



## **Extending the Case Study on When to Collect Social Security: Economic Decision Making for Couples**

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### **Abstract**

The decision of when to start collecting social security benefits is a complex one. Many people must answer the question of whether to start collecting reduced benefits at age 62 or wait until age 66 (or later) for regular payments. Most available literature, including the publications of the Social Security Administration, focuses on the dollar difference in monthly payments and completely disregards the time value of money. For single individuals, this is a complicated decision. For couples, the decision making process is much more complex.

Couples facing the question of when to start collecting benefits have more options than do single people. For example, anyone may elect to start collecting early at age 62. However, if one's spouse is already age 66, they may elect (starting at age 62) to collect up to half of their spouse's benefit. Or they may start collecting their own benefit, and switch to collecting spousal benefits if that is in their best interest. Also, a widow(er) may collect survivor's benefits. The best strategy for defining both people's benefit plans depends on each other's, and opens many options. Of course, other considerations such as health and income sources become a part of the decision.

Much of the literature ignores the need for couples' strategies. A better way to approach the question is to use decision analysis tools that incorporate the time value of money. These tools are taught in engineering economy courses and the *social security for couples* issue can be used as a case study to apply these tools to real issues faced by students' parents, grandparents, and instructors. The focus here is pedagogical. What information is needed, and how can it be put together to identify optimum choices? The difference in couples ages, the difference in past income, and current and future work status all combine to create many different possible scenarios and many different best choices.

### **Introduction**

The Social Security system provides retirement benefits to most of the people that have an extended work history in the U.S. For those people born between 1943 and 1954 (those who are retiring now and in the near future), the full retirement age is 66. Most people are eligible to begin benefits as early as age 62, and as late as age 70. However, retirement is not a requirement to begin taking benefits.

Choosing whether or not to retire is heavily influenced by lifestyle choices that may or may not be constrained by economics. Benefits from social security may be paying for necessities such as food, rent, and medical care or for discretionary expenses such as travel or college for grandkids. It is not possible to model whether work is fulfilling or exhausting, or whether family needs dictate that a person should retire to take care of an ailing or aging spouse or parent. A person may want time to travel the world or to live near grandchildren, time to focus on a favorite hobby, time to make a difference by volunteering, etc. Receiving social security benefits may make choices possible, but valuing those choices is impossible to generalize for a wide population. In addition, some people choose to continue to work past the normal social security retirement age, and draw benefits while still working full time. Thus, a case study that addresses

the “retirement” decision must be for an individual or family, and its non-economic features will dominate the economic analysis of the time value of money.

The choice of when to begin collecting benefits is an important personal decision. Quite often, the recommendation is “wait until you are 70 because the monthly benefit is higher.” This is regularly provided by Social Security offices. For some people, this is a good answer, but for many, this answer is not the best. Many people approaching the decision of when to start collecting benefits are married or widowed, and there are more options for couples than for single people. The regulations regarding Social Security are complicated, especially regarding couples, and the decisions are not simple. Because people can begin collecting benefits at age 62, the decisions need to start at that time. Economic decision tools are useful in helping to make the best decisions of when to begin receiving benefits.

This paper discusses possible cases regarding the analysis of social security benefits for couples. This involves time value of money, comparison of alternatives, and economic decision making. Any of the example cases may be kept fairly simple by specifying all variables, or a case may be expanded by incorporating a range of possibilities and performing sensitivity analysis. Rules can be provided to the students, or left for the students to research them. Cases can have a nearly infinite variety by changing the ingoing assumptions. Case studies of this type more nearly approximate real world issues and help to demonstrate the use of economic tools beyond what can be done with end of chapter problems. The cases included here provide an outline of how to approach a fairly complicated issue by analyzing one step at a time. While we use social security as an example, similar problems can be created using any defined benefit program. A short series of cases is given, demonstrating how couples strategies differ from that of singles strategies, and how various engineering economy tools may be used to support the needed decisions.

Our 2012 paper<sup>1</sup> was class tested during the spring 2012 semester. In that situation, students worked in teams and were given an open ended problem, where a person’s income was given, but whose age of death was unknown and uncertain. Student teams typically started work two weeks before the due date, working on the case outside of class. Results, including sensitivity analysis, were then presented by the students in class and discussed. Feedback was very positive because they saw a direct application of newly learned tools to a realistic situation. One student reported that a discussion of the social security case occupied twenty minutes of a job interview, where the employer was looking for evidence that the student was able to use spreadsheets as applied to a real-world economic problem. She received and accepted the job offer.

### **Literature Review**

The Social Security Administration website<sup>2</sup> is a likely first stop for students looking for information. The website is written in understandable English, but is often short on hard information unless the right location is found. The website does not make recommendations. A compilation of the Social Security regulations is also available,<sup>3</sup> but these are written in typical government legalese, are virtually unreadable, and are not recommended as a source.

There is a variety of material available, much of it providing conflicting recommendations. There are recommendations to not take benefits at age 62,<sup>4,5</sup> as well as those recommending to wait until 70,<sup>6,7</sup> while others write about the risk of postponing until 70<sup>8</sup>. While the Social Security Administration website focuses on monthly benefits,<sup>2</sup> others use various discounted

cash flow tools.<sup>9, 10, 11, 12</sup> Others say the timing of beginning benefits depends on the real interest rate.<sup>13, 14</sup>

Information regarding strategies for couples is more limited.<sup>15, 16, 17</sup> The best reference we have found for detailing the many facets of couples strategies is from Reichenstein and Meyer,<sup>18</sup> which has proven to be an excellent resource.

### **Determining Benefit Amounts**

Identifying the average indexed monthly earnings (AIME) is the first step for determining benefits. An individual's earnings record is indexed for inflation, using the national average wage index, published by the Social Security Administration. A person's highest 35 years of earnings are used in the calculation. The index is updated annually based on average wages, not the cost of living. The most recent update was October 2012, which added 2011 wage information.<sup>19</sup>

A person's monthly benefit is based on their primary insurance amount (PIA). The PIA is the monthly benefit that a person would receive if they start benefits at their full retirement age (FRA). The computation of the PIA uses a formula which contains two "bend points" that increase with inflation. For 2012, the bend points were \$767 and \$4624. For 2013, the bend points are \$791 and \$4768.<sup>20</sup> For 2013, the PIA calculation is as follows:

$$\begin{array}{ll} \text{If AIME} < \$791, & \text{PIA} = (0.90)(\text{AIME}) \\ \text{If } \$791 < \text{AIME} < \$4768, & \text{PIA} = (0.90)(791) + (0.32)(\text{AIME} - 791) \\ \text{If AIME} > \$4768, & \text{PIA} = (0.90)(791) + (0.32)(4768 - 791) + (0.15)(\text{AIME} - 4768) \end{array} \quad (1)$$

So a person having an AIME is \$5000 has a PIA of \$1980.90 in 2012 and \$2019.30 in 2013, an increase of 1.9%. The schedule is progressive and the social security benefit may nearly replace pre-retirement income at low incomes—half-time at minimum wage.

When analyzing these problems, we need to have a common measure of economic value. The most common measures in the popular literature are the monthly benefit and the total amount of benefits received over a period of time (without considering the time value of money). Although real interest rates continue to be low at the present time, we do not believe that this will continue for the next several decades while we are still alive and hopefully collecting benefits.

Discounted cash flow techniques are highly recommended, and this paper will use present value.

### **Summary of Relevant Social Security Rules**

Rules can be given to the students as part of the case study, or students can be directed to research them. The Social Security website<sup>2</sup> has much of the information, but it can be very time consuming to find all of the relevant information. The important rules are captured here to assist the reader in walking through the proposed cases.

We will limit our discussion to people who were born between 1943 and 1954, as this group shares the same full retirement age of 66 years. This age slowly increases for people born after 1954.

- A person will receive their PIA if they begin benefits at age 66 (their FRA).
- If a person starts early, they receive a reduced benefit. Benefits are reduced 6.67% for every year before age 66, up to 3 years, and 5% for every year beyond 3 years. For example, if a person begins benefits at age 62, they will receive 75% of their PIA. The earliest that normal retirement benefits can be received is 62.
- If a person starts after age 66, they receive an increased benefit up to age 70. Benefits are increased 8% for every year beyond age 66. For example, if a person begins benefits at age 70, they will receive 132% of their PIA.
- If a person's spouse is receiving benefits or has registered for benefits, he or she (but not both) can receive spousal benefits if this increases their benefit. Benefits are reduced 8.33% for every year before their FRA, up to 3 years, and 5% for every year beyond 3 years.
- If a person's spouse dies, they can receive survivor's benefits that are based on the deceased's benefits or age at death.
- A person may work and receive their normal level of benefit if they are 66 or older. If they are less than 66, there is a reduction in benefits if they make more than \$15,120/year.<sup>2</sup>

In addition to the above social security rules, some assumptions are made in order to streamline the cases. These assumptions are stated here.

- Any recommendation to collect before age 66 assumes an income of less than \$15,120/year.
- Couples are of the same age, and planning takes place just before their 62<sup>nd</sup> birthday.
- Their birthdays are in very early January and both will receive 12 months of benefits in their first year.

### **Case Studies**

The estimated average age of death is a key variable. Assuming both are alive at age 62, the average age at death for males is 81.4 and the average age of death for females is 84.3.<sup>21, 22</sup> For computing ease, we will round this up to the nearest full year; thus males die at the beginning of their 82<sup>nd</sup> year and females at the beginning of their 85<sup>th</sup>. Social Security benefits are indexed for inflation, and so any interest rate used for time value of money calculations must be a real interest rate. We will use 3%, and will compound annually to ease the computation burden.

### Base case

Our base case is a married couple, where both are turning 62. Both have average indexed monthly earnings (AIME) of \$3342. This matches our ASEE 2012 paper<sup>1</sup>, but it represents a slightly lower income since indexing increases the *indexed average* each year. Having both with the same AIME will allow us to demonstrate how differences in longevity affect the present worth without the AIME causing complications. He is working and we will assume that he will continue to work at least until the age of 66. She has recently been laid off and doubts that she will be able to work full time in the future.

The optimum strategy for this couple can be determined by working through a series of short cases. These are organized as follows:

- Case 1a      Compute the monthly benefits that each person can receive as individuals
- Case 1b      Determine the present value of each of these options
  
- Case 2a      Determine the female's spousal benefit options
- Case 2b      Determine the male's spousal benefit options
- Case 2c      Determine the female's survival benefit
- Case 2d      Determine the male's survival benefit and alternative strategies
  
- Cases 3a, 3b, 3c, 3d      Determine the present value of alternative strategies, with each case representing different ages where each can start receiving benefits
  
- Case 4      Organize and present the information using different tools

Case 1a. Compute PIA & other monthly benefits

Equation 1 is used to determine the PIA of each person. For an AIME = 3342,

$$PIA_{2013} = (0.90)(791) + (0.32)(3342 - 791) = \$1528.22 \text{ per month,}$$

which is rounded down to the nearest \$0.10, or \$1528.20. This compares with a PIA in 2012 of \$1514.30 per month. Because a 2013 AIME of \$3342 represents a slightly lower income individual than a 2012 AIME of \$3342, a slightly larger amount of income is “replaced” by the PIA (by increasing the bend points). This is the amount that either person should receive if they begin benefits at age 66. Once benefits begin, annual cost of living increases (1.7% for 2013) are made by increasing a person's PIA, not by changing the AIME.

If she starts benefits at age 62, then her reduced benefits are as follows:

$$\begin{aligned} \text{Reduction} &= (6.67\%)(3 \text{ years}) + (5\%)(1 \text{ year}) = 20\% + 5\% = 25\% \\ \text{Monthly benefit} &= (1 - 0.25)(1528.20) = \$1146.10 \text{ per month} \end{aligned}$$

If either starts benefits at age 70, then the monthly benefit is increased as follows:

$$\begin{aligned} \text{Increase} &= (8\% \text{ per year})(4 \text{ years}) = 32\% \\ \text{Monthly benefit} &= (1.32)(1528.20) = \$2017.20 \text{ per month} \end{aligned}$$

Case 1b. Compute the Present Value

He can start benefits at age 66 or 70 (or anywhere in between). Because he is assumed to be employed, his benefit would be reduced or eliminated if he starts collecting before full retirement age. Using Excel formats, present value uses the following to determine present value.

$$\begin{aligned} &=PV(\text{rate}, \text{nper}, \text{pmt}, [\text{fv}], [\text{type}]) \\ \text{where rate} &= \text{interest rate} \\ \text{nper} &= \text{number of periods} \\ \text{pmt} &= \text{uniform payment} \\ [\text{fv}] &= \text{optional future value. Default is 0.} \\ [\text{type}] &= \text{optional cash flow type. Default is end of period.} \end{aligned}$$

We will use annual compounding, and assume all cash flows occur at the end of the year. The interest rate is 3%, and the expected age of death for him is 82; 85 for her. This value must then be discounted to age 62.

$$\begin{aligned} \text{At age 66,} & \quad =PV(3\%,82-66,1528.20*12)*PV(3\%,4,0,1) = \$204,663 \\ \text{At age70,} & \quad =PV(3\%,82-70,1528.20*12*1.32)*PV(3\%,8,0,1) = \$190,211 \end{aligned}$$

He is better off starting social security at age 66 than at 70.

Likewise, she can start benefits at age 62, 66, or 70. Although her PIA is the same as his, her expected lifetime is longer, so all present values need to be recomputed.

$$\begin{aligned} \text{At age 62,} & \quad = -PV(3\%,85-62,1528.20*12*0.75) = \$226,162 \\ \text{At age 66,} & \quad =PV(3\%,85-66,1528.2*12)*PV(3\%,4,0,1) = \$233,384 \\ \text{At age 70,} & \quad =PV(3\%,85-70,1528.20*12*1.32)*PV(3\%,8,0,1) = \$228,122 \end{aligned}$$

Her expected longevity increases the present value of her benefits relative to his. Economically, she is better off starting Social Security at age 66 if she can afford to wait. There may be other issues that influence the decision, such as a need for current income, health concerns, family history of early death, and others. If she expects to die at an early age, an earlier start of benefits will be more economically attractive. We will assume that she begins benefits at age 62.

Their combined benefit is \$204,663 (his at age 66) + \$226,162 (hers at age 62) = \$430,825.

The key variable is the age at death. Notice that even though her monthly benefit is less than his, her lifetime benefit is greater. To analyze in more detail, a sensitivity analysis can be performed using different life expectancies and interest rates. Students could demonstrate how age of death is more important than the interest rate using a spiderplot.

### **Spousal and Survivor's benefits**

Either person can collect spousal benefits, receiving up to half of their spouse's PIA. Benefits are reduced if a person starts receiving benefits before their FRA. Either spouse can collect, but not both at the same time. Case 2 involves calculating spousal benefits.

Assume that she has decided to begin receiving benefits at age 62, based on her own earnings record. Her monthly benefits will be \$1146.10 per month.

Case 2a. What is her spousal benefit if she were to take them at age 62 or 66?

She can receive spousal benefits after he registers or begins taking benefits. She can receive either her own retirement benefit or spousal benefits, but not both. If she starts early, spouse benefits are reduced by 8.33% for each year before FRA up to 3 years, and by 5% for each additional year.

If she starts spouse benefits at age 62, then she will reduce her benefits as follows:

$$\text{Reduction} = (8.33\%)(3 \text{ years}) + (5\%)(1) = 25\% + 5\% = 30\%$$

$$\text{Monthly benefit} = (1 - 0.30)(0.5)(1528.20) = \$534.80 \text{ per month}$$

This is significantly below her current benefit of \$1146.10, so there is no reason to take spousal benefits. In addition, he has not registered for benefits (and will not until age 66), so she is not yet eligible for spousal benefits. If she waits until age 66, there is no reduction so her monthly spousal benefit would be:

$$\text{Monthly benefit} = (0.5)(1528.20) = \$764.10 \text{ per month}$$

This is still below her current benefit, so there is no reason to switch.

Case 2b. What is his spousal benefit if he were to take them at age 66 or 70?

Assume he registers for benefits at age 66. He can delay taking benefits up to age 70 if he prefers. She has a PIA of \$1528.20 per month, so his spousal benefit would be:

$$\text{Monthly benefit} = (0.5)(1528.20) = \$764.10 \text{ per month}$$

There is no increase to the spousal benefit by delaying.

Case 2c. What is her survivor's benefit?

He registers for Social Security benefits at age 66. She is eligible for Survivor's benefits if he dies. If she begins taking Survivor's benefits before she is 66, there will be a reduction in benefits, but if she begins Survivor's benefits at age 66 or later, she will collect his benefit instead of hers. So if he begins benefits at age 66 and dies at age 82 (as assumed in Case 1b), she will receive his PIA of \$1528.20 per month instead of her benefit of \$1146.10 from his death until hers. However, if he delays taking benefits to age 70, then she will receive his increased benefit of \$2017.20 per month.

Case 2d. What is his survivor's benefit and possible strategies?

Because she began benefits at age 62, his Survivor's benefits would be her monthly benefit of \$1146.10. He has no reason to take Survivor's in case she dies, because it is less than his monthly benefit.

However, he can take spousal benefits at age 66 and later switch to benefits based on his own record at age 70. In this way, he can take increased benefits at age 70 while obtaining some benefit between the ages of 66 and 70. Also, by delaying regular benefits to age 70, her survivor's benefits will be the increased benefit reflecting his delay.

### **Determine NPV for the alternative strategies**

Case 3a. Determine the PV for her if she starts benefits at 62, if he starts benefits at 66, and her survivor benefit assuming he dies at age 82 and she dies at age 85.

As determined in Case 1, the PV for her benefit, starting at age 62, is:

$$\text{At age 62, } = -PV(3\%, 85-62, 1528.20 \cdot 12 \cdot 0.75) = \$226,162$$

His benefit, taken on his own earnings record, starting at age 66 is:



At age 66,  $=PV(3\%,82-66,1528.20*12)*PV(3\%,4,0,1) = \$204,663$   
 Her Survivor benefit, assuming that he dies at age 82 and she at age 85 is:  
 $=PV(3\%,85-82,1528.20*12)*PV(3\%,20,0,1) = \$28,720$   
 So this strategy has a total value of  $226,162 + 204,663 + 28720 = \$459,546$

Case 3b. Determine the PV for her if she starts benefits at 62, if he starts benefits at 70, and her survivor benefit assuming he dies at age 82 and she dies at age 85.

Again, the PV for her benefit, starting at age 62, is still \$226,162  
 His benefit, taken on his own earnings record, starting at age 70 is:  
 At age 70,  $=PV(3\%,82-70,1528.20*12*1.32)*PV(3\%,8,0,1) = \$190,211$   
 Her Survivor benefit, assuming that he dies at age 82 and she at age 85 is:  
 $=PV(3\%,85-82,1528.20*12*1.32)*PV(3\%,20,0,1) = \$37,911$   
 So this strategy has a total value of  $226,162 + 190,211 + 37,911 = \$454,284$

Case 3c. Determine the PV for her if she starts benefits at 62, if he starts spousal benefits at 66 then switches to retirement benefits at 70, and her survivor benefit assuming he dies at age 82 and she dies at age 85.

Again, the PV for her benefit, starting at age 62, is still \$226,162  
 His spousal benefit, taken from age 66 to age 70, is:  
 At age 66,  $=PV(3\%,70-66,764.10*12)*PV(3\%,4,0,1) = \$30,282$   
 His benefit, taken on his own earnings record, starting at age 70 is still \$190,211  
 Her Survivor benefit, assuming that he dies at age 82 and she at age 85 is still \$37,911  
 So this strategy has a total value of  $226,162 + \$30,282 + 190,211 + 37,911 = \$484,566$

Case 3d. Determine the PV for her if she starts benefits at 66, if he starts spousal benefits at 66 then switches to retirement benefits at 70, and her survivor benefit assuming he dies at age 82 and she dies at age 85.

If she were to begin benefits at age 66 instead of age 62, Case 3c becomes:  
 Her benefit, starting at age 66, is:  
 At age 66,  $= PV(3\%,85-66,1528.20*12)*PV(3\%,66-62,0,1) = \$233,384$   
 His spousal benefit, taken from age 66 to age 70, is still (Case 3c) \$30,282  
 His benefit, taken on his own earnings record, starting at age 70 is still \$190,211  
 Her Survivor benefit, assuming that he dies at age 82 and she at age 85 is:  
 $=PV(3\%,85-82,1528.20*12*1.32)*PV(3\%, 0,0,1) = \$37,911$   
 So this strategy has a total value of  $233,384 + \$30,282 + 190,211 + 30,911 = \$491,788$

In Case 1b, she decided to begin benefits at age 62 for reasons other than the present value. The decision to take benefits at 62 is worth \$7,222 or 1.5%. This difference is relatively small.

### **Organizing and presenting alternatives**

Case 4. Organize and present the information

We can present the information from the preceding cases in a table or in a decision tree to organize the alternatives and help the decision making process. Table 1 shows a simple table to

depict each of the cases, showing the different benefits, and presenting the totals. This proves to be a very simple yet effective method of presenting the information and arriving at a conclusion.

TABLE I. Summary of Benefits

Case	Age she starts own benefit	Age he starts own benefit	PV her own benefit	PV his own benefit	PV his spousal benefit	PV her survivor's benefit	PV of total benefit
3a	62	66	\$226,162	\$204,663		\$28,720	\$459,545
3b	62	70	\$226,162	\$190,211		\$37,911	\$454,284
3c	62	70	\$226,162	\$190,211	\$30,282	\$37,911	\$484,566
3d	66	70	\$233,384	\$190,211	\$30,282	\$37,911	\$491,788

A decision tree can also be built showing all of the alternatives and the resulting present values. However, the decision tree becomes extremely large, and becomes completely overwhelming, as seen in Figure 1. Decision trees do not work well as learning exercises when the issue is this complex. The decision tree can be simplified (and could be made to fit better), but becomes usable only by limiting the scope of the decisions.

### Case Study Options

In order to simplify this problem, a number of variables have been fixed. For instance, we have assumed that decisions are made at age 62, 66, and 70. In reality, decisions can be made anywhere between ages 62 and 70, and the problem can be analyzed by year (or by month if one wanted to have maximum granularity). However, these three ages are the key break points in that they identify the earliest start of benefits, when full benefits take place, and the latest age with maximum benefits.

More variations can be used, including using real people with their real ages. Life expectancies can be found on the social security website<sup>2</sup> for a variety of current ages. People's PIAs can be real or created, and couples will rarely have the same age and PIA as we have assumed here. A variety of retirement options can be used, and some options become complex if both spouses start collecting benefits before their FRA.

The case problem can be made as simple or complex as desired. Information such as survivor's benefits may be provided, or may be left to the student to find the information. The social security website<sup>2</sup> will prove to be a key source of information, but finding all of the information could prove to be very time consuming for students.

There are also a number of uncertainties within the case, including the actual age of death, interest rate, and relative differences in age and AIME between the two people. We recommend using sensitivity analysis, such as spiderplots, to demonstrate the impact of each variable on the final decision.

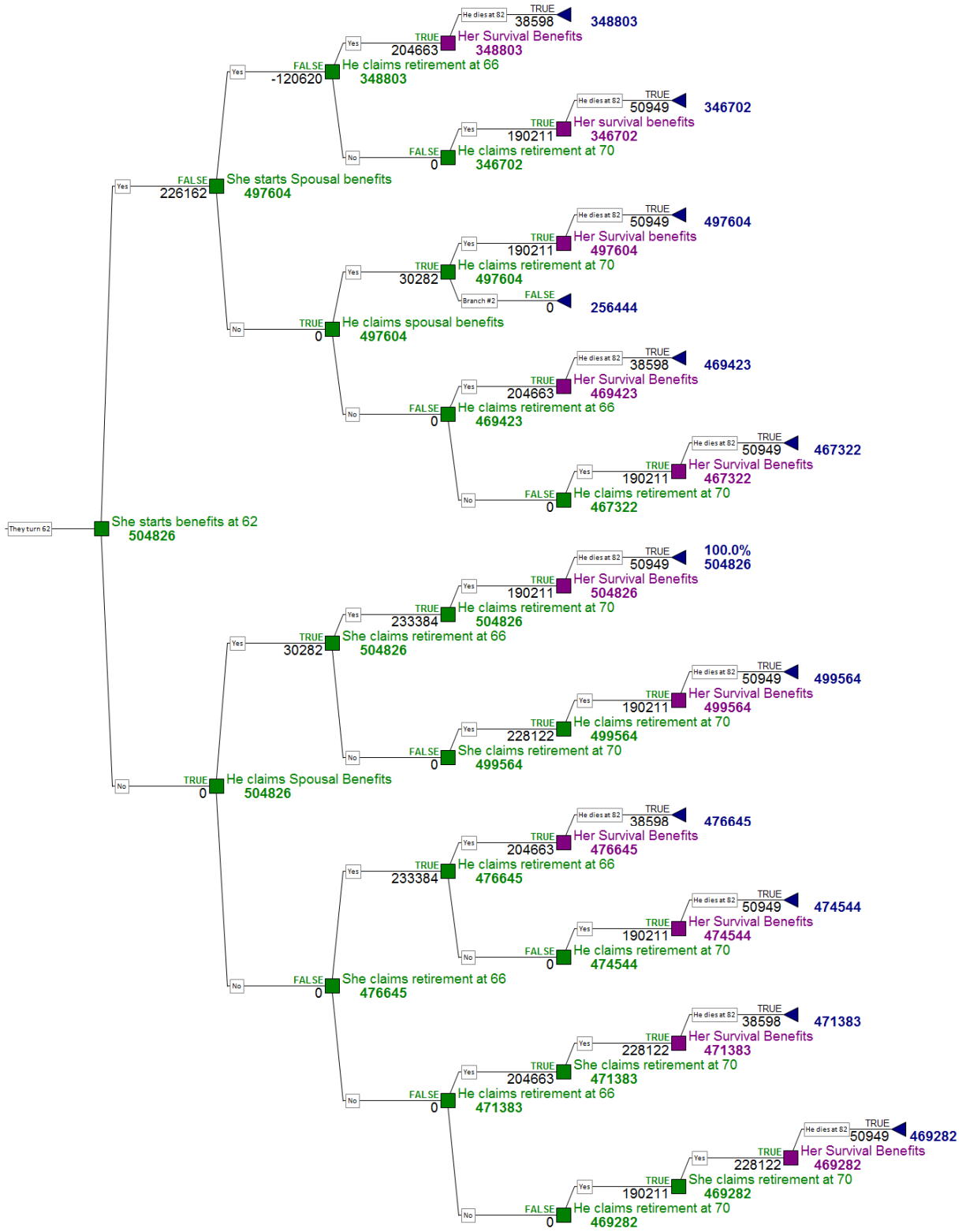


Figure 1. Decision Tree of Social Security Strategies

## Conclusions

This case can be used in either undergraduate or graduate classes with students who are not close to retirement. Our initial case study has been used in a graduate course with great interest from the students, in the guise of “Your aging professor needs advice.” The current series of cases could be given all at one time, but would likely be given over the course of several weeks for an undergraduate class. The instructor can limit the case if needed or can change variables so that every student has a slightly different situation. For a true case study, the instructor can also have the students research and assemble the information needed for analysis. While there are many ways to specify the case study, there is one correct solution to any set of assumptions.

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