
MONITORING THE SUFFICIENCY OF A RETIREMENT PORTFOLIO

PORTFOLIO SUFFICIENCY MONITORING: AN OVERLOOKED STEP

The Traditional Financial Plan

In designing a retirement portfolio, the prudent financial advisor conducts a thorough analysis of the client's needs and objectives. This analysis generally includes:

- determination of the client's projected retirement income needs, on a current dollar (inflation-adjusted) basis;
- identification of assets earmarked for the retirement portfolio, and any expected future additions to the portfolio;
- identification of the client's preferred retirement date and pattern of expected post-retirement distributions, to determine the time period available for asset accumulation and growth;
- assumptions regarding future inflation rates; and
- estimation of the client's post-retirement life expectancy, to determine the period over which the retirement portfolio must provide an income stream.

Based on this information, the advisor estimates how well the projected asset accumulation will support targeted retirement income needs. If this analysis indicates a future shortfall, the advisor generally suggests revisions to the client's retirement portfolio, such as:

- changing asset allocation strategy to increase expected return;
- increasing the rate of savings;
- deferring the planned retirement date; or
- reducing retirement income expectations.

The Retirement Portfolio Sufficiency Paradox

Paradoxically, this traditional approach to retirement planning often fails, even when assumptions about inflation and return prove accurate. Even a well-designed portfolio, seemingly operating within expected parameters, and approximating over the long run its statistically expected return, runs the risk that its actual dollar value at some critical juncture will differ widely from the projected value.

The portfolio sufficiency paradox springs from a variety of sources. Most obvious is the pernicious and unpredictable

effect of inflation on the purchasing power of accumulated wealth. Second, there may be a confusion between the compounding of investment returns over time and the compounding of investment wealth. A simple example may suffice to illustrate possible sources of confusion: suppose that, over a five year period, you made a series of investments at the beginning of each year. The pattern of investment dollars and returns is as follows:

Year	Investment	Rate of Return
1	\$5,000	-7%
2	\$10,000	-10%
3	\$15,000	+4%
4	\$20,000	+32%
5	\$25,000	+16%
5 year total	\$75,000 investment	\$104,507 ending dollar value

Over the five year period, a total investment of \$75,000 grows to \$104,507. The internal rate of return - i.e., the measure which best characterizes how your real wealth grows - was 14.55%. However, if you had reversed the pattern of investments over the five year period your results would have looked quite different:

Year	Investment	Rate of Return
1	\$25,000	-7%
2	\$20,000	-10%
3	\$15,000	+4%
4	\$10,000	+32%
5	\$5,000	+16%
5 year total	\$75,000 investment	\$106,985 ending dollar value

The aggregate investment of \$75,000 grows to \$106,985. Although the dollar value of the portfolio is greater under the second cash flow pattern, the dollar-weighted internal rate of return of 9.97% is less. If your expected return had been, say, 10%, you might (paradoxically) have been pleased with the result of the first return series even though you had built less wealth. Despite the fact that \$75,000 grows to a larger sum in the second pattern of cash

Although the example illustrates how the vagaries of investment cash flows can mask mediocre performance, the converse is also true - good investment performance can be hidden because of the timing of contributions and withdrawals.

The Law of Large Numbers may pan out for all investors, but not for every investor. The future dollar value of each portfolio is determined by the unique and unpredictable pattern of compounded returns and inflation it suffers. The longer the period over which this pattern can exercise its effects, the greater the potential divergence of the portfolio from its expected - i.e., its required - future value. This fact, if unattended, can destroy a retirement.

flows, the compound return is less because, in this case, the larger sums of money were committed at an earlier period and, initially, suffered a decline in value.

Additional confusion may arise if a client tracks the underlying investment performance of the portfolio. The Time-Weighted Rate of Return calculates how an investment performed, irrespective of the timing of cash flows:²

Year	Investment	Rate of Return
1	\$5,000	-7%
2	\$10,000	-10%
3	\$15,000	+4%
4	\$20,000	+32%
5	\$25,000	+16%
5 year total	\$75,000	+5.92%

In this case, we are interested in evaluating how well the investment performed as opposed to how fast the dollars accumulated in the account. In the example, the investment, independent of the amount and timing of cash flows, earned only a 5.92% rate of return.

Although the example illustrates how the vagaries of investment cash flows can mask mediocre performance, the converse is also true - good investment performance can be hidden because of the timing of contributions and withdrawals. Depending on what performance measure is being tracked by the client or the client's advisor, the portfolio may seem woefully off track or marvelously ahead of schedule.

A third source of possible confusion lies in the fact that, often, it is the *arithmetic* average (i.e. expected) investment return that is compounded in order to project ending wealth over multiperiod horizons. However, the accumulation of dollars within the nest egg is determined by the *geometric* compounding of actual returns. Obviously, it is no good telling an investor he has averaged +25% per year when he did so by losing 50% the first year and gaining 100% the second, to end up where he started. Less obvious is the fact that the multiperiod compounding of arithmetic averages may raise the performance measurement bar too high for real-world portfolios which compound geometrically. A portfolio which experiences, for example, a ten percent loss in a year must achieve a

return of approximately 11% in the following year just to recoup those losses.

A final source of confusion regarding measurement of retirement portfolio sufficiency lies in the fact that the longer the investment horizon, the further the portfolio can wander from its expected dollar value despite the fact that it is approaching its expected return. Buffeted by market volatility, many investors have taken comfort that the Law of Large numbers ensures that, over time, average annual returns will approach ever more closely the returns they expect. That this supposition is true (so far - as Samuelson² points out, we have only one history of capitalism to go on - not a statistically significant set of datapoints) does not mean anyone should take comfort in it. The Law of Large Numbers may pan out for all investors, but not for every investor. The future dollar value of each portfolio is determined by the unique and unpredictable *pattern* of compounded returns and inflation it suffers. The longer the period over which this pattern can exercise its effects, the greater the potential divergence of the portfolio from its expected - i.e., its required - future value. This fact, if unattended, can destroy a retirement.

Consider the following hypothetical portfolio, established for a forty-five year old, who is planning to retire at age 65:

Assumptions:

- 1) Current investment assets earmarked for the retirement income portfolio amount to \$300,000.
- 2) Upon retirement, systematic annual distributions from the portfolio will provide the majority of spendable income.
- 3) Current health condition, family history, age of spouse, etc., indicate that it is reasonable to plan for a 20 to 30 year pay out horizon.
- 4) Portfolio allocation is based on the expectation of a long-term rate of return of 10% at the selected level of risk.
- 5) Inflation is expected to average 4%.
- 6) At retirement, the investor will withdraw \$65,000 per year (before tax) on an inflation-adjusted basis.

The investor was fortunate that the actual rates of both return and inflation were extremely close to the advisor’s projections... Unfortunately, the portfolio was entirely depleted eighteen years after retirement. What went wrong? The portfolio experienced worse than expected performance in the fourth and fifth years, from which it never recovered.

The investor has engaged a financial advisor who explains that real (i.e., “nominal” or “reported” returns, net of the current inflation rate) rates of return are most important when building a portfolio for generating retirement income. The advisor demonstrates that a \$300,000 portfolio returning a real 5.77% per year (this is the real rate of return assuming 10% nominal returns and 4% inflation³) will grow to \$921,000 in constant dollars over the next 20 years. The advisor also demonstrates that a \$921,000 portfolio at age 65 will permit withdrawals of \$65,000 per year for a period of 30 years if it continues to earn a real rate of return of 5.77% per year. The advisor’s projections are listed in the following table, in the column entitled “Projected Real Portfolio Value.” The investor implemented the portfolio in accordance with the advisor’s recommendations, and carefully tracked both nominal portfolio returns and actual inflation rates over time.

The investor was fortunate that the actual rates of both return and inflation were extremely close to the advisor’s projections. Over the fifty year period, inflation was slightly higher than expected, averaging 4.2% per year. However, portfolio rates of return were also slightly better than expected, averaging 10.6% per year, thus providing an average real rate of return of 6.14% per year. Thus the investor expected that his portfolio would support a constant dollar distribution of \$65,000 per year from the portfolio. Unfortunately, as indicated in the following table (right) and graph (next page), the portfolio was entirely depleted eighteen years after retirement.

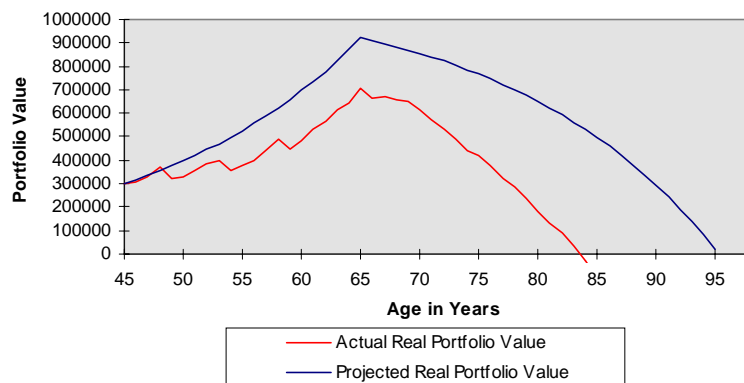
What went wrong? The portfolio experienced worse than expected performance in the fourth and fifth years, from which it never recovered. Although the portfolio’s average real performance exceeded both the advisor’s projections and the investor’s expectations, the pattern of the portfolio’s real performance generated a gap between the portfolio’s projected and actual value that was neither detected nor corrected.

Portfolio sufficiency monitoring provides a structured methodology for determining how well a portfolio is performing relative to projections. Sufficiency monitoring also includes several approaches for corrective action if the retirement portfolio’s variance from projections becomes sufficiently large.

Age	Actual Portfolio Return	Actual Inflation	Actual Real Portfolio Value	Projected Real Portfolio Value
45	N/A	N/A	300,000	300,000
46	7.00%	4.50%	307,177	317,308
47	12.00%	5.20%	327,033	335,614
48	21.00%	5.90%	373,663	354,976
49	-11.00%	3.50%	321,314	375,456
50	4.00%	2.10%	327,294	397,117
51	13.00%	3.90%	355,959	420,027
52	14.50%	6.00%	384,503	444,259
53	12.50%	7.20%	401,720	469,890
54	-3.00%	8.40%	359,473	496,999
55	14.00%	9.50%	374,246	525,672
56	11.80%	5.20%	397,725	555,999
57	18.40%	7.40%	438,460	588,076
58	17.40%	5.10%	489,774	622,023
59	-5.60%	3.80%	445,420	657,888
60	12.30%	4.10%	480,506	695,843
61	14.00%	3.20%	530,792	735,988
62	11.00%	3.90%	567,064	778,449
63	14.00%	4.50%	618,615	823,359
64	9.00%	5.10%	641,570	870,861
65	13.00%	2.70%	705,914	921,103
66	7.50%	4.10%	663,970	909,244
67	14.20%	3.20%	669,742	896,700
68	12.50%	4.10%	658,785	883,433
69	13.80%	5.20%	647,740	869,400
70	12.10%	6.40%	617,335	854,557
71	6.20%	2.30%	575,870	838,859
72	7.40%	4.20%	528,555	822,255
73	8.10%	3.40%	487,580	804,692
74	11.80%	7.10%	443,977	786,117
75	12.00%	2.30%	421,075	766,470
76	8.10%	3.20%	376,067	745,689
77	7.40%	4.10%	322,989	723,710
78	12.30%	3.70%	284,775	700,462
79	9.40%	3.50%	236,008	675,874
80	7.50%	4.20%	178,483	649,864
81	14.90%	5.10%	130,125	622,359
82	23.80%	1.50%	93,714	593,264
83	9.40%	3.40%	34,152	562,491
84	7.20%	4.10%	N/A	529,942
85	14.80%	5.20%	N/A	495,916
86	11.20%	6.10%	N/A	459,103
87	9.40%	4.10%	N/A	420,590
88	8.70%	2.80%	N/A	379,854
89	13.40%	3.40%	N/A	336,769
90	14.80%	4.20%	N/A	291,198
91	8.20%	5.20%	N/A	242,998
92	9.50%	4.10%	N/A	192,017
93	12.50%	3.80%	N/A	138,095
94	8.40%	5.10%	N/A	81,062
95	14.80%	3.40%	N/A	20,739

After some further discussions and examples outlining the academic and accounting rationale behind the portfolio sufficiency monitoring concept, we will return to this example to investigate how a sufficiency monitoring program could have identified and corrected the shortfall in this hypothetical portfolio.

Projected and Actual Retirement Income Portfolio (with no Sufficiency Monitoring Adjustment)



MONITORING RETIREMENT PORTFOLIO SUFFICIENCY

An effective retirement portfolio sufficiency monitoring system provides clients with the information necessary to determine how well their retirement portfolios are doing relative to their specific *personal* objectives. It is a method that periodically tests whether the money on hand will be enough to fund projected future expenses. It therefore differs from investment performance monitoring.

Performance Monitoring vs. Sufficiency Monitoring

In contrast to sufficiency monitoring, we define investment performance monitoring as:

- tracking and reporting the rates of return of each specific investment for a given period (year-to-date, annually, return from portfolio inception, etc.);
- tracking and reporting the rates of return for the aggregate portfolio (each investment's return weighted for the proportion of the portfolio which the investment represents);
- tracking and reporting the rates of return according to the most appropriate calculation formats (annualized average returns, compounded internal rate of return, time-weighted rate of return); and
- tracking and reporting comparative data for investment performance (performance relative to comparable investments, indexes, composites, benchmarks, and so forth).

While investment performance monitoring provides important insights, it does not address

the question which lies at the heart of the entire investment process: namely, is my portfolio doing well enough that, after inflation, I will have the money to pay taxes and buy the goods and services I will need to support my retirement lifestyle objectives? The key components of portfolio sufficiency monitoring are:

- adjusting nominal performance results for inflation;
- establishing benchmarks for performance objectives;
- setting triggers for reevaluation of the portfolio when it wanders too far from established benchmarks; and
- monitoring and adjusting portfolio risk to maximize the probability of meeting retirement portfolio objectives.

In summary, investment performance monitoring answers the question: *Is my retirement portfolio performing well relative to other portfolios?* Portfolio sufficiency monitoring answers the question: *Will I have sufficient assets to meet my retirement income needs?*

AN EXAMPLE

To further illustrate the issue of portfolio sufficiency monitoring, consider the following example.

Assumptions:

- 1) Investor, age 60, plans to retire in five years.
- 2) Current investment assets earmarked for the retirement income portfolio amount to \$1,000,000.
- 3) Upon retirement in five years, system-

...investment performance monitoring answers the question: Is my retirement portfolio performing well relative to other portfolios? Portfolio sufficiency monitoring answers the question: Will I have sufficient assets to meet my retirement income needs?

The chance that inflation will remain constant over sixty months is, of course, nil. Thus it is shortsighted to examine only nominal returns. Prudence dictates the analysis of real returns, that is, returns net of inflation.

A lifetime of work and savings could unravel because the investor did not receive portfolio sufficiency monitoring data specific to his unique economic situation and objectives.

atic annual distributions from the portfolio will provide the majority of spendable income.

- 4) Current health condition, family history, age of spouse, etc., indicate that it is reasonable to plan for a 25 year pay out horizon.
- 5) Portfolio allocation is based on the expectation of a long-term rate of return of 10% at the selected level of risk.
- 6) Allocation is based on expected yearly variability in portfolio returns between -20% to +40% at the 95% confidence level (i.e. a standard deviation of $\pm 15\%$).
- 7) Inflation is expected to average 4%.
- 8) At retirement, the portfolio owner will withdraw \$80,000 per year (before tax) on an inflation-adjusted basis from the portfolio.

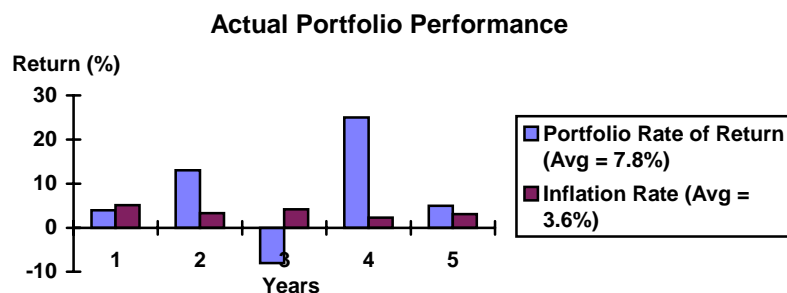
Measuring Success

The answer to the question, "how well is the client doing?" is traditionally addressed by comparing the targeted return with the actual return. Let us assume that, five years from inception, our sample portfolio has experienced exactly the expected 10% average annual return. Will this knowledge suffice?

Perhaps - but only if inflation has matched the expected 4% throughout the five year period. The chance that inflation will remain constant over sixty months is, of course, nil. Thus it is shortsighted to examine only nominal returns. Prudence dictates the analysis of real returns, that is, returns net of inflation.

Interpreting Performance Results

Suppose this sample investor's portfolio experiences performance results over the five year period, as illustrated in the following graph:



A number of queries may be reasonably made:

- Should the investor be concerned about the underperformance of the portfolio relative to its expected long-term return?
- Does the fact that inflation has averaged a full 10% less than expected make up for the shortfall in nominal returns? Is the investor better off on a relative basis because inflation was less than expected?
- Given the year-to-year performance results, the actual dollar value at the end of 5 years amounts to \$1,419,054 instead of the originally expected \$1,610,510. How large must the shortfall become before it threatens the investor's ability to retire at the targeted income level?
- When yearly withdrawals are made from the portfolio, how can the investor ensure that the remaining funds will be sufficient for the full 25 year distribution period?
- If the portfolio is off track, should the investor simply give it more time? If so, how much more time? At what point should the portfolio be reevaluated? What are the options for corrective action?

Although the correct answers to these questions are not usually apparent, they are crucial. A lifetime of work and savings could unravel because the investor did not receive portfolio sufficiency monitoring data specific to his unique economic situation and objectives.

Why Not Annuitize?

After contemplating the complexity of constructing a retirement portfolio, the rational investor might question whether it might be preferable to purchase a life annuity from an insurance company. The annuity offers several apparent advantages, including:

Risk has many definitions for investment management. In a retirement portfolio, the investor's primary risk is that the portfolio will not last through retirement.

If the investor monitors portfolio performance solely by determining whether the investments stay within certain rate-of-return guidelines, he may well miss some troubling storm clouds on his retirement horizon.

- guaranteed lifetime income during the distribution phase (including benefits payable to the investor's beneficiary, if this option is selected); and
- guaranteed fixed rates of return during the accumulation phase.

However, the annuity also imposes numerous costs and risks. Costs include sales charges and loads and investment management fees. Risks include:

- the risk that future inflation will erode the purchasing power of the fixed monthly annuity distribution payment;
- the risk that the rate of return on the annuity will be insufficient to generate sufficient assets to fund the investor's retirement income objectives;
- the risk that the insurance company may default on its obligation to pay annuity benefits.

For investors with sufficient accumulated assets to fund their retirement income needs, with enough of a cushion to cover expected future inflation during the distribution phase, an annuity may be a rational approach to minimizing risk in the portfolio. However, for investors requiring real growth in their investment portfolio, purchase of a fixed annuity is not a viable option.

MONITORING PORTFOLIO RISK

Risk has many definitions for investment management. In a retirement portfolio, the investor's primary risk is that the portfolio will not last through retirement. That is to say, he defines risk as the possibility that he will either attain his desired retirement age with fewer (inflation-adjusted) dollars than expected, or deplete his funds earlier in the retirement period than he had anticipated.

Defining Portfolio Risk: Time and Volatility

This risk is inherent in portfolios of risky assets.⁴ The value of risky assets is necessarily uncertain at any given point in time—including retirement age. Although it is possible to determine a portfolio's statistically expected return, its actual value at any time is a function of the expected return and chance (sometimes ex-

pressed as standard deviation).

How large is the chance error likely to be? The mathematics of the answer depend on two inputs: (1) the amount of time over which the portfolio operates; and, (2) the degree of variability in year-to-year investment returns. The first input is the investor's planning horizon, and the second input is the portfolio's spread of possible returns (standard deviation) around its expected return (mean).

Additional Time Increases Risk

According to the law of averages, the size of the chance error (i.e., the amount of a shortfall or windfall of dollars in the portfolio) increases with the planning horizon, even if the standard deviation remains constant. Fortunately, the increase in the chance error increases only by the square root of time. Thus the possible chance error grows slowly over time. Lengthening the time horizon from 1 year to 100 years increases error by a factor of 10, (i.e., square root of 100) rather than by a factor of 100.⁵

Nevertheless, it is important to remember:

- 1) The probability that the actual dollar value of a portfolio will deviate from projected dollar value either positively or negatively increases over time.
- 2) This is the case even though the portfolio's average long-term rate of return converges with the expected rate of return established when the portfolio was originally implemented.
- 3) This is the case even though the portfolio is well designed and operates within expected parameters.

If the investor monitors portfolio performance solely by determining whether the investments stay within certain rate-of-return guidelines, he may well miss some troubling storm clouds on his retirement horizon.⁶ Alternatively, if the investor simply compares actual portfolio values with projected nominal values, he may mistake the forces operating upon the portfolio and take inappropriate structural (asset allocation) actions.⁷ In any event, informed portfolio sufficiency monitoring is the key to assuring the integrity of the investor's retirement.

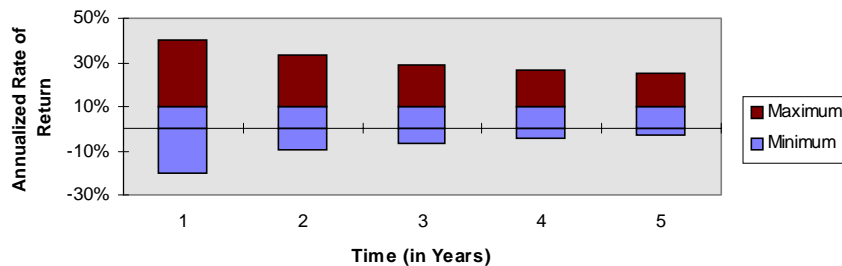
Despite the fact that the expected range for the annualized rate of return narrows over time, the expected range for the terminal value (i.e., the assets available to fund retirement income needs) diverges over time (i.e., the variability increases).

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Rate of Return Convergence versus Terminal Value Divergence

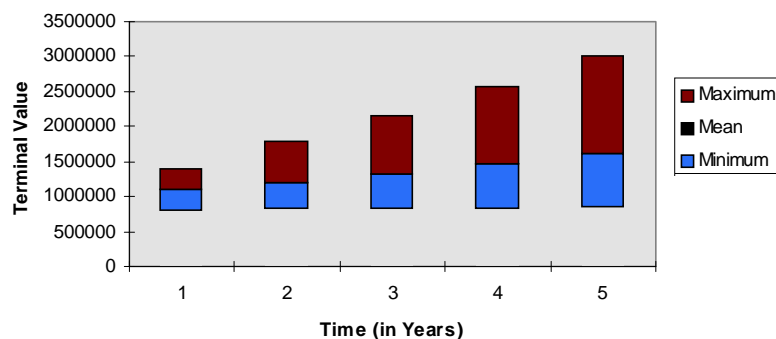
Consider the case of our sample investor, who has a somewhat risky portfolio, with returns and year-to-year volatility comparable to an investment in the S&P 500. Despite the fact that the expected range for the annualized rate of return narrows over time, the expected range for the terminal value (i.e., the assets available to fund retirement income needs) diverges over time (i.e., the variability increases). The following graphs illustrate ranges for portfolio rates of return and terminal portfolio value, both reported at the 95% confidence level:

Distribution of Rate of Return on S&P 500 Portfolio



Note that the range of expected returns narrows over time, while the range of terminal values increases over time. After five years, there is roughly a 2.5% chance that the actual portfolio value could be as high as \$3,022,815 and a 2.5% chance that it could be as low as 858,063.

Distribution of Terminal Value of S&P 500 Portfolio



Thus, although the *relative* deviation of terminal wealth from expected wealth increases with the length of the investment period and with the variability of investment returns, the *absolute* dollar uncertainty of risky assets di-

minishes greatly over lengthy horizons. After a sufficiently long planning horizon, the question becomes not if an equity portfolio will outperform a risk free asset, but rather, by how much will it surpass the risk free return.

FASB 87: ACCOUNTING FOR PORTFOLIO SUFFICIENCY

Accounting for Corporate Pension Plans: A Model for the Individual

The principles of the Financial Accounting Standards Board's ruling number 87 (FASB 87) provide insight into how to monitor portfolio performance for clients. FASB 87, adopted in 1985, governs the way in which U.S. corporations account for and disclose information about their pension plans. The rules are specifically applicable to defined benefit pension plans — i.e. plans that promise participants a defined benefit throughout retirement regardless of whether plan assets are sufficient to fund it, and for which promise, therefore, the sponsoring company is absolutely at risk.

Although there are many significant differences between corporate defined benefit pension plans and an individual's retirement income portfolio — specifically, the corporation has an expectation that it will continue generating earnings for an indefinitely long period of time while the individual has a relatively fixed career expectation, the corporate plan spreads mortality risk (the risk that the individual receiving retirement benefits will live longer than expected, and thus will receive benefits longer than expected) across numerous individuals while the individual's retirement income portfolio cannot spread mortality

risk, etc. – there are also significant similarities between the two. Similarities include:

- the individual investor, like the corporate retirement plan sponsor, is the party who bears all the risk;
- the individual investor and the corporate retirement plan sponsor both seek to create a fund adequate to provide defined (i.e. targeted) benefits throughout retirement; and
- inflation-adjusted targets, projected yearly additions, distribution requirements, life expectancy, etc., determine the rate of return necessary to hit the funding target.

The corporate retirement plan's required rate of return is analogous to the individual investor's long-term expected return for the portfolio, and both plan sponsor and investor implement a portfolio that seeks the required return without excess or unnecessary risk.

Further, both the corporate plan sponsor and the individual portfolio owner seek to avoid the financial distress that would accompany unexpected announcements of a drastic shortage of funds.

Changing Requirements to Secure Pension Promises

Prior to 1985, corporate plan sponsors had a great deal of latitude in the way they accounted for pension plans. Actuarial and investment-related assumptions differed greatly from employer to employer; and, just as importantly, none of the key assumptions had to be disclosed in the company financial statements. Although FASB 87's provisions are both lengthy and technical in nature, as a result of its adoption, companies now use a relatively uniform methodology to account for their pension plans and measure the periodic cost of providing pension benefits.

OUTLINE OF FASB 87 METHODOLOGY

Measuring Cash Flow Obligations

FASB 87 contains a myriad of provisions (transition gains or losses, prior service credits, yearly service costs, etc.) that apply solely to corporate pension plans. However, for any portfolio designed to produce targeted amounts of future cash flows, it is possible to compute the present value, lump-sum equivalent of esti-

mated future cash flows. FASB 87 assigns the term "Projected Benefit Obligation" (PBO) to the discounted value of the future obligations – that is, the retirement income earned to date by the worker, projected forward to his or her retirement date.⁸

Measuring the Influence of Time

FASB 87 also stipulates that as time unfolds, the time-sensitive discount must be "backed-out" of the calculation because each year that passes is one year less that is available to accumulate a fund of assets for retirement. FASB 87 refers to this calculation as the determination of plan "Interest Costs." Interest Costs are offset by the plan's long term Expected Return on Plan Assets, which measures the portion of the cost expected to be covered by the plan's investment return on its currently accumulated portfolio.

Accounting for Variances in Actual Experience

FASB 87 mandates a calculation designed to determine the effect of the long-term expected rate of return on the year-to-year actual value of the investment portfolio. Of course, it is highly unlikely that any one year's investment return will match exactly the long-term expected return. However, the rationale for performing the calculation based on the long-term expected rate of return rather than short-run actual returns lies in the fact that chance variations are as likely to be positive as negative and that, over time, they will cancel out and the plan will converge towards expected return. FASB 87 also provides a threshold level at which variances from expectations (generally, if the variance exceeds 10% of the greater of the plan's assets or total PBO) must begin to be amortized.

USING FASB CONCEPTS FOR RETIREMENT PORTFOLIO SUFFICIENCY MONITORING

FASB Provides Rational Tools

Although there are significant differences between corporate retirement plans and an individual's retirement income portfolio, there are enough similarities that the individual investor can enhance his or her ability to manage a retirement income portfolio by using portfolio monitoring techniques based on the corporate retirement plan accounting rules.

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Portfolio sufficiency monitoring is relatively simple in concept. In theory, the process simply requires tracking experience variances from the parameters developed in the original financial plan, and determining benchmarks that will trigger strategic revisions to the plan.

Extrapolating from corporate rules to the individually owned portfolio, it is apparent that FASB 87 provides a consistent methodology for assessing how well a portfolio is doing relative to a specific objective. A similar methodology can be developed and applied by the individual. For example, as the chance error inherent in investing in risky assets moves the portfolio toward a surplus or deficit position, we can determine the percentage amount by which the actual amount deviates from the projected amount. Variation in the rate of inflation can be considered analogous to actuarial gains or losses and the impact of such variations can be accurately assessed. Likewise, the investor can calculate the impact of other actuarial or investment factors such as a change of health, the receipt of an inheritance, and so forth.

Guidelines for Adjusting Strategy

Finally, appropriate action can be taken to compensate for the impact of results on portfolio sufficiency objectives. FASB 87 prescribes specific actions in order to prevent a large accumulation of either gains or losses. Specifically, it dictates that cumulative differences from the projected value of the benefit obligation must be amortized on a straight line basis. A variety of equally appropriate alternative steps are, of course, available to the owner of an individual retirement portfolio.

FASB 87 is designed to provide a structured methodology for determining the actual periodic cost of providing pension benefits. It also requires a continuous reexamination of the assumptions upon which the portfolio operates and an assessment of the important trends which unfold as time passes.

Advantages of the FASB Methodology

Using a structured sufficiency portfolio monitoring approach based upon the applicable provisions of FASB 87 has at least three significant advantages for the individual investor:

- 1) It minimizes the likelihood of a sudden, unexpected revelation that retirement lifestyle objectives are in jeopardy;
- 2) It minimizes the likelihood that corrective actions will be hasty, ill-considered, and self-defeating; and,
- 3) It provides a rational methodology for evaluating and acting on differences between expected and actual portfolio performance.

IMPLEMENTING A PORTFOLIO SUFFICIENCY MONITORING PROGRAM

Portfolio sufficiency monitoring is relatively simple in concept. In theory, the process simply requires tracking experience variances from the parameters developed in the original financial plan, and determining benchmarks that will trigger strategic revisions to the plan. In practice, however, a portfolio sufficiency monitoring system requires:

- rigorous recordkeeping to track experience variances, including variances in portfolio performance, inflation, additional assets, etc.;
- distinguishing between acceptable statistical performance variances, and significant trend differentials that require revisions to the underlying asset allocation or other components of the financial plan;
- the ability to implement strategic revisions, if required; and
- a methodology for determining the magnitude of corrective revisions required.

Consequently, most individuals seeking to monitor the sufficiency of their retirement portfolio should utilize the services of a professional investment advisor.

COMPONENTS OF A PORTFOLIO SUFFICIENCY MONITORING PROGRAM

Establishing Retirement Portfolio Objectives

The first step in setting portfolio objectives is to identify retirement income needs. The advisor then should develop a portfolio target value, sufficient to meet those needs, given assumed future inflation rates, life expectancy, proposed retirement date, etc.

Based on this goal, the individual should set reasonable objectives for the portfolio. In general, a retirement portfolio builds through both savings and investment growth. Since risk and return are positively correlated, most investors must assume some risk to attain their retirement planning objectives. However, most investors are risk averse, and seek to minimize investment risk. This relationship between a portfolio's expected return and the sufficiency of assets at a future point in time (e.g., at retirement) drives the asset allocation

"...companies experiencing earnings distress have higher average stock returns than companies with good earnings prospects, suggesting that the market demands compensation for this risk factor..."

Findings to be reported to the investor should include:

- ◇ *gains or losses relative to expected portfolio rate of return and inflationary experience;*
- ◇ *deficits or accumulations in excess of predefined benchmark variance percentages; and*
- ◇ *key trends indicating the need (or opportunity) for revisions to the financial plan.*

decision. How much risk must the portfolio bear in order to obtain the required results?

Designing an Appropriate Retirement Portfolio

Once the investor has selected the risk level most appropriate for his or her goals and circumstances, the planner should design a portfolio which has a statistically high probability of achieving the investor’s objectives.

Storing Portfolio Assumptions

After completing the portfolio design, the final process is to store expected annual investment results of the portfolio, through both the accumulation and distribution phases of the retirement plan. This summary of expected results forms the benchmark against which actual investment experience should be measured, during the portfolio sufficiency monitoring phase.

PERIODIC SUFFICIENCY MONITORING

Each year, the advisor should conduct a thorough portfolio review to determine the ongoing viability of the original financial plan. The review should include:

- a comparison of the portfolio’s actual rate of return with the expected rate of return developed at portfolio inception, on both a current period and cumulative basis;
- monitoring actual portfolio contribution and distribution information against projections specified in the financial plan; and
- an analysis of actual inflationary experience, compared to projected inflation according to the original plan.

Findings to be reported to the investor should include:

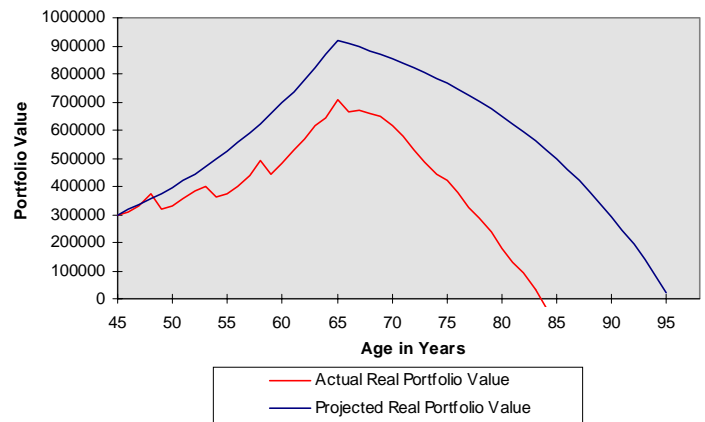
- gains or losses relative to expected portfolio rate of return and inflationary experience;
- deficits or accumulations in excess of predefined benchmark variance percentages; and

- key trends indicating the need (or opportunity) for revisions to the financial plan.

AN EXAMPLE REVISITED

To examine the impact of a portfolio sufficiency monitoring program on a retirement income portfolio, let us revisit the hypothetical example developed in the first section of this paper. Let us assume that our investor has established a variance threshold which triggers action when the actual real portfolio value drops 10% or more from the projected real portfolio value (consistent with the FASB 87 methodology for defined benefit pension plans). Let us further assume that our investor decides to take corrective action by amortizing variances between actual and projected portfolio performance over a 10 year period. Before any adjustments, our hypothetical investor’s retirement income portfolio lasted for just 60% of the planned distribution period (as illustrated in the chart and graph on pages 3 and 4, and reproduced again, below). How would the portfolio have fared, given the same patterns of actual performance and inflation, if a portfolio sufficiency monitoring program had been in place?

Projected and Actual Retirement Income Portfolio (with no Sufficiency Monitoring Adjustment)



Adjustment During Accumulation and Distribution

The graph on the following page demonstrates the impact of a portfolio sufficiency monitoring program with corrective action taken during both the accumulation and distribution phases of the portfolio.

The dashed blue line indicates the variance threshold, set 10% below the projected

real portfolio value. In this illustration, the hypothetical investor plans to take the following corrective actions:

- prior to age 65, each year the investor will contribute one-tenth of the amount that the actual real portfolio value is below the variance threshold; and
- after age 65, the investor will reduce the planned annual distribution by one-tenth of the amount that the actual real portfolio value is below the variance threshold.

Adjustment During Distribution Phase Only

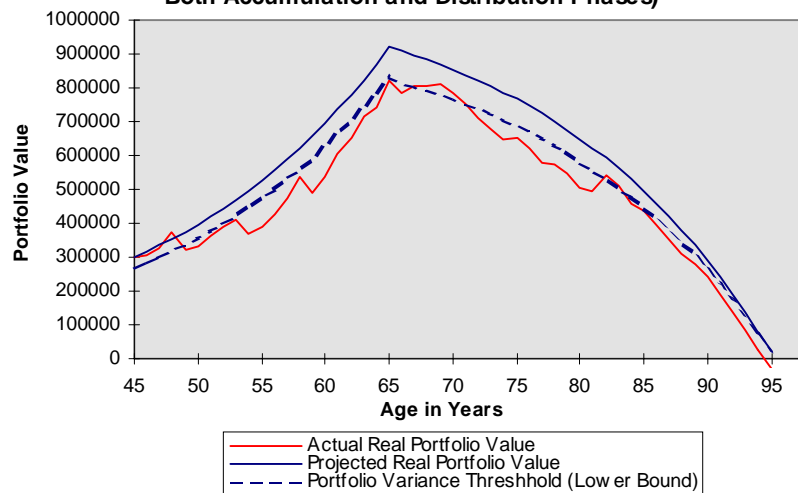
The graph at the bottom of the page demonstrates the impact of a portfolio sufficiency monitoring program with corrective action taken during the distribution phase only. This assumes that the investor is either unwilling or unable to make contributions to the portfolio during the accumulation phase.

Once again, the dashed blue line indicates the variance threshold, set 10% below the projected real portfolio value. In this illustration, the hypothetical investor will not take any corrective action prior to age 65, but will reduce planned distributions by one-tenth of the variance between the actual real portfolio value and the variance threshold for each year after age 65.

Under this scenario, our hypothetical investor will receive his distributions for only the first 28 of the planned 30 years. Further, he will receive reduced distributions in each year of the distribution phase. Nonetheless, the portfolio will last 10 years longer than our unadjusted example...

in which the portfolio was completely depleted after just 18 years. Reductions range from \$6,103 to \$14,502 per year, and total

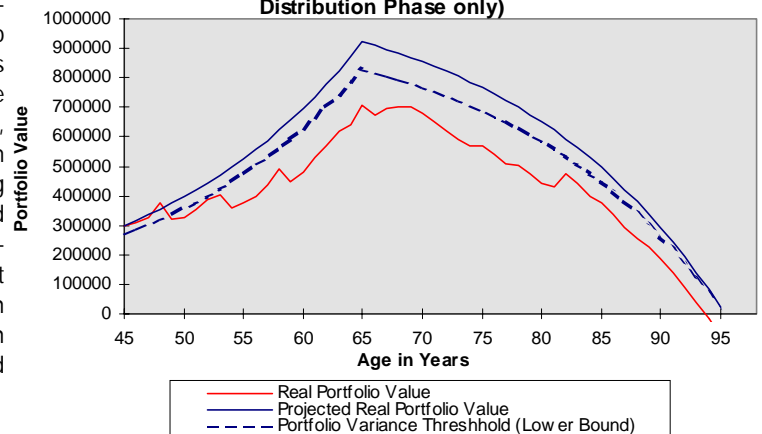
Projected and Actual Retirement Income Portfolio (With Sufficiency Monitoring Adjustments During Both Accumulation and Distribution Phases)



...our hypothetical investor will receive his distributions for only the first 28 of the planned 30 years. Further, he will receive reduced distributions in each year of the distribution phase. Nonetheless, the portfolio will last 10 years longer than our unadjusted example...

As a result of implementing these policies, our hypothetical investor makes additional inflation-adjusted contributions to the portfolio totaling \$76,592 over 16 of the 20 years of the accumulation phase, with contributions ranging from \$857 to \$10,244. Further, he reduces his planned distribution in 24 of the 30 years of the distribution phase, with reductions ranging from \$349 to \$7,007, and totalling \$94,085 (all amounts expressed in inflation-adjusted dollars). However, he receives at least \$57,993 in distributions in each of the 30 years of retirement, with the planned \$65,000 distributed in 6 of the 30 years.

Projected and Actual Retirement Income Portfolio (with Sufficiency Monitoring Adjustments During Distribution Phase only)



Since the portfolio's ability to supply a stream of retirement income is dependent on the portfolio value, not on the portfolio's rate of return, it is imperative that the investor monitor variances from the portfolio's projected value.

Portfolio sufficiency monitoring can also be used to initiate appropriate corrective action when actual portfolio experience varies significantly from projections.

\$299,232 (all amounts expressed in inflation-adjusted dollars). The good news is that the investor will receive at least 77% of his planned annual distribution across 93% of his planned distribution period.

CONCLUSION

Building an investment portfolio designed to supply a significant source of retirement income requires appropriate planning, and necessarily commits funds to the portfolio for a significant period of time. As the investment time frame is extended, although the actual rate of return on the portfolio tends to converge towards the expected rate of return, the range of possible portfolio values becomes larger. Since the portfolio's ability to supply a stream of retirement income is dependent on the portfolio value, not on the portfolio's rate of return, it is imperative that the investor monitor variances from the portfolio's projected value.

Portfolio sufficiency monitoring establishes a structure for measuring such variances that is loosely based on the FASB 87 accounting rules which apply to corporate defined benefit plans. Although the FASB 87 rules are not directly applicable to the individual investor, due to the differences between an individual and a corporation, there are enough similarities in the planning objectives of the individual and the corporation that the FASB methodology provides useful guidelines.

Portfolio sufficiency monitoring can also be used to initiate appropriate corrective action when actual portfolio experience varies significantly from projections. Depending on the type of corrective action implemented, sufficiency monitoring can significantly enhance the probability that a reasonable income stream is available throughout an individual investor's planned retirement distribution period.

¹ Specifically, the percentage returns of the investment are multiplied together and then raised to the power of 1/n, where n is the number of measurement periods.

² The fallacy of utilizing the Law of Large Numbers as a justification for an all-equity portfolio in order to maximize the geometric mean of terminal wealth is discussed in a more comprehensive manner in "The Long-Term Case for Equities (And How it Can Be Oversold)," Paul A. Samuelson, *The Journal Of Portfolio Management* (Fall, 1994), pp. 15-24.

³ The formula for calculating real rates of return is:

$$i_r = \left(\frac{[1+i_n]}{[1+CP]} - 1 \right) \text{OC}$$

where i_r = real rate of return and i_n = nominal rate of return

⁴ See, for example, "What Practitioners Need to Know . . . About Time Diversification," Mark Kritzman, *Financial Analysts Journal*, January/February, 1994: "The notion that above-average returns tend to offset below-average returns over long horizons is called time diversification. Specifically, if returns are independent from one year to the next, the standard deviation of annualized returns diminishes with time. The distribution of annualized returns consequently converges as the investment horizon increases.... Although it is true that the annualized dispersion of returns converges toward the expected return with the passage of time, the dispersion of terminal wealth also diverges from the expected terminal wealth as the investment horizon expands."

⁵ Investment in risky assets makes uncertain the actual number of dollars that will be available to spend in the future. As an example, we can examine a portfolio with a 10% expected return and a standard deviation of 15%. Statistically, there is a 95% probability that, at the end of year one, the actual investment results will encompass a two standard deviation range (15% x 2) of -20% to +40%. If we invested \$100,000 our expected return after one year is \$100,000(1.10) or \$110,000. However, the possible upper and lower values are:

$$\begin{aligned} \text{upper value} &= \$100,000[1 + .10]^{1+2(.15)} = \$143,000 \\ \text{lower value} &= \$100,000 \frac{[1+.10]}{[1+2(.15)]} = \$84,615. \end{aligned}$$

Note that the lower value is 23% less than expected value (\$84,615 ÷ \$110,000). The percentage value 23% is substantially higher than the 15% standard deviation of annual returns. What happens if we project possible results over a twenty year planning horizon? From the law of averages, we know that the average deviation of the rate of return will decrease with the square root of time. Specifically:

$$\text{Standard Deviation of the average rate of return} = \frac{\pm 15}{\sqrt{20}} = 3.35$$

For our \$100,000 investment the expected return after 20 years equals \$100,000(1.10)²⁰ or \$672,750. The limits of the range of values at the 95% probability level equals:

$$\begin{aligned} \text{upper value} &= \$100,000[1 + .10]^{20} [1 + 2(.0335)]^{20} = \$2,461,172 \\ \text{lower value} &= \$100,000 \frac{[1+.10]^{20}}{[1+2(.0335)]^{20}} = \$183,892. \end{aligned}$$

Time **decreased** risk in the sense that no money was lost-\$100,000 worst case became \$183,892 after 20 years despite the fact that the worst one year case projected a possible loss of over 15%. Time **increased** risk in the sense that the worst case long-term return is only 27.3% of the amount of dollars which we expected to have in the portfolio. After twenty years of compound growth in the portfolio we have approximately 73% fewer dollars to spend than the amount we anticipated. For a discussion of chance error see *Statistics* D. Freedman, R. Pisani, R. Purves and A. Adhikare, Second Edition W.W. Norton & Company (New York, 1991), pp. 276-277. For a discussion of how the law of large numbers applies to risk and investment portfolios, see "The Long-Term Case for Equities," Paul A. Samuelson, *The Journal of Portfolio Management* (Fall, 1994), pp. 15-24.

⁶ It is sometimes suggested that investment portfolios that tend to produce year-to-year returns equal to or in excess of the investor's required long-term return may be preferred to investments that have a greater propensity in any given year to drop below the required return. The measurement of investment risk considers only deviations in performance which are below the targeted long-term return. "Shortfall" is, therefore, measured not in terms

of the ongoing cumulation of inflation-adjusted wealth, but rather in terms of the number of times a portfolio's returns fall below the minimum acceptable return (with the severity of each of the shortfalls weighted by squaring the deviation). In actuality, the "shortfall" measurement gauges the likelihood for and severity of interim tracking errors. It does not provide insight into the probability (ex ante) of achieving required returns over the investor's planning horizon [see, for example, "Dimarzio, A., Ritter, T., & Haire, D., "An Alternative Perspective on Investment Performance," *Journal of Financial Planning* (July, 1993), pp. 129-133.] Conversely, much useful research has been done in the interrelationships between the mathematics of statistical distributions based on ex-post data and the probability of achieving future returns equal to or in excess of specified targets. [see, for example, an especially valuable methodology for calculating, at various confidence levels, cumulative shortfall probabilities over a multi-period planning horizon developed by Garcia, C., Gould, F., & Mitchell, D., in the appendix to "The Historical Validity of Shortfall Estimates," *The Journal of Portfolio Management* (Summer, 1992), p. 41. For additional insight into the probability of distributions of multiyear returns and the implications for investors who pursue strategies to increase wealth in worst-case scenarios--maximize the minimum--over various holding periods, see, Reichenstein, W. & Dorsett, D., *Time Diversification Revisited* (The Research Foundation of the Institute of Chartered Financial Analysts), Charlottesville, Virginia, 1995].

⁷ We assume that the asset allocation decision at the time the portfolio is established reflects the mix of risk-free and risky assets which optimized the portfolio--that is to say, which enabled the portfolio owner to achieve the rate of return necessary to produce targeted income at the level of risk appropriate for the investor's economic objectives and personal circumstances. If the variability (risk) of T-Bills is zero and their expected return exceeds the rate of return required to generate cash for the retiree, then the optimal position of the portfolio is 100% T-Bills. If the portfolio's required rate of return exceeds the expected return from T-Bills, then the owner must risk some percentage exposure (from 1% to 100% of the portfolio) to risky assets (equities). This model stands in direct contrast to the "life-cycle" investment model which has received great play in the popular press. Effective portfolio monitoring assists the investor to quantify the required risk/return tradeoffs as time unfolds, not according to formulas derived from the popular press, but according to his actual economic circumstances. Without this type of specific information, ongoing investment decisions are likely to be ad hoc. For further discussion on this topic see, "Asset Allocation, Life Expectancy and Shortfall," Kwok Ho, M.A. Milevsky, and Chris Robinson, *Financial Services Review* (1994), pp. 109-126.

For an analysis and review of the provisions of FASB 87 see, [The Analysis and Use of Financial Statements](#), Gerald White, A. Sondhi, and D. Fried, John Wiley & Sons (New York, 1994), pp. 638-683.

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