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How the ROA created the Public Pension Crisis !

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According to an October 2010 study by Professors Robert Novy-Marx and Joshua Rauh[1], if State and Local pension assets and liabilities were marked to market, their combined pension deficit would exceed $3.3 trillion. If TARP I was a national emergency at less than $1 trillion, what do you call the pension underfunding? The reason this pension dilemma is a crisis is that it became a ***budget crisis*** for most cities and states. To makeup this pension growing shortfall cities and states were faced with spiking pension *contribution* costs they were not prepared for resulting in deep budget deficits. For many cities and states the pension contribution costs are close to 100% of their budget deficits. Many have blamed the generous and increasing pension benefits as the *cause* of the pension crisis. Yes, growth in pension benefits hurts the funded ratio and costs of a defined benefit plan. However, the true villain is the inappropriate accounting rules… mainly the use of the ROA as the discount rate for liabilities. Higher contribution costs, lower funded ratios, increased benefits, inappropriate asset allocation… it all links to the inappropriate accounting rules.

Let's begin with the true objective of a public pension plan. The New York City Employees Retirement System (NYCERS) actuarial report says it succinctly in every annual report:

[1] The Crisis in Local Government Pensions in the United States, Professors Robert Novy-Marx and Joshua Rauh, October 2010

"The financial objective of the New York City Employees' Retirement System (the "Plan") is to fund members' retirement benefits during their active service and to establish employer normal contribution rates that, expressed as a percentage of active member annualized covered payroll, would remain approximately level over the future working lifetimes of those active members and together with member contributions and investment income, would ultimately be sufficient to accumulate assets to pay benefits when due."[2]

The stated objective of any pension fund is to fund the liability payments in such a way that ***contribution costs*** **remain stable and low over the future pension horizon!** Contribution costs are the extra funds pension plan sponsors have to contribute to reach a fully funded status. Such contribution costs are in addition to the pension benefit payments. Contribution costs are the result of pension asset growth being insufficient to fund the pension benefit payments. This shortfall in asset growth is funded by an annual pension contribution which is an added pension cost factor. Perhaps, the clearest example of such escalating contribution costs is the New York City Employees Retirement System (NYCERS). This is the largest of five New York City pension funds. Here is their history of contribution payments[3]:

Fiscal Year Ended	Annual Required Contribution	Employer Rate of Contribution
6/30/00	$ 68,619,745	0 .915%
6/30/01	100,024,692	1.271
6/30/02	105,660,069	1.241
6/30/03	197,823,998	1.213
6/30/04	542,229,450	3.526
6/30/05	1,020,379,985	8.985
6/30/06	1,024,358,175	11.142
6/30/07	1,471,029,609	15.556
6/30/08	1,874,242,487	19.001
6/30/09	2,150,438,042	20.570

[2] 2009 Annual Report on New York City Employees Retirement System, page 126

[3] New York City Comprehensive Annual Financial Report, June 30, 2009, page 181

Amazingly, NYCERS contribution costs increased over 30 times in nine fiscal years equal to **46.64% annual growth**. How could any city or state budget keep up with such rising costs especially when they are not foreseen or even understood how such costs could arise? This is my story. How did pension contribution costs explode in growth creating today's public budget crises? Moreover, how do we solve and prevent this trend from ever surfacing again.

The Problems

The villain of our story is the ROA (Return On Asset assumption). This inappropriate and inaccurate forecast is used to calculate contributions and value liabilities. This caused the **Funded Ratios (present value of assets/liabilities) to be greatly exaggerated which led to inappropriate asset allocation, benefit and contribution decisions… they all link!** When I testified before the ERISA Committee in 2003 I brought in a five foot pencil which I introduced as **"Woody"** the weapon of mass destruction in financial America. I started my testimony with a strong point… if you thought Enron and WorldCom had magic accounting pencils that led to their debacle; wait till to see what the pension pencil "Woody" can do.

Instead of marking to market, GASB ("Woody") allows public pension plans to ***smooth*** assets over a moving five year average.[4] Imagine the stock that went from $100 to $80 to $60 to $40 to $20 to $0 over five years (sounds like GM from 2000 thru 2009). On average it is a $40 stock which would seriously *overvalue* this asset. Of course it could go the other way as it did in the late 1990s. The point here is that a 5-year *average* price or valuation is not a reflection of reality and may mislead you into the wrong decision(s) affecting your assets. Smoothing in the 1990s caused pension assets to be consistently *undervalued* and in the last 11 years smoothing caused assets to be consistently *overvalued*. The truth is… the market value growth of pension assets is volatile and can be negative… certainly nothing like the ROA.

GASB allows pension liabilities to be valued at a discount rate equal to the ROA. The ROA is a forecast of asset growth. It is usually *static* and is a *single* discount rate. Liabilities are certainly a term structure or yield curve of monthly benefit payments. Liabilities are considered risk-free since they are unconditional obligations of a city or state. As a result, the risk-free Treasury STRIPS yield curve is the more accurate and appropriate discount rate for

[4] GASB 25, paragraphs 139 & 140

liabilities. FASB directs corporations to use discount rates that can *settle* the liabilities. They also require that such discount rates must be zero-coupon bonds that have a certain future value. This is proper advice. The discount rate used should be a risk-free rate that you can purchase to settle or fund the liabilities. It should be a portfolio of zero-coupon bonds matched to the liability benefit payment amounts and dates. How a single discount rate (ROA) that is not certain, not responsive to market conditions and is much higher than the Treasury STRIPS yield curve can be used to price liabilities is difficult to validate. The difference between STRIPS and the ROA in valuation can be enormous. To get an estimate of this difference: subtract the yield difference between the ROA and the Treasury STRIPS yield curve (400+ bps) and multiply it by the average duration of liabilities (10 to 15 years). Currently this works out to a difference or undervaluation of liabilities by 40% to 65%. As a result, **the reported Funded Ratio of most cities and states is usually 35% to 55% *overstated*.**

Based on the calculations of Ryan ALM in our Newsletter entitled "The Ryan Letter" here is our estimate of the growth rates of pension assets and liabilities for the last 11 years ending 12/31/10.[5]

Table 1
The Ryan Letter

Total Returns											
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Assets	-2.50	-5.40	-11.41	20.04	8.92	4.43	12.25	6.82	-24.47	19.43	11.89
Liabilities	25.96	3.08	19.47	1.96	9.35	8.87	0.81	11.76	33.93	-19.52	10.13
Difference: Annual	-28.46	-8.48	-30.89	18.08	-0.43	-4.44	11.44	-4.94	-58.40	38.95	1.76
Cumulative		-37.60	-73.40	-60.08	-66.13	-76.75	-64.60	-78.38	-181.57	-106.94	-115.67
Fund Ratio	77.41	71.04	52.68	62.01	61.76	59.25	65.97	63.22	35.66	52.91	53.75

Based on an asset allocation of: 60% S&P 500, 30% Barclay's Aggregate, 5% MSEAFE, 5% Ryan Cash Index, pension assets would have grown by 34.44% since 12/31/99. Liabilities as a portfolio of the 1-25 year Treasury STRIPS equal weighted would have grown by 150.11% cumulative over this period. As a result, **pension liabilities should have outgrown pension assets by 115.67% over the last 11 years**. **This would have caused**

[5] Ryan ALM, Inc., "The Ryan Letter" , December 2010

Funded Ratios to deteriorate by -46.25% requiring a Funded Ratio of 186.04% in 1999 to be fully funded today! Moreover, given a deficit the assets have to grow faster to catch up to liabilities. A Funded Ratio of 50% suggests assets have to grow twice as fast as liabilities to catch up, a 75% ratio requires 33% more asset growth, etc...

GASB 25/27 accounting and ASOP 27 allows for pension liabilities to be valued at a discount rate equal to the Return on Asset (**ROA**) assumption. Based on the study by the Center for State and Local Government Excellence[6] the average ROA used by public pensions is 8.0%. Such an ROA tends to be a static and robust projection. This annual growth rate is in sharp contrast to the history of liability growth rates which are quite volatile with high positive and high negative annual growth rates. Based on the Ryan Liability Index (equal weighting of the Ryan STRIPS indexes as a yield curve) Table 2 displays how volatile the liability growth rates (returns) of a typical pension should have been using the Treasury STRIPS yield curve as the discount rates:

Table 2
History of Liability Growth Rates

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
3.23	19.26	7.87	22.46	-12.60	41.60	-3.70	19.63	16.23	-12.70

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
25.96	3.08	19.47	1.96	9.35	8.87	0.81	11.76	33.93	-19.52

2010
10.13

Given that interest rates are quite volatile the GASB accounting rules and ASOP 27 ignore reality and the true *economic* valuations. Notable, such accounting rules were established to avoid volatility in contribution costs by smoothing assets and keeping liability growth a constant. **The truth is… economic growth of liabilities is volatile and can be negative. Not using accurate economic or market valuations created volatile contribution costs, added benefit costs and produced inappropriate asset allocation by misleading pensions as to the proper economic valuation of their Funded Ratios (i.e. *overvalued* assets + *undervalued* liabilities) and the true growth rate of liabilities.**

[6] Center of State and Local Government Excellence, "Valuing Liabilities in State and Local Plans", June 2010

The worst consequences of the ROA focus are its effect on Asset Allocation, Benefit and Contribution decisions… it all links to the ROA! Because GASB made the ROA the liability growth rate, the ROA became the *target growth rate or hurdle rate* for assets. The logic of this is due to the way actuaries calculate the projected contribution costs. The annual required contribution (ARC) calculated by actuaries is the balancing item between the annual projected future values of assets vs. liabilities. Actuaries grow the assets at the ROA. Liabilities are discounted at the ROA and then grow at the ROA. Conceptually, the annual growth rate difference in $ becomes the annual required contribution (ARC) to be fully funded for that fiscal year. This is the **only value of the ROA… to calculate contributions!** However, pensions are told that when assets don't grow at the ROA level they create a pension deficit that is funded through extra contributions. As a result, most pensions use the ROA as their hurdle rate.

This is *not* correct thinking since the contribution calculation grows assets + liabilities at the same ROA growth rate! If there is a deficit, then even if the assets grow at the ROA rate, contribution costs go up! Mathematically, the ROA on a higher value (liabilities) will outgrow in $ the same ROA on a lower value (assets). If there is a deficit, assets must *outgrow* liabilities for contributions to stay the same or go down. If there is a surplus, assets can grow *less* than the ROA and stay at NO Contribution costs (pension holiday)!

Table 3

Contribution Calculation

(Deficit)	The Contribution Calculation						(Surplus)			
	Assets	Liabilities	Funded Ratio	Contribution $	% Increase		Assets	Liabilities	Funded Ratio	Contribution
Start	$60.00	$100.00	60%				$100.0	$71.43	140%	NA
Year 1	64.80	108.00	60%	$3.20	8.13%		108.00	77.14	140%	
Year 2	69.98	116.64	60%	3.46	16.56		116.64	83.32	140%	
Year 3	75.58	125.97	60%	3.73	25.63		125.97	89.98	140%	
Year 4	81.68	136.05	60%	4.02	36.25		136.05	97.18	140%	
Year 5	88.16	146.93	60%	4.36	45.94		146.93	104.95	140%	

Deficit: Assets > Liabilities by +5.33% per year for Contributions to stay level
Surplus: Assets < Liabilities by -2.28% per year to stay at NO Contributions

Table 3 shows clearly that if there is a deficit, assets have to *outgrow* liabilities to reduce contribution costs and reach full funding. For example, given assets of $60 and liabilities of $100 there is a 40% shortfall. Obviously, if they both grow at 8% (ROA), then 8%

of $60 is less than 8% of $100 creating a greater $ deficit although the Funded Ratio remains at 60%. Such a growing $ deficit requires a higher contribution to reach full funding. In Table 3 above **with a Funded Ratio of 60%, in just six short years with assets and liabilities both growing at 8%, the contribution costs go up over 45%**. Accordingly, assets have to outgrow liabilities to reduce contribution costs. To be exact, assets have to outgrow liabilities by 5.33% per year (13.33% ROA) in this example for contribution costs to remain level although at a high rate:

With a surplus position, assets don't need to work as hard as the ROA. If assets just match economic liability growth they will secure the surplus. This is why immunization strategies are so highly recommended when Funded Ratios are fully funded on an economic basis (market value). In Table 3 we show a 140% Funded Ratio with assets of $100 and liabilities of $71.43. Naturally if they both grow at 8% (ROA), 8% of $100 will be greater than 8% on $71.43 thereby creating a growing surplus in $ with no contribution costs (pension holiday) although the Funded Ratio will remain constant at 140%. Assets could grow -2.28% less than liabilities without creating a contribution cost over the six years shown. However, the true target return should be to match or hedge liability growth in market values not actuarial values. This is best accomplished with a **Liability Index or Liability Beta portfolio**.

In truth, assets and liabilities never grow at the ROA so the ROA is a bad growth forecast that leads to a lot of bad decisions… it all links! The real problems start with Asset Allocation. The ROA needs to be validated by an asset allocation model. Usually, the pension consultant is required to come up with an asset allocation that has the highest probability of achieving the ROA. Asset allocation models use an optimization technique based on the average returns from long historical index data bases (@ 20 years) for every asset class but one… bonds. Bonds go into the asset allocation models at their *current yields*. In the late 1990s most pension funds enjoyed surpluses wherein they reduced, if not eliminated, contribution costs. Benefit increases were also a beneficiary of these good times. One would think the prudent pension investor would have altered their asset allocation to more and more bonds matched to liabilities (i.e. immunization strategy) to secure this victory and lock in reduced contributions for the future. But **asset allocation models are based on achieving the ROA and never consider the Funded Ratio… a fatal flaw**. When bond interest rates went below the ROA (8%) back in the late 1980s bonds became a drag on achieving the ROA so the asset

allocation models reduced their allocation to bonds. This continued as a consistent trend such that by 1999 most asset allocation models had the lowest allocation to bonds in modern history and the highest allocation to equities… the $3.3 trillion mistake![7] When the equity correction arrived in 2000 thru 2002, public pensions were hard hit due to their asset allocation skewness to equities. Most pension equity assets underperformed liability growth by over 70% in just those three years (see Ryan Letter in Table 1):[8]

Pension Boards of Trustees were given reports that communicated their Funded Ratio based on GASB accounting and actuarial valuations but not economic reality. Such accounting *overvalued* assets in the early 2000s by over 20% due to *smoothing* and *undervalued* liabilities by 30% to 50% during most of the last 11 years due to the ROA as too high a discount rate. This caused a severe exaggeration of the Funded Ratio such that pensions increased benefits and reduced contributions at a time they could not afford either. The Pension Protection Act (PPA) is a good model here that requires private pensions to have a high Funded Ratio based on market values before they can increase benefits. **I recommend that public pensions consider adopting a PPA approach plus considering an *annual benefit bonus* rather than a permanent benefit increase due to the volatility of their Funded Ratios.**

Most pensions have been brain washed into thinking the ROA is their focus and target. Had pensions matched asset to liabilities using high quality zero-coupon bonds in the surplus years of the 1990s they would have *secured* a fully funded position for the future thereby reducing or even eliminating contribution costs. **The focus of pensions should be their Funded Ratio and *not* the ROA**. A surplus Funded Ratio should have a radically more conservative asset allocation then a deficit position to secure the surplus and reduce contribution costs long-term. But in the 1990s and 2000s the opposite took place because of a secular trend towards lower interest rates which skewed asset allocation increasingly away from bonds (which yielded < ROA) into more risky securities trying to validate the ROA… **the $3.3 trillion asset allocation mistake!** Imagine a 120% economic Funded Ratio with asset allocation heavily skewed away from bonds. This was a very risky situation. The lesson learned here is: **given the wrong objective (ROA)… you will get the wrong risk/reward!**

[7] Robert Novy-Marx and Joshua Rauh, "The Crisis in Local Government Pensions in the U.S.", Oct. 2010

[8] Sources: Ryan Letter and S&P

The Solutions

The solution to the public pension and budget crisis starts with the true objective (funding liabilities at a low and stable cost). **Until a *Custom* Liability Index (CLI) is installed as the proper benchmark, all asset allocation, asset management, benefit and contribution decisions will be made based upon erroneous and misleading calculations trying to achieve the ROA**. The proper pension benchmark must be a ***Custom* Liability Index** since no two pensions are alike due to different salaries, mortality and plan amendments. The CLI will allow pensions to know the market value of liabilities such that the true *economic* Funded Ratio will now be known frequently and accurately so all decisions are well informed with accurate economic valuations.

Asset allocation is usually the first decision. **It should be based on the *economic* Funded Ratio and not the ROA**. Any surplus Funded Ratio should be immunized with a core portfolio of a Liability Index Fund (i.e. Liability Beta Portfolio) for most of the assets with a separate surplus portfolio created for the excess funds as a reserve against actuarial noise in their liability projections. A 70% economic Funded Ratio would require a more aggressive asset allocation (more Alpha assets or non-bonds) to makeup the deficit over time. Fortunately, pensions have time to cure deficits equal to the average life (duration) of their liabilities. This is best measured by the CLI. A 30% deficit with 10-year duration suggests that assets have to outgrow liabilities by 4.29% per year (100/70 – 1 divided by 10 years) on average for 10 years to reach full funding. With 10-year Treasury STRIPS yielding around 2.47% as of August 31, 2011 we can calculate a proper asset hurdle rate of 6.76% annually to reach full funding in 10-years. However, that assumes interest rates do not change. If interest rates trend upward in the next five years then the present value growth rate of liabilities will be less than their YTM of 2.47%. In fact with a 10-year duration, an average interest rate increase of only 60 bps per year would cause liabilities to have an -11% negative cumulative growth over five years. If assets could grow at just 6% per year then in five years the plan would be fully funded. Please note that at no time would the assets achieve the ROA growth rate (@8%).

The pension growth rate objective should be positive *relative* growth vs. liability growth and not an *absolute* growth rate (ROA). With the CLI in place just like a scoreboard in sports, the pension plan can now adjust its asset allocation whenever the score (Funded Ratio) indicates it's time to do so. The sports team way ahead will change its strategy and get

conservative (and vice versa)… all based on the *relative* score vs. their opponent. The same should be true for pensions. As the Funded Ratio improves, asset allocation should be responsive (i.e. Tactical or Dynamic). A 90% Funded Ratio should have more bonds than a 70% Funded Ratio. What was missing all these years was a scoreboard (i.e. the CLI) measuring assets vs. liabilities continually, accurately and transparently.

The next asset allocation step is to separate the Liability ***Beta*** assets from the Liability ***Alpha*** assets. **Beta is redefined as the portfolio that *matches* the liability objective risk/reward behavior (not a generic market index)**. As proven through Defeasance, Dedication and Immunization this is best executed with a portfolio of high quality zero-coupon bonds matched to the cash flows of the liability benefit payment schedule. With a CLI in place, the Liability Beta portfolio is a **Liability Index Portfolio.** Without a CLI, it would be hard or impossible to immunize the liabilities risk/reward behavior. **Alpha is also redefined as the excess return above the liability growth rate (return) measured by the CLI**. For example, if an equity manager outperforms the S&P 500 but loses to liability growth… the pension plan loses (no Alpha)! The allocation between the Beta and Alpha assets is based on the Funded Ratio. The lower the Funded Ratio the more is allocated to the Alpha assets (and vice versa). A 70% Funded Ratio with a 10-year duration should require a high Alpha allocation (i.e. 70%). If the Alpha assets can outgrow liabilities by 4.29% per year then a 70% allocation to the Alpha assets reaches full funding in 10 years ((4.29% x 70%) x 10 years = 30% deficit erased). With 10-year liabilities yielding 2.47% this suggests an Alpha annual target growth rate of only 6.76%. However, if interest rates go up, then for every 1% of negative liability growth (only 10 bps increase in rates) then the Alpha assets can work 1% less in growth. Note the allocation to the Beta assets (bonds) is the reciprocal (30%) from this asset allocation process and matches liability growth.

Performance measurement studies (i.e. PIPER) prove that investment grade bonds have little or no Alpha vs. a bond market objective like the Lehman (now Barclay's) Aggregate index. PIPER shows consistently that the median bond manager struggles to outperform the market index (especially after estimated fees of 25 bps) over 10 years[9]:

[9] Source: Morningstar

Table 4
PIPER
Domestic Fixed Income Investment Grade

10 years periods ending:	2008	2009	2010
1st Quartile	5.75%	6.92%	6.87%
Median	5.22%	6.46%	6.12%
Lehman Aggregate	5.63%	6.33%	5.80%

(Note: Returns are shown *before fees*)

If any asset class consistently underperforms its market index benchmark… you index that asset class! The only question is… what index to use? The answer is: **the Index that best represents the client (i.e. Custom Liability Index)**. As a result, pensions need to reconsider the use of investment grade bonds. Investment grade bonds should be the core portfolio (Liability Beta portfolio) but ***not*** be actively managed vs. *generic* bond market indexes. Instead investment grade bonds should be managed *passively* as the liability matching portfolio (Liability Beta portfolio or Liability Index portfolio). This rearrangement of investment grade bonds from active to passive management will also save on fees and eliminate tracking deviations versus liabilities. Both Beta and Alpha require a CLI to be managed and measured against. Traditionally, performance measurement has been entirely focused on the risk/reward behavior of assets vs. *generic market indexes*. Pension plan sponsors need to know the risk/reward behavior of their assets vs. their liabilities (especially the Alpha assets) and the resulting economic Funded Ratio. Unfortunately, liabilities are usually missing in action at every pension investment review meeting. Given a CLI… asset allocation, asset management, performance measurement, benefit and contribution decisions are all now in harmony with the liability objective and focused on the Funded Ratio.

Given the wrong index objective… you will get the wrong risk/reward!