Chapter Eighteen

Capital Needs Analysis

Chapter Goals

This chapter will enable you to:

- Understand the role of capital needs in PFP integration.
- Appreciate how risk can alter the capital needs calculation.
- Observe the advantages of a total portfolio management approach.
- Apply a retirement needs analysis.
- Appreciate how a retirement needs calculation forces choices.
- Perform an insurance needs analysis.

As the financial plan was drawing closer to its end, Dan and Laura would come in to drop off necessary and not so necessary documents. I had the feeling they were trying to influence its results, to make them rosier. At a recent meeting, Dan asked how financial planners went about reaching conclusions.

Real Life Planning

The Johnsons

For middle-aged people, retirement matters often become their number one financial concern. As people reach their 40s and 50s, many want to implement a savings plan that can provide a secure retirement.

One couple that the advisor worked with did not follow the normal path. Frank and Sarah Johnson were both in their late 40s. He was a distinguished architect in a high-paying specialty and was associated with a prominent firm. She was a lively, well-dressed woman who worked part-time. No one would suspect that these prominent people had only $35,000 in accumulated savings, all of it attributable to a recent inheritance.

When he first saw the couple, who had come from a different part of the country to consult him, they were despondent. They felt that at their stage in life, no one could help them. In fact, they had $60,000 worth of repairs and renovations that needed to be made on their home. The advisor assured them that while he couldn't produce an attractive retirement at age 65, one later on could be feasible.

The advisor went through the process of looking at assets, compiling their cost of living, incorporating returns on assets and projected inflation rates. It was clear that they would have to find a way to save more money. The wife's goals precluded a full-time job.

Therefore, they would have to cut back on expenses. Two items stood out. One was tens of thousands of dollars spent on clothing each year, mostly hers. The second was education expenses for their son, who was in graduate school.

The advisor thought about how he could best present what would be a sharp cutback in expenses and enrolled other members of his staff in the process. A carrot-and-stick approach was decided on. At the next meeting, the couple was assured that if they followed the plan, an age 67 retirement at somewhat close to their current standard of living would result. Sarah would have to cut back on her clothing expenditures. The advisor said, "All your clothes that I've seen are very attractive—so much so that they can be used for at least two years instead of one." Their son was to finance graduate school through borrowing. Their home renovation would wait and would be instituted after a fixed level of household savings was developed.

The advisor sensed they weren't fully buying into his recommendations. He decided to become more graphic. They were told that any inaction would be like playing Russian roulette, with the risk of adverse job or health circumstances placing them in a precarious situation. Savings would have to start immediately.

Two years later the couple came back, this time with only modest savings. They had implemented the expense cutbacks. However, they said there had been negative circumstances that forced them to liquidate most of the inheritance. Since little of the savings plan had been implemented, a harder line was taken. They were told that the stakes in Russian roulette had been raised and now "all the gun's chambers were loaded." They assured the advisor of their ability to comply. The advisor wanted more frequent contact but settled on a meeting in one year.

At the end of the year there were further modest additional pension savings, and the entire inheritance was spent. Once again they had failed to save. The advisor was perplexed. Why were these people coming to see him and paying money if they wouldn't follow his advice? He wondered how could two seemingly normal middle-class, well-respected people place themselves in such a vulnerable position? Other people had made the necessary adjustments fairly quickly. The advisor decided it was time to be even more blunt and graphic.

He told them that if they didn't begin material savings, their new lifestyle, which was to start when the husband retired, voluntarily or involuntarily, would be close to poverty. Without savings, if they were careful they could treat themselves once a week to a full meal at a McDonald's. Moreover, if they didn't follow the savings program, the advisor said he would resign.

The couple's request for a box of tissues and subsequent discussions indicated that the advisor had finally reached them. For the first time, Sarah said she did not believe in saving since "no one knows when it is their turn to go." However, the stark portrayal of a highly unattractive lifestyle in retirement had forced her to look at another picture—one in which the rest of her life was extremely disappointing. In fact, the Johnsons' delay had already significantly increased that risk.

In practical terms, they were now on their way to reducing the risk of an unsatisfying quality of life. They started a true savings program. From the advisor's standpoint, retirement planning had at last begun.

We will use the Johnsons' story as background for the case study later in the chapter.

OVERVIEW

Financial integration means using all assets and liabilities, all cash flows, all household activities, all future plans to arrive at decisions. Put simply, it means including all current and future resources and information in decision making. It is the opposite of making one decision at a time based strictly on the merits of that item.

Earlier in this book, you learned that the household operates as an enterprise. Let's briefly review its characteristics. The household has current and projected revenues and expenses and generates money to fund future goals. Your goals determine what future financial resources you need. These goals are expressed in a life cycle framework, generally with at least a desire for some consistency in your standard of living over time.

There are three principal ways of making integrated financial decisions: simple capital needs analysis, capital needs analysis incorporating risk, and full integration—total portfolio management.

You will learn the strengths and weaknesses of each method as well as how to do a capital needs analysis yourself. Integration will take place through a retirement needs setting that is fairly common in practice. The final part of the chapter is devoted to it. A life and disability insurance needs analysis is demonstrated in Appendix I. Both will use information on the Johnsons, whose case we have just discussed.[1]

SIMPLE CAPITAL NEEDS ANALYSIS

Capital needs analysis qualifies as a PFP integration approach because it takes into account all current and projected income, expenses, assets, and liabilities over our life cycle. It is frequently used to determine the sum needed at retirement to fund our retirement needs.

The approach taken for retirement is to estimate retirement living expenses and compare them with revenues available through Social Security and other revenue sources that we can be reasonably sure will be available. The difference, which can be called the shortfall, is typically made up through additional savings.

We compute the lump sum needed at retirement to provide cash thereafter that will meet living needs. This retirement lump sum is funded through implementation of a yearly savings figure. We need to employ a full life cycle approach in connection with the yearly savings figure to determine whether, given the costs of our current cost of living and goals, we will be able to generate that yearly savings. If the savings are not sufficient, we then determine what adjustments have to be made.

Life insurance analysis is another major use of capital needs analysis. The approach is very similar to retirement needs except life insurance is broader. The major life cycle period needs, including the retirement period, are discounted to today. The insurance needed is just the sum total of all the period's shortfalls. Life insurance is often intended to replace the cash flow from a deceased wage earner. It is discussed in Appendix I.

The simple retirement needs calculations are illustrated in a later section of this chapter.

CAPITAL NEEDS ANALYSIS—RISK-ADJUSTED

Simple capital needs analysis provides a single estimate of an outcome. For example, it attempts to tell us the amount we have to save to retire comfortably. However, virtually all projections are subject to risk. Some common risks are disappointing investment returns, longer-than-average life cycles, and higher-than-projected inflation rates.

These risks can result in your savings pattern being insufficient to meet your need, say, for retirement. Notice that our objective has now shifted from funding the single estimate[2] to one that incorporates risk. For example, the best estimate for male life span may be around age 80, but, if we funded until age 80, 50 percent of the time we would not have enough money.

[1] Given the complexity of the Dan and Laura case study, the simpler Johnson case was used to demonstrate the steps mathematically. Integration for the Dan and Laura case is discussed in Chapter 20.

[2] This estimate can be overly optimistic. See, for example, withdrawal risk in Chapter 12.

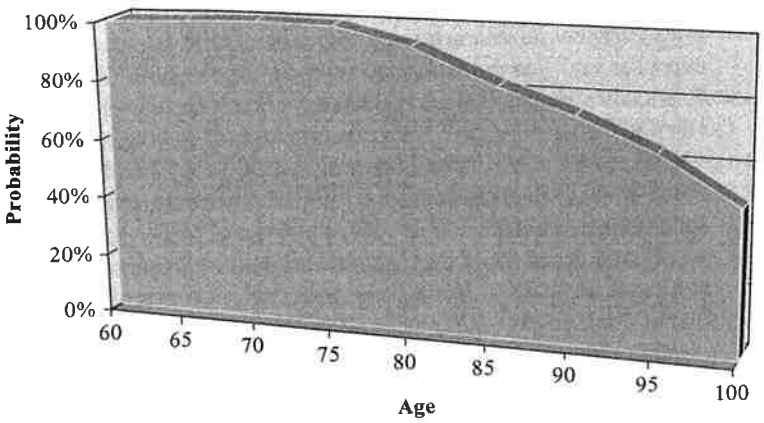

FIGURE 18.1
Monte Carlo Simulation—Probability of Having Sufficient Assets to Fund to Extended Retirement Age

We meet that possibility by funding to an age that extends well beyond the 50 percent probability, with the exact age selected being dependent on our risk tolerance. There are two overall methods that are commonly used to adjust for that possible occurrence.

The first method is to be more conservative in our simple capital needs projections. For retirement, we may lower our assumed investment return, raise the inflation rate, and, as discussed above, provide for living well into our 90s.[3]

The advantage of this method of including risk is that it is easy to understand and to execute. The disadvantage is that you really have no benchmark to determine how much to alter each calculation. For example, to be conservative, should you take the return figure down 1, 3, or 5 percent or more? After you select a reduction in investment return, should you also raise the inflation rate and assume living to a ripe old age? You could end up being too conservative and, as a result, save too much money and forfeit a better lifestyle. Alternatively, you could not be conservative enough, thus exposing yourself to a potential negative planning outcome.

The second method used is Monte Carlo simulation. Under **Monte Carlo analysis,** selected key factors are run randomly, based on their mean figures and potential outcomes around their means. Each individual run, called a trial, provides a different combination of factor outcomes. Think of it as resembling a slot machine with many choices. Each time you press the handle, you get a different combination. Each individual combination produces a different result in money terms, telling you whether your money lasted long enough. If many of these trials are run, you receive a frequency distribution of potential outcomes. Then the probability of a favorable or unfavorable result can be estimated.

As the accompanying Figure 18.1 for Monte Carlo simulation shows, the probability of having enough money to fund retirement declines as the client's age increases. In this set of simulations, the probability declines from 100 percent at age 75 to 75 percent at age 90.

Note that Monte Carlo is run by a computer program and what is more important is an understanding of its strengths and weaknesses.

Monte Carlo allows you to combine many factors at the same time, often using their mean and standard deviations to determine the frequency of each factor's outcome. For example, running the previously mentioned investment return, age, and inflation risk together, you can get a better reading on the probability of outliving your diminishing savings. Assume the calculation indicates that there is a 75 percent chance of having sufficient funds. You can then raise the savings rate to bring that figure up to, say, 90 percent if that is the probability that you find acceptable.

[3] Given the withdrawal risk for many people, an investment return reduction to compensate for a poor outcome can amount to 3 percent or more.

Practical Comment Introductory Comment

Stanley was a liberal arts professor who had great natural curiosity. He wasn't particularly interested in money matters, but the way people made investment decisions intrigued him. He quickly learned the essence of the capital asset pricing model with its beta and alpha coefficients. He used them as input in his stock and bond purchases. When he came in to see the advisor for an overall review, he wanted to know why finance limited its analysis to publicly traded securities. He said he made his decisions based on all the assets available to him and took into account his obligations as well. From his perspective, many people used the same approach.

The advantage of Monte Carlo is a more precise calculation than the "guesstimated" risk-adjusted approach. The disadvantage is that people prefer one clear figure to probabilities. Moreover, the basic Monte Carlo approach assumes that the key factors are not correlated with each other, although they may be. On balance, Monte Carlo provides additional insight as compared with a simple capital needs analysis. Monte Carlo analysis is being used, at least in part, by a growing number of financial planners.

TOTAL PORTFOLIO MANAGEMENT

The Practical Comment above serves as an introduction to the topic.

The total portfolio management system explained below can be considered an answer to his question. Total portfolio management (TPM) is a fully integrated approach to personal financial planning. As you will see, it can provide a purer form of capital needs analysis. It does so by using all household resources in making its planning and investment decisions. The other forms of capital needs analysis we have discussed input a separately arrived-at investment return, which doesn't fully reflect individual circumstances.

Let's review what you have already learned about TPM. Unlike other models, it includes all assets and liabilities, not just financial assets alone. Assets can be separated into financial investments—stocks, bonds, mutual funds, and nonfinancial investments—real assets, human-related assets, and other assets.[4] Liabilities are made up of financial liabilities and overhead costs.[5]

Assets and liabilities include not only items that are currently marketable but those that are estimated from cash inflows and outflows using market-based discount rates. For example, a person with a U.S. government–guaranteed job for $50,000 a year indexed for inflation for 40 years, who we assume has no risk of not getting paid or being unable to work, would have a human-asset value of $2 million ($50,000 × 40). Few would argue that the cash flow from this job isn't an asset even though you cannot point to a daily traded asset figure in the newspaper since human assets are not marketable.

These assets and liabilities form a portfolio, the household portfolio. It is assumed that important decisions for the household are made on an integrated portfolio basis. That

[4] Sometimes we left this category out since often it is not as meaningful as the two other nonfinancial asset categories.

[5] In practice, some may wish to omit overhead costs and perhaps modest miscellaneous financial debt such as credit card obligations. This leaves only assets and debt attached to financing them to be processed—for example, mortgages paid to finance a house. If TPM is being used principally for investment allocation matters, a less exact but still beneficial approach is to drop all liabilities and concentrate on an asset-only allocation.

means decisions are made including all relevant information and activities. We call this process total portfolio management.

Example 18.1

Selena had to decide whether to go to graduate school for an MBA. She had taken a course in PFP as an undergraduate and understood that she has a proposed capital expenditure—an investment in a human asset, her own. She considered its effect on her cash balance and her need to borrow money to finance it. Importantly for her, it would cut into her leisure time and force her to postpone the purchase of both a car and a home. On the other hand, it would result in a significant increase in her income over her remaining work years.

She decided to enroll in graduate school but to postpone its date for 24 months. That would allow her to purchase the car now. She would postpone buying the home until she graduated. At the same time, she would be able to add to her financial investments. She smiled to herself when she thought about her decision, which took into account all her relevant factors, including all her assets and liabilities.

She remembered the professor calling it "total portfolio management" and saying that it was easier for her to accomplish the process than for a large organization whose owners and many workers may not always agree on actions.

The TPM method incorporates all household risks as well. Each asset and liability carries risks, as you learned in Chapter 10. The TPM approach reflects what comprehensive personal financial planning and capital analysis needs do. In fact, TPM can be thought of as a further modification of simple capital needs analysis. It uses the same basic information as inputs but employs them differently.

TPM does not depend on the validity or lack of workability of any one formula for making decisions. However, the origins of its financial solution are the Markowitz approach to modern portfolio theory (MPT). MPT is discussed in Chapter 9 and Web Appendix A, Modern Investment Theory. It uses risk-return principles to find the optimum mix of assets.

That optimum mix provides the highest return for a given level of risk.[6] When you input all assets and liabilities using the Markowitz approach, the outcome presents the net income or leisure outlays you can afford to make.[7]

Use of All Assets

TPM's use of all assets and obligations against them creates a broader and deeper analysis of a person's future requirements. It is the logical outgrowth of PFP theory discussed in Chapter 4 and more closely approximates the way financial planning practitioners think in making their recommendations to clients.

Example 18.2

There are two retirees, age 67, who have the same living costs and the same cash inflow stream including identical Social Security payments. Jack, a corporate employee without a fixed company pension, has saved in stocks and bonds currently worth $600,000 and is largely being supported by income from them and by slow withdrawals of principal. Jason, a public school teacher, receives the majority of income from a fixed government pension that has a net present value of $600,000. They have the same overall risk tolerance. Each has received a $300,000 inheritance recently. Should their allocation for that inheritance be the same?

[6] Or, less often in PFP circumstances, the lowest risk for a given level of return. A given maximum risk may approximate human behavior more closely.

[7] There are a few limitations in practice called *constraints*. The first is the assumption of flat real leisure expenditures over time as used in Modigliani's life cycle theory. The second is a budget constraint. You can only spend in early adult years as much cash flow as generated. Therefore, flat real expenditures become more appropriate over time. Finally, certain variables, including human assets and real assets such as the home, are considered separately determined and TPM may focus on the financial asset mix. These limitations are often consistent with real-life financial planning assumptions by practitioners. Where the assumption of flat real expenditures over time is not appropriate, the analysis can be modified.

TABLE 18.1
Sample Breakdown of Total Portfolio Management of Assets over the Life Cycle

	Individual Asset Categories as a Percentage of Total Assets					
Age	Human Assets	Financial Assets	House	Pension Assets	Social Security	Total
25	93%	0%	0%	2%	5%	100%
35	83	0[1]	9	2	6	100
45	74	3	13	3	7	100
55	57	12	19	3	9	100
65	18	35	29	5	13	100
75	0	45	43	3	9	100
85	0	35	65	0	0	100

[1] Financial assets at age 35 are less than 1 percent; lack of savings due to assumption of life cycle theory of level leisure expenditures throughout life span.

Although in practice some advisors might provide them with the same stock/bond mix, the answer is probably no. Jason's pension is bondlike in its payment of fixed annual sums[8] and, as a government obligation, is extremely safe. Both should view Social Security payments as bondlike as well. As it currently stands, Jason's household portfolio incorporating all assets—in this case, including human-related assets as represented by a teacher's pension—is safer than Jack's. Therefore, Jason should be provided with a greater percentage of stocks than Jack to bring their overall portfolio risks in line.

One sample breakdown of TPM assets over a life cycle is seen in Table 18.1.

Use of Correlations

The household is more than the sum of its separate assets less its liabilities. It is an operating enterprise in which the individual activities influence each other. Under TPM, the influence is partially reflected in the correlations among the assets and liabilities. The total portfolio risk is a more accurate measure of risk and makes better investment decisions. Example 18.3 illustrates the impact of including TPM.

Example 18.3

Walter was a bond buyer for a major bond firm. His strength was marketing, and he claimed no particular knack for selecting better-than-average bonds. He had his personal account managed by an independent investment advisor. Walter received the recommendations of the investment advisor from a friend, a tenured professor who was using that same person.

When the two friends were talking one day, they found they had the same asset allocation, about 50 percent invested in stocks and 50 percent in bonds. They asked the advisor why they had the same financial asset allocation. He told them each had filled out the questionnaire that provided an overall tolerance for risk in a similar way.

Walter went to a financial planner who practiced TPM. Walter was told that his human asset, his job as a bond buyer, was highly correlated with his financial assets. This correlation raised the risk of an unfavorable outcome should inflation increase sharply causing interest rates to rise materially, thereby bringing bond prices down. A sustained decline in the bond market would adversely affect both his investment portfolio and his commission income, which dropped precipitously when bond markets were weak.

The planner recommended that Walter reduce his position in traditional bonds substantially and place the monies in inflation-indexed bonds and private real estate. He said that the risk of his household portfolio would decline significantly as a result.

Integration of Investments and PFP

Investments, including asset selection and investment policy, represent one part of PFP, but often investment policy is established by itself and the return inputted into planning operations. For example, capital needs analysis runs on an assumed investment growth

[8] Of course, it is more precisely an annuity, which, unlike bonds, has no repayment of principal at death.

TABLE 18.2 Summary of Capital Needs Characteristics

	Simple Capital Needs Analysis	Simple Capital Needs Analysis Adjusted for Risk	Monte Carlo Simulation	TPM
Solves for life cycle needs	Yes	Yes	Yes	Yes
Integrates financial planning process	Yes	Yes	Yes	Yes
Tells you how much to save	Yes	Yes	Yes	Yes
Uses market-based returns as inputs	Yes	Yes	Yes	Yes
Provides a one-number savings figure	Yes	Yes	Yes	Yes
Adjusts for risk	No	Yes	Yes	Yes
Presents probability of success	No	No	Yes	Yes
Includes all assets and liabilities in investment decisions	No	No	No	Yes
Incorporates correlations of factor inputs	No	No	No	Yes
Provides full integration of planning and investing	No	No	No	Yes

rate separately decided upon. In contrast, the return on TPM is an integral part of the overall planning procedures. The asset selection and return can be combined in the planning process. Its disadvantages are that it hasn't been tested extensively and that it is somewhat more intricate to solve.

Although TPM can be used exclusively to determine asset selection alone, it is truly the end result of an overall personal financial planning process. It merits that designation because it is the implementation arm of PFP theory and approximates the goal of financial planning and practitioners.

A summary of the characteristics of alternative approaches to capital needs analysis is shown in Table 18.2.

Although TPM and Monte Carlo simulation have distinct advantages, the most popular form of analysis is the simple capital needs approach, sometimes modified to include deliberately conservative inputs to incorporate risk. It is the calculation that people taking the CFP® exam are required to be able to perform.[9] In the balance of this chapter, we will go over this method. First, we will describe the method using a retirement needs example and then we will compute its result using the Johnson case study.

SIMPLE RETIREMENT NEEDS ANALYSIS

Retirement needs analysis is broadly based on the life cycle theory of spending and saving. It is a way of mapping future cash inflows and outflows to establish resource requirements during retirement. Its objective is to ensure that enough resources are available prior to retirement to cover retirement needs. Often the retiree's goal is to maintain the standard of living in retirement that was established while working.[10]

Retirement needs analysis involves the following planning steps:

1. Review goals.
2. Establish risks and tolerance for them.
3. Determine rates and ages to be used for calculations.
4. Develop retirement income, expenses, and required capital withdrawals.
5. Calculate lump sum needed at retirement.
6. Identify current assets available at retirement.

[9] Exam takers should be familiar with the basics of the Monte Carlo method for retirement analysis as well.

[10] Often the same standard-of-living costs are less in retirement because of lower living costs.

7. Compute yearly savings needed.
8. Project income, expense, and savings during remaining working years.
9. Reconcile needs and resources.
10. Finalize plan and implement.
11. Review and update.

As you can see, retirement needs analysis is highly structured, a necessary condition to obtain the right results. We will consider each step separately.

1. Review Goals

At this point in the process, overall retirement goals already should have been established. Our role is to review them to make sure they reflect our best thinking. Key goals are the age at which retirement is to take place and the standard of living desired at that time. Are there goals to leave money to children, other individuals, or charities? If so, for what amount and are they subject to maintaining a stated minimum standard of living for household members or is a fixed amount to be provided for heirs? The answers to these questions help frame the calculations.

2. Establish Risks and Tolerance for Them

Significant risks are those occurrences that can alter retirement goals. There are many risks while working. Essentially, they were covered in previous chapters. As mentioned, retirement risks can be divided into a few major categories: longevity risk, extraordinary expenses, often health-related investment risk, and inflation risk. Our tolerance for risk helps us to determine our responses to those risks. For example, if we were to provide funds only to an average mortality date of around age 80, we would be a high-risk taker since in 50 percent of the cases we would live longer and have insufficient funds to cover the extra time. Providing funds until the early 90s would give us less than a 10 percent chance of outliving our assets, a much more conservative stance.

3. Determine Rates and Ages to Be Used for Calculations

The relevant rates required for capital needs analysis are the rate of return on investments[11] and the inflation rate. Investment returns can be calculated based on historical rates for stocks, bonds, and money market funds and the particular asset allocation used. Where different asset allocations are used before and after retirement, the assumed rate of return will change at retirement.

Rates of return should normally be expressed on an after-tax basis, which means that returns on tax-sheltered pensions would be compounding at a different rate than personal sums. Long-term inflation expectations may be estimated based on historical rates, which have averaged 3 percent over the past 20 years, or based on the current or projected time frame.

We are concerned with two ages: the retirement age and the number of years we are going to provide funds for in retirement. As already discussed, setting these ages, we combine goals and tolerance for risk.

4. Develop Retirement Income, Expenses, and Required Capital Withdrawals

Cash flow figures can change materially once retirement begins. Job-related income is replaced by Social Security and company pension payments, if any; personal investment

[11] The tax rate should be estimated from anticipated growth rates in revenues and deductible expenses and relevant tax-favored rates for investments. Since job-related revenues decline sharply or are eliminated in retirement, the marginal tax rate is likely to drop at that time, particularly when private pension and IRA withdrawals are not very high.

Practical Comment Withdrawals

Many people are afraid to take withdrawals of principal. They correctly perceive that declining principal increases their risk of running out of money. They prefer living on their income. Such withdrawals are often necessary, however, and in theory and fact desirable since they permit a higher standard of living in retirement. When investments are diversified and a retirement plan logically executed, much of this fear can be eliminated.

income and sometimes a part-time job are two other sources of retirement income. Returns from financial investments are excluded from this step. They are placed in step 6. Household expenses should be altered by a number of factors. Outlays for health should be examined carefully and may rise as costs for non- or partially reimbursable drugs and other charges that are not covered increase as the retiree ages. Vacation and other leisure costs also may climb, at least initially. Other costs may decline significantly. For example, job-related transportation, clothing, and food expenditures are eliminated. Household mortgage and children's educational debt are often paid off prior to retirement.

Very significantly, the household's tax bill generally declines in retirement since both the amounts subject to taxation and the marginal tax rate frequently drop. In addition, retirees have more time to focus on value-oriented shopping and, in some instances, are given senior citizen discounts to eat out and shop for food, clothing, gasoline, transportation, travel, and so on. On balance, in many cases, the cost of living declines in retirement without a perception of a decline in standard of living.

Net cash flow figures should be developed based on the decline in both revenues and costs. Most people in retirement will have to make withdrawals from investment accounts. That was the principal reason they accumulated those assets to begin with. The rate of withdrawals may rise as the cost of living can rise with inflation, but not all revenue sources are indexed for it. In addition, principal withdrawals reduce the amount of investment return, which in turn results in a greater need for further principal withdrawals.

A breakdown of income for the average retiree by source is shown in Figure 18.2.

5. Calculate Lump Sum Needed at Retirement

Once annual withdrawals and the number of years we are funding for retirement are established, we can calculate the lump sum needed at retirement to fund our retirement needs.

6. Identify Current Assets Available at Retirement

Retirement assets are those that you have on hand today. They can be brought up to the retirement date using the assumed investment return. This amount at retirement provides a partial funding of the need.

7. Compute Yearly Savings Needed

Yearly savings is the sum required to deposit annually to accumulate the shortfall between assets needed at retirement and the amount projected to be available based on existing assets.

8. Project Income, Expenses, and Savings during Remaining Working Years

Now that we know how much we need to save each year, we should compare that with our current and projected savings rate. A detailed cash flow statement incorporating income, expenses, and current savings can be developed. The method for making these pro forma statements was shown in Chapter 5. The figures are likely to be segregated by financial period since each may have its own revenues and cost structure.

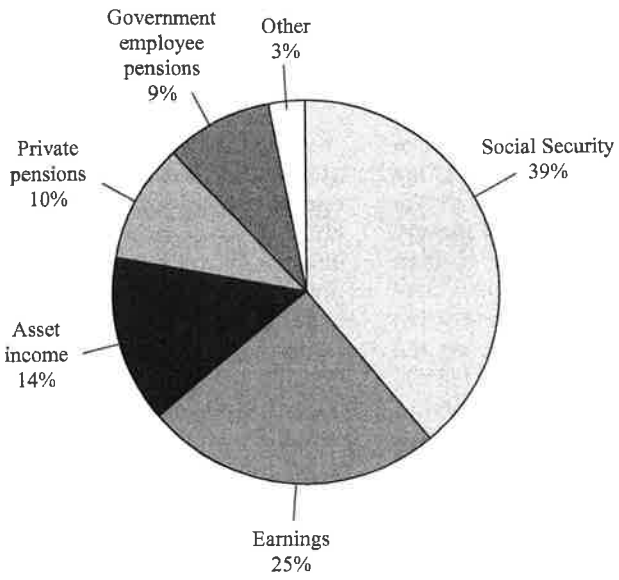

FIGURE 18.2
Breakdown of Retirement Income by Source for Average Retiree, 2003

Source: Social Security Administration, *Fast Facts & Figures about Social Security* (2005), http://www.ssa.gov/policy/docs/chartbooks/fast_facts/2005/fast-facts05.html.

Projected savings figures should be compared with current actual savings with differences reconciled. If there are large unreconciled differences, they often come about through underestimating future expenses. When this occurs, a miscellaneous expenditure figure should be added to projections; the miscellaneous figure should generally grow at the inflation rate over time as well.

For people with less complex household operations or who best respond to saving based on need, a simpler approach of saving a fixed sum per year or a fixed percentage of salary can be feasible.

9. Reconcile Needs and Resources

The projected yearly savings needed and the anticipated yearly savings to be generated should be compared. In other words, needs should be measured against current and future resources. When resources exceed needs, no other steps have to be made. If not yet retired, household members may, if they wish, retire earlier, raise their standard of living at the current time, or increase it in retirement. Alternatively, they can use the extra money to lower their risk of insufficient funds during adverse circumstances or leave it to their heirs.

If there is a shortfall in retirement resources compared with needs, then action is called for. They may cut back expenditures today or generate additional income through changes in work-related positions or additional hours on the job. Alternatively, they may decide to work longer before retiring, work part-time during retirement, or lower their standard of living while working or in retirement.

10. Finalize Plan and Implement

Once the calculations are made and needs and resources are in balance, three questions should be asked. The first asks one last time, Is this particular plan what you want to do, given the resources available to you? The second is, Are the assumptions those that you believe in? The third is, Will you be able to carry out this plan? If the answers to all your questions are yes, then the plan can be finalized and implementation should begin.

11. Review and Update

Actual savings and accumulated investment sums should be reviewed against projected sums periodically. Major differences should be accounted for. When actual resources differ substantially from projected ones, particularly when there is a shortfall, a reappraisal

Practical Comment Savings

Planning for retirement usually involves a sacrifice of resources to spend today for a higher quality of life in retirement. As a consequence, there often can be a difference between intended and actual savings. Rather than acknowledge to themselves or their advisor that they have spent beyond their plan, people sometimes attribute shortfalls to nonrecurring expenses. One year it can be fix-up of the house, the next an expensive variation, and so on. Of course, when nonrecurring expenditures happen frequently, even if they arise from different causes, they become, in effect, recurring.

Therefore, one nonrecurring charge may be overlooked, but a succession of them may have a significant impact on retirement plans and should be addressed. This can be done by focusing on retirement goals and acknowledging that a continuation of the preceding pattern can reduce the household's quality of life in retirement.

PROJECTIONS

Making projections is an inexact science. A 1 percent difference between actual and estimated revenues, costs, or investment returns annually can have great impact if taken over an extended period of time. Moreover, given withdrawal risk, when the possibilities of an extreme negative occurrence (particularly at the beginning of retirement) are included, the potential for a retirement planning shortfall can increase significantly. Consequently, it can be advisable to estimate all figures conservatively. If greater-than-needed savings develop, spending can be raised later on.

In making retirement projections, to be conservative, financial planners may use assumed investment returns that are a few percentage points lower than historical rates and may use higher end estimates of inflation for cost purposes. When clients are, by admission, optimists, planners may encourage moderation in projecting job-related revenues that are well in excess of inflation, particularly for extended periods of time. Similarly, consideration should be given to questioning projections of people who are unduly pessimistic—for example, when they assume flat or declining job-related revenues. If there is a spouse, he or she often can help validate these projections.

In many cases, revenue increases that are substantially different from the anticipated annual rises in the inflation rate, for more than 5 to 10 years, whether the projected differences are higher or lower, create results that may not be justified. On the other hand, the planner must take care not to influence assumptions so much that they are viewed as not being credible by household member-owners. When individuals do not believe projections are credible, they find it difficult to implement.

For example, a planner who makes too conservative an estimate of increases in wages and in investment returns, even when the prompting to do so comes from the client, can undercut the motivation for savings. The client may ignore the shortfalls as not being believable.

A more systematic method of incorporating risk in retirement planning is given in Chapter 20.

of retirement projections may be called for. Similarly, when circumstances change significantly, an overall review should be undertaken.

RETIREMENT NEEDS CASE STUDY

In this portion of our chapter, we will go over a discussion and then calculation for a retirement needs analysis. We will use the Johnson case discussed earlier. We begin that study at the point where Frank and Sarah have come to terms with their need to save money for retirement. At that time, age 50, they had $35,000 in accumulated savings.

Their steps, keyed to the previous discussion, follow.

1. Review Goals

The goal for Frank and Sarah is to live a comfortable "middle-class life" in retirement, preferably at the standard of living they enjoy today. The retirement age desired is age 67.

2. Establish Risks and Tolerance for Them

The Johnsons are subject to all the normal retirement risk exposures. Their tolerance for retirement risk has been high, as measured by their lack of saving and resultant lack of

financial preparation for such exposures as health and longevity risk. There is some indication of a change to a more conservative risk tolerance, as seen in their willingness to face future expenses. They have decided to fund for living expenses through age 92, thereby reducing the longevity risk to about 10 percent.

3. Determine Investment and Inflation Rates and Time Spans to Be Used for Calculations

We decided to use a 3 percent rate for inflation and a 5 percent after-tax rate for investment both before and after retirement. They have decided to retire at age 67 and to fund for living expenses through age 92.

4. Develop Retirement Income, Expenses, and Required Capital Withdrawals

Income in retirement would come from Social Security. It was estimated at $30,000 a year combined. In addition, Frank would receive $10,000 a year as a pension. Frank grumbled that his architectural firm was cheap with its pension policy. Friends of his were receiving pensions of at least five times that amount. It didn't help that he had moved to this firm only nine years ago. Since the firm had no 401(k) plan and Sarah didn't want to put any money in IRA plans that she said "locked it up," all future savings would have to be in accounts that are not tax-advantaged.

Their retirement expenditures would be lower than the $150,000 present rate. Their tax rate in retirement would decline and the mortgage would be paid off at the anticipated retirement age of 67.

Vacation expenses, which were already sizeable, would not change and other additions and subtractions would cancel themselves out. With some additional effort when prodded by the advisor, they arrived at a figure of $95,000 for retirement expenditures including taxes.

The difference between $40,000 in income and $95,000 in expenses was a sizeable retirement need of $55,000 annually.

5. Calculate Lump Sum Needed at Retirement

The Johnson's decided they wanted to fund for a 25-year retirement that would carry them financially through age 92. Using the $55,000 annual figure, they would need $1,821,708 in lump-sum savings in retirement, as Table 18.3 shows.

6. Identify Current Assets Available at Retirement

Frank and Sarah had saved $35,000 currrently. That amount invested for 17 years would only amount to $80,221 at retirement.

7. Compute Yearly Savings Needed

The amount available at retirement of $80,221 was meager. There the lump-sum net need at retirement of $1,741,487 was almost as large as the gross need of $1,821,708. The required savings amount was $67,394 annually.

8. Project Income, Expenses, and Savings during Remaining Working Years

The Johnsons currently had household income of $150,000 per year growing at the rate of inflation. Their calculations of expenditures including taxes were about $130,000. In reality, however, they were spending every dollar that came in. A category of miscellaneous expenses was set up for $20,000. They preferred to wait until their retirement needs were calculated to establish a savings pattern.

TABLE 18.3
Retirement Needs Statistics

	As Planned	Revised
Preretirement period	**Ages 50–67**	**Ages 50–70**
Revenues		
Household income	$150,000	$185,000
Expenses		
Household expenditures	$130,000	$134,000
Miscellaneous expenses	20,000	20,000
Total expenses	$150,000	$154,000
Cash flow	0	31,000
Postretirement period	**Ages 67–92**	**Ages 70–91**
Revenues		
Social Security income	$30,000	$33,000
Pension—Frank	10,000	12,000
Total revenues	40,000	45,000
Expenses	95,000	80,000
Cash shortfall	($55,000)	($35,000)
Lump sum needed at retirement	$1,821,708	$1,102,686
Required savings	$67,394	$30,540

9. Reconcile Needs and Resources

It was apparent that the required saving of $67,394 per year was too great. The Johnsons had waited too long to begin saving. We discussed ways of reconciling needs and resources. They decided to postpone retirement to age 70. Furthermore, the couple thought they could reduce their retirement living costs to $80,000 from $95,000. Although that level was not what they hoped for, it would meet their minimum goals.

Retiring later would add about $5,000 each year to retirement income coming from Social Security and a higher company pension payout. It also would require three years less for retirement funding. Finally, they cut back their funding date one year and assumed they would sell their house at age 91 if necessary. Consequently, retirement funding dropped by a total of four years.

When the retirement needs were recalculated, the figure came to $30,540. Sarah thought for just a minute and said she would take a full-time job. She could earn $45,000 a year pretax and $30,000 after taxes as compared with her current income of $10,000 a year pretax and $7,000 per year after-tax. Consequently, there would be a net increase of $23,000 per year in retirement funding. The final piece, then, would be a further current expense cutback of about $8,000 a year net of higher taxes due to Sarah's higher income. This would result in total additional yearly savings of $31,000, just enough to meet the need.

There are two periods in the Johnsons' retirement planning horizon: preretirement and postretirement. The retirement needs statistics for these two periods are presented in Table 18.3.

10. Finalize Plan and Implement

I summarized the parts of the revised plan. The couple would work until age 70, live on $80,000 a year in retirement, and cut back expenses by $8,000 a year. Sarah was already looking forward to the adventure of a new full-time job. The financial pieces had been agreed to.

11. Review and Update

Given the difficulty the couple had with compliance in the past, I strongly suggested meeting every quarter for the first year. I was gratified to see a new purpose and savings discipline in the follow-up meetings. The retirement plan was being implemented according to schedule.

Here we begin by presenting a retirement needs calculation format in Table 18.4 and follow it with the actual calculations for Frank and Sarah in Table 18.6. Notice that the steps are keyed to our discussion.

A summary of appropriate capital needs rates to apply under different circumstances is shown in Table 18.5.

TABLE 18.4 Retirement Needs Calculation—Described

Step	Item	Symbol	Explanation or Calculation
3	Investment rate	IR	The rate of return for investments
3	Inflation rate	ER	The rate of increase in expenses
3	Real rate	RR	The combination of the inflation and investment rates Formula: $RR = \left(\frac{1 + IR}{1 + ER} - 1\right) \times 100$
3	Present time	t_0	Today
3	Future time	t_1	Beginning of payout period
3	Number of years for payout period	N_{t_p}	From beginning to end of payout period
3	Number of years to beginning of period	N_{t_1}	From today to start of payout period
3	Number of years to today	N_{t_0}	From beginning of payout period to today
4	Cash inflows	CI_{t_0}	Includes the total of retirement pension investment and other yearly cash inflows in current dollars
4	Cash outflows	CO_{t_0}	Discretionary and nondiscretionary expenses, capital expenditures, and other yearly retirement cash outflows in current dollars
4	Cash shortfall	CS_{t_0}	Current yearly cash inflows − cash outflows $CS_{t_0} = CI_{t_0} - CO_{t_0}$
5	Cash shortfall future	CS_{t_1}	Current yearly shortfall brought forward to beginning of payout period. The inflation rate is used to calculate the estimated future cost of the present cash shortfall. **Calculator Solution** *Input:* N_{t_1} ER CS_{t_0} [N] [I/Y] [PV] [PMT] [FV] *Solution:* Press for CS_{t_1}
5	Lump-sum shortfall future	LS_{t_1}	Amount of full payout period, yearly shortfalls discounted back to beginning of payout period. Since there are a series of payments occurring over a period of time, both investment and inflation rates are employed through the real rate. Use BEGIN function for beginning of the year payments. **Calculator Solution** *Input:* N_{t_p} RR CS_{t_1} [N] [I/Y] [PV] [PMT] [FV] *Solution:* Press for LS_{t_1}
6	Assets accumulated	AA_{t_0}	Assets available today to help fund retirement shortfall
6	Assets accumulated future	AA_{t_1}	Assets accumulated brought forward to beginning of payout period. The investment rate is used to calculate the estimated future value of today's sum. **Calculator Solution** *Inputs:* N_{t_1} IR AA_{t_0} [N] [I/Y] [PV] [PMT] [FV] *Solution:* Press for AA_{t_1}
7	Additional assets required future	AR_{t_1}	Lump-sum shortfall less estimated future assets accumulated $AR_{t_1} = LS_{t_1} - AA_{t_1}$
7	Required yearly savings	$RS_{t_{0\to1}}$	The yearly savings required to produce the additional sum needed at the beginning of the payout period. The investment rate is used because investment return influences the amount required for the series of savings deposits. **Calculator Solution** *Inputs:* N_{t_0} IR AR_{t_1} [N] [I/Y] [PV] [PMT] [FV] *Solution:* Press for $RS_{t_{0\to1}}$

TABLE 18.5
Summary of Appropriate Capital Needs Rate to Use

Step	Investment Rate	Inflation Rate	Real Rate
To bring current cash shortfall to future period CS_{t_0} to CS_{t_1}	No	Yes	No
To bring current investment sum to future period AA_{t_0} to AA_{t_1}	Yes	No	No
To establish lump-sum shortfall from the amount of payouts CS_{t_1} to LS_{t_1}	No	No	Yes
To bring lump-sum cash shortfall back from future period to present LS_{t_1} to LS_{t_0}	Yes	No	No
To establish yearly savings needed to fund lump-sum shortfall AR_{t_1} to $RS_{t_{0\to1}}$	Yes	No	No

TABLE 18.6 **Retirement Needs Calculation—Before Revision**

Step	Item	Symbol	Explanation or Calculation
3	Investment rate	IR	5% given
3	Inflation rate	ER	3% given
3	Real rate	RR	1.9417 RR = $\left(\frac{1+0.05}{1+0.03}-1\right)\times 100$
3	Number of years for payout period	N_{t_0}	25 Age 67 to age 92
3	Number of years to beginning of period	N_{t_1}	17 Age 50 to age 67
3	Number of years from future period to today	N_{t_0}	17 Age 67 to age 50
4	Cash inflows	CI_{t_0}	$40,000 given
4	Cash outflows	CO_{t_0}	$95,000 given
4	Cash shortfall	CS_{t_0}	$55,000 95,000 − 40,000
5	Cash shortfall future	CS_{t_1}	*Inputs:* 17 [N] 3 [I/Y] 55000 [PV] [PMT] [FV] Press *Solution:* **$90,907**
5	Lump-sum shortfall future (Use BEGIN function)	LS_{t_1}	*Inputs:* 25 [N] 1.9417 [I/Y] 90907 [PV] [PMT] [FV] Press *Solution:* **$1,821,708**
6	Assets accumulated today	AA_{t_0}	$35,000 given
6	Assets accumulated future	AA_{t_1}	*Inputs:* 17 [N] 5 [I/Y] 35000 [PV] [PMT] [FV] Press *Solution:* **$80,221**
7	Additional assets required future	AR_{t_1}	$1,741,487 $AR_{t_1} = LS_{t_1} - AA_{t_1} = 1{,}821{,}708 - 80{,}221$
7	Required yearly savings	$RS_{t_{0\to1}}$	*Inputs:* 17 [N] 5 [I/Y] [PV] [PMT] 1741487 [FV] Press *Solution:* **$67,394**

TABLE 18.7 Retirement Needs Calculation—After Revision

Step	Item	Symbol	Explanation or Calculation
3	Investment rate	IR	5% given
3	Inflation rate	ER	3% given
3	Real rate	RR	1.9417 RR = $\left(\frac{1+0.05}{1+0.03}-1\right)\times 100$
3	Number of years for payout period	N_{t_p}	21 Age 70 to age 91
3	Number of years to beginning of period	N_{t_1}	20 Age 50 to age 70
3	Number of years from future period to today	N_{t_0}	20 Age 70 to age 50
4	Cash inflows	CI_{t_0}	$45,000 given
4	Cash outflows	CO_{t_0}	$80,000 given
4	Cash shortfall	CS_{t_0}	$35,000 80,000 − 45,000
5	Cash shortfall future	CS_{t_1}	*Inputs:* 20 [N] 3 [I/Y] 35000 [PV] [PMT] [FV] Press **$63,214** *Solution:*
5	Lump-sum shortfall future (Use BEGIN function)	LS_{t_1}	*Inputs:* 21 [N] 1.9417 [I/Y] [PV] 63214 [PMT] [FV] *Solution:* Press **$1,102,686**
6	Assets accumulated today	AA_{t_0}	$35,000 given
6	Assets accumulated future	AA_{t_1}	*Inputs:* 20 [N] 5 [I/Y] 35000 [PV] [PMT] [FV] Press **$92,865** *Solution:*
7	Additional assets required future	AR_{t_1}	**$1,009,820** $AR_{t_1} = LS_{t_1} - AA_{t_1} = 1{,}102{,}686 - 92{,}865$
7	Required yearly savings	$RS_{t_{0\to 1}}$	*Inputs:* 20 [N] 5 [I/Y] [PV] [PMT] Press **$30,540** 1009820 [FV] *Solution:*

Table 18.7 provides the calculation rerun based on revised goals.

This retirement analysis and accompanying calculations for Frank and Sarah contrast with the more-involved Dan and Laura retirement case study, which takes place over three chapters—12, this one, and 20.

Back to Dan and Laura

CAPITAL NEEDS ANALYSIS

As the financial plan was drawing closer to its end, Dan and Laura would come in to drop off necessary and not-so-necessary documents. I had the feeling they were trying to influence its results, to make them rosier. At a recent meeting, Dan asked how financial planners went about reaching conclusions. He said that he, as a mathematically oriented person, could handle any simple mathematical discussion I would want to go over.

We sat down. Laura had one of those "here we go again" looks on her face. She smiled at me, took out a paperback book, and wasn't heard from for the remainder of the time together. After my explanation, Dan asked if I would summarize the discussion in writing, which I did.

Dan, there are several ways that financial planners handle integration. The first is on what I would call an ad hoc way. That is, they do it the way your grandmother might have cooked. There was no fixed recipe. She put in a little of this and that from her head, integrating all ingredients. If she was an experienced creative cook, the dish might come out well. If not, the results could be poor, each time tasting different.

Similarly, the ad hoc way is not scientific and can be off markedly from subsequent outcomes. The ad hoc way is more popular with financial advisors who aren't financial planners.

The second approach, a capital needs analysis, tells you how much money you require to fund your goals. In its simple form, it assesses the cost of your goals and compares that with the resources you are currently generating and what you expect to obtain in the future. Adjustments are made between goals and projected resources to bring them into line. The outcome is often expressed simply as the amount that is needed in savings annually to achieve your goals.

As you mentioned to me, you are familiar with Monte Carlo simulation. It can be used as a refinement of simple capital needs analysis. You are probably aware that any single amount of savings cannot predict all outcomes. What is needed is a framework that takes into account the probabilities of an outcome; for example, the probability that the savings rate given in a simple capital needs analysis will come to pass. In other words, Monte Carlo is more sophisticated than the simple method. It doesn't give the one-figure solution that you might find satisfying, but it is more realistic.

Total portfolio management is even more advanced. It takes into account all assets and obligations and their correlations in making investment decisions. It, like Monte Carlo, incorporates risk in capital needs analysis and can be looked upon in mathematical terms as a further refinement of capital needs analysis. It is a planning tool that comes directly from PFP theory and integrates PFP and investments in a way the others don't.

In performing our simple retirement calculations, often the practical reflection of capital needs analysis, we made the following assumptions:

1. An inflation rate and your costs both rising 3 percent a year.
2. Dan's salary rising 10 percent a year through 2014 and then at the rate of inflation; Laura's salary rising at the rate of inflation.
3. Stocks rising 11 percent a year. Bonds increasing 5.5 percent a year.
4. Retirement funding to age 95, as you requested, even though I prefer ages 95 and 91 for Laura and Dan, respectively, to provide an actuarially derived lower-than-10-percent chance of outliving your money.

The analysis indicates that you will have to save $60,000 in projected savings plus approximately an additional $41,000 per year beginning in year 6 to meet your goal of retiring at age 55. I consider this amount of savings difficult to achieve without further adjustments. I should mention that I have taken the investment return down 1 percent from 8.7 percent to 7.7 percent to be conservative. I recommend that we wait for the results of a risk-adjusted analysis in our final decision-making integration meeting before further discussions on retirement.

I have also promised you the outcome of a life insurance needs analysis. Based on your current living pattern, Laura needs $1,289,421 on Dan's life. If Laura passes away, the need, including the hiring of a household assistant for the children, would be $673,091.

You have no current insurance, so the entire amount will have to be purchased. Again, here I think we should wait for the risk-adjusted analysis before making specific recommendations of amounts to purchase.

We will use TPM concepts in completing your plan shortly (shown in Chapter 20).

I hope this helps in your understanding of integration. If you have any questions, let me know.

The calculations are given below.

RETIREMENT NEEDS ANALYSIS

Inputs

General	
Dan's age	35
Laura's age	35
Dan's retirement age	55
Laura's retirement age	55
Dan's assumed age of death	95
Laura's assumed age of death	95
Years until retirement period 1	20
Years until retirement period 2	30
Years in retirement period 1	10
Years in retirement period 2	30
Laura	
Pension at age 65, today's dollars	$40,000
After-tax pension	28,800
Current salary	0
Salary in five years, today's dollars	68,000
Annual increase thereafter	3%
Social Security benefits at age 67	$21,996
Dan	
Salary	$100,000
Annual increase through 2014	10%
Annual increase beginning 2015	3%
Social Security benefits at age 67	$25,512
Expenses	
Living expenses, today's dollars[1]	$83,452
15% COL reduction in retirement	($12,518)
Additional travel expenses	$10,000
Total expenses in retirement	$80,935
Economic	
Inflation	3.0%
Tax rate in retirement[2]	28.0%
Investment return	7.7%
After-tax investment return	5.5%
Real return	4.6%
After-tax real return	2.5%

[1] Sum of discretionary, nondiscretionary, and capital expenses in year 6, discounted to year 1.

[2] Estimated marginal federal and state rate. Assumes flat state tax rate of 5% and blend of ordinary income and capital gains federal rates.

Step 1. Calculate the Amount Needed in Retirement

Retirement Period 1 (55–65)	
Living expenses in retirement, today's dollars	$80,935
Laura's pension in today's dollars, after taxes	0
Annual shortfall, today's dollars	80,935
Annual shortfall, age 55	146,177
Lump sum needed to retire mortgage[1]	156,712
Lump sum needed at beginning of period	**$1,469,701**
Retirement Period 2 (65–95)	
Living expenses in retirement, today's dollars	$80,935
Laura's pension in today's dollars, after taxes	28,800
Social Security benefits at 65 in today's dollars, after taxes	31,350
Annual shortfall, today's dollars	20,784
Annual shortfall, age 65	50,449
Lump sum needed at age 65	**$1,086,354**

[1] Amount owed after 19 years of mortgage payments at normal amortization. Assumes mortgage begins in year 2 of plan.

Step 2. Bring the Lump Sum Needed Back to the Present

Lump sum currently needed, retirement period 1	$499,526
Lump sum currently needed, retirement period 2	215,261
Lump sum needed in year 6, retirement period 1[1]	654,223
Lump sum needed in year 6, retirement period 2	281,924
Total lump sum needed now	714,787
Total lump sum needed in year 6	**$936,147**

[1] Assumes that savings cannot begin until year 6, when Laura returns to work.

Step 3. Repeat Steps for Other Needs

Lump sum needed for college in year 6	$175,665
Total other needs lump sum, year 6	**$175,665**

Step 4. Establish the Current Value of Projected Future Saving

Accumulated assets as of year 6	$100,003
Projected after-tax savings starting year 6	60,000
PV of future savings in year 6	600,498
Total existing and projected resources in year 6	**$700,500**

Step 5. Compare Resources and Needs

Total needs in year 6	$1,111,813
Total existing and projected resources in year 6	700,500
Additional resources needed	**$411,312**

Step 6. Establish Additional Annual Savings Needed

Additional savings needed beginning year 6 (level payment)	$41,097
Additional annual savings needed beginning year 6	**$41,097**

INSURANCE NEEDS ANALYSIS—DAN

Inputs

General	
Dan's age	35
Laura's age	35
Laura's retirement age	55
Dan's assumed age of death	35
Laura's assumed age of death	95
Years in preretirement period 1	5
Years in preretirement period 2	15
Years in retirement period 1	10
Years in retirement period 2	30
Laura	
Pension	$40,000
After-tax pension	30,000
Current salary	0
Salary in year 6	68,000
Salary after tax	51,000
Annual increase	3%
Social Security benefits	
Laura's Social Security in retirement	21,996
Survivor benefits until children grown, before tax[1]	26,250
Expenses	
Current expenses	$103,032
Expense reduction at Dan's death	10%
Expenses after Dan's death	92,729
Expenses after children grown	72,841
Available Assets	
Investment assets	$150,000
Liabilities	86,000
Available assets	64,000
Economic	
Inflation	3.0%
Investment return	7.7%
After-tax investment return	5.5%
Real return	4.6%
After-tax real return	2.5%
Average tax rate, years 1–5	0%
Average tax rate, years 6–20	25%
Average tax rate in retirement	25%

[1] Estimate. Actual numbers will be modestly different because different benefits end in different years.

Step 1. Determine the Amount Needed to Fund the Preretirement Period

Preretirement period 1, years 1–5 (All figures in today's dollars)	
Annual expenses	$92,729
Social Security survivor benefits, after taxes	26,250
Laura's salary, after taxes	0
Total income, after taxes	26,250
Annual shortfall	66,479
Lump-sum shortfall, today's dollars	**$316,754**
Preretirement period 2, years 6–20 (All figures in today's dollars)	
Annual expenses	$92,729
Social Security survivor benefits, after taxes	20,672
Laura's salary, after taxes	51,000
Total income, after taxes	71,672
Annual shortfall, today's dollars	21,057
Annual shortfall, year 6	24,411
Lump-sum shortfall, year 6	310,397
Lump-sum shortfall, today's dollars	**$237,001**

Step 2. Determine the Amount Needed to Fund the Retirement Period

Retirement Period 1 (55–65)	
Living expenses in today's dollars	$72,841
Income	0
Annual shortfall, today's dollars	72,841
Annual shortfall, age 55	131,559
PV lump-sum future survivor benefits	105,816
Lump-sum shortfall, age 55	1,075,874
Lump-sum shortfall, today's dollars	**$365,671**
Retirement Period 2 (65–95)	
Living expenses in today's dollars	$72,841
Laura's annual pension	30,000
Social Security benefits, after taxes	15,001
Total income	45,001
Annual shortfall, today's dollars	27,840
Annual shortfall, age 65	67,576
Lump-sum shortfall, age 65	1,455,153
Lump-sum shortfall, today's dollars	**$288,338**

Step 3. Determine the Total Lump Sum Needed Today

Lump sum currently needed, preretirement period 1	$316,754
Lump sum currently needed, preretirement period 2	237,001
Lump sum currently needed, retirement period 1	365,671
Lump sum currently needed, retirement period 2	288,338
Total lump sum needed, today's dollars	**$1,207,764**

Step 4. Repeat Steps for Other Needs

Lump sum needed currently for college	$125,657
Burial expenses	20,000
Total lump sum for other needs, today's dollars	**$145,657**

Step 5. Establish Insurance Need

Total lump sump needed for all needs, today's dollars	**$1,353,421**
Available assets	**$64,000**
Total insurance needed, today's dollars	**$1,289,421**

INSURANCE NEEDS ANALYSIS—LAURA

Inputs

General	
Dan's age	35
Laura's age	35
Dan's retirement age	55
Laura's assumed age of death	35
Dan's assumed age of death	95
Years in preretirement period 1	18
Years in preretirement period 2	2
Years in retirement period 1	10
Years in retirement period 2	30
Dan	
Salary	$100,000
Annual increase through 2014	10%
Annual increase beginning 2015	3%
Social Security benefits	
Dan's Social Security in retirement	25,512
Survivor benefits until children grown, before tax[1]	24,150
Expenses	
Current expenses	$103,032
Expense reduction at Laura's death	10%
Expenses after Laura's death	92,729
Expenses after children grown	72,841
Available Assets	
Investment assets	$150,000
Liabilities	86,000
Available assets	64,000
Economic	
Inflation	3.0%
Investment return	7.7%
After-tax investment return	5.5%
Real return	4.6%
After-tax real return	2.5%
Average tax rate, preretirement period	30%
Average tax rate, retirement period	28%

[1] Estimate. Actual numbers will be modestly different because different benefits end in different years.

Step 1. Determine the Amount Needed to Fund the Preretirement Period

Preretirement period 1, years 1–18	
Annual expenses	$92,729
Social Security survivor benefits, after taxes	17,992
Annual shortfall	74,737
Lump-sum currently needed	1,102,088
NPV Dan's salary, after taxes	1,445,285
Lump-sum surplus, today's dollars	**$343,198**
Preretirement period 2, years 19–20	
Annual expenses	$92,729
Social Security survivor benefits, after taxes	0
Annual shortfall	92,729
Annual shortfall, year 19	157,865
Lump-sum shortfall, year 19	311,925
Lump-sum shortfall, today's dollars	118,099
NPV Dan's salary years 19–20, after taxes	147,223
Lump-sum surplus, today's dollars	**$29,124**

Step 2. Determine the Amount Needed to Fund the Retirement Period

Retirement Period 1 (55–65)	
Living expenses in today's dollars	$72,841
Income	0
Annual shortfall, today's dollars	72,841
Annual shortfall, age 55	131,559
PV lump-sum future survivor benefits	52,737
Lump-sum shortfall, age 55	1,128,953
Lump-sum shortfall, today's dollars	**$383,712**
Retirement Period 2 (65–95)	
Living expenses in today's dollars	$72,841
Social Security benefits, after taxes	16,835
Annual shortfall, today's dollars	56,006
Annual shortfall, age 65	135,941
Lump-sum shortfall, age 65	2,927,300
Lump-sum shortfall, today's dollars	**$580,044**

Step 3. Determine the Total Lump Sum Needed Today

Lump-sum surplus, preretirement period 1	$343,198
Lump-sum surplus, preretirement period 2	29,124
Lump sum currently needed, retirement period 1	383,712
Lump sum currently needed, retirement period 2	580,044
Total lump sum needed, today's dollars	**$591,434**

Step 4. Repeat Steps for Other Needs

Lump sum needed currently for college	$125,657
Burial expenses	20,000
Total lump sum for other needs, today's dollars	**$145,657**

Step 5. Establish Insurance Need

Total lump sum needed for all needs, today's dollars	**$737,091**
Available assets	**$64,000**
Total insurance needed, today's dollars	**$673,091**

Summary

This chapter demonstrated how to do a simple capital needs analysis and outlined other methods. You learned that

- A simple capital needs analysis takes into account all financial cash flow factors.
- A risk-adjusted capital needs analysis provides a subjective attempt to account for uncertainty.
- Monte Carlo simulations can present the probability of achieving a certain outcome.
- Total portfolio management provides a fully integrated approach to personal financial planning. It combines PFP and the calculation of investment returns.
- TPM includes all assets, liabilities, and risk including the correlations among them.
- Retirement needs analysis is generally a very structured system that establishes the amount of cash shortfall at retirement and the sums needed to meet it.

Key Terms

financial integration, *503*

Monte Carlo analysis, *505*

retirement needs analysis, *509*

Web Site

http://www.finplan.com
Capital Needs Analysis
This site contains a section dedicated to capital needs analysis.

Questions

1. Why perform a retirement needs analysis?
2. Contrast simple and risk-adjusted capital needs analysis.
3. Identify the advantages of Monte Carlo simulation.
4. What is total portfolio management?
5. Why is overhead cost considered a liability under TPM?
6. Should a comedian and a government employee receive the same financial asset allocation if they have similar tolerances for risk? Why?
7. Provide a reason why a real estate salesperson should not have the same amount allocated to his or her home as the average person.
8. Discuss the planning steps in a simple capital needs analysis.
9. Why bring figures from today to the beginning of the retirement period?
10. When should the investment rate, the blended rate, and the inflation rate be used respectively?
11. List the steps in the retirement needs analysis.

Problems

18.1 If the investment rate of return is 7 percent after tax and the inflation rate is 4 percent, find the blended rate of return.

18.2 Eleanor needs $40,000 a year to live on in retirement net of the income she will receive. She will be retiring in 22 years and is funding for a 25-year retirement. The inflation rate is expected to be 3.5 percent a year and the after-tax return on her investments 6 percent.

a. How much will the short fall amount to at the beginning of the retirement period?
b. What lump sum will she need at the beginning of the retirement period?
c. What is the required yearly savings?

18.3 Frank, age 28, wants to calculate his resources in real (inflation-adjusted) terms. Calculate the amount of resources made available by age 65 retirement if $18,000 a year is saved. Assume that outflows from ages 65 to 90 are at the rate of $27,000 a year. The projected inflation rafe is 4 percent, and the anticipated investment return is 6 percent.

a. How much in new savings will Frank have available at age 65 before subsequent withdrawals?
b. How much will he have left at age 90?
c. What is the present value of that sum at age 65?
d. How much will he have to save per year to exactly meet his need?

18.4 The Smiths had $110,000 in savings at age 51. They had a desired retirement age of 65. They want to fund through age 92. Assume a 4 percent inflation rate and a 5 percent after-tax rate for investment both pre-and postretirement. They have household income of $140,000, which is increasing at the rate of inflation. Their expenditures including taxes are $125,000 a year. They estimate that in retirement they will receive $28,000 a year together in Social Security and Mr. Smith will receive a $12,000-a-year pension, both in today's dollars. Their retirement expenditures would be $90,000 a year in today's dollars.

1. Calculate
   a. The lump sum needed at retirement.
   b. Current assets available at retirement.
   c. Yearly savings needed.
   d. The difference between needs and resources.

2. Analysis
   a. Is their retirement plan achievable as is?
   b. If not, what are the alternatives that could help reconcile needs and resources?
   c. What is your recommendation?

CFP® Certification Examination Questions and Problems

18.1 A client is concerned about the impact that inflation will have on her retirement income. The client currently earns $40,000 per year. Assuming that inflation averages 5.5 percent for the first five years, 4 percent for the next five years and 3.5 percent for the remaining time until retirement, what amount must her first-year retirement income be when she retires 13 years from now if she wants it to equal the purchasing power of her current earnings?

a. $62,550
b. $68,841

General Calculator Approach	Specific HP12C	Specific TI BA II Plus
Enter cash inflow Year 4	1,000 [g] [CF$_j$]	1,000 [ENTER] [↓] [↓]
Enter the discount rate		[NPV]
	10 [i]	10 [ENTER] [↓]
Calculate the net present value	[f] [NPV]	[CPT]
	10,788	10,788

INFLATION-ADJUSTED EARNINGS RATES

Earnings is the amount received, and the earnings rate, the return on assets held. **Inflation,** the rate of increase in prices in our economy or in specific items, can distort earnings results. For example, we may receive $2,000 a year in dividends from stocks today. Those dividends are projected to grow 3 percent a year. Overall inflation, meanwhile, is expected to increase by 5 percent a year. That means the inflation-adjusted return on stocks in the form of dividends will decline each year. We call the inflation-adjusted return on assets the **real return.**

The real return on assets contrasts with the **nominal return.** The nominal return and nominal dollars are the figures we are used to seeing. They are based on the actual number of dollars received, not those adjusted for inflation.

When the nominal number of dollars goes up but the value in real dollars goes down, those dollars can purchase fewer goods and services. As a result, we have had a decline in purchasing power terms.

We can calculate the real return:

$$\text{RR} = \left(\frac{1+r}{1+i} - 1\right) \times 100$$

where

RR = Real return

r = Investment return

i = Inflation rate

When multiplying by the real return to get a new cumulative sum, we use the real growth rate, which is equal to $\frac{1+r}{1+i}$.

We will employ the real return frequently in capital needs analysis in Chapter 18.

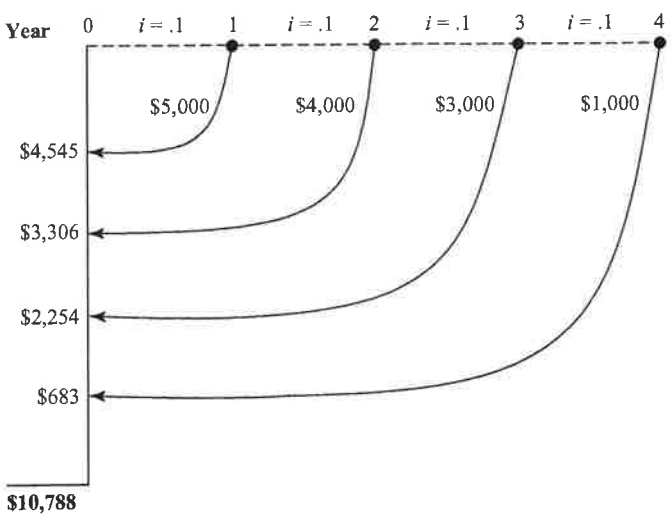

FIGURE 2.9
Present Value of Series of Irregular Payments

Example 2.11 Brad was about to retire. He wanted to live on the return on the $500,000 savings he had accumulated and leave the entire amount to his children. The $500,000 provided him with $35,000 this year, which is growing 3 percent annually. Inflation is projected to rise 5 percent per year. Calculate the amount of cash he has available to spend currently as well as how much he will receive in nominal and real dollars over the next five years.

$$\begin{aligned}
\text{Cash available} &= \$35{,}000 \text{ this year} \\
\text{Nominal return Year 1} &= 35{,}000 \times (1 + \text{Nominal growth rate}) \\
&= 35{,}000 \times 1.03 \\
&= 36{,}050 \\
\text{Real return Year 1} &= 35{,}000 \times \text{Real growth rate} \\
&= 35{,}000 \times \left(\frac{1 + 0.03}{1 + 0.05}\right) \\
&= 35{,}000 \times 0.9810 \\
&= 34{,}335
\end{aligned}$$

Years	0	1	2	3	4	5
Nominal dollars	35,000	36,050	37,132	38,245	39,393	40,575
Real dollars	35,000	34,335	33,683	33,043	32,415	31,791

Calculator Solution

Sample calculation for = real dollars Year 5

$$\text{Real return} = \left(\frac{1.03}{1.05} - 1\right) \times 100 = -1.9048\%$$

Inputs: 5 (N) −1.9048 (I/Y) −35,000 (PV) (PMT) (FV)

Solution: 31,791

Brad's situation is deteriorating each year. That is because the growth rate of his income is 3 percent while the inflation rate is 5 percent. More precisely, as this solution shows, his returns are declining 1.9048 percent in real terms annually. Each year, while his cash amounts in nominal dollars are going up, in real dollars they are dropping. Consequently, his dollars will be able to purchase fewer and fewer goods over time. If he cannot raise the returns on his assets so that they are more in sync with the inflation rate, he will have to accept either a lower standard of living or a reduced amount to be left to his children, even in nominal terms.

INTERNAL RATE OF RETURN

The **internal rate of return (IRR)** uses time value of money principles to calculate the rate of return on an investment. It obtains that rate of return by combining all cash flows including cash outflows (usually initial outlays to purchase the investment plus any subsequent