



Words From the Wise

Martin Leibowitz

Arguably *the* first bond quant on Wall Street, Martin (Marty) Leibowitz pioneered many central concepts and strategies that have come to form the foundations of modern fixed-income portfolio management. Dr. Leibowitz's academic training — first in physics and later in mathematics — provided an important education to succeed at an otherwise daunting task. Earning his bachelor's in liberal arts and a master's degree in physics from the University of Chicago, and a Ph.D. from New York University, Dr. Leibowitz spent a quarter-century at Salomon Brothers as a Partner, initially as Head of Fixed Income Research, and ultimately becoming in charge of all research activities at the firm. Dr. Leibowitz then joined TIAA-CREF as Chief Investment Officer and Vice Chairman, and now serves as Managing Director in Equity Research at Morgan Stanley. Over the decades, he has written or coauthored more articles than anyone else in the *Financial Analysts Journal* and has contributed to numerous books on a wide range of asset management topics. He is one of only two people who have won all three top awards from CFA Institute. Apart from the many industry awards bestowed upon him, Marty consistently appears on the short list of people when other thought-leaders in finance are asked to identify the most important and influential people in the investment profession.

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Executive Summary

Corporations in the U.S. have been shedding defined-benefit (DB) plans and moving toward defined-contribution (DC) plans. The remaining DB plans have been shifting gradually to liability-driven investing (LDI) for a host of reasons, including:

- DB plans grew to be quite large relative to the sponsoring firm's market value.
- The attraction of reducing contributions by holding equity-oriented portfolios diminished as pension plans' funded status became more volatile in the early 2000s.
- Changing accounting regulations increased the magnitude and visibility of the sponsoring firm's balance sheet volatility.

We explore "What's next for DB plans?" and the conditions in which increasing or decreasing risk makes the most sense, with provocative insights.

We then turn to assessing the observed greater risk-taking by U.S. public pension plans, taking in some lessons from pension models implemented abroad, and asking how best to support a more secure retirement for individual investors.

We conclude with Marty's thoughts on his research on asset allocation, duration targeting and equity valuations.

A fascinating discussion about how Marty came to Wall Street, what he discovered when he arrived there, as well as an exploration of his heroes is included in a special section.

Finally, for readers not well versed with the challenges of U.S. DB plans, Appendix A provides some terminology and key concepts as background for the discussion in the next few pages.



Pension Investing Challenges

CORPORATE DEFINED-BENEFIT PLANS

Antti Imanen: You are arguably the father of the asset-liability perspective in pension management. The approach has been called various things like asset-liability management (ALM) or liability-driven investing (LDI), but whatever name used, your ideas gave investors the tools in the 1980s for immunization, surplus optimization and more. They attracted institutional attention (and action) but in the 1990s moved to the background as defined-benefit (DB) plans increasingly focused on growing assets, especially via equity-oriented portfolios. More recently, ALM has made a comeback. Why was your prescient advice ignored for so long?

Marty Leibowitz: I don't think I ever believed that a narrow view of things was the whole story. Every situation is different; the nature of the risks and time horizons that people can stomach dictates an awful lot of the final result. So, to say that you're going to drive down to the point where you minimize your liability risk is, I think, too stark. There are too many other variables that enter into it.

Even back in the 1980s, when we were talking about surplus optimization, we were really noting that, hey, look, if you take a look at the liabilities and you're concerned with how to manage the surplus, there are ways to likely improve the situation.

We never really intended for immunization to be the total advice or endpoint for an institution, but a starting point, really, which I think is helpful, even if it's not the final solution. We tried to promote a combined perspective.¹

Imanen: Some people are more pure-minded about the need to immunize liabilities.

Leibowitz: Yes, Stan Kogelman and I had some huge debates with Larry Bader on this topic. Larry is a brilliant actuary with a photographic memory, so you can't win an argument against him. I learned a lot from Larry, but never convinced him. I guess I should pride myself on having the prescience to bring an actuary and an accountant into Salomon Brothers' bond research group. Larry is an actuary's actuary.

Rodney Sullivan: One issue we'd like to discuss is why the asset-liability perspective was not more influential in 1990s and why corporate DB plans seem more inclined to pursue it now.

Leibowitz: That's an interesting case, because it's not clear that plan sponsors have all of a sudden gone back and read all the literature, seen what Fischer Black², Irwin Tepper³ or Larry Bader⁴ had to say about it — that a pension fund should invest all in fixed income, because it was tax free, and then take the equity risk in the corporate structure. Clearly some broader forces have been in play.

¹ For instance, see Leibowitz and Henriksson (1988).

² See, for example, Black (1980)

³ See, for example, Tepper (1981)

⁴ See, for example, Bader and Gold (2007)



Ilmanen: One broad trend has been the shift from DB plans to DC plans. The growing interest in LDI and various forms of de-risking in remaining DB plans seems related. Do both trends reflect waning willingness by corporate sponsors to underwrite pension related risks?

Leibowitz: Well, corporate DB plans are slowly becoming extinct — going the way of the dinosaur. The world is turning to DC, certainly in corporate America, and amazingly, globally according to Roger Urwin's stats with DC defined in a flexible fashion.⁵

Behaviorally, I think corporations are eager to shed that liability, no matter what. This is understandable, given how the market and investors view those liabilities and the potential impact on earnings, the associated cost of deficits and so on.

I think while corporate senior executives want to move toward minimizing the impact of plan fluctuations and to move toward ultimately unloading their DB plans, they also don't necessarily want to incur excessive costs, by doing it at times when it seems unwise, especially when viewed in hindsight. Corporations look at interest rates these days as being low, and how can you argue with them? And they see that if interest rates rose to a level where they seem reasonable, *and* their deficits were low and tolerable, they would then likely try to immunize their plans.

Ilmanen: Some critics ask *why* such a transition was not done, say 10 to 15 years ago, when interest rate levels were higher. We just discussed the related trend to close DB plans. When DB plans were open to new enrollment, there was a stronger case for holding equities to support associated future wage growth. Was another reason for the change in attitudes that pension plans grew so large relative to their sponsoring companies?

Leibowitz: Yes, that's a biggie. The game has changed over the last 50 years. There's been a huge increase in financial assets, far greater than the growth of GDP. The typical corporate pension fund used to be a peanut compared to where it was going to be and compared to the sponsoring organization's market value. So, that changed a lot of the game, legitimately, as it is now at the point where the pension sometimes dominates the corporate capital structure. This means that the level of risk that's appropriate for the plan is actually quite different now. Managing a pension fund in an environment where it's such a huge presence in your corporate life is different than when it was a sidebar.

Ilmanen: So the tradeoff between reducing expected contributions and pension-related risks became less attractive merely because the plans grew larger and those risks less affordable. Some say that the tail began to wag the dog here.

I guess a related game changer must be the accounting change (FASB158 in 2006) which required showing market-based valuation of the funded status on the corporate balance sheet by using the corporate bond yield as the discount rate for liabilities.

Leibowitz: Yes, it's more onerous to have deficits when the funded status is more visible on the balance sheet. The stock market takes note of it in the corporation's stock price. And the balance sheet volatility may be intolerable, given the huge fluctuations in funding ratios over the last 15 years or so.

Sullivan: Large corporate DB plans shifted from being overfunded (123% funding ratio) in 2000 based on the Milliman 100 index⁶ to underfunded (82%) in 2002, largely due to falling equity

⁵ See Towers Watson, *Global Pensions Assets Study*, (2014)



markets and bond yields, as the latter boosted liability values. The rollercoaster continued in 2008 when the typical funding ratio fell from 105% to 79%.

Leibowitz: And it wasn't just adverse developments in capital markets. Pension obligations have also grown because of rising longevity and increasing pension insurance costs.

In addition, the Pension Protection Act (PPA) of 2006 based minimum contributions of underfunded plans on corporate bond yields. The impact so far has been lessened because later legislation has allowed some smoothing of those discount rates.

Ilmanen: I have also heard it said that corporations can no longer extract plan surpluses but yet are responsible for any deficits, making pension plans adversely asymmetric.

Leibowitz: There was more flexibility years ago — where plans could actually take back surplus cash from the plan. Then, there were some arrangements where they could transfer from a surplus in one plan to another pension plan or a VEBA (voluntary employees' beneficiary association) type of retiree health plan. So, there were various ways of extracting, which became I think ever more constrained in ever more complex ways.

Currently, I believe the way to think about it is that a surplus only benefits a corporation in that it allows a contribution holiday. So the returns to a corporation have indeed become more asymmetric.

Sullivan: We can try to summarize the descriptive case why corporations have shifted from equity-oriented DB portfolios toward bond-oriented portfolios. The key elements seem to be the broad DB-to-DC trend (declining sponsorship); growing size of pension plans (making it more risky for sponsors to hold large equity positions to reduce expected contributions); and finally capital market developments and accounting changes (the larger and more visible fluctuations in the funded status).

Ilmanen: Let's now turn from descriptive to normative and consider some advice for today on best practices. There are many nuances, of course, but the big-picture question is: Under what conditions should corporate DB plans stick with the equity-oriented portfolio and when should they consider LDI? Let's start with the case of a fully funded corporate DB plan, without a willing sponsor to keep the plan open, and normal market conditions. Does de-risking make sense here?

Leibowitz: Yes. I believe it does.

Ilmanen: OK, then let's explore the harder case, which is most relevant today: a DB plan that is underfunded at a 80% to 90% funding ratio. Is it a good idea to try to grow out of that deficit, as is the conventional wisdom? Or should one de-risk and immunize to prevent even larger losses, which inevitably require sponsor contributions.

Leibowitz: This can be argued in many ways. Let's use the analogue of an individual who is facing retirement. You can only fund yourself at 80% to 90% of the lifestyle you desire at retirement. Do you take risks and how much risk?

Well, if you're at 90%, at least it's viable and you have some degrees of freedom, I would think. If you found yourself deteriorating down to 80%, it's extraordinarily painful. So, yes, you might want to de-risk at that 90% point.

⁶ Ehrhardt, Wadia, and Perry (2014)



On the other hand, if you find that you're at 90% funding ratio of what's a fairly comfortable lifestyle and you feel that you have some degrees of lifestyle freedom, and a future surplus would be nice (if not absolutely necessary), then you may want to remain in risky assets to garner more return.

So, these issues are all over the place, but to grow your way out of a situation, which would be desperate if you lose money, would not be the analog I would give a corporation. With a closed fund, with people who are desperately depending upon it, I think that in some ways de-risking might be the answer, even at a deficit.

On the other hand, with an open fund, given some willingness of the corporation to sponsor downside risks, or even with a closed fund but with the presence of some other back-up, the case for growing out instead of paying up now is appealing for the sponsor.

Ilmanen: Yes, that makes sense. There is tension between the desire to grow out of the hole and the fear of getting deeper into it. You sympathized earlier with investor concerns regarding the low starting yields. Does your de-risking advice vary with the yield level?

Leibowitz: Let me just say: You're asking questions which lead to complex answers. Why can't you ask me a "yes" or "no" question!?! (laughter)

Even the issue of de-risking is not simple, because de-risking is thought of as LDI. De-risking in some situations may mean go to cash; just take your risk assets off the table entirely. So, here you are, you've got a closed plan or you are an individual and you're at the 80% funding level. You're really worried, but you also think interest rates are quite low. That view might push you to either move everything to cash with the hope of investing in long bonds later at higher rates.

Ilmanen: I'd just say that any timing decision where one puts the whole portfolio into cash would be hard to sustain unless one is incredibly skillful or lucky with that timing decision.

Leibowitz: Let me rephrase it this way. Suppose you have a neutral view on the future of interest rates and interest rates are high enough so that they could decline enough so that you really would find yourself in a worse funding situation. Then the case for de-risking would be stronger than it is today with the near-record-low yields.

Ilmanen: So, you suggest delaying de-risking in an abnormal interest rate environment, which is a valuation-sensitive and view-driven perspective. This is indeed the common glide path adopted by many U.S. pension plans to commit themselves to de-risking but only once market conditions and funding ratios improve. It reminds me of the youthful St. Augustine's prayer to "become chaste but not quite yet."

But to be clear, you would say that in normal conditions, an underfunded plan should just in some way "bite the bullet" because trying to grow out of your hole involves an even worse downside scenario, and that's a bigger consideration?

Leibowitz: Underfunded AND with no backup support, yes. Given all those conditions we discussed. Then yes.

Ilmanen: Let's expand on your "no backup" comment. Maybe one thing that is different today versus 10 or 20 years ago, is that a corporation once had the willingness to be the backup?



Leibowitz: That's a good point, because the willingness is both a cultural thing and a size thing, because as we were talking about earlier, the level of anteing up that you'd have to do now would really hurt. In the past it was relatively smaller.

So, why not? If you've got a really rich uncle, you may take more risks as an individual. The larger size of the pension plans today means that many firms are less able or willing to underwrite further contributions when needed. Don't we all wish we had a bailout uncle?

PUBLIC DEFINED BENEFIT PLANS

Ilmanen: Let's now turn to other pension investor types. An even larger group of DB plans are, of course, the U.S. public plans, which mostly remain open. To what extent does your advice to public plans differ from the above? Can public plans maintain their higher risk profile, despite having even lower funding ratios than corporate plans?

Leibowitz: Public plans are quite complicated, and I don't pretend to fully understand how the situation plays out from this point in time. It's clear that in many cases, at least at the first order, that these benefits are guaranteed by the government, the local government. On the other hand, it's also clear that if the local government finds itself in dire straits, that there can be issues, especially on various forms of the liabilities.

So, if you take one extreme and say the taxing power of a governmental entity is unlimited, without any kind of consequences, and the liabilities are guaranteed by that taxing power, then I would say that taking appropriate risk, in terms of garnering more return over the long term, makes sense. A long investment horizon is often presumed to allow this more aggressive risk-taking and even the use of a higher discount rate related to long-run expected asset returns. The problem is of course, as we've seen, those assumptions can be called into question in the extremes.

It's interesting. Go back and ask even a more basic question. Why should we even have trust funds in the first place? Why not just be a pay-as-you-go plan?

Ilmanen: And some do.

Leibowitz: Yes. In fact, that's the way it used to be. And in fact, in that model we've just described — infinite taxing power, guaranteed payouts — why would you need any funding at all?

The answer to that is pretty clear, because the assumptions involved in pay-as-you-go are just that: assumptions! People don't necessarily have comfort in those assumptions, and you can't even know exactly where you stand in terms of the cost or anything without having something akin to a trust fund.

So, the problems with the model, which are really quite complex, create the need for a trust fund.

Ilmanen: So the long horizon and taxing powers as a back-up enable greater risk-taking for public plans. Unlike corporate plans, I don't see anybody really pushing public plans to de-risk in this environment.

Leibowitz: In theory, one might argue that higher funding ratios SHOULD allow for greater risk-taking. However, when I have tried to describe how institutional risk tolerances might vary at



different levels of a funding ratio, I've found that there are two opposite reactions to large deficits. One can go to asset preservation mode and protect some floor level of wealth, or one may embrace risks and roll the dice.⁷ This also applies to individuals in comparable situations.

Turning to a happier positive-surplus situation, one finds that some individuals may adopt an attitude of “why take a risk I don't need,” and move into some form of personal de-risking.

INDIVIDUAL RETIREMENT PLANNING

Ilmanen: This is a nice segue to asking what our industry can do to support a more secure retirement for individuals. Are DC plans and target date funds the best way forward? Or is there something better?

Leibowitz: In some ways, going from a DB to a DC in a corporate framework may look like a win-win. Individuals' associations are becoming more tenuous, in terms of how much time they'll spend employed by any one corporation — people are not career players with corporations these days. So, employees may prefer a DC plan — IF the contribution rates are sufficiently high, IF there is a good range of investment options, IF the net fees are reasonable, IF they vest pretty quickly, IF there is an economically viable annuity option, etc. Yet, I have concerns about DC plans, 401(k)'s. As many benefits and virtues that they have, they have some real downsides which are underappreciated. And DB plans have great virtues, for society.

Target date funds are a move in the right direction. The question about what the target dates are and how they should apply to everybody in the same situation, I think are open questions.

I think the bigger issue is: Are contribution rates sufficient given reasonable prospective returns and risk levels of the funds, to provide the level of after-tax annuities or after-tax payouts that people really need to maintain their desired lifestyle?

Sadly, I think the answer is, for a whole bunch of reasons, no. Now, TIAA-CREF [where Marty was the Vice Chairman between 1995 and 2004] — for some reasons which were happenstance and some which were just very, very purposeful — has turned out to be a magnificent DC plan, in my opinion. But a lot of those characteristics aren't always the same in the corporate world, starting with contribution levels and longevity of the plan.

And it was nice to be a long-term investor over, maybe not the 1970s, but the 1980s and the 1990s and the 2000s. In some ways, we earned returns which were better than we had any reason to expect.

Ilmanen: Arguably, to some extent, the unexpected high returns that the current generation experienced may be taken from the next generation via the current low expected returns for fixed income and some correction of the capital gains windfall we enjoyed. Perhaps either the slow pain of long-term low-return persistence, or the fast pain of a correction.

Leibowitz: That's a further sobering thought, among many sobering thoughts. Actually, these are not sobering thoughts; these are the ones that could lead you to drink.

⁷ For example, Leibowitz and Bova (2014)



Sullivan: Anti-sobering.

Ilmanen: Why hasn't the TIAA-CREF model been copied more? It is certainly a success story.

Leibowitz: Well, I think Australia is doing something along those lines, where they have a pretty high mandated contribution level.

TIAA-CREF also received a high basic employer contribution rate of 9% from the universities. When I joined TIAA-CREF, one of the most amazing things that I learned is that Andrew Carnegie founded TIAA in 1918, and in his founding documents, he said because the professoriate as a group is no longer just the scions of wealthy families and people have to live on what are relatively modest, very modest salaries, it is very difficult for many professors to retire. This is where it gets really amazingly prescient, because Carnegie went on to say that if professors can't afford to retire, then new blood and new ideas cannot come into the educational system.

So, there is a great benefit to be able to facilitate the retirement at an appropriate age of the old guard. And that was 1918! It sounds like the issue of the day, doesn't it?

Sullivan: Amazing. Another TIAA-CREF feature has been the use of annuities. Does TIAA-CREF still offer them in retirement plans?

Leibowitz: As far as I am aware, yes.

Sullivan: Are they somehow getting them more cost effectively than others?

Leibowitz: Well, I guess one of the things that you have to have is a big pool of annuity takers, because it's the socialization of mortality risks that leads to fair pricing. It's very tough for those organizations lacking a broad pool of participants.

Ilmanen: Besides Aussies, the Dutch pension plans are often seen as models for other countries. They really think hard about these issues in the Netherlands.

Leibowitz: Well, the Dutch pension funds are a very, very interesting study. I have great admiration for the way they think about things.

Ilmanen: Yes. The funny thing is that the Dutch people in general are very unhappy about pensions, even though they have got one of the best systems in the world in terms of plan sophistication.

Leibowitz: Yes, and funding!

Ilmanen: Yes, and funding. Being overfunded allows them to follow the classic ALM prescription of reducing risk as the funding ratio *falls* toward 100, choosing not to take a high level of risks lest they might become underfunded. In contrast, the typical glide path for U.S. corporate plans involves reducing risk as the funding ratio *rises* from 80 toward 100.

Leibowitz: Another point is that I believe the U.S. is the only country in the world where the general norm for corporate pension funds is nominal dollar liabilities. Just think about the ramifications of that. In the Netherlands, with the greatest pension reserves per capita in the world, they found that they could not continue to provide full inflation protection.



Nominal liability plans as used in the U.S. have huge implications for society. With retirement horizons now lengthening to 20 and 30 years and beyond, even low levels of inflation can inflict severe damage to the real income derived from either a DC plan or a nominal dollar DB plan.

RECENT RESEARCH: ASSET ALLOCATION

Sullivan: We'd like to now change gears and discuss some of your research in recent years. We might start with asset allocation topics. In your 2014 paper⁸ on risk functions, or generalized funding ratios, you suggest that investors tend to migrate to one of two portfolios; one with a beta of 0.6, which would be a 60 equities/40 bonds type of portfolio, or to one of very low-risk with a beta of around 0.2. Why these two groups?

Leibowitz: Well, there are two answers to that. There are certain types of institutional investors that are driven by their liabilities, or by their regulatory charter, to essentially be bond investors: like insurance companies. They don't get to choose their beta. The "burning bush" gives it to them.

Sullivan: These are the 0.2 beta investors?

Leibowitz: Yes. And the really intriguing result is that most institutional portfolios, apart from these regulatory-constrained portfolios, have a beta of 0.6, although that may be changing currently. Some research we did at TIAA-CREF led me to show that most variants of real-world allocations consistently had equity betas near 0.6. We found that equity risk dominates diversified portfolios, even in normal times, and that they basically have the beta sensitivity of a 60/40 portfolio, no matter their composition, which was astonishing to me and to a lot of people. It's not the dominance of equity risk that is so surprising, it's the fact that so many institutional portfolios — endowment, sovereign wealth, foundation, pre-LDI pension plan — map into a 60/40 portfolio risk profile.

Sullivan: What are some of the practical implications?

Leibowitz: Once you have a model, you can employ intuition and start putting questions and answers into that framework. So, I began thinking about the implications for the individual investor, because I always found the individual investors' problems more challenging. For instance, they don't have infinite time horizons like many institutional investors say they do, nor various degrees of sponsor backup if things go poorly.

So, the first benefit that comes out of this research is a better understanding of how people might approach retirement. They have to, or most should, go to lower-risk portfolios as they enter retirement. That idea has been around for many years and is widely applied in life-cycle funds.

The prevalence of the 60/40 model means, of course, that equity market beta is indeed the dominant source of risk, just like the theory says. It also means that to the extent that you can find ways of generating returns which are uncorrelated with that portfolio, those are really good

⁸ Leibowitz and Bova (2014)



returns, those are the ultimate alpha. It was these findings that eventually led to the “Endowment Model” book.⁹

Sullivan: Are there other implications?

Leibowitz: Another observation is that there are some institutions that basically live off their existing endowment to a very large extent and cannot incur any risk because they don’t have any backup or sponsor to bail them out if things don’t go well. They don’t have a flexible spending plan.

I happen to be involved with an academic institute that employs this low-beta approach. The mantra here is to maintain a low beta, because we can’t take the risk of a high-beta event. So, clearly, there are some institutions for whom this low-beta approach may make sense.

However, if someone came down from Mars and looked at the range of allocations of various institutions in this world they would undoubtedly ask, “Why do all these institutions that have very different situations, different spending plans, different backup sponsors, different investment capabilities all have roughly the same risk level? It doesn’t make sense!”

This “Martian paradox” prompted me to try to understand if there is something meaningful, something deep here, in terms of how the risk level is determined in various situations. This exploration led to the “Generalized Funding Ratio” paper.¹⁰

Ilmanen: One question we have recently been exploring is *when* did the 60/40 model become so popular? There seems to have been a big transition sometime in 1960s-70s that many institutions moved to 60/40 orientations? And *why* has it stuck?

Leibowitz: Going way back, how were pension funds managed? They were trust departments at banks. What do the trust departments at banks do? Fixed income. Why do they do it? Were they trying to do LDI? No, they were just trying to be safe and they didn’t want to be criticized for any losses.

Coming out in the 1960s, the idea emerged that managers could make more money by being more active; by just having other assets in the portfolio. It was then that the trust departments started putting assets into the active manager world.

I don’t know what the aggregate numbers were, but it was not uncommon to have endowments and some pension funds being virtually all equity: 80% equity was not at all uncommon.

There was a very early and interesting paper, often called the “BAI Study,” from the Bank Administration Institute.¹¹ This paper contained a lot of very basic concepts that fueled a lot of great finance, one of which was to use volatility as a gauge of risk. I think that paper had a lot of influence.

Following that paper, a number of pension funds and endowments moved to high equity percentages. Their argument was, “We are long-term investors, and our greatest fear is inflation, and equities are a defender against inflation.” Now, a lot of those issues have come into closer scrutiny in recent years (to say the least), but that was the mantra back then.

⁹ Leibowitz, Bova, and Hammond (2010).

¹⁰ Leibowitz and Bova (2010)

¹¹ Bank Administration Institute (1968)



As pension plans became sizable, there was a limit to what kind of negative event plans could tolerate. Some of the reasons were more behavioral than economic, as to what the sponsors were willing to tolerate. I think that people would push their equity or risk percentage up to the point where they reached the limit of potential pain. It was not a formal optimization. If you think about it, sponsors want to have a sufficiently low probability of a negative 20% event within a reasonable career span. This takes you to a 60/40 portfolio.

We wrote a paper called “Convergence of Risks,”¹² where we looked at three types of risks that people would want to avoid: a within-one-year loss, an over-three-year decline below initial value, and a drawdown risk. And we assigned various probabilities of these things and we just took standard numbers and simple normal distributions. And it turned out that a lot of these different types of risks converged to being within shortfall bounds for a 60/40 portfolio basis.

Ilmanen: So you think these painful worst-case scenarios influence institutional asset-class allocations?

Leibowitz: Yes, and not just 60/40. That goes to “dragon risk,” a term, as you know, I borrow from Cliff Asness with his permission. A term used historically to describe unknown parts of the world with maps having borders labeled “here be dragons.”

I thought that this was a great term to define how much of an asset class people are comfortable using in their portfolios. This comfort level is a critical factor in determining asset allocation weights.

Ilmanen: “Dragon risk” represents the point where people top out on asset weights?

Leibowitz: Yes, why not have 30% or 40% in real estate? Strategic optimization model output with standard data input would have maybe zero fixed income, lots of real estate, lots of commodities, lots of emerging market equity. End of story, and yet nobody does it.

RECENT RESEARCH: DURATION TARGETING

Sullivan: Let’s turn now to your recent research on duration targeting. Earlier, you alluded to your research into returns to bonds and the relationship to starting yields and what you call duration targeting. What is duration targeting?

Leibowitz: Duration targeting is a term that Stan Kogelman and I coined in the early 1990s along with my colleague Terry Langetieg. We found that, as bond managers became more performance oriented, they tended to rebalance toward a duration target, instead of holding to maturity as they had done in the past.

We started looking into what duration targeting meant for the return pattern of bonds through simulations. Terry, who led the work on this, found that, curiously, there was a time in the future where the variability of annualized returns on a portfolio of bonds was minimized.

In the course of this project, Terry was diagnosed as having an aggressive and inoperable brain tumor. Terry told us that, during this terrible period, pushing forward on this project helped to

¹² Leibowitz and Bova (2005)



give him some moments of respite and even joy. The results were published in the *FAJ*¹³ and we rushed to get a copy of that issue to Terry's home before it was too late. Terry's wife told us that he smiled broadly when she placed the journal in his hands. He passed shortly thereafter.

Sullivan: Why does duration targeting matter so much to investors in today's low-yield environment but with potentially rising yields?

Leibowitz: I picked up this idea again recently due to a request by Bill Falloon at Wiley to think about writing a new version of *Inside the Yield Book*.¹⁴ So, Stan, Anthony and I started looking at how trend lines would relate to duration targeting.

This is where it gets interesting. What we pretty clearly found was that with a simple trend line process with fixed annual moves in rates for any period of time, the early price depreciations accumulate at a certain linear pace, while the accruals start slowly but then accumulate at a more quadratic pace. The quadratic pace ultimately overcomes the linear pace, so that returns converge back to the starting yield. Most astonishing is that it doesn't matter how big the annual rate moves are.

We started with the Treasury index, which for a long time was quite stable at around 5 years. So, we had a great testing ground for duration targeting. We explored the question "Does the return converge to the starting yield over a prescribed period of time?"

Ilmanen: You found that you earn roughly the average starting yield?

Leibowitz: Yes, but over six years, instead of the nine we expected. There are important reasons why the returns converge sooner than we expected. This was also in the course of a wonderful bull market, a huge trend downward in yields. In such a bull market for bonds, one might have expected ever better returns over time. But it turned out that that returns converged around the yield at the start of the investment horizon.

As we continued to pursue this analysis, we had some of those wonderful "Aha!" moments.

Ilmanen: Some people have more of those than others.

Leibowitz: For example, consider the impact of a yield curve that creates what we call rolling yields. We knew that the rolling yield should theoretically be the convergence target, given a stable yield curve shape. So, we sought to test it further; we wanted a data set where the shape of the yield curve did not change that much. And bingo, municipal bonds. We found the same empirical result — as well as many interesting relations between ladder portfolios (common in the muni market), rolling yields and forward rates. This work will soon appear in a *FAJ* article.¹⁵

Ilmanen: So, one key result in your return convergence studies is that trend wise changing yields do not have too much of an impact on multiyear returns of duration-targeted portfolios. Is this similar to the old immunization literature, where price effect (capital losses) and reinvestment effect offset each other?

Leibowitz: The principles are definitely connected.

¹³ Langetieg, Leibowitz and Kogelman (1990)

¹⁴ Homer, Leibowitz, Bova, and Kogelman (2013)

¹⁵ Leibowitz, Bova, and Kogelman (2015).



Ilmanen: In the current environment of low yields, does this suggest we do not need to worry quite as much about rising yields, given that there are some cushioning effects. There is the steep yield curve giving a rolling yield benefit, and should yields rise gradually, there are capital losses but these can be offset by accrual or reinvestment effects.

Leibowitz: Yes. However, there are always two sides to every coin. For a long-term investor, if you can stomach the short-term effects of what might be higher yields and price deterioration, then you can have some assurance that your return will come back over time to your original yield. If on the other hand, you think there's a high probability that rates are more likely to go up than down in the near term, that doesn't mean you should just sit on your convergence prospects.

RECENT RESEARCH: EQUITY VALUATIONS AND REAL YIELD LEVEL

Ilmanen: Finally, we'd like to discuss your so-called "tent" pattern¹⁶ that relates equity market valuations and real bond yield levels. You show that equity markets have historically achieved high price/earnings ratios (P/E) in some sweet spot environment of moderately positive real bond yields, and have lower P/Es at the times of both very high and very low real yields. Do you think that relationship applies today?

Leibowitz: Not without qualification, because I think having super active central bankers changes the equation. In the past, very low real rates used to coincide with poor economic conditions. You now have very low rates driven by a central banking system seemingly determined to try to generate growth and to avoid financial debacles. They are having some success at least in asset markets so the relation between low rates and bad economic environments is now more tenuous. I think that helps explain a little bit why you have much higher P/Es in this environment now than you had historically.

Ilmanen: Good point.

Leibowitz: The tent analysis was a combination of some empirical and some theoretical analysis. First, it was the empirical results that surprised me, but we could then tell a theoretical story to explain it. We saw the pattern of low P/Es in 1970s amid high rates, followed by the falling rates and rising valuations in 1980s and '90s. Subsequently, my colleague at Morgan Stanley, Adam Parker, carried this analysis back to the 1930s, and he found the same tent pattern. So, that was pretty astonishing to us. As a theoretical story, if low interest rates were associated with lousy economic prospects, then it would make sense that the risk premiums for equities would be sufficiently high so as to depress their valuations, and depressed valuations would be appropriate in that environment.

However, as we've just talked about, things have changed. But it is hard to say much more than that. We haven't had that many independent periods of really low rates that persisted for a while.

Sullivan: Thank you, Marty, for taking the time to share your insights and wisdom with us and for the opportunity to discuss your many contributions to our profession. We look forward to seeing more of your novel research contributions in the future.

¹⁶ Leibowitz and Bova (2005,2007).





EARLY CAREER

Sullivan: In addition to the classic *Inside the Yield Book*, you have published numerous books and more articles (40 and counting!) than anyone else in the *Financial Analysts Journal*, the foremost practitioner finance journal. You had a huge influence in fixed-income investing and later broadened into equities and asset allocation topics.

You came to the world of finance not from an academic background in finance, but an academic background in physics. What drew you into the world of finance and how did you arrive on Wall Street?

Leibowitz: I hate to start off such a sad note, but I wanted to mention the sad obituary today in *The New York Times* for William Salomon. He was over 100 years old. I had the pleasure of being present at a very special birthday party for him that we had this spring. He was totally “with it” at that time. Very, very impressive. His death represents the passing of an era.

That’s a reasonable segue into how I got to Wall Street in 1969. I was very interested in mathematics from a young age and was particularly intrigued by trying to use it for applications that I saw around me — real-world type of applications.

It was natural that I got interested in finance and investments, and then try to think of how quantitative techniques could be applied, even when I didn’t know either what finance was or much about quantitative techniques.

Even though prior to going to New York University to earn my Ph.D. in physics I never took a course in mathematics, I just figured I could teach myself what mathematics was necessary for physics. That was wrong. It was stupid. It was costly. But I squeaked through.

The point is that I was really interested in physics because it was application of mathematics. When I went to look for a job, the field of operations research was just starting, and all of a sudden I had one of those, “My gosh, that’s what I want to do” moments.

So, my first initiative after getting my master’s in physics was *not* to go on for a doctorate in physics at Chicago. U of Chicago faculty members were shocked because they offered me a position to do so, a fellowship, but I didn’t realize what a great honor that was.

Instead, I decided to pursue the field of Operations Research (O.R.), but the only positions available were in military applications of O.R. I first went to General Dynamics and later to Stanford Research Institute. We were doing computer simulations into various military battle plans, when I met an NYU professor of mathematics named Harold Shapiro. His small consulting firm was doing some really advanced thinking in terms of computer simulation, and Shapiro gave me the opportunity to join them. I got intrigued and decided that everyone should spend at least one year in New York. That was 1959, and I have not moved out since then. I got my doctorate in math at NYU’s Courant Institute over several hard years, working full time and going to evening classes.

We were working on various types of computer languages that would enable one to have greater facility in developing simulations for different types of problems, and one of our “competitors” in this area was one Harry Markowitz. So, I crossed paths with Harry, sort of, way back then, long before I was familiar with his work in finance.

But at the same time, I was still trying on the side to think about ways to apply mathematics to finance. And I didn’t know that anyone had any jobs in this area or there was a field.

Ilmanen: No, they didn’t.

Leibowitz: They didn’t. When I was at the University of Chicago, I had the good luck to get to know Jim Lorie, not because I ever took any courses with him; I never took any courses in economics or in mathematics. At some point I saw that there was this Fisher-Lorie paper (then novel evidence about equities’ long-run outperformance since 1920s based on the new CRSP database), and I said, “Wow, this is really intriguing.” So, I got in touch with Jim, and he helped me with a list of readings and introduced me to people in the field like Jack Treynor and Gil



EARLY CAREER

Hammer.

Also, by a fluke, my wife's uncle happened to be Sidney Homer (a partner at Salomon Brothers, the author of a classic study called *A History of Interest Rates*). Sidney happened to be writing a book on the mathematics of bonds. He said to me, "Well, you're a mathematician. I'm writing about the mathematics of bonds and I'd like your help. I thought I knew how bonds worked, but as I write about them, I discover things I'm writing about that don't square with the way the numbers work. So, could you help me?"

Sullivan: It's interesting how writing makes one think through things very completely and helps one to *really* understand things that you thought you already knew.

Leibowitz: Yes, absolutely. Writing is a most humbling activity. How many times have we "written ourselves into a corner?"

So, believe it or not, I replied to Sidney, "Well, how do you describe the yield on a bond? What does that mean?"

Homer's response was to hand me a yield book. Not many people today know about the yield book. It was that book of tables from *Financial Publishing*, and they were monstrous, fat things with coupons and yields and prices, and there was about a four or five page section at the beginning which described the calculation of a yield.

So, I reverse engineered what this meant and explained my findings to Sidney. For instance, the fact that deep discount bonds are more volatile than premium bonds [which meant that bond volatility did not always increase with its maturity].

I found out there was no house mathematician at Salomon Brothers, and I decided, well, I know who should be their house mathematician!

Ilmanen: So, you were proactive.

Leibowitz: I was very proactive. Things often happen in very serendipitous ways.

I have two patents to my name in materials handling, because early in my career, I actually had a real job, doing real things, with real factories. That was an invaluable experience which not many people in the financial world have had.

I was part of a rapidly growing small company, manufacturing company, not very sexy, but it was growing at a very fast clip. And I said, "We should explore going public." And the founder said, "Okay, YOU explore going public."

So, I asked for Sidney's help and he put me in touch with his partners at Salomon who just happened to be getting into corporate finance at that point in time. And so, that was actually the route that I ended up going to Salomon Brothers.

Several serendipitous events proved to be very helpful in those early years. One was that interest rates went above 6%, and the yield books didn't. And I had a little computer on the Salomon trading floor, one of those time sharing, ticker-tape computers, that could calculate yields and prices.

Sullivan: So, yields went off the table, literally. (laughter)

Leibowitz: Exactly. So, here I was, at a tiny desk on the trading floor, with this clicky-clack computer. And all of a sudden, many of the most senior partners of the firm would line up behind my desk, waiting for me to give a yield or a price, which they desperately needed to get a trade done. So, I became very popular all of a sudden. I thought it was my sense of humor. (laughter).



HEROES

Sullivan: Can you discuss your heroes, those who made a profound influence on your thinking?

Leibowitz: Sure. First, there is Henry Kaufman who played a great role at Salomon as the head of research. He believed that if research didn't have full integrity, it was useless.

He continually fought that battle within the firm, and thereby enabled research to flourish. I remember the first time that I came up with an outcome that would kill a trade, and I was nervous. What do you do with this information? The answer from Henry was to tell the client. That was it. Henry's presence and strength of character within the firm made that happen.

Another person that I met early was Jack Treynor. I learned an enormous amount from him. Jack is such a deep and broad thinker that any conversation with him stretches your mind.

I also got to know Bill Sharpe, who was just phenomenal in terms of his clarity of thought and his ability to express himself in ways that were both deep and refreshing.

I mentioned Harry Markowitz earlier, but I didn't really get to know Harry until later in my career, but I was a great follower of his work (and I still am!).

You also won't be surprised that one of my big heroes was John Burr Williams. His classic book on the *Theory of Investment Value* (1938) is very innovative. Just an incredibly creative guy in a period when valuation was not the thing to talk about. I had, for a while, boxes of John Burr Williams' signed copies of that book. I had asked him to sign them all for me when I had the great good fortune of meeting him in the 1970s.

Then there is Jack Bogle, for whom I have enormous respect. He once said to me, "I have one virtue: when I see what I think is right, I say it." A simple, yet powerful virtue.

Sullivan: That's the Jack we've all come to know and admire.

Leibowitz: A mutual fund chairman was once reported to have said that, "If Jack Bogle had decided he wanted to become a saint, I wish he had chosen another field." (laughter)

By the way, one of the things I like about all my heroes is that they are always questioning what they've done. They're building an edifice and they're chipping away at the old edifice that they themselves have built.

It's remarkable. They really have that kind of intellectual integrity and curiosity. So, if you keep your eyes open, you're always learning about what you did that was not quite right, and that can be a great motivation for probing ever deeper.



Appendix A

KEY TERMS AND CONCEPTS FOR U.S. CORPORATE DEFINED-BENEFIT PLANS

- A U.S. defined-benefit (DB) plan promises defined retirement benefits to the participating employees according to some formula often tied to the salary in the final working years and the number of years. The investment risk and longevity risk is with the sponsor who may need to make additional contributions if initial contributions and investment returns result in underfunding.
- Sponsor firms have increasingly stopped offering DB plans to new employees, instead offering defined-contribution (DC) plans, where the investment and longevity risks belong to the employee. In existing DB plans, some sponsors have frozen the plan (stopping the growth of liabilities with wages), de-risked using liability-driven investing (LDI), and in extreme cases terminated the plan.
- The post-retirement benefits in corporate DB plans are typically defined in nominal terms so the main liability is nominal (for mature or frozen plans) but during the working years the liability is also related to inflation and real wage growth.
- The most important measure of pension liabilities is the projected benefit obligations (PBO), which includes both accumulated obligations and projections related to future wage growth and longevity assumptions. The PBO is present-valued using a discount rate which was traditionally tied to actuarial assumptions on the expected return of assets, but which for single-employer corporate plans became tied to long-dated corporate bond yields since 2006. There are many discount rates used for different purposes: (i) for calculating minimum pension contributions some smoothing is allowed (PPA 2006, MAP-21 2012, HATFA 2014) which has enabled the use of discount rates above market yields and thus lower contributions; (ii) for calculating the value of pension surplus or deficit on the corporate balance sheet, no smoothing has been allowed since accounting changes adopted in 2006 (FASB 158).
- Pension assets reflect the market value of its holdings whose size reflects employer contributions over time as well as investment returns earned on them. The difference between assets and liabilities is called the funded status (surplus or deficit), or if expressed as a ratio of A/L, it is called the funding ratio (FR) — overfunded / fully funded / underfunded if FR is $>/=/<$ 100. If a plan becomes underfunded, the sponsor is required to cover it by making further contributions over a multi-year period. (In extreme cases, if the sponsor is unable to make contributions, the PBGC insurance will help; in exchange, DB plans pay annual insurance fees, partly related to the funded status).
- Asset perspective involves analyzing the expected returns and risks of the asset portfolio without considering liabilities. Equities have higher expected returns and risks than long-term bonds which in turn are riskier than cash. Pension plan sponsors who want to minimize contributions prefer to ‘let the equity premium do the work’ while accepting the resulting



volatility in contributions and/or funded status as a reasonable trade-off. This perspective was long supported by the actuarial approach in discounting liabilities with asset returns which supported pension plan's presumed long investment horizon and ability to look through market fluctuations.

- A-L perspective focuses on the assets-minus-liabilities (A-L) surplus. In surplus management, a liability-matching long-term bond portfolio is deemed the lowest-risk investment (nominal bonds for fixed liabilities; though inflation-linked bonds and even equities have a role in matching real and growing liabilities). This perspective emphasizes funding ratio volatility as a key risk and may link a plan's risk tolerance to the level of the funding ratio.
- The asset perspective tends to result in equity-dominated portfolios, the pure A-L perspective in bond-dominated portfolios. Put simply, the former is cost-minimizing (lower expected contributions) while the latter is risk-minimizing (lower uncertainty). The former approach was the prevailing U.S. corporate DB practice for long, but the latter (renamed as LDI) has become increasingly popular in the past decade.



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