THE LOGIC OF PENSION VALUATION II
A RESPONSE TO ANDREW BIGGS

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1. Introduction

For quite a few years now, public pension liabilities have been a growing concern for policymakers and public finance professionals. The methods used to value the liabilities are fundamentally important both for designing plan policies and for plan administration. They are an essential tool for budgeting because they help account for the costs of public services and create appropriate funding schedules for plan contributions to ensure the fiscal soundness of both the plan and its provider.

The Governmental Accounting Standards Board (GASB) has recently revised its valuation rules regarding public pensions, which basically require that future payments to retirees be discounted at the rate of return on the plan's assets. Meanwhile, some economists[1] have been arguing that plan liabilities ought to be valued using a discount rate derived from the yield on high-grade government bonds. Because these rates currently are much lower than those used by GASB, pension liabilities and the annual payments necessary to service them would be substantially higher with this approach.

A recent paper by Andrew Biggs[2] provides a very good summary of these two approaches for the non-expert. Unfortunately, it also takes the untenable position that the municipal bond yield is the appropriate discount rate for public pension liabilities. This conviction reveals an obvious misconception about the purpose of actuarial valuation – that it is supposed to capture the value of the plan benefits to employees rather than the cost of the plan to the government. It also contradicts the most fundamental principle of financial markets, which requires that greater risk be taken only if it would provide higher returns.

Most importantly, the implementation of an accounting rule such as the one advocated by Biggs is utterly impractical in that it will not only artificially bankrupt most pension plans and many municipalities, but also potentially precipitate a financial crisis unprecedented in history. Using short-term returns on any asset for valuation purposes would make the funding requirements which are dependent on them volatile and unreliable, rendering almost any defined-benefit plan overly expensive and unsustainable.[3] Furthermore, given inconstant correlations between the returns on different asset classes, this approach would be useless for managing defined-contribution plans as well.

2. "Fair Market Valuation": Theoretical Fantasies and Empirical Reality

Valuation is not an end in itself. It is supposed to be designed so as to enable effective decision making, which implies that a valuation method ought to be both informative (accurate and complete) and naturally suggestive of the best course of action; it must not just supply an easy-to-use number, but also prompt the right kinds of questions and subsequent actions. Finding the specific properties of an effective valuation technique should then begin with stipulating the proper goals of the financial manager – namely, (a) securing the future provision of the earned benefits at (b) minimal cost to taxpayers.

A wide variety of actuarial assumptions can have profound effects on the estimated costs (and the corresponding overall liability) in addition to the discount rate: salary and payroll growth rates, inflation, demographics, retirement patterns, disability incidence, etc. These assumptions all play a role in projecting the cash outflows needed to fulfill benefit obligations; the discount rate is the only variable needed to collapse that schedule of payouts into a single present value for the corresponding liability.

The discount rate's impact on the two fundamental pension-management goals arises from the fact that it determines the unfunded liability of the plan and, therefore, the schedule of future payments necessary to offset it. GASB rules require that if those payments are not made in time, they must be accrued as a liability directly on the balance sheet of the entity (not just disclosed in the notes like the rest of the obligations), where an annual interest cost is also applied to the unpaid amount.

This GASB requirement only makes more transparent an ever-present fact – that unwarranted delays in payments increase the actuarial cost of the benefit. Because the discount rate can cause a chronic mismatch between benefit expenses and actual payments, it may increase the overall cost of the plan by under- or overfunding. Note that an effective discount rate need not match every fluctuation of the securities markets; rather, it must be commensurate with the lifetime of the liability (typically over 50 years[4]). A premium may even be associated with a measure that provides relative stability or predictability in required contributions (Fig. 1).

Despite the volatility concerns, the financial planner needs to make sure that costs are measured as accurately as possible and matched with services rendered over time – so that it is clear whether the plan makes sense from the employer's perspective. When cash-flow matching is enforced as well (i.e., plan funding requires contributing the full cost accrued during the fiscal year), this also ensures some fiscal discipline because current costs must be paid almost immediately. Obviously, the disciplining effect is highly contingent on the accuracy and stringency of the valuation and funding methods.

The limited number of cases of municipal bankruptcies at hand emphatically demonstrate that unlike corporate shareholders, taxpayers

FIGURE 1. POSSIBLE GOALS OF EFFECTIVE PENSION VALUATION

1. Minimize cost of providing a particular benefit
2. Minimize the volatility of contributions
3. Match labor costs and cash flows to enforce fiscal discipline
4. Secure benefits by timely funding
5. Guide the plan's investment policy
6. Guide the plan principal's compensation policy

are far from shielded from the liabilities of their jurisdictions. In Biggs' words, "the fact that governments cannot go out of business implies that government pension benefits are more likely to be paid than private pensions." *From the pension recipient's perspective*, "this justifies a *lower* rather than a higher discount rate."[5]

From taxpayers' perspective, however, the opposite is true – because typically they are on the line both for the collateral they have already paid in (the assets of the pension plan) and for the entire amount of the future pension payments, it is quite reasonable that they should expect a better return than the one on a municipal bond, whose owners would have no recourse to a pension plan's assets in a credit event. Because the pension leverage is collateralized, its cost to the taxpayer must be lower rather than higher, which translates into a higher discount rate for those liabilities (depending on the riskiness of the collateral assets).

However, Biggs' conviction that "taxpayers have a 100 percent obligation to make good on the plan's benefit promises" should not be taken at face value. Unfunded liabilities can be shed in bankruptcy as has been done by Central Falls, RI, and – after a favorable ruling by a its bankruptcy judge – will likely be done by Detroit and even by Stockton, CA, which potentially faces legal challenges by the California Public-Employee Retirement System.

In any case, the problems with Biggs' "fair market valuation" go far beyond its mistaken perspective; they are rooted in a misinterpretation of fundamental economic theory, of notions of risk and uncertainty and of empirical realities in the financial markets.

3. DISMISSING THE IMPORTANCE OF CAPITAL STRUCTURE

The justification for the approach advocated by some financial economists is riddled with logical fallacies and misconceptions. "To economists, the discount rate used to value the liability should be based on the risk of the liability itself, not of any assets used to fund the liability."[6] While this statement leaves one wondering what the risks of a

venture could possibly be other than the risks of its component parts, Biggs explains in a footnote that this perspective is derived from the Modigliani-Miller theorem of capital structure.

In simple terms, Modigliani-Miller states that the value of a firm (or an asset portfolio) would be the same regardless of how it is financed. However, the theorem requires the following assumptions to hold:

- no taxes;
- no transaction costs;
- no bankruptcy costs;
- equal borrowing costs for both companies and investors;
- symmetry of market information (all market participants have the same information);
- no effect of debt on a company's earnings before interest and taxes.

Modigliani and Miller also implicitly assume that company managers do not waste excess cash on hand. With its underlying assumptions, Modigliani-Miller effectively disregards the value and risk impact of the collateral (the assets of the firm or pension plan) posted against the venture's liabilities. Obviously, in real markets none of these requirements are even remotely satisfied, which is why the Modigliani-Miller theorem is a trivial proposition with little practical relevance.

This fact was clear to the theorem's authors themselves, who followed up with further refinements of their theory using more realistic assumptions. While the practicability of those refinements is still suspect, it is worth noting that the upshot of that subsequent work is that companies with more leverage have lower costs of capital and higher returns.[7] In other words, Modigliani and Miller conclude not just that capital structure matters, but that it matters in the exact opposite direction of where "fair value" advocates would have it.

The recent financial crisis provides an even starker example of why the theorem as incorrectly cited by Biggs and others has no real-world relevance. The very reason many banks leveraged themselves

at a rate of 30 or 40 to 1 was because the leverage substantially increased their (booked) profits. Furthermore, they were able to lever up so much and take advantage of that leverage in the marketplace precisely because they had better information than other market participants, including the various discombobulated regulatory authorities. Despite the clear and present danger not just to many a financial institution's balance sheet, but to senior executives' bonuses, restricted stock and option grants, the profitability of leverage in an upmarket was seen as sufficient to negate any of those very real concerns.

4. Facts and Fiction about Investment Returns

Having established that capital structure and, consequently, asset returns are every bit as relevant as any other actuarial metric, one must determine how those discount rates can be measured or extrapolated from available data. An obvious concern is that discounting is done on future values – i.e., discount rates for the future need to be "predicted" or, more appropriately, "assumed."

Biggs avers that "there is actually less than 50% probability that the plan will achieve its assumed rate of return over any given period of time."[8] This assertion is accurate; it is also trivial. There is less than a 50% probability that any one specific rate of return will be achieved over any period of time simply because the distribution of returns until the end of time is not known and will remain so. Biggs' motivation for this red-herring concern again appears in a footnote: he claims that stock returns are skewed so that there are a small number of high, but more deviated, returns and a large number of low returns, so the odds of achieving the average return are less than half.

First, the specific distribution of the returns is irrelevant to the author's argument because if his conclusion is valid about a GASB-determined discount rate, it must also be valid for any other positive rate that is an aggregate of returns on a similarly risked portfolio. Second, many of Biggs' other arguments require a normal distribution –

i.e., returns are symmetrically dispersed around the average so that the probability of achieving it or better is exactly 50%. Third, it therefore also contradicts the earlier reliance on Modigliani and Miller, whose entire framework is based on the assumption that returns are normally distributed.

Thus, Biggs' reasoning provides no basis to adopt "fair market valuation" because it does not demonstrate any advantages thereof. It is worth reiterating, however, that predicting future returns over any extended period in the future is a loser's game.[9] Without a well-defined physical law or statistical distribution premised on robust mathematics and logic (not on assumptions or assertions), such predictions amount to little more than superstition – presupposing causal relationships in the artifacts of randomness. The capital asset pricing model and its offshoots, like most of modern portfolio theory, have been conclusively refuted by empirical evidence.[10]

In this context, there is also a problem with the methodologies currently utilized for pension valuation. The issue here is not so much with GASB rules as with the Actuarial Standards of Practice (ASoPs) which ultimately leave it to the actuary to determine the appropriate rate of return on the assets used to discount future payments. Typically, those choices tend to exhibit the myopic availability biases endemic to most human decision making – assumptions are tilted towards recent experience rather than based on all the available data.[11]

The intricacy of the problem is illustrated by the level of confusion in the following paragraph, where every single sentence contradicts Biggs' earlier arguments, financial research methods and the theoretical premises of fair market valuation while also demonstrating a lack of understanding of how pension plans (whether public or private) work:

> GASB's new approach to discounting is, if anything, even less economically coherent than current rules. To the degree there is any insecurity to public pension benefits, it is due to plan underfunding. Since benefits that are backed by assets are presumably more secure, they would be discounted using a lower interest rate. Likewise, if benefit liabilities that are not backed by assets are less secure, they might be valued using a higher discount rate. Even if you accept the idea of a bifurcated discount rate, the new GASB rules have economic logic precisely backward.[12]

First, GASB 68 brings valuation rules closer to widely accepted economic principles by discounting collateralized debt at different rates than uncollateralized debt. Specifically, the collateralized obligation will be discounted at the rate of return of the assets posted against it. The remaining unfunded liability will be discounted at the opportunity cost of the plan principal as captured by the yield of high-grade government bonds of similar duration.[13] Thus, the unfunded liability component will reflect a fairly precise debt-equivalent amount, which is easier to understand for bondholders, for example.

Second, while governments across the country have been known to be unreliable contributors to their pension systems,[14] investment losses, egregious benefits and plain-vanilla mismanagement can pose a much more acute and urgent threat to the health of a pension plan. Apart from that, a collateralized obligation poses a greater risk to the plan provider in the long run because the committed assets of the pension plan can be lost on the market. The principal's exposure includes not just the benefit liability, but also the asset value already paid towards it.

The cost of a contributory plan is also more volatile because the funded portion of the exposure is affected by the volatility of investment returns as well as the other actuarial assumptions that affect the unfunded liability component. Thus, regardless of whether risk is conceptualized as cost volatility or total exposure at any given time, applying a uniform discount rate to all the liabilities regardless of the underlying funding structure could not possibly provide the vaunted "risk-adjusted" present value – it simply does not account for these attendant risks.

Of course, Biggs' commentary also customarily adopts the incorrect perspective – that of the beneficiary rather than the provider – while also contradicting an earlier assertion that economics unequivocally disregards assets in collateral when valuing liabilities. The package is then completed by the unwarranted assumption that bond yields will indefinitely stay lower than the GASB-mandated rates of return, which suggests an unsavory focus on reaching a particular conclusion regardless of political-economic theory and empirical data. Substantively, these misconceptions are all driven by ignoring the double-entry bookkeeping that underlies economic transactions in both the public and the private sector of a capitalist economy.[15]

5. Ignoring Double-Entry Accounting

Biggs notes that "there is a *contingent* liability to pay full benefits even if […] investments do not produce the expected returns" and quotes the Bureau of Economic Analysis (BEA) as stating that such an "obligation represents an additional source of pension wealth for participants in an underfunded plan."[16] Taking this quote as supportive is revealing of one of the recurrent fallacies in Biggs' argument – the implicit assumption that the liability for the government must equal the benefit for the pensioner.

This is obviously wrong because, while the benefit can be viewed more or less as fixed, the cost is mediated by the return on the plan's investments, which would place it below or above the value of the benefit, but almost certainly never at the same level. For example, whenever investment returns are higher than the plan provider's cost of borrowing (e.g., the yield on the provider's bonds), the plan could be viewed as cheaper to the government than it is valuable to the retiree.

A defined-benefit pension is effectively an annuity paying out over a finite but indeterminate period beginning in the future (based on actuarial projections for longevity, retirement choices and other factors). From the employee's perspective,

the present value of that annuity can be obtained by discounting it for its exposure to declines in purchasing power.

If the provider is setting aside money for pension investments, however, the minimum projected cost of the benefit declines along with increases in the expected rate of return on the assets held. Suppose that instead of buying the annuity, the provider invested an equal amount in securities yielding a net rate of return greater than the inflation rate. The provider would then be able to pocket the difference between return and inflation while servicing the obligations fully or, equivalently, to defer that difference towards future obligations.

The advantage for plan beneficiaries is not that they get more wealth (in most cases retirees do not get a boost to their pension if a defined-benefit plan outperforms its target return), but that they get less risk because they keep the committed funds in case of bankruptcy of the provider. Thus, the advantage for the pensioner is not an increase of the upside, but a reduction of the downside on his or her allowance.

The rather pervasive confusion on this point is largely attributable to a lack of understanding regarding the role of stocks and flows in the context of double-entry bookkeeping. When a company purchases a piece of machinery on account for $100, the transaction is recorded as a credit to accounts payable of $100 (a liability) and a debit to machinery (an asset) of $100. However, the producer of the machinery records at least two journal entries: a debit of $100 to accounts receivable and an equal credit to sales (revenue), while also crediting inventory and debiting cost of goods sold with the production cost of the item of, say, $80.

The difference between cost of goods sold and sales revenue is ultimately reflected in the income statement as earnings before interest, depreciation, taxes and amortizations (EBITDA), which is the main generator of shareholder equity in the long run; the transaction *flow* of profits accumulates in the capital *stock* of shareholder equity.

Note that the transaction created a liability of $100 on the balance sheet of the purchaser (i.e., the buyer values the item at no less than $100), whereas the producer recorded a cost of goods sold of $80 (i.e., that is the cost of the item to the seller). Similarly, a pension plan aims to provide a benefit to employees (who "purchase" that benefit with their service and contributions) at a cost lesser than its actual value to the recipients; some of the surplus difference between the cost of benefits to the provider and their value to recipients is generated by investment returns on the assets backing the pension plan.

Of course, it is more than conceivable that the exact opposite scenario transpires and investment returns end up being low enough to make the provider's cost larger than the monetary value of the benefit, thus generating a loss rather than a gain from trade in the marketplace. In either case, "fair market valuation" as defined by its advocates is not the appropriate way to quantify the plan's costs because it *requires* that the capital (or funding) structure of the plan and the gains (or losses) from trade be ignored. In other words, it would rather apply under some form of utopian communism than in a market economy.

6. Disregarding Context (*Ceteris Paribus* Assumptions)

A persistent set of problems with attempts at justifying fair market valuation as a "risk-adjusted" method is that they commonly violate the implicit assumption of all else being kept equal (*ceteris paribus*), which is needed to maintain the implicit risk level unchanged (no matter how that is conceptualized – or not) and, consequently, the risk-adjusted value. For instance, Biggs asserts that

> if a pension plan wished to hire an insurance company to take over its benefit liabilities [something not uncommon in the UK] the insurance company would set the price without regard to how the pension plan invested its assets. What matters is how much the plan owes and with what level of guarantee.[17]

Surely, the insurer would be fully justified in ignoring the investment strategy of the provider because what would matter after the transfer of the plan is only the total value of the assets at the time of the transfer, the structure of the obligations and the investment strategy of the insurer itself, which will determine the hedging costs and the profits expected on the transaction. The "value" of the liability will change because the investment strategy and managerial goals will also change, violating the ceteris paribus requirement for maintaining the equivalence. This is but another instance of the value-generating market exchange described in the preceding section, which seems to present a somewhat unsurmountable intellectual challenge to some financial economists.

In a similar manner of self-contradiction, Biggs first implies that the discount rate should not affect the investment strategy, then almost immediately states that

> plans can easily hedge against interest-rate risks by holding Treasuries in their investment portfolios; if interest rates on newly-issued bonds fell, thereby increasing the value of the plan's liabilities, a portfolio of existing Treasury bonds would rise in value due to their higher interest rates, keeping plan funding levels roughly constant.[18]

(Since most public pension plans are prohibited from shorting securities or holding financial derivatives, the only meaningful way to hedge the interest-rate risk would be to invest almost exclusively in government bonds of the type underlying the discount rate.) Such an investment strategy would consign most pension plans to insolvency because of the dismal long-run performance of bonds relative to equity. It would also defeat the purpose of having a contributory system by returning the money back to the provider, thus effectively resulting in a pay-as-you-go arrangement.[19]

Biggs' misinterpretation is ultimately rooted in the misplaced belief that pension funds' risk taking is driven by assumptions about asset returns. "Under the new [GASB] rules, a plan that takes greater investment risk can assume its trust funds will last

longer," which according to him creates "incentives to take greater investment risk."[20] However, the unfunded liability itself is another important (but often covert) driver of portfolio-allocation decisions aptly identified by Biggs' own overview of portfolio changes in the aftermath of the financial crisis.[21]

Thus, adopting a discount rate that increases the unfunded liability exponentially in the short run would induce an even more desperate rush to chase yield in the securities markets, thereby increasing risk and exposure – as well as the losses that will inevitably ensue such precipitous and ill-advised decisions. Whether the risk-matching or the unfunded-liability effect dominates portfolio allocation, the fair market valuation approach is a lose-lose proposition. In either case, the discount rate will impact both investment decisions and contribution flows from plan providers, which would theoretically violate the ceteris paribus assumption and ultimately result in higher real costs.

> *"Whether the risk-matching or the unfunded-liability effect dominates portfolio allocation, the fair market valuation approach is a lose-lose proposition."*

7. Plan Structure Matters to Discount Rates

That bond yields are not an appropriate risk-adjusted discount metric is patently obvious not just from its theoretical underpinnings and the expected impacts on actual plan performance, but also from historical data. Another critical flaw and

> "a central point of fair market valuation is that how a plan is funded is distinct from the value of its liabilities. If a plan chooses to fund its liabilities on a smoothed basis to avoid […] fluctuations in contribution rates, that is a policy decision distinct from the value of those liabilities at any given time."[22]

Such a disconnect between funding and valuation is not admissible even theoretically; it is strictly

reserved for the sphere of wishful thinking. For example, if a state does not fund its liability at all, in the real world that effectively increases its outstanding debt, which in turn magnifies its perceived credit risk and the cost of obtaining further financing, which becomes manifest in higher bond yields. Thus, paradoxically, a state that used fair market valuation could potentially be able to *decrease* its pension liability by *increasing* its pension underfunding, overall leverage and/or credit risk. Under "fair market valuation," higher credit risk would result in a lower estimate for the total liability, providing incentives to lever up.

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The disconnect between bond yields and plan risks can be illustrated with a simple comparison of a pay-as-you-go and an advance-funded benefit. For simplicity, suppose that in both cases the plan furnishes the employee with the same annuity B purchased from an external provider at the time of retirement. If the benefit was not being funded while it was being earned, the employer's minimum payoff at the time of retirement is the cost of the annuity $-B$ and the maximum conceivable one is a complete write-off of the liability, as in a bankruptcy (Fig. 2). Correspondingly, the minimum payoff of the workers is also zero, while the largest possible is to receive the full annuity B.

The picture is a bit more complicated if the employer starts making contributions to a pension fund early on. Because the value of those investments could conceivably go to zero before the employee retires, the overall payoff of the provider could fall as low as losing all the contributions C and still having to pony up for the value of the annuity B. In the ideal case, just the first contribution $c<C$ would have generated such returns as to make further contributions unnecessary to cover the cost of the annuity. Meanwhile, the beneficiary of the advance-funded

FIGURE 2. PAYOFFS FOR PROVIDER AND BENEFICIARY OF DEFINED-BENEFIT PLANS AT POINT OF RETIREMENT

Plan Type	Provider		Beneficiary	
	Min	Max	Min	Max
Pay-as-You-Go	− B	0	0	B
Advance-Funded	− B − C	− c	A	B

FIGURE 3. EXAMPLE OF MINIMUM AND MAXIMUM PAYOFFS FOR PROVIDER AND BENEFICIARY OF DEFINED-BENEFIT PLANS

Plan Type	Provider		Beneficiary	
	Min	Max	Min	Max
Pay-as-You-Go	− $1,000	$0	$0	$1,000
Advance-Funded	− $1,900	− $150	$400	$1,000

plan can still receive no more than B (the value of the annuity), but the minimum benefit is equal to the residual value of assets already committed to the plan $A{\leq}B$, which can still have been lost entirely by time of retirement.

Figure 3 provides a specific numerical example with annuity value of $B=$ \$1,000, first employer contribution of c= \$150, total contributions of $C=$ \$900 and residual asset value of $A=$ \$400. Clearly, the government takes on more risk (by posting a collateral) with the advance-funded plan, where both the minimum and maximum payoffs are lower than those for the pay-as-you-go plan. However, Biggs' fair market valuation would apply the same discount rate to the benefit B of both plans and arrive at the same supposedly risk-adjusted estimate for the liability, even though the two plans have radically different risk structures.[23] And this overly simplified example does not even touch on the much more complex issue of distribution of cash flows and investment returns over the lifetime of the liability.

8. DEBT YIELDS IN THE PRACTICE OF FINANCE

Biggs uses a put on the obligation as insurance against asset underperformance to measure

the cost of the investment risk of the plan's assets. What he neglects to mention is that such a calculation would be valid only under the same impossible assumptions as the original Modigliani-Miller theorem, but also adding an assumption that market rates of return (or bond yields) effectively capture risk, which is tantamount to begging the question. (Such a valuation approach is also unnecessarily complicated because market rates could instead be used directly for the computation.)

The belief that current bond yields reflect future default risk suggests an academic undercurrent of market fundamentalism, which is inconsistent with free market exchange. In the market fundamentalist view, market prices constitute *information predictive of future events*, including the quantifiable risks of specific economic enterprises. In real markets, participants often must have very different views of the future for exchange to occur in the first place and there is no guarantee that those transactions magically converge on an accurate representation of the entire economy. What distinguishes market fundamentalism is not the idea that free markets benefit society, but the irrational belief that they are infallible – in this case, that the market can predict the future

volatility of the investment returns and of the tax receipts needed to fund the pension plan. Only under such an assumption would the bond yield constitute a proper risk-adjusted discount rate.

Contrarily, most economic schools of thought have a much more nuanced and humble view of the market, accepting that prices are not a crystal ball providing a clear and reliable picture of the future. Rather, free-market activity is at best an informative reflection of participants' *beliefs* about the future and their willingness to take risks on traded assets. Unfortunately, US government-debt markets are too far even from this more modest and realistic perspective; they are most closely manipulated by political appointees.

US governmental units control all the new issuance in this asset class, while the Federal Reserve has been purchasing such securities aggressively for nearly half a decade; both supply and demand are subject to intensive government intervention as a matter of course, not just in some specific economic conditions. Therefore, suggesting that US government bond yields objectively measure the creditworthiness of their issuers (let alone the riskiness of a pension plan) is, quite simply, a naïve and ludicrous endorsement of central planning. Even a most cursory look at the facts reveals that Biggs' "fair market valuation" is neither "fair" nor particularly "market."

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This reality is reflected unambiguously in the behavior of bond rates since the financial crisis of 2008-2009. For months and years, US debt yields kept registering new record lows all along the yield curve even though federal, state and local government added trillions of dollars of new debt to its balance sheet. Public debt relative to both gross domestic product and tax revenues reached historic highs. Since more leverage typically entails more default risk, an effective risk-adjusted metric

of the cost of borrowing would have gone up rather than down.

Of course, one could argue that this counterintuitive behavior must reflect a decline of the debt's riskiness *relative* to other assets', but this would again violate the ceteris paribus assumption necessary to justify the use of bond yields in pension discounting. In this view, the plan's liabilities would increase as other assets become riskier (making it more difficult to fund the liability with equity investments, for example), but this practically reasonable implication directly contradicts the much-touted advantage of "fair market valuation" that it is unaffected by other assets' performance or riskiness.

Historically, monetary and fiscal policy have had even more extreme and incongruous effects on bond yields, which would in turn produce dramatic changes in liability valuations and funding requirements. The Bond Buyer Go 20-Bond Municipal Bond Index can be used as a handy approximation for the discount rates that would be applied in fair market valuation. The index was at about 6% in the first quarter of 1978, but had reached 13% by March 1982 and was back at about 7% by early 1986. What would these fluctuations have meant for a pension plan's liabilities and funding?

In 1978, a liability of $100 million with duration 20 years would have been valued at about $31 million (Fig. 4). Monetary tightening by the Federal Reserve in the early 1980s pushed the index up to about 13%, which entails a liability estimate of about $8.7 million for 1982. Even if a community's financial situation had not changed in any way, the present value of the same future obligation would fall almost four times just because the Fed raised its discount rate. (The current bond buying by the Fed is, in a similar vein, very much unprecedented in history and has clearly helped produce record-low interest rates.)

The required contribution under a 20-year level-dollar funding schedule would be more than halved from $2.7 million in 1978 to $1.2 million

in 1982, only to double again by 1986 as bond yields fell after the Fed gradually reversed its monetary tightening. The plan liability would have posed a greater fiscal risk in 1982 than in the other two years of record because the high interest rates had made it very difficult to borrow if the need should have arisen. Nevertheless, both the overall measured liability and the contribution due would have been dramatically lower. Contrarily, an effective risk-adjusted liability (or cost) metric should be expected to rise along with the riskiness the obligations bring about for the promisor.

The valuation numbers presented by Biggs are calculated on the basis of the 30-year US bond yields of 2.97% as of May 2012. Just over a year later, the yield had risen to almost 3.86%. This 30% increase in the cost of government debt would have a tremendous impact on the valuation numbers produced if the so-called "fair value" method were used. This volatility reveals the short-term bias inherent in this method, which makes it highly inaccurate and unworkable for anyone who seriously intended to manage public finances, not just pensions. If this approach were applied using the debt yields of the late 1970s, which reached as high as 18%, plans which today are at near-bankrupt funding levels of 30-40% at an 8% assumed rate of return would appear in fabulous shape.

Coincidentally, since the beginning of the 1980s,[25] a growing body of empirical research has challenged the theoretical orthodoxy that risk and return are invariably positively correlated in the marketplace. The relationship swings back and forth across time and asset class, to the extent that a valid correlation is even identifiable. This empirical fact conclusively negates the proposition that bond yields can be a valid risk-adjusted metric of just about anything. Clearly, the nonmonotonic relationship between risk (operationalized as volatility) and return also disqualifies other assets' returns as possible candidates for risk-adjusted discount rates on pension liabilities. (However, advocates for GASB rules generally have not claimed that their approach is "risk-adjusted.")

It must be noted that required contributions are already subject to the vagaries of securities markets because the former are partly dependent on the overall value of the fund's assets. However, using a similarly unstable discount rate to determine the liability as well would increase the volatility even further. And unless claims that funding requirements do not have to be linked to estimated liabilities are accompanied by a practicable proposal of such a scheme, they should be dismissed without further ado.

9. Discussion and Conclusion

Advocates of using municipal debt yields or similar instruments in discounting liabilities regardless of the latter's capital structure exhort that the risk associated with the liabilities should be included in their ultimate valuation. Then, they assume – usually without making that explicit at all – that market yields are a risk-adjusted discount rate that can be used to achieve that. But market rates reveal only participants' beliefs about risk, if anything at all, and government intervention can and does easily disrupt those signals. US debt markets have been the object of almost unremittent intervention

FIGURE 4. IMPACT OF YIELD FLUCTUATION ON PENSION FUNDING[24]

Year	1978	1982	1986
Q1 Bond Buyer Go 20-Bond Index	6%	13%	7%
Duration (Years)	20	20	20
Future Value	$100,000,000	$100,000,000	$100,000,000
Present Value	$31,180,473	$8,678,229	$25,841,900
Annual Payment	$2,718,456	$1,235,379	$2,439,293

at least since the incorporation of the Federal Reserve System in 1913 and that interventionism has intensified in the past half century.

From the very outset of his paper, Biggs asserts that "'fair market valuation' more fully [sic] reveals the value of public sector plan liabilities."[26] These words are indeed revealing, although not of what their author seems to have intended.

Why weren't financial economists advocating just as vehemently for such an approach to discounting pension liabilities in the 1970s and 1980s? Then, as more recently, the Federal Reserve intervened aggressively in the financial markets – but to drive interest rates to sky-high levels compared with nowadays. At that time, the unusable assumptions on which Biggs' "fair market valuation" approach is based were in their heyday, but its application would have made pension benefits appear virtually costless.

These facts are not so much a verdict on Biggs or likeminded economists as they are an indication of the biases that inevitably – and usually unbeknownst to their victims – come to pervade attempts to forecast socioeconomic phenomena. The weather does not have an agenda, but a corporation and a consumer do. Financial forecasting, in particular, tends to adopt a view based on averaging, statistical assumptions and other dangerous entropies, which create the illusion of clarity and certainty where none exist and cover that illusion with the veil of scientism.

The real damage caused by fair market valuation is that it has precluded a meaningful debate about improving the deeply flawed pension-management traditions that it seeks to supplant. Arguments over discount rates are a distraction from the real issue, which is that humans are really bad at predicting the future and managing risk. Instead of looking into a crystal ball to forecast market conditions, the prudent financial manager *prepares* for them by limiting exposure (hedging) and building positive optionality. Legendary investors tend to succeed with very disparate strategies, but share two common characteristics – they do not

deviate from their investment rules and do not predicate them on knowing what the future holds.

Historical rates of return provide the firm rules necessary to generate a discount rate that can be the basis of such a robust investment policy for the purposes of pension plans.[27] But those rates certainly should not be viewed as predictive of the future, nor should any single valuation number be considered reflective of the risks associated with the liability.

One cannot defease the contingent risks of a liability by trying to measure the unmeasurable or predict the unpredictable; the appropriate stance is to focus on hedging the downside risks inherent in the scheme. The "real" cost of the risk can then be approximated by the cost of the plan with the cheapest possible hedge that accomplishes the risk-tolerance goals of the financial manager. Even so, effective risk management cannot be based on any single metric – a fact that will be elaborated on in future research.

About the Author

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Endnotes

1. Novy-Marx, Robert and Joshua D. Rauh. "The Liabilities and Risks of State-Sponsored Pension Plans." *Journal of Economic Perspectives* 23 (4): 191-210.

2. Biggs, Andrew G. "Public Sector Pensions: How Well Funded Are They Really?" *State Budget Solutions White Paper*, July 2012, p. 1.

3. See Atanasov, Iliya. "The Logic of Pension Valuation I: a Response to Robert Novy-Marx." *Pioneer Institute White Paper* No. 107, November 2013 for a more detailed discussion of these problems.

4. The lifetime of the obligation starts with the beginning of service and ends as the employee (or the recipient of a corresponding survivor benefit) exits the retirement system. If an employee starts at age 25, retires at 65 and lives to be 85 and has no survivor benefit, the total lifespan or lifetime of the liability would be 60 years. Note that this is different from the average duration of the liability or of the fund's assets.

5. Biggs 2012, p. 9.

6. Ibid., p. 6.

7. Franco Modigliani and Merton Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review* 48, no. 3 (1958): 261–97.; Franco Modigliani and Merton Miller, "Corporate Income Taxes and the Cost of Capital: A Correction," *American Economic Review* 53, no. 3 (1963): 433–43.

8. Biggs, p. 9.

9. Tellingly, e.g., Charles Ellis, *Winning the Loser's Game: Timeless Strategies for Successful Investing*, 6th ed. (New York, NY: McGraw-Hill, 2013).

10. Eugene Fama and Kenneth French, "The CAPM: Theory and Evidence," *Journal of Economic Perspectives* 18, no. 3 (Summer 2004): 25–46.

11. Cf. Iliya Atanasov, "Market Rates of Return for Effective Financial Management," *Pioneer Institute White Paper* No, 123, November 2014.

12. Biggs. p. 19.

13. It should be noted the exact rate to be used is again subject to the actuary's discretion insofar as ASoP 25 and 27 do not provide concrete restrictions on the assumption.

14. *The Widening Gap Update* (Pew Center for the States, June 18, 2012).

15. For a more detailed discussion, see Atanasov 2012, p. 8 ff.

16. Biggs 2012, p. 6.

17. Biggs, p. 11.

18. Ibid., p. 15.

19. See Jim Reid and Nick Burns, *Long-Term Asset Return Study* (London, UK: Deutsche Bank, September 10, 2010).

20. Biggs 2012, p. 19.

21. Andrew Biggs, "How Have Public Sector Pensions Responded to the Financial Crisis?" *Pension Research Council Working Paper*, no. 2011–18 (2011).

22. Biggs 2012, p. 15.

23. Here *ceteris paribus* is preserved because fair market valuation can only rely on broad market aggregates since many retirement systems' principals are simply too small to have broadly traded public debt; such aggregates are unlikely to be materially affected by a small system switching from one plan to another. Furthermore, the fundamental assumptions necessary for the fair-market valuation argument also require that the principals are price-takers on the debt market – i.e., they cannot affect bond yields.

24. Yields rounded to the largest smaller percent integer.

25. Bowman, Edward. "A Risk/Return Paradox for Strategic Management." *Sloan Management Review* 21 (3): 17-31, 1980 and "Risk Seeking by Troubled Firms." *Sloan Management Review* 23 (4): 33-42, 1982.

26. Biggs 2012, p. 1.

27. Atanasov 2014.

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