Primary Residence, 0 = Not Primary Residence										
75											
76	<u>Property Rentals in \$2022</u>		Annual								
77			Rental	Until Yr	S1 Age	S2 Age					
78	RE1 Rent 1		0	2060	99	96					
79	RE1 Rent 2		0								
80	RE 2 Rent 1		12,000	2030	69	66					
81	RE2 Rent 2		0								
82	RE3 Rent 1		0	2061	100	97					
83	RE3 Rent 2		0								
84	II Rent 1		3,000	2034	73	70					
85	II Rent 2		3,000								
86	RP Rent 1		0	2035	74	71					
87	RP Rent 2		0								
88											
89	Inheritance Year		2034		73	70					
90											
91	SPENDING ANALYSIS										
92	Current Spending Level		60,000								
93	Ret. Base Spend (\$2022)		80,000	133.33%							
94	Init. Spend in Ret. Future \$		84,000								
95											
96	Proposed Spending (\$2022)										
97	Food		12,000	15.00%							
98	Housing		12,000	15.00%							
99	Entertainment		10,000	12.50%							
100	Medical		10,000	12.50%							
101	MSC		10,000	12.50%							
102	Give Away		3,000	3.75%							
103	Car		8,000	10.00%							
104	Travel		10,000	12.50%							
105	Long Term Care Insurance		5,000	6.25%							
106											
107	Total Spending		80,000								

This table shows input variables and preliminary calculations for the model. Presented in Worksheet 'M'.

The pension increases annually in retirement. The annual increase equals some percentage of the initial pension amount. In the example presented here the user adjustable percentage equals three. Suppose a worker receives an initial annual pension equaling \$20,000. The annual pension increases equal \$1,200 per year ($20,000 \times 0.03$). The retiree receives a \$1,200 annual increase each year for life. This feature exposes the retiree to inflation risk, especially problematic at higher levels of inflation. Retirees facing this situation must make other accommodations to address the decreasing purchasing power or decrease real spending throughout their life.

Table 3, contained in Worksheet M, continues the presentation of model parameters and assumptions. The first section of Table 3 shows salary inputs. Users enter their beginning, 2021 salary in Cell M:C53. The worksheet calculates salaries in following years based on the inflation rate.

Workers might expect salary increases above or below inflation. To accommodate this possibility users enter their expected annual salary adjustment as a percent of inflation in Cell M:D50. Advanced users, who wish to more specifically estimate future salaries, may override figures in cells M:D54-D63 to reflect their expectations.

The next worksheet section deals with real estate holdings. Users enter the current value of current and future real estate holdings in cells M:D68-D72. RE1, RE2 and RE3 represent standard properties owned by the retiree, including their primary residence. I1 indicates an inherited property, with Cell M:C89 indicating when the retiree expects to acquire the inheritance. RP1 represents a purchase for retirement purposes. This purchase occurs on the retirement date noted in cell M:C12. Users who do not have real estate holdings set these values to zero. Users enter property current tax bases in cells M:E68-E71. Primary residence properties receive special tax treatment. Entries in Cells M:C68-C72 inform the tool of the primary residence status of each property. An entry of 1 denotes a principal residence. An entry of 0 denotes a non-principle residence property. Users enter their tax basis for each property in cells M:D68-D71.

Retirees may rent a property to provide income during retirement. Cells M:C78-C87 indicate annual rental income proceeds from each property in current dollars. The model accommodates two rental periods with separate rental rates. For example, RE2 has annual rental income of \$12,000 from the retirement year, adjusted for inflation, through 2030. Some retirees use a property for their personal needs for some years, followed by a rental period. In this case, enter 0 for the first rental period and the current dollar rent value in the second period. Enter the end of the first rental period in cells M:D78, M:D80, M:D82, M:D84 and M:D86.

Retirees commonly sell properties as they progress through their retirement years. For example a second home may become undesirable when retirees reach their 90's. Further, some retirees sell their home when they transition to an extended care facility. In other cases, retirees sell homes to extend their spending power. Cells M:F68 through M:F72 indicate the intended sale year for each property. The tool calculates property sales proceeds based on the current price and assumed return on real estate, entered in cell M:C6. Real estate transaction fees, noted in Cell M:C27 reduce the sales price. The spreadsheet calculates taxable gain on sales considering the sales price, property basis, real estate transaction fee and any applicable exclusions for primary residences.

Table 3 continues with an examination of spending. Users indicate their current annual spending level in cell M:C92. Retirees spend more or less than this amount in retirement. Some individuals will spend more money in the newly available free time in retirement. New spending might include entertainment and travel expenses. Others spend less in retirement because lower income forces an adjustment in spending or because they no longer have work related expenses. Retirees indicate their planned total annual retirement

spending in cell M:C93 in current dollars. Cell M:C94 shows future spending in year 1 of retirement after accounting for inflation.

Cells M:C97-C105 allow the user to develop a planned retirement budget with expenses classified into categories. Users adjust these figures to reflect their own spending. Users enter their choices on spending by area to assure planned spending corresponds with the overall spending budget. While these figures do not factor into other calculations in the spreadsheet, they do provide an explicit statement about what expenses need to be covered by various sources of income.

Table 4, contained in Worksheet M, continues the presentation of model parameters and assumptions. The table begins with an analysis of operating cash. Users input their current operating cash level in cell M:C110. Enter projected annual savings, in current dollars, for the remaining pre-retirement years in cell M:C123. They also indicate the desired operating cash level in their retirement years in cell M:C115. Next, users enter planned cash purchases prior to retirement in cells M:C111–C116. These purchases might include new cars, house repairs or other items. With this information entered, the spreadsheet reports the amount of excess operating cash on hand or the operating cash deficit in cell M:C120. Users adjust their spending plans to reach the targeted amount of operating cash on the retirement date.

Table 4: Model Parameters and Assumptions (Continued)

	A	B	C	D	E	F	G
109	<u>CASH ANALYSIS</u>						
110	Current Cash		100,000				
111	S1 Car Purchase		35,000				
112	S2 Car Purchase		35,000				
113	RE1 Repair		4,000				
114	RE 2 Prepair		3,000				
115	RE3 Repair		2,000				
116	Business Liabilities		1,000				
117	Savings pre retirement		24,000				
118	Net Cash for Retirement		44,000				
119	Desired Cash Level		40,000				
120	Excess Cash		4,000				
121							
122	<u>Savings</u>						
123	Current Annual Savings		24,000				
124							
125	<u>Tax Assumptions</u>						
126	Hawaii Exemptions		2				
127	HI Standard Deduction		2,000				
128	HI Exemptions		1,444				
129	Current Ordinary Income Tax Rate Fed + S		32%		Filing Status		
130	HI CG Tax Rate		7.5%		Single = 1		
131	2022 Fed Standard Deduction		25,900		Married Filing Joint = 2		
132	Once in a Life time exclusion		500,000		Married Filing Separate = 3		
133	Filing Status		2		Head of Household = 4		
134							
135	<u>Fund Balance Calculations</u>						
136	Current Retirement Funds		600,000				
137	After Tax RP		26,400				
138	SS Fund		94,530				
139	Unused GA Funds		0				
140	Initial GA Fund		418,494				
141	Reserve Funds		60,575				
142	Starting Total Funds EX SS fund		505,470				
143	Starting Total Funds EX Ret. Purch.		573,600				

This table shows input variables and preliminary calculations for the model. Presented in Worksheet 'M'.

Reserve funds reported in Cell M:C141 represent money remaining in excess of funds necessary to pay for the retirement purchase, M:C136, provide the delayed Social Security offset fund, M:C137, and, fund the growing annuity, M:C139. The calculation includes excess growing annuity funds that occur as a result of delayed retirement. Reserve funds cover discrepancies that may occur between income and spending throughout the lifetime and functions as an emergency fund for unexpected occurrences. The rows labeled Starting Total Funds EX SS fund and Starting Total Funds EX RP represent intermediary computations to complete calculations that follow.

Next Table 4 requires tax assumption inputs. The program incorporates basic tax calculations. Advanced users can consider more detailed tax calculations. This template incorporates the U.S. Federal taxes and the Hawaii State tax system. Advanced users may modify the spreadsheet to reflect taxes associated with other states and localities. Users enter three tax parameters. State of Hawaii taxation utilizes exemptions. Enter the number of Hawaii exemptions in Cell M:C126. Enter the filing status in cell M:C133 (1 for single, 2 for married filing a joint return, 3 for married filing a separate return and 4 for head of household).

The presentation continues with the current ordinary income state and federal tax rate entered in cell M:C129. This rate relates to purchase of the retirement property noted in row 72. By assumption, IRA's hold all retirement funds. To obtain funds necessary to make the retirement purchase, retirees withdraw money from the IRA. The current ordinary income State and Federal tax rate, noted in cell M:C129 equals the rate of taxes retirees must pay on these withdrawals. The following discussion reflects calculations based on this rate.

The section titled Fund Balance Calculations provides some preliminary computations. Current retirement funds are taken from cell M:C18. As noted above the retirement purchase requires withdrawal from the pre-tax IRA. Cell M:C137 shows the sum of the purchase amount entered in cell M:D72 plus the tax due on withdrawal. Thus, a \$20,000 purchase requires withdrawing 26,400 from the retirement fund. SS Fund indicates the special fund set aside to substitute for Social Security receipts in the years between retirement and the time Social Security is drawn. In the example presented here, the retiree sets aside \$94,530 at the time of retirement to supplement income until the retiree claims Social Security.

The analysis here uses a growing annuity to supplement pension receipts that decline in value due to inflation. The growing annuity provides increasingly large payments to offset the loss in purchasing power thereby maintaining a constant real spending pattern. Cell M:C140 shows the amount of money required today, to achieve the payments throughout the live expectancy noted in cells M:C10 and M:C11.

Table 5, appearing in Worksheet M shows income calculations from the pension, Social Security and investments. Figures in Table 5 require no user input. Calculations reflect user entries in Tables 2-4. The presentation shows results for each year from retirement through age 111 for Spouse 1 and 109 for Spouse 2. Column M:P, M:Q and M:R shows the year, along with the age of each spouse. Column M:S shows a year counter to facilitate computations. Column M:T reflects pension income along with the annual raise in Column M:U. As noted earlier, annual pension raises equal a fixed dollar amount based on a percentage of the initial pension payment. Pension amounts reflect changes in work earnings amounts and changes in retirement year noted in cells M:D53-D63 and M:C12 respectively. Table 9, presented in Worksheet P, shows supporting pension calculations. Table 9 requires no user input. The table shows pension amounts that occur in each retirement year, for each possible retirement date. Pension calculations average the highest three years of earnings. Annual pension payments in the first retirement year equal a percentage of the highest three-year average salary. Gross pension, Column P:E equals the first-year annual pension amount without the spouse protection feature. Post Reduction equals the first-year annual pension with spouse protection.

Table 5: Income from Pension Social Security and Investment Income

	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
1	AGE				INCOME										
2					PENSION			SOCIAL SECURITY					INVESTMENTS		
3					Annual	Pension							Invest	Special	PV Special
4	Year	S1 Age	S2 Age	Year	Pension	Raise		S1 SS	S2 SS1	S2 SS2	Total SS		Withdrawal	Withdrawals	Withdrawal
5	2023	62	59	0	31,056	932		0	0	0	0		18,900	21,000	19,626
6	2024	63	60	1	31,988	932		0	0	0	0		19,845	22,050	19,259
7	2025	64	61	2	32,919	932		0	0	0	0		20,837	23,153	18,899
8	2026	65	62	3	33,851	932		0	0	0	0		21,879	24,310	18,546
9	2027	66	63	4	34,783	932		0	0	0	0		22,973	25,526	18,199
10	2028	67	64	5	35,714	932		39,379	0	0	39,379		24,122	0	0
11	2029	68	65	6	36,646	932		41,348	28,715	1,340	71,402		25,328	0	0
12	2030	69	66	7	37,578	932		43,415	30,150	1,407	74,973		26,594	0	0
13	2031	70	67	8	38,509	932		45,586	31,658	1,477	78,721		27,924		
14	2032	71	68	9	39,441	932		47,865	33,241	1,551	82,657		29,320		
15	2033	72	69	10	40,373	932		50,258	34,903	1,629	86,790		30,786		
16	2034	73	70	11	41,305	932		52,771	36,648	1,710	91,130		32,325		
17	2035	74	71	12	42,236	932		55,410	38,480	1,796	95,686		33,942		
18	2036	75	72	13	43,168	932		58,180	40,404	1,886	100,470		35,639		
19	2037	76	73	14	44,100	932		61,089	42,425	1,980	105,494		37,421		
20	2038	77	74	15	45,031	932		64,144	44,546	2,079	110,769		39,292		
21	2039	78	75	16	45,963	932		67,351	46,773	2,183	116,307		41,256		
22	2040	79	76	17	46,895	932		70,719	49,112	2,292	122,122		43,319		
23	2041	80	77	18	47,826	932		74,254	51,567	2,407	128,229		45,485		
24	2042	81	78	19	48,758	932		77,967	54,146	2,527	134,640		47,759		
25	2043	82	79	20	49,690	932		81,866	56,853	2,653	141,372		50,147		
26	2044	83	80	21	50,621	932		85,959	59,696	2,786	148,441		52,655		
27	2045	84	81	22	51,553	932		90,257	62,681	2,925	155,863		55,287		
28	2046	85	82	23	52,485	932		94,770	65,815	3,072	163,656		58,052		
29	2047	86	83	24	53,416	932		99,508	69,105	3,225	171,838		60,954		
30	2048	87	84	25	54,348	932		104,483	72,561	3,386	180,430		64,002		
31	2049	88	85	26	55,280	932		109,708	76,189	3,556	189,452		67,202		
32	2050	89	86	27	56,211	932		115,193	79,998	3,733	198,925		70,562		
33	2051	90	87	28	57,143	932		120,953	83,998	3,920	208,871		74,090		
34	2052	91	88	29	58,075	932		127,000	88,198	4,116	219,314		77,795		
35	2053	92	89	30	59,006	932		133,350	92,608	4,322	230,280		81,685		
36	2054	93	90	31	59,938	932		140,018	97,238	4,538	241,794		0		
37	2055	94	91	32	60,870	932		147,019	102,100	4,765	253,884		0		
38	2056	95	92	33	61,801	932		154,370	107,205	5,003	266,578		0		
39	2057	96	93	34	62,733	932		162,088	112,565	5,253	279,907		0		
40	2058	97	94	35	63,665	932		170,193	118,194	5,516	293,902		0		
41	2059	98	95	36	64,597	932		178,702	124,103	5,792	308,597		0		
42	2060	99	96	37	65,528	932		187,637	130,308	6,081	324,027		0		
43	2061	100	97	38	66,460	932		197,019	136,824	6,385	340,228		0		
44	2062	101	98	39	67,392	932		206,870	143,665	6,705	357,240		0		
45	2063	102	99	40	68,323	932		217,214	150,848	7,040	375,102		0		
46	2064	103	100	41	69,255	932		228,074	158,391	7,392	393,857		0		
47	2065	104	101	42	70,187	932		239,478	166,310	7,762	413,550		0		
48	2066	105	102	43	71,118	932		251,452	174,626	8,150	434,227		0		
49	2067	106	103	44	72,050	932		264,024	183,357	8,557	455,939		0		
50	2068	107	104	45	72,982	932		277,226	192,525	8,985	478,736		0		
51	2069	108	105	46	73,913	932		291,087	202,151	9,434	502,672		0		
52	2070	109	106	47	74,845	932		305,641	212,259	9,906	527,806		0		
53	2071	110	107	48	75,777	932		320,923	222,872	10,401	554,196		0		
54	2072	111	108	49	76,708			320,923	222,872	10,921	554,716		0		

This table shows income calculations for pension, Social Security, and investments. Column P shows the year, Column Q and R indicate the ages of Spouse 1 and Spouse 2, respectively. Column S is a year counter. Column T and U show the annual pension payment and annual pension increase for Spouse 1. Column W shows annual Social Security receipts for Spouse 1. Column X and Y show the annual Social Security receipts for Social Security accounts of Spouse 2. Column Z shows the joint Social Security receipts for the couple. Column AB shows withdrawals from the growing annuity element of the investment portfolio. Column AC shows special withdrawals to supplement Social Security receipts. Column AD shows the present value of special withdrawals. Presented in Worksheet 'M'.

Returning to Table 5, Social Security computations begin in Column M:W. S1 SS indicates the annual Social Security for Spouse 1. S2 SS1 reports the annual Social Security for Spouse 2. S2 SS2 shows the second Social Security type account for Spouse 2. Calculations automatically adjust to reflect changes in earnings amounts and Social Security draw years. Table 10, presented in Worksheet ‘SS’ shows supporting Social Security calculations. Table 10 requires no user input. U.S. Social Security earnings statements show payment amounts in current dollars. The analysis requires future values of these figures. Table 10 provides calculations of future dollar social security amounts calculated using the user entered inflation rate provided in Cell M:C4 of Table 2.

Table 10 shows annual Social Security receipts for each initial draw year from age 62 through 70. Users enter the Social Security draw date in Table 2 Cells M:C23 through M:C25. The worksheet selects the column of data corresponding to the user inputted Social Security retirement year. Table 10 shows results for Spouse 1 only. The spreadsheet includes similar figures for Spouse 2 social security accounts 1 and 2. The later figures do not appear here to conserve space.

Returning to Table 5, Columns M:AB through M:AC report investment account withdrawals. Column M:AB reports withdrawals from the growing annuity. These withdrawals begin in the retirement year and increase at a rate equaling inflation through the couple’s life expectancy. Table 11, shown in Worksheet A, requiring no user input, shows the supporting calculations. Consider a growing annuity with desired first year payment of, PMT, payment growth rate of G, return on investment of I, and life of N. Then Equation 1 calculates the growing annuity present value, PVGA, for the example annuity with a desired first year payment of \$18,900, a payment growth rate of 5 percent, a return on investments of 7 percent and a lifetime of 31 years:

$$PVGA = \frac{PMT}{I-G} \left[1 - \left(\frac{1+G}{1+I} \right)^N \right] \tag{1}$$

$$PVGA = \frac{18,900}{.07-.05} \left[1 - \left(\frac{1+.05}{1+.07} \right)^{31} \right] = 418,494.43$$

The result indicates that achieving a growing series of payments starting at \$18,900 requires a beginning balance of \$418,494.13. Table 11 shows growing annuity calculations along with an amortization table that depicts the account earnings, withdrawals and balances in each year. Table 11 requires no user input.

In the event of delayed retirement, some growing annuity payments are not expended. Unused sums add to the reserve fund for other retirement needs and appear in Table 4 Cell M:C139. Table 12, shown in Worksheet O indicates the amount of these additions. Table 12 requires no user input.

Special withdrawals from the retirement account replace Social Security receipts between the retirement year and initial Social Security draw year. Amounts of these withdrawals depend upon an initial desired withdrawal rate, inflation, retirement date and Social Security collection date. Returning to Table 5, Column M:AC reports withdrawal amounts. Column M:AD calculates the present value of these withdrawal amounts discounted at the return on investments. Table 12 shows an amortization table for special funds set aside to replace Social Security receipts. The combined present value of these withdrawals reduce pension funds available to establish the growing annuity.

Table 6, presented in Worksheet M, shows rental income earned on real properties and the sale of those properties. Table 6 requires no user input. Calculations reflect entries noted in Tables 2-4. Columns M:AF-AJ report income for the five classes of property. User entries in cells M:A76-C89 drive reported figures. Rents increase annually at the inflation rate. Table 13, shown in Worksheet R shows supporting calculations which do not require user inputs.

Table 6: Property Rental and Sales

	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP
1												
2		RENTAL						PROP SALES				
3		RE 1	RE 2	RE 3	II	RP		RE1	RE2	RE3	II	RP
4	Year	Rental Inc.	Rental Inc.	Rental Inc.	Rental Inc.	Rental Inc.		Sale	Sale	Sale	Sale	Sale
5	2023	0	12,000	0	0	0		0	0	0	0	0
6	2024	0	12,600	0	0	0		0	0	0	0	0
7	2025	0	13,230	0	0	0		0	0	0	0	0
8	2026	0	13,892	0	0	0		0	0	0	0	0
9	2027	0	14,586	0	0	0		0	0	0	0	0
10	2028	0	15,315	0	0	0		0	0	0	0	0
11	2029	0	16,081	0	0	0		0	0	0	0	26,453
12	2030	0	0	0	0	0		0	0	0	0	0
13	2031	0	0	0	0	0		0	0	0	0	0
14	2032	0	0	0	0	0		0	0	0	0	0
15	2033	0	0	0	0	0		0	0	0	0	0
16	2034	0	0	0	5,131	0		0	0	0	0	0
17	2035	0	0	0	5,388	0		0	0	0	0	0
18	2036	0	0	0	5,657	0		0	0	0	0	0
19	2037	0	0	0	5,940	0		0	0	0	0	0
20	2038	0	0	0	6,237	0		0	0	0	0	0
21	2039	0	0	0	6,549	0		0	0	0	0	0
22	2040	0	0	0	6,876	0		0	0	0	0	0
23	2041	0	0	0	7,220	0		0	0	0	0	0
24	2042	0	0	0	7,581	0		0	0	0	0	0
25	2043	0	0	0	7,960	0		0	0	0	0	0
26	2044	0	0	0	8,358	0		0	0	0	0	0
27	2045	0	0	0	8,776	0		0	288,723	0	0	0
28	2046	0	0	0	9,215	0		0	0	0	0	0
29	2047	0	0	0	9,675	0		0	0	0	0	0
30	2048	0	0	0	10,159	0		0	0	0	0	0
31	2049	0	0	0	10,667	0		0	0	0	0	0
32	2050	0	0	0	11,200	0		0	0	0	0	0
33	2051	0	0	0	11,760	0		0	0	309,533	0	0
34	2052	0	0	0	12,348	0		0	0	0	0	0
35	2053	0	0	0	12,966	0		0	0	0	0	0
36	2054	0	0	0	13,614	0		0	0	0	0	0
37	2055	0	0	0	14,295	0		0	0	0	0	0
38	2056	0	0	0	0	0		0	0	0	246,907	0
39	2057	0	0	0	0	0		0	0	0	0	0
40	2058	0	0	0	0	0		0	0	0	0	0
41	2059	0	0	0	0	0		0	0	0	0	0
42	2060	0	0	0	0	0		1,500,587	0	0	0	0
43	2061	0	0	0	0	0		0	0	0	0	0
44	2062	0	0	0	0	0		0	0	0	0	0
45	2063	0	0	0	0	0		0	0	0	0	0
46	2064	0	0	0	0	0		0	0	0	0	0
47	2065	0	0	0	0	0		0	0	0	0	0
48	2066	0	0	0	0	0		0	0	0	0	0
49	2067	0	0	0	0	0		0	0	0	0	0
50	2068	0	0	0	0	0		0	0	0	0	0
51	2069	0	0	0	0	0		0	0	0	0	0
52	2070	0	0	0	0	0		0	0	0	0	0
53	2071	0	0	0	0	0		0	0	0	0	0
54	2072	0	0	0	0	0		0	0	0	0	0

This table shows real estate rental income and real estate sales prices. Sales prices equal the future value of current real estate values calculated using the user entered return on real estate investments, Cell M:C6. Sales prices are reduced by user entered real estate transaction fees, Cell M:C7. RE1-RE3 equal real estate properties 1-3 respectively. II indicates an inherited property. RP indicates a property bought for retirement use. Presented in Worksheet 'M'.

As noted earlier, retirees may sell real estate over time to supplement their income needs. Returning to Table 6, Columns M:AI-AP reflect these sales. Sales amounts equal the future value of the property, calculated with interest rate equal to the return on real estate property noted in cell M:C6. Real estate transaction fees input in cell M:C7 reduces sales receipts.

Table 7, presented in Worksheet M, reveals total income in Column M:AT. Columns M:AR and M:AS segregate income into ordinary and capital gain components, respectively. Column M:AV reports Federal taxes due and Column M:AW reports State taxes due. Column M:AX shows the total tax due. Net for spending, reported in Column M:AY, indicates after-tax funds available for spending in each year.

Tables 14-17 show supporting Federal tax calculations, as reported on Worksheet F. The spreadsheet provides corresponding computations for State of Hawaii taxes; however, to conserve space this manuscript excludes these calculations. Tables 14-17 require no user inputs.

Unknown future tax rates and taxable income ranges complicate tax calculations. To address these issues, the analysis here assumes rates remain unchanged, however, standard deductions and tax rate income ranges increase with inflation. These assumptions generally correspond to current tax policies.

A three-step process simplifies the tax calculations. Step 1: calculate the present value of future taxable income streams. Step 2: Calculate the tax due at current rates. Step 3: Calculate the future value of taxes due. Table 14 shows 2022 Federal tax rates. The worksheet shows tables for each filing status (Married Filing Separately and Head of Household tables not reported to conserve space). The spreadsheet selects the appropriate table based on user entries in Table 4: Cell M:C133. For future use, the template should be modified to reflect relevant tax rates.

Table 15 reports the gain on sale for each real estate property owned and totals these gains. The worksheet completes the calculations based on user entered figures in Table 3: Rows M:67-72. Tables 16 and 17 show further tax calculations. The analysis divides income into capital gains and ordinary income components. Calculations show taxes due on each income type separately then combines them to reach the total taxes due.

Table 7: Total Income, Tax and Net Funds for Spending Calculations

	AQ	AR	AS	AT	AU	AV	AW	AX	AY
1									
2		TOTAL INCOME				TAXES			
3		Gross	Gross	Gross					Net For
4	Year	Ord. Inc.	C.G. Inc.	Total Inc.	Fed Tax	State Tax	Total Tax		Spending
5	2023	82,956	0	82,956	7,554	1,561	9,115		73,841
6	2024	86,483	0	86,483	7,857	1,794	9,651		76,832
7	2025	90,139	0	90,139	8,170	2,054	10,224		79,915
8	2026	93,932	0	93,932	8,493	2,344	10,837		83,095
9	2027	97,868	0	97,868	8,826	2,669	11,496		86,372
10	2028	114,530	0	114,530	9,971	605	10,576		103,954
11	2029	149,458	26,453	175,911	10,172	1,229	11,401		164,510
12	2030	139,145	0	139,145	6,767	1,100	7,868		131,277
13	2031	145,155	0	145,155	6,897	1,299	8,197		136,958
14	2032	151,419	0	151,419	7,024	1,524	8,548		142,871
15	2033	157,949	0	157,949	7,146	1,775	8,921		149,028
16	2034	169,891	0	169,891	8,393	1,984	10,377		159,514
17	2035	177,252	0	177,252	8,563	2,294	10,857		166,394
18	2036	184,934	0	184,934	8,732	2,641	11,372		173,562
19	2037	192,954	0	192,954	8,899	3,152	12,050		180,904
20	2038	201,328	0	201,328	9,063	3,606	12,670		188,659
21	2039	210,075	0	210,075	9,226	4,113	13,339		196,736
22	2040	219,212	0	219,212	18,605	4,049	22,655		196,557
23	2041	228,760	0	228,760	19,366	4,636	24,002		204,758
24	2042	238,738	0	238,738	20,159	5,290	25,449		213,289
25	2043	249,169	0	249,169	20,987	6,033	27,020		222,149
26	2044	260,074	0	260,074	21,850	6,876	28,726		231,348
27	2045	271,479	288,723	560,202	22,750	23,471	46,221		513,981
28	2046	283,407	0	283,407	23,690	8,863	32,553		250,853
29	2047	295,885	0	295,885	24,671	10,066	34,738		261,147
30	2048	308,940	0	308,940	25,696	11,409	37,105		271,834
31	2049	322,601	0	322,601	26,767	12,904	39,671		282,930
32	2050	336,899	0	336,899	27,885	14,567	42,452		294,447
33	2051	351,865	309,533	661,398	29,054	34,381	63,435		597,963
34	2052	367,532	0	367,532	30,276	18,471	48,747		318,786
35	2053	383,937	0	383,937	31,553	20,754	52,307		331,630
36	2054	315,346	0	315,346	22,596	0	22,596		292,750
37	2055	329,048	0	329,048	23,478	0	23,478		305,570
38	2056	328,379	246,907	575,287	22,597	14,768	37,365		537,921
39	2057	342,640	0	342,640	23,468	0	23,468		319,172
40	2058	357,567	0	357,567	24,377	0	24,377		333,190
41	2059	373,194	0	373,194	25,326	0	25,326		347,868
42	2060	389,555	1,500,587	1,890,142	26,316	60,044	86,360		1,803,782
43	2061	406,688	0	406,688	27,351	0	27,351		379,338
44	2062	424,631	0	424,631	28,431	0	28,431		396,200
45	2063	443,425	0	443,425	29,560	0	29,560		413,865
46	2064	463,112	0	463,112	30,740	0	30,740		432,372
47	2065	483,736	0	483,736	31,973	0	31,973		451,763
48	2066	505,346	0	505,346	33,263	0	33,263		472,083
49	2067	527,989	0	527,989	34,611	0	34,611		493,378
50	2068	551,717	0	551,717	36,021	0	36,021		515,696
51	2069	576,586	0	576,586	37,496	0	37,496		539,090
52	2070	602,651	0	602,651	39,039	0	39,039		563,612
53	2071	629,973	0	629,973	40,654	0	40,654		589,319
54	2072	631,425	0	631,425	39,570	0	39,570		591,855

This table shows taxable ordinary, capital gains and total income. It also shows approximate tax calculations of Federal and State taxes. Tax calculations incorporate user entered filing status data in cell M:C133 and number of exemptions noted in cell M:C126. The final column indicates after-tax funds available for the retiree to spend. Presented in Worksheet 'M'.

Table 8, presented in Worksheet M, presents figures showing spending patterns and fund balances. Column M:BA shows actual spending of the couple. Actual spending figures reflect annual increases to support a constant inflation adjusted spending pattern throughout the retirement years. Users enter the current dollar, desired annual spending level in Cell M:C93 of Table 3. Table 3, Cell M:C94 and Table 8, cell M:BA5 show the inflation adjusted annual spending amount in the first year of retirement. Returning to Table 8, initial spending increases at the inflation rate throughout retirement as noted in Column BA entries. Column BB calculates differences in spending between actual spending noted in Column BA and funds available for spending reported in Column M:AY. The 2023 calculation shows that actual spending exceeds funds available for spending by \$10,159. Money to accommodate the excess spending, noted in Column M:BB, comes from the reserve account noted Table 4, Cell M:C141. Pre-tax accounts hold the reserve funds, requiring tax payment on their withdrawal. Returning to Table 8, Column M:BS shows tax due on excess spending withdrawals, calculated at the relevant marginal tax rate.

The Fund Balance part of Table 8 shows funds held in various retirement accounts. Column M:BD shows funds withdrawn from all accounts in each year. Careful readers will note some negative figures in Column M:BD which indicate a surplus for the year. Surpluses generally occur upon sale of properties or when a major new income stream becomes available. Column M:BE shows total fund earnings for the year. Fund earnings occur based on the stock market investment return rate entered in Table 2, Cell M:C5. Returning to Table 8, Column M:BF indicates total year-end fund balances held in all accounts. The calculation incorporates previous year fund balances along with withdrawals and earnings on the account. Columns M:BG, M:BH and M:BI indicate details of the Total Fund Balance. Columns M:BG, M:BH and M:BI indicate growing annuity, Social Security, and reserve fund balances respectively. Finally, Column BJ indicates the present value of all funds held. These present values allow users to visualize their future financial position in terms relatable to their current financial position.

Table 8: Spending and Fund Balances

	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ
1											
2		SPENDING			FUND BALANCE						
3		Actual	Excess	Tax on Ex.	Total Fund	Total Fund	All Funds		SS Act.	Res Fnd	PV All
4	Year	Spending	Spending	Spending	Draws	Earnings	Balance	GA Bal.	Bal.	Balance	Funds Balance
5	2023	84,000	10,159	1,910	51,969	40,152	561,783	428,889	80,147	52,746	561,783
6	2024	88,200	11,368	2,137	55,401	39,325	545,707	439,066	63,708	42,933	519,721
7	2025	92,610	12,695	2,387	59,071	38,199	524,836	448,964	45,015	30,857	476,041
8	2026	97,241	14,146	2,659	62,994	36,738	498,580	458,512	23,856	16,212	430,692
9	2027	102,103	15,731	3,020	67,249	34,901	466,231	467,635	0	-1,404	383,569
10	2028	107,208	3,253	569	27,945	32,636	470,923	476,247	0	-5,325	368,980
11	2029	112,568	-51,942	0	-26,615	32,965	530,502	484,257	0	46,245	395,869
12	2030	118,196	-13,080	0	13,514	37,135	554,123	491,561	0	62,562	393,805
13	2031	124,106	-12,851	0	15,072	38,789	577,839	498,046	0	79,793	391,104
14	2032	130,312	-12,559	0	16,761	40,449	601,527	503,589	0	97,938	387,750
15	2033	136,827	-12,201	0	18,585	42,107	625,049	508,054	0	116,994	383,726
16	2034	143,669	-15,845	0	16,480	43,753	652,322	511,293	0	141,029	381,399
17	2035	150,852	-15,542	0	18,399	45,663	679,585	513,142	0	166,443	378,418
18	2036	158,395	-15,167	0	20,472	47,571	706,684	513,423	0	193,262	374,770
19	2037	166,314	-14,589	0	22,831	49,468	733,321	511,942	0	221,379	370,377
20	2038	174,630	-14,029	0	25,263	51,332	759,390	508,486	0	250,905	365,280
21	2039	183,361	-13,375	0	27,882	53,157	784,666	502,824	0	281,843	359,465
22	2040	192,530	-4,028	0	39,291	54,927	800,302	494,702	0	305,600	349,169
23	2041	202,156	-2,602	0	42,883	56,021	813,440	483,846	0	329,594	338,001
24	2042	212,264	-1,025	0	46,734	56,941	823,646	469,956	0	353,691	325,945
25	2043	222,877	728	140	51,015	57,655	830,287	452,705	0	377,581	312,926
26	2044	234,021	2,672	513	55,840	58,120	832,566	431,740	0	400,826	298,843
27	2045	245,722	-268,259	0	-212,972	58,280	1,103,818	406,675	0	697,144	377,340
28	2046	258,008	7,155	1,374	66,580	77,267	1,114,505	377,090	0	737,415	362,851
29	2047	270,908	9,761	1,913	72,629	78,015	1,119,892	342,532	0	777,360	347,242
30	2048	284,454	12,619	2,473	79,095	78,392	1,119,189	302,507	0	816,682	330,500
31	2049	298,677	15,746	3,086	86,035	78,343	1,111,498	256,480	0	855,017	312,598
32	2050	313,610	19,164	3,756	93,482	77,805	1,095,820	203,872	0	891,949	293,514
33	2051	329,291	-268,672	0	-194,582	76,707	1,367,110	144,052	0	1,223,057	348,741
34	2052	345,755	26,970	5,286	110,051	95,698	1,352,756	76,341	0	1,276,416	328,647
35	2053	363,043	31,413	6,157	119,255	94,693	1,328,195	0	0	1,328,195	307,314
36	2054	381,195	88,445	11,852	100,297	92,974	1,320,871	0	0	1,320,871	291,067
37	2055	400,255	94,685	12,688	107,373	92,461	1,305,960	0	0	1,305,960	274,077
38	2056	420,268	-117,654	0	-117,654	91,417	1,515,031	0	0	1,515,031	302,813
39	2057	441,281	122,109	16,363	138,472	106,052	1,482,611	0	0	1,482,611	282,222
40	2058	463,345	130,155	17,441	147,596	103,783	1,438,797	0	0	1,438,797	260,840
41	2059	486,513	138,644	18,578	157,223	100,716	1,382,290	0	0	1,382,290	238,663
42	2060	510,838	-1,292,944	0	-1,292,944	96,760	2,771,995	0	0	2,771,995	455,815
43	2061	536,380	157,042	21,044	178,086	194,040	2,787,948	0	0	2,787,948	436,608
44	2062	563,199	166,999	22,378	189,377	195,156	2,793,728	0	0	2,793,728	416,679
45	2063	591,359	177,494	23,784	201,278	195,561	2,788,010	0	0	2,788,010	396,025
46	2064	620,927	188,555	25,266	213,822	195,161	2,769,350	0	0	2,769,350	374,642
47	2065	651,973	200,210	26,828	227,038	193,854	2,736,166	0	0	2,736,166	352,527
48	2066	684,572	212,489	28,474	240,963	191,532	2,686,735	0	0	2,686,735	329,674
49	2067	718,801	225,423	30,207	255,630	188,071	2,619,176	0	0	2,619,176	306,080
50	2068	754,741	239,044	32,032	271,076	183,342	2,531,442	0	0	2,531,442	281,741
51	2069	792,478	253,388	33,954	287,342	177,201	2,421,301	0	0	2,421,301	256,650
52	2070	832,102	268,490	35,978	304,467	169,491	2,286,325	0	0	2,286,325	230,803
53	2071	873,707	284,387	38,108	322,495	160,043	2,123,873	0	0	2,123,873	204,194
54	2072	917,392	325,537	43,622	369,159	148,671	1,903,384	0	0	1,903,384	174,281

This table shows spending patterns and fund balances. GA indicates the growing annuity account balance. SS Act Bal. indicates retirement savings earmarked to replace income missed by delaying drawing Social Security until after retirement. Table entries require no user input. Presented in Worksheet 'M'.

Table 9: Pension Income

	A	B	C	D	E	F	G	H	I	J	K
1	PENSION										
2											
3	Salary Gr. Rel. to Infl.		0.75								
4											
5	S1	S1	Pension	Pension	Gross	Post	Annual				
6	Age	Salary	Salary	Percent	Pension	Reduction	Raise				
7	60	80,000									
8	61	83,000									
9	62	86,113	83,038	0.44	36,537	31,056	932				
10	63	89,342	86,151	0.46	39,630	33,685	1,011				
11	64	92,692	89,382	0.48	42,903	36,468	1,094				
12	65	96,168	92,734	0.5	46,367	39,412	1,182				
13	66	99,774	96,211	0.52	50,030	42,525	1,276				
14	67	103,516	99,819	0.54	53,902	45,817	1,375				
15	68	107,398	103,563	0.56	57,995	49,296	1,479				
16	69	111,425	107,446	0.58	62,319	52,971	1,589				
17	70	115,604	111,475	0.6	66,885	56,852	1,706				
18											
19				Ret Year Ind		3					
20	Year	AGE	2023	2024	2025	2026	2027	2028	2029	2030	2031
21	2023	62	31,056	0	0	0	0	0	0	0	0
22	2024	63	31,988	33,685	0	0	0	0	0	0	0
23	2025	64	32,919	34,696	36,468	0	0	0	0	0	0
24	2026	65	33,851	35,706	37,562	39,412	0	0	0	0	0
25	2027	66	34,783	36,717	38,656	40,594	42,525	0	0	0	0
26	2028	67	35,714	37,727	39,750	41,777	43,801	45,817	0	0	0
27	2029	68	36,646	38,738	40,844	42,959	45,077	47,192	49,296	0	0
28	2030	69	37,578	39,749	41,938	44,141	46,353	48,566	50,775	52,971	0
29	2031	70	38,509	40,759	43,032	45,324	47,629	49,941	52,254	54,560	56,852
30	2032	71	39,441	41,770	44,126	46,506	48,904	51,315	53,732	56,149	58,558
31	2033	72	40,373	42,780	45,220	47,688	50,180	52,690	55,211	57,738	60,264
32	2034	73	41,305	43,791	46,314	48,871	51,456	54,064	56,690	59,327	61,969
33	2035	74	42,236	44,801	47,408	50,053	52,732	55,439	58,169	60,917	63,675
34	2036	75	43,168	45,812	48,502	51,235	54,007	56,813	59,648	62,506	65,380
35	2037	76	44,100	46,822	49,596	52,418	55,283	58,188	61,127	64,095	67,086
36	2038	77	45,031	47,833	50,690	53,600	56,559	59,562	62,606	65,684	68,791
37	2039	78	45,963	48,844	51,784	54,783	57,835	60,937	64,085	67,273	70,497
38	2040	79	46,895	49,854	52,878	55,965	59,110	62,311	65,563	68,862	72,203
39	2041	80	47,826	50,865	53,972	57,147	60,386	63,686	67,042	70,451	73,908
40	2042	81	48,758	51,875	55,067	58,330	61,662	65,060	68,521	72,041	75,614
41	2043	82	49,690	52,886	56,161	59,512	62,938	66,435	70,000	73,630	77,319
42	2044	83	50,621	53,896	57,255	60,694	64,213	67,809	71,479	75,219	79,025
43	2045	84	51,553	54,907	58,349	61,877	65,489	69,184	72,958	76,808	80,730
44	2046	85	52,485	55,917	59,443	63,059	66,765	70,558	74,437	78,397	82,436
45	2047	86	53,416	56,928	60,537	64,241	68,041	71,933	75,916	79,986	84,142
46	2048	87	54,348	57,939	61,631	65,424	69,316	73,307	77,394	81,575	85,847
47	2049	88	55,280	58,949	62,725	66,606	70,592	74,682	78,873	83,164	87,553
48	2050	89	56,211	59,960	63,819	67,788	71,868	76,056	80,352	84,754	89,258
49	2051	90	57,143	60,970	64,913	68,971	73,144	77,431	81,831	86,343	90,964
50	2052	91	58,075	61,981	66,007	70,153	74,420	78,805	83,310	87,932	92,670

This table shows pension calculations. Table entries require no user input. Initial pension payments depend upon the highest three-year average salary of the employee, a percentage based on the number of years worked and a reduction to extend the pension through the lifetime of a surviving spouse. Calculations by year show the pension amount for each candidate retirement year. Presented in Worksheet 'P'. Final rows removed for formatting.

Table 10: Social Security Calculations

	A	B	C	D	E	F	G	H	I	J	K
1	Initial Retirement From SS Statement										
2		S1		S2							
3		Initial	Future	Initial	Future						
4	Age	Draw	Value	Draw	Value						
5	62	20,000	21,000	15,000	17,364						
6	63	21,600	23,814	16,200	19,691						
7	64	23,328	27,005	17,496	22,330						
8	65	25,194	30,623	18,895	25,321						
9	66	27,209	34,726	20,407	28,715						
10	67	29,385	39,379	22,040	32,563						
11	68	31,736	44,656	23,803	36,926						
12	69	34,275	50,640	25,707	41,874						
13	70	37,015	57,422	27,763	47,484						
14											
15											
16											
17											
18	S1 Ret Yr Ind		8				Initial Draw Year				
19			2023	2024	2025	2026	2027	2028	2029	2030	2031
20		S1 Age	62	63	64	65	66	67	68	69	70
21	2023	62	21,000								
22	2024	63	22,050	23,814							
23	2025	64	23,153	25,005	27,005						
24	2026	65	24,310	26,255	28,355	30,623					
25	2027	66	25,526	27,568	29,773	32,155	34,726				
26	2028	67	26,802	28,946	31,262	33,762	36,463	39,379			
27	2029	68	28,142	30,393	32,825	35,450	38,286	41,348	44,656		
28	2030	69	29,549	31,913	34,466	37,223	40,200	43,415	46,889	50,640	
29	2031	70	31,027	33,509	36,189	39,084	42,210	45,586	49,233	53,172	57,422
30	2032	71	32,578	35,184	37,999	41,038	44,321	47,865	51,695	55,830	60,294
31	2033	72	34,207	36,943	39,899	43,090	46,537	50,258	54,279	58,622	63,308
32	2034	73	35,917	38,790	41,894	45,245	48,863	52,771	56,993	61,553	66,474
33	2035	74	37,713	40,730	43,988	47,507	51,307	55,410	59,843	64,631	69,797
34	2036	75	39,599	42,767	46,188	49,882	53,872	58,180	62,835	67,862	73,287
35	2037	76	41,579	44,905	48,497	52,377	56,566	61,089	65,977	71,255	76,952
36	2038	77	43,657	47,150	50,922	54,995	59,394	64,144	69,276	74,818	80,799
37	2039	78	45,840	49,508	53,468	57,745	62,364	67,351	72,739	78,559	84,839
38	2040	79	48,132	51,983	56,142	60,632	65,482	70,719	76,376	82,487	89,081
39	2041	80	50,539	54,582	58,949	63,664	68,756	74,254	80,195	86,611	93,535
40	2042	81	53,066	57,311	61,896	66,847	72,194	77,967	84,205	90,942	98,212
41	2043	82	55,719	60,177	64,991	70,190	75,803	81,866	88,415	95,489	103,122
42	2044	83	58,505	63,186	68,240	73,699	79,593	85,959	92,836	100,263	108,279
43	2045	84	61,430	66,345	71,653	77,384	83,573	90,257	97,478	105,276	113,692
44	2046	85	64,502	69,662	75,235	81,253	87,752	94,770	102,352	110,540	119,377
45	2047	86	67,727	73,145	78,997	85,316	92,139	99,508	107,469	116,067	125,346
46	2048	87	71,113	76,803	82,947	89,582	96,746	104,483	112,843	121,871	131,613
47	2049	88	74,669	80,643	87,094	94,061	101,584	109,708	118,485	127,964	138,194
48	2050	89	78,403	84,675	91,449	98,764	106,663	115,193	124,409	134,362	145,104
49	2051	90	82,323	88,909	96,021	103,702	111,996	120,953	130,630	141,081	152,359
50	2052	91	86,439	93,354	100,822	108,887	117,596	127,000	137,161	148,135	159,977

This table shows Social Security calculations for Spouse 1. No user input is required in the table. The table incorporates initial payments based on year of retirement. These initial payments increase each year at the rate of inflation. The table shows Social Security payments for each candidate initial claim year and for each subsequent retirement year. Presented in Worksheet 'SS'. Final rows removed for formatting.

Table 11: Growing Annuity Calculations

	A	B	C	D	E	F	G	H	I	J	K	L
1	Growing Annuity Calculations				Age S1	Year	Seq.	Val	Gain	End	Withdraw	End Value
2					62	2023	1	418,494	29,295	447,789	18,900	428,889
3	Inflation	G	0.05		63	2024	2	428,889	30,022	458,911	19,845	439,066
4					64	2025	3	439,066	30,735	469,801	20,837	448,964
5	Earned on Investments	I	0.07		65	2026	4	448,964	31,427	480,391	21,879	458,512
6	Years of Retirement Life	N	31		66	2027	5	458,512	32,096	490,608	22,973	467,635
7	Desired 1st Yr Withdrawal	PMT	18,900		67	2028	6	467,635	32,734	500,369	24,122	476,247
8					68	2029	7	476,247	33,337	509,585	25,328	484,257
9					69	2030	8	484,257	33,898	518,155	26,594	491,561
10	PV Calculations				70	2031	9	491,561	34,409	525,970	27,924	498,046
11					71	2032	10	498,046	34,863	532,909	29,320	503,589
12	PMT/(I-G)		945,000		72	2033	11	503,589	35,251	538,841	30,786	508,054
13					73	2034	12	508,054	35,564	543,618	32,325	511,293
14	(1+G)/(1+I)		0.9813		74	2035	13	511,293	35,790	547,083	33,942	513,142
15					75	2036	14	513,142	35,920	549,062	35,639	513,423
16	{{(1+G)/(1+I))^N		0.5571		76	2037	15	513,423	35,940	549,362	37,421	511,942
17					77	2038	16	511,942	35,836	547,778	39,292	508,486
18	PVGA = PMT/(I-G) * [1 - ((1+G)/(1+I))^N]		418,494		78	2039	17	508,486	35,594	544,080	41,256	502,824
19					79	2040	18	502,824	35,198	538,021	43,319	494,702
20					80	2041	19	494,702	34,629	529,331	45,485	483,846
21					81	2042	20	483,846	33,869	517,715	47,759	469,956
22					82	2043	21	469,956	32,897	502,853	50,147	452,705
23					83	2044	22	452,705	31,689	484,395	52,655	431,740
24					84	2045	23	431,740	30,222	461,962	55,287	406,675
25					85	2046	24	406,675	28,467	435,142	58,052	377,090
26					86	2047	25	377,090	26,396	403,486	60,954	342,532
27					87	2048	26	342,532	23,977	366,509	64,002	302,507
28					88	2049	27	302,507	21,175	323,683	67,202	256,480
29					89	2050	28	256,480	17,954	274,434	70,562	203,872
30					90	2051	29	203,872	14,271	218,143	74,090	144,052
31					91	2052	30	144,052	10,084	154,136	77,795	76,341
32					92	2053	31	76,341	5,344	81,685	81,685	0
33					93	2054	32	0	0	0	0	0
34					94	2055	33	0	0	0	0	0
35					95	2056	34	0	0	0	0	0
36					96	2057	35	0	0	0	0	0
37					97	2058	36	0	0	0	0	0
38					98	2059	37	0	0	0	0	0
39					99	2060	38	0	0	0	0	0
40					100	2061	39	0	0	0	0	0
41					101	2062	40	0	0	0	0	0
42					102	2063	41	0	0	0	0	0
43					103	2064	42	0	0	0	0	0
44					104	2065	43	0	0	0	0	0
45					105	2066	44	0	0	0	0	0
46					106	2067	45	0	0	0	0	0
47					107	2068	46	0	0	0	0	0
48					108	2069	47	0	0	0	0	0
49					109	2070	48	0	0	0	0	0
50					110	2071	49	0	0	0	0	0
51					111	2072	50	0	0	0	0	0

This table shows the growing annuity calculations. Entries in this table require no user input. The growing annuity present value (PVGA) equals: $PVGA = \frac{PMT}{I-G} \left[1 - \left(\frac{1+G}{1+I} \right)^N \right]$ where PMT equals the desired first year payment, having payment growth rate of G, return on investment of I, and life of N. The table also shows an amortization table for the growing annuity. Presented in Worksheet 'A'.

Table 12: Miscellaneous Calculations

	A	B	C	D	E
1	Unused Growing Annuity Funds				
2					
3	Retirement Year		Sum	PV	
4	2023	0			
5	2024	1	18,900	17,664	
6	2025	2	38,745	33,841	
7	2026	3	59,582	48,637	
8	2027	4	81,461	62,146	
9	2028	5	104,434	74,460	
10	2029	6	128,556	85,662	
11	2030	7	153,884	95,831	
12	2031	8	180,478	105,040	
13					
14	SS Fund Amortization Table				
15					
16	Year	Beg Bal	Draw	Interest	End Bal
17	2023	94,530	21,000	6,617	80,147
18	2024	80,147	22,050	5,610	63,708
19	2025	63,708	23,153	4,460	45,015
20	2026	45,015	24,310	3,151	23,856
21	2027	23,856	25,526	1,670	0
22	2028	0	0	0	0
23	2029	0	0	0	0
24	2030	0	0	0	0

This table shows the unused growing annuity funds at each potential retirement age. The table also shows amortization of the Social Security supplement fund balance. Presented in Worksheet 'O'

Novice users may experience a sense of intimidation and confusion regarding the plethora of figures presented in the analysis. The analysis goal is accommodating a long retirement, with income that increases at the rate of inflation, achieved by using all assets available and without exhausting the total portfolio value or reserve fund value. Users examine the total of fund balances presented in Table 8, Column M:BF and reserve fund balances noted in Column BI to determine the success of their plan. The presence of all positive figures in these two rows indicates success.

To simplify this process, Table 18, presented in Worksheet M provides an easy-to-understand summary of results. Table 18 shows total portfolio and reserve fund values at six future points along the retirement horizon. In addition, the worksheet provides present value calculations for both funds. Present value calculations allow users to relate results to their current financial perspective.

For a more detailed portfolio check, Table 18 identifies the number of years with negative outcomes in cells M:D158 and M:F158. A negative outcome indicates the number of years where the total portfolio or the reserve fund show negative balances. Results show a portfolio present value equal to \$174,281 at Spouse 1 age 111 years. While this result suggests the possibility of additional spending, a cautious retiree might reserve these funds for unanticipated contingencies. The results reveal two negative outcomes. Closer examination of Table 8 shows reserve fund balances of -1,404 and -5,325 in 2027 and 2028, respectively. The retiree may choose to adjust their plan to eliminate these negative amounts. Alternatively, given the overall portfolio size and annual spending amounts, the negative balances could be managed by carefully timing certain expenses.

CONCLUDING COMMENTS

Retirement planning can overwhelm and intimidate individuals. Financial planning tools help reduce the complexity of financial planning. This paper provides a comprehensive lifetime retirement planning tool.

The approach here maintains constant, inflation adjusted, spending throughout the retirement years. The spreadsheet incorporates income from multiple sources and allows users to modify fifty-five parameters to most closely approximate their own financial situation. The spreadsheet is especially well suited for planning when the retiree faces a fixed annual dollar amount pension increase, not indexed to inflation. The spreadsheet utilizes a growing perpetuity to offset declining purchasing power of such a pension. The tool includes up to three pre-owned real estate properties, one inherited property and one property purchased at the time of retirement. The analysis incorporates rent on these properties and the ultimate sale of the properties.

As noted previously, the tool represents a starting place for retirement planning. Modifying certain parameters in the spreadsheet could produce unintended and erroneous results. For this reason, users should only utilize this spreadsheet in consultation with a licensed and qualified professional financial advisor who can fully evaluate the results and advise them on such matters.

This document and associated files represent an academic project intended for general scientific purposes. The authors of this paper and creators of the associated files are not licensed to provide financial advice. The materials here are not intended, and should not be taken, as financial advice to any person. The authors do not warrant the accuracy of information in the paper or the suitability of the information here for any purpose. The template provides a starting place for evaluating retirement choices and may require modifications. While care was used in developing the tool, issues may remain that could lead to incorrect or misleading results. Moreover, some circumstances might cause the tool to function erroneously. Individuals should seek independent professional financial advice from a properly credentialed advisor. Readers should not rely on information in this paper or spreadsheet for financial or other decisions.

The authors encourage users to begin working with the tool independently. Doing so can assist them in accumulating necessary information and identifying issues for their consideration to assist the professional financial planner. Preparing this document in advance offers the possibility of reduced financial planning fees and provides the user a better understanding of their own finances. The user should present the completed template to their financial advisor for review and modifications.

This paper and the associated planning tools have limitations. In the current format, only one spouse may have a pension plan and only one spouse may have multiple Social Security income streams. Future iterations of the spreadsheet might allow for multiple pensions and multiple Social Security income streams for both spouses. State tax analysis incorporates only State of Hawaii taxes. Including other state tax systems would enhance the generality of the tool. Optimally, users could enter their state of residence and the analysis would incorporate relevant state tax rules. The current template does not allow for work income in retirement. However, many people continue to work in retirement. Allowing retirement work income presents an opportunity to further advance the tool. The technique assumes all retirement funds are held in pre-tax retirement accounts. Expanding the analysis to allow for post-tax retirement accounts represents an avenue for improvement. Finally, the spreadsheet currently requires both spouses to retire at the same time. Future iterations of the spreadsheet may allow multiple retirement dates.

Table 13: Real Estate Rental Income

1	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
2	Year	Base	Rent	DV	Rnt Inc.		Base	Rnt	DV	Rnt Inc.		Base	Rnt	DV	Rnt Inc.
3	2023	0	0	1	0		12000	12,000	1	12,000		0	0	1	0
4	2024	0	0	1	0		12000	12,600	1	12,600		0	0	1	0
5	2025	0	0	1	0		12000	13,230	1	13,230		0	0	1	0
6	2026	0	0	1	0		12000	13,892	1	13,892		0	0	1	0
7	2027	0	0	1	0		12000	14,586	1	14,586		0	0	1	0
8	2028	0	0	1	0		12000	15,315	1	15,315		0	0	1	0
9	2029	0	0	1	0		12000	16,081	1	16,081		0	0	1	0
10	2030	0	0	1	0		0	0	1	0		0	0	1	0
11	2031	0	0	1	0		0	0	1	0		0	0	1	0
12	2032	0	0	1	0		0	0	1	0		0	0	1	0
13	2033	0	0	1	0		0	0	1	0		0	0	1	0
14	2034	0	0	1	0		0	0	1	0		0	0	1	0
15	2035	0	0	1	0		0	0	1	0		0	0	1	0
16	2036	0	0	1	0		0	0	1	0		0	0	1	0
17	2037	0	0	1	0		0	0	1	0		0	0	1	0
18	2038	0	0	1	0		0	0	1	0		0	0	1	0
19	2039	0	0	1	0		0	0	1	0		0	0	1	0
20	2040	0	0	1	0		0	0	1	0		0	0	1	0
21	2041	0	0	1	0		0	0	1	0		0	0	1	0
22	2042	0	0	1	0		0	0	1	0		0	0	1	0
23	2043	0	0	1	0		0	0	1	0		0	0	1	0
24	2044	0	0	1	0		0	0	1	0		0	0	1	0
25	2045	0	0	1	0		0	0	0	0		0	0	1	0
26	2046	0	0	1	0		0	0	0	0		0	0	1	0
27	2047	0	0	1	0		0	0	0	0		0	0	1	0
28	2048	0	0	1	0		0	0	0	0		0	0	1	0
29	2049	0	0	1	0		0	0	0	0		0	0	1	0
30	2050	0	0	1	0		0	0	0	0		0	0	1	0
31	2051	0	0	1	0		0	0	0	0		0	0	0	0
32	2052	0	0	1	0		0	0	0	0		0	0	0	0
33	2053	0	0	1	0		0	0	0	0		0	0	0	0
34	2054	0	0	1	0		0	0	0	0		0	0	0	0
35	2055	0	0	1	0		0	0	0	0		0	0	0	0
36	2056	0	0	1	0		0	0	0	0		0	0	0	0
37	2057	0	0	1	0		0	0	0	0		0	0	0	0
38	2058	0	0	1	0		0	0	0	0		0	0	0	0
39	2059	0	0	1	0		0	0	0	0		0	0	0	0
40	2060	0	0	0	0		0	0	0	0		0	0	0	0
41	2061	0	0	0	0		0	0	0	0		0	0	0	0
42	2062	0	0	0	0		0	0	0	0		0	0	0	0
43	2063	0	0	0	0		0	0	0	0		0	0	0	0
44	2064	0	0	0	0		0	0	0	0		0	0	0	0
45	2065	0	0	0	0		0	0	0	0		0	0	0	0
46	2066	0	0	0	0		0	0	0	0		0	0	0	0
47	2067	0	0	0	0		0	0	0	0		0	0	0	0
48	2068	0	0	0	0		0	0	0	0		0	0	0	0
49	2069	0	0	0	0		0	0	0	0		0	0	0	0
50	2070	0	0	0	0		0	0	0	0		0	0	0	0
51	2071	0	0	0	0		0	0	0	0		0	0	0	0
52	2072	0	0	0	0		0	0	0	0		0	0	0	0

This table shows real estate rental income. The table requires no user input. Rental income reported here considers when the property will be rented as well as inflation adjusted rent amounts. Presented in Worksheet 'R'. Columns related to any inherited properties or retirement property purchases are excluded to conserve space.

Table 14: Federal Taxes

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	FEDERAL TAXES												
2	Standard Deductions												
3													
4	Single	12,950											
5	MFJ	25,900											
6	MFS	12,950											
7	HH	19,440											
8													
9	2022 Ordinary Income Tax Table						Applied Tax Table						
10	Single		Base Tax		MFJ		Base Tax	Row		Tax Inc	Tax Inc	Base Tax	Tax Rate
11	0	10,275	0	0	10,275	0		1	0	10,275	0	0	10%
12	10,276	41,775	1,028	10,276	83,550	2,055		2	10,276	83,550	2,055	12%	
13	41,776	89,075	4,808	83,551	178,150	9,615		3	83,551	178,150	9,615	22%	
14	89,076	170,050	15,214	178,151	340,100	30,427		4	178,151	340,100	30,427	24%	
15	170,051	215,950	34,648	340,101	431,900	69,295		5	340,101	431,900	69,295	32%	
16	215,951	539,900	49,336	431,901	347,850	98,617		6	431,901	347,850	98,617	35%	
17	539,901		162,718	647,851		174,254		7	647,851	0	174,254	37%	
18													
19													
20	2022 Capital Gains Tax Table												
21	Single				MFJ			Row	Applied Tax Table				
22		Tax Inc	Base Tax		Tax Inc	Base Tax			Tax Inc	Tax Inc	Base Tax	Tax Rate	
23	0	41,675	0	0	83,350	0		1	0	83,350	0	0%	
24	41,676	459,750	0	83,351	517,200	0		2	83,351	517,200	0	15%	
25	459,751		62,711	517,201		65,077		3	517,201	0	65,077	20%	

This table shows Federal tax rates for each filing status. The spreadsheet selects the correct table based on user inputted filing status in Table 4 Cell M133. Presented in Worksheet 'F'. Tables for Married Filing Joint returns and Head of Household are excluded to conserve space.

Table 15: Federal Taxes (Continued)

	A	B	C	D	E	F	G	H
34			GAIN ON SALE					
35								
36		Tot Prop						Tot. Tax
37	Year	Sale	RE1	RE2	RE3	II	RP1	Prop. Sale
38	2023	0	0	0	0	0	0	0
39	2024	0	0	0	0	0	0	0
40	2025	0	0	0	0	0	0	0
41	2026	0	0	0	0	0	0	0
42	2027	0	0	0	0	0	0	0
43	2028	0	0	0	0	0	0	0
44	2029	0	0	0	0	0	6,453	6,453
45	2030	0	0	0	0	0	0	0
46	2031	0	0	0	0	0	0	0
47	2032	0	0	0	0	0	0	0
48	2033	0	0	0	0	0	0	0
49	2034	0	0	0	0	0	0	0
50	2035	0	0	0	0	0	0	0
51	2036	0	0	0	0	0	0	0
52	2037	0	0	0	0	0	0	0
53	2038	0	0	0	0	0	0	0
54	2039	0	0	0	0	0	0	0
55	2040	0	0	0	0	0	0	0
56	2041	0	0	0	0	0	0	0
57	2042	0	0	0	0	0	0	0
58	2043	0	0	0	0	0	0	0
59	2044	0	0	0	0	0	0	0
60	2045	288,723	0	208,723	0	0	0	208,723
61	2046	0	0	0	0	0	0	0
62	2047	0	0	0	0	0	0	0
63	2048	0	0	0	0	0	0	0
64	2049	0	0	0	0	0	0	0
65	2050	0	0	0	0	0	0	0
66	2051	309,533	0	0	239,533	0	0	239,533
67	2052	0	0	0	0	0	0	0
68	2053	0	0	0	0	0	0	0
69	2054	0	0	0	0	0	0	0
70	2055	0	0	0	0	0	0	0
71	2056	246,907	0	0	0	196,907	0	196,907
72	2057	0	0	0	0	0	0	0
73	2058	0	0	0	0	0	0	0
74	2059	0	0	0	0	0	0	0
75	2060	1,500,587	800,587	0	0	0	0	800,587
76	2061	0	0	0	0	0	0	0
77	2062	0	0	0	0	0	0	0
78	2063	0	0	0	0	0	0	0
79	2064	0	0	0	0	0	0	0
80	2065	0	0	0	0	0	0	0
81	2066	0	0	0	0	0	0	0
82	2067	0	0	0	0	0	0	0
83	2068	0	0	0	0	0	0	0
84	2069	0	0	0	0	0	0	0
85	2070	0	0	0	0	0	0	0
86	2071	0	0	0	0	0	0	0
87	2072	0	0	0	0	0	0	0

This table shows capital gains on property sales. This table requires no user input. Presented in Worksheet 'F'.

Table 16: Federal Taxes (Continued)

	J	K	L	M	N	O	P	Q	R	S
36	Gross	SS Tax	Net Tax	PV Gross	PV Ord Net.			Tot. CG	PV Tax.	FV
37	Ord. Inc	Excl.	O. I.	O Tax Inc	Tax Income			Inc.	CG Inc.	Total Inc.
38	82,956	0	82,956	79,006	53,106			0	0	82,956
39	86,483	0	86,483	78,442	52,542			0	0	86,483
40	90,139	0	90,139	77,866	51,966			0	0	90,139
41	93,932	0	93,932	77,278	51,378			0	0	93,932
42	97,868	0	97,868	76,682	50,782			0	0	97,868
43	114,530	5,907	108,623	81,056	55,156			0	0	114,530
44	149,458	10,710	138,747	98,605	72,705			6,453	4,586	149,458
45	139,145	11,246	127,899	86,567	60,667			0	0	139,145
46	145,155	11,808	133,346	85,956	60,056			0	0	145,155
47	151,419	12,399	139,020	85,346	59,446			0	0	151,419
48	157,949	13,019	144,931	84,738	58,838			0	0	157,949
49	169,891	13,669	156,221	86,990	61,090			0	0	169,891
50	177,252	14,353	162,899	86,389	60,489			0	0	177,252
51	184,934	15,071	169,863	85,793	59,893			0	0	184,934
52	192,954	15,824	177,130	85,203	59,303			0	0	192,954
53	201,328	16,615	184,713	84,619	58,719			0	0	201,328
54	210,075	17,446	192,629	84,043	58,143			0	0	210,075
55	219,212	18,318	200,894	83,476	57,576			0	0	219,212
56	228,760	19,234	209,525	82,916	57,016			0	0	228,760
57	238,738	20,196	218,542	82,366	56,466			0	0	238,738
58	249,169	21,206	227,963	81,826	55,926			0	0	249,169
59	260,074	22,266	237,808	81,295	55,395			0	0	260,074
60	271,479	23,379	248,099	80,774	54,874			208,723	67,954	560,202
61	283,407	24,548	258,858	80,264	54,364			0	0	283,407
62	295,885	25,776	270,109	79,764	53,864			0	0	295,885
63	308,940	27,065	281,875	79,275	53,375			0	0	308,940
64	322,601	28,418	294,183	78,796	52,896			0	0	322,601
65	336,899	29,839	307,060	78,329	52,429			0	0	336,899
66	351,865	31,331	320,534	77,873	51,973			239,533	58,194	661,398
67	367,532	32,897	334,635	77,427	51,527			0	0	367,532
68	383,937	34,542	349,395	76,992	51,092			0	0	383,937
69	315,346	36,269	279,077	58,569	32,669			0	0	315,346
70	329,048	38,083	290,966	58,156	32,256			0	0	329,048
71	328,379	39,987	288,393	54,897	28,997			196,907	37,482	575,287
72	342,640	41,986	300,654	54,506	28,606			0	0	342,640
73	357,567	44,085	313,482	54,125	28,225			0	0	357,567
74	373,194	46,290	326,904	53,755	27,855			0	0	373,194
75	389,555	48,604	340,951	53,395	27,495			800,587	125,376	1,890,142
76	406,688	51,034	355,654	53,045	27,145			0	0	406,688
77	424,631	53,586	371,045	52,705	26,805			0	0	424,631
78	443,425	56,265	387,160	52,376	26,476			0	0	443,425
79	463,112	59,079	404,033	52,056	26,156			0	0	463,112
80	483,736	62,032	421,704	51,745	25,845			0	0	483,736
81	505,346	65,134	440,211	51,444	25,544			0	0	505,346
82	527,989	68,391	459,598	51,152	25,252			0	0	527,989
83	551,717	71,810	479,907	50,869	24,969			0	0	551,717
84	576,586	75,401	501,185	50,594	24,694			0	0	576,586
85	602,651	79,171	523,480	50,328	24,428			0	0	602,651
86	629,973	83,129	546,844	50,071	24,171			0	0	629,973
87	631,425	83,207	548,217	47,807	21,907			0	0	631,425

This table shows tax calculations. This table requires no user input. Future taxes due calculations require calculating taxes due on the present value of future income. The future value of the taxes due represent the estimate of future tax liabilities. Presented in Worksheet 'F'.

Table 17: Federal Taxes (Continued)

	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
34	ORDINARY INCOME TAX						CAPITAL GAINS TAXES						TOTAL TAX	
35														
36	O.I.	Base	Tax on		PV OI		CG	Base	Tax on		PV CG		PV Total	FV Total
37	Tax Bkt	Amount	Base	Rate	Tax		Tax Bkt	Amt	Base	Rate	Tax		Tax	Tax
38	2	10,276	2,055	0.12	7,195		1	0	0	0	0		7,195	7,554
39	2	10,276	2,055	0.12	7,127		1	0	0	0	0		7,127	7,857
40	2	10,276	2,055	0.12	7,058		1	0	0	0	0		7,058	8,170
41	2	10,276	2,055	0.12	6,987		1	0	0	0	0		6,987	8,493
42	2	10,276	2,055	0.12	6,916		1	0	0	0	0		6,916	8,826
43	2	10,276	2,055	0.12	7,441		1	0	0	0	0		7,441	9,971
44	3	83,551	9,615	0.22	7,229		2	83,351	0	0.15	0		7,229	10,172
45	3	83,551	9,615	0.22	4,580		2	83,351	0	0.15	0		4,580	6,767
46	3	83,551	9,615	0.22	4,446		2	83,351	0	0.15	0		4,446	6,897
47	3	83,551	9,615	0.22	4,312		2	83,351	0	0.15	0		4,312	7,024
48	3	83,551	9,615	0.22	4,178		2	83,351	0	0.15	0		4,178	7,146
49	3	83,551	9,615	0.22	4,674		2	83,351	0	0.15	0		4,674	8,393
50	3	83,551	9,615	0.22	4,541		2	83,351	0	0.15	0		4,541	8,563
51	3	83,551	9,615	0.22	4,410		2	83,351	0	0.15	0		4,410	8,732
52	3	83,551	9,615	0.22	4,280		2	83,351	0	0.15	0		4,280	8,899
53	3	83,551	9,615	0.22	4,152		2	83,351	0	0.15	0		4,152	9,063
54	3	83,551	9,615	0.22	4,025		2	83,351	0	0.15	0		4,025	9,226
55	2	10,276	2,055	0.12	7,731		2	83,351	0	0.15	0		7,731	18,605
56	2	10,276	2,055	0.12	7,664		1	0	0	0	0		7,664	19,366
57	2	10,276	2,055	0.12	7,598		1	0	0	0	0		7,598	20,159
58	2	10,276	2,055	0.12	7,533		1	0	0	0	0		7,533	20,987
59	2	10,276	2,055	0.12	7,469		1	0	0	0	0		7,469	21,850
60	2	10,276	2,055	0.12	7,407		1	0	0	0	0		7,407	22,750
61	2	10,276	2,055	0.12	7,346		1	0	0	0	0		7,346	23,690
62	2	10,276	2,055	0.12	7,286		1	0	0	0	0		7,286	24,671
63	2	10,276	2,055	0.12	7,227		1	0	0	0	0		7,227	25,696
64	2	10,276	2,055	0.12	7,169		1	0	0	0	0		7,169	26,767
65	2	10,276	2,055	0.12	7,113		1	0	0	0	0		7,113	27,885
66	2	10,276	2,055	0.12	7,059		1	0	0	0	0		7,059	29,054
67	2	10,276	2,055	0.12	7,005		1	0	0	0	0		7,005	30,276
68	2	10,276	2,055	0.12	6,953		1	0	0	0	0		6,953	31,553
69	2	10,276	2,055	0.12	4,742		1	0	0	0	0		4,742	22,596
70	2	10,276	2,055	0.12	4,693		1	0	0	0	0		4,693	23,478
71	2	10,276	2,055	0.12	4,302		1	0	0	0	0		4,302	22,597
72	2	10,276	2,055	0.12	4,255		1	0	0	0	0		4,255	23,468
73	2	10,276	2,055	0.12	4,209		1	0	0	0	0		4,209	24,377
74	2	10,276	2,055	0.12	4,164		1	0	0	0	0		4,164	25,326
75	2	10,276	2,055	0.12	4,121		1	0	0	0	0		4,121	26,316
76	2	10,276	2,055	0.12	4,079		1	0	0	0	0		4,079	27,351
77	2	10,276	2,055	0.12	4,039		1	0	0	0	0		4,039	28,431
78	2	10,276	2,055	0.12	3,999		1	0	0	0	0		3,999	29,560
79	2	10,276	2,055	0.12	3,961		1	0	0	0	0		3,961	30,740
80	2	10,276	2,055	0.12	3,923		1	0	0	0	0		3,923	31,973
81	2	10,276	2,055	0.12	3,887		1	0	0	0	0		3,887	33,263
82	2	10,276	2,055	0.12	3,852		1	0	0	0	0		3,852	34,611
83	2	10,276	2,055	0.12	3,818		1	0	0	0	0		3,818	36,021
84	2	10,276	2,055	0.12	3,785		1	0	0	0	0		3,785	37,496
85	2	10,276	2,055	0.12	3,753		1	0	0	0	0		3,753	39,039
86	2	10,276	2,055	0.12	3,722		1	0	0	0	0		3,722	40,654
87	2	10,276	2,055	0.12	3,451		1	0	0	0	0		3,451	39,570

This table shows Capital Gains and Ordinary Income taxes due along with the present and future values of taxes due. The FV Total Tax figure represents the final result and the input for income and spending calculations. Presented in Worksheet 'F'.

Table 18: Results

	A	B	C	D	E	F	G
148	RESULTS						
149					PV	Reserve	PV Res.
150		S1 Age	S2 Age	Port. Val.	Port. Val.	Fund	Fund
151		70	68	577,839	391,104	79,793	54,007
152		80	78	813,440	338,001	329,594	136,953
153		90	88	1,367,110	348,741	1,223,057	311,994
154		100	98	2,787,948	436,608	2,787,948	436,608
155		105	103	2,686,735	329,674	2,686,735	329,674
156		111	109	1,903,384	174,281	1,903,384	174,281
157							
158	Negative Outcomes			0		2	

This table show the final analysis results. This table requires no user input. The analysis goal is accommodating a long retirement, with income that increases at the rate of inflation, achieved by using all assets available and without exhausting the total portfolio value or reserve fund value. Negative outcomes indicate the reserve fund produces a negative balance in two years. Presented in Worksheet 'M'.

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BIOGRAPHY

Terrance Jalbert, Ph.D. is Professor of Finance at University of Hawaii Hilo. He also serves as an arbitrator for the Financial Industry Regulatory Authority (FINRA). His research appears in journals including *International Journal of Finance*, *American Business Review*, *Financial Services Review*, *Journal of Personal Finance*, *Advances in Taxation*, *Journal of Emerging Markets*, *Latin American Business Review*, *Journal of Applied Business Research* and *The International Journal of Business and Finance Research*. He can be reached at University of Hawaii Hilo, 200 West Kawili St., Hilo, HI 96720.

Jonathan D. Stewart, Ph.D. CFA is the A. Overton Faubus Professor of Finance at Abilene Christian University. His research appears in journals including *Economic Review / Federal Reserve Bank of Atlanta*, *Management Accounting Quarterly*, *The Journal of Financial Research*, *The Journal of Investing*, *Journal of Economics and Finance Education*, *Advances in Financial Education*, *Journal of Corporate Treasury*

Management, International Journal of Business and Finance Research, Journal of Applied Business Research. He can be reached at Abilene Christian University, ACU Box 29313, Abilene, TX, 79602.