Creeping Up the Ladder to the "Best and Safest" Risk-Free Return

Graham **Mitenko**, Ph.D. and Michael J. **O'Hara**, J.D., Ph.D.: contact author: mohara@mail.unomaha.edu
College of Bus. Admin.; Univ. of Neb. at Omaha; Omaha NE 68182

ABSTRACT: Satisfying the plaintiff's entitlement to the "best and safest" risk free return might be better achieved by laddering both the duration of and the risk of the underlying investment portfolio (e.g., short term investments of Treasury Notes and long term investment of insurance-grade corporate bonds).

The "best and safest" risk-free return investment requirement ala *Jones & Laughlin Steel Corp. v. Pfeifer*, 462 U.S. 523 (1983) and its prodigy often translates into practice as a then-current long term tax-free bond market rate (e.g., muni bonds or T-bonds). It is noteworthy that judges created this standard. It is a standard that does not match the expectations of those trained in accounting, economics, or finance. In the eyes of an accountant, an economist, or a financier best is not safest, and neither best nor safest is risk-free. That said, the forensic economist (FE) acting as an expert before the court is to do the bidding of the court.

The practice of using a then-current long term tax-free bond market rate is, in effect, a point estimate of a central tendency of the yield curve. Implicitly this point estimate is an assertion of a flat yield curve, when normal is an upward sloping yield curve.

The "best and safest" standard is (speaking statistically) biased. And it ought to be.

The "best and safest" standard is a means of estimating the discount rate to be used rather than to estimate an actual return on an actual investment portfolio. The "best and safest" standard is applied to the calculation of the time value of future money in the damage award only after applying the assumption that the jury has found the defendant liable for the plaintiff's damages. Upon a jury's finding of the defendant's liability all risks related to the estimation of the discount rate shifts to the defendant. Hence, the "best and safest" standard is an intentionally plaintiff (speaking statistically) biased estimation.

Necessarily the damages awarded to the plaintiff by the court are less than the losses suffered by the plaintiff as a consequence of the defendant's actions. Some losses are quite real but are not recognized as pecuniary losses (e.g., hedonic damages). Also, the plaintiff must incur transaction costs to obtain the jury's award of damages. At a minimum, the plaintiff's damages do not include the transaction cost of attorney's fees (e.g., 25% of the damage award). It is feasible that a given plaintiff might recover trial costs, however that is rare. Typically, trial costs only are awarded in the USA when a court makes a finding of inappropriate behavior during litigation (e.g., spoliation of evidence). Some statutes do contain a legislative finding of predictable abuse of some classes of plaintiff's by some classes of defendants, and those statutes then either [a] (uncommon) contain the legislature's express authorization of or encouragement to the court to award costs, or [b] (rarest) contain the legislature's express requirement that the court award costs. If one assumes that the USA Supreme Court was not ignorant of the mathematical consequences of adopting the "best and safest" standard, then one obvious function of the "best and safest" standard is to shift from the plaintiff and onto the defendant all risks associated with calculating that time value of future money, and a second function is to (partially? fully?) cover the plaintiff's transaction costs of obtaining the award of damages.

This short paper will explore whether it might be feasible to approximate the simplicity of a then-current market rate as the point estimate and at the same time increase accuracy of the forecast. However, any such attempt runs the risk of delusional exactitude[1] as well as run the risk of undermining the appropriate (speaking statistically) bias in the "best and safest" standard. To avoid mere delusional exactitude the increased cost of complexity must be covered by a clear and substantial increase in the quality of forecast. The "best and safest", partly, is a judicial allocation of the risk of forecast error. The defendant's liability justifies the "best and safest" standard being plaintiff (speaking statistically) biased. A simple tool that generates the appropriate magnitude of bias is superior to a more complex forecasting tool with the same appropriate magnitude of bias.

Presently, you, dear reader, will be the judge of that requisite sufficient improvement in forecast quality that must be gained by laddering if laddering is to avoid being mere delusional exactitude. Prior to seeing the results of this paper, with the 10 year Treasurer bonds over the period 1962 through 2007 having a **geometric mean of 6.93%**, what must be the gain in precision to avoid being mere delusional exactitude?

Does:

[a] any change in the forecasted rate avoid delusional exactitude?; or

[b] must forecasted rate changes be at least 10 basis points off of that long term average to avoid delusional exactitude?; or

[c] must the forecasted rate changes be at least 10% of that long term average (i.e., 69 basis points) avoid delusional exactitude?; or

[d] must the forecasted rate changes be an amount greater than [c] so as to avoid delusional exactitude?

Circle the letter of your answer.

Normal is a upward slopping yield curve. The math necessary to calculate the appropriate interest rate from that positive yield curve is within the skill set of a forensic economist (FE). However, that math is far from simple for the typical juror or the typical lawyer *qua* judge, and thus runs the clear risk of the FE not assisting the trier of fact. A diversified portfolio of securities offers a safer (read: less volatile) than a portfolio of a single security of a single duration. Diversification may include laddering.

Laddering can be simple or can be complex. Complex laddering would include adjustments for both [a] duration, and [b] risk characteristics of the securities' (e.g., t-bills through to and including equities). Laddering the duration of the securities in the portfolio may be but one attribute of diversification. The simplest laddering would use one type of very low risk security (e.g., T-bonds), but laddering using different durations. Such simple laddering keeps the math simple and might improve the forecast quality by providing a better point estimate of the upward slopping yield curve without paying the price of delusional exactitude. With those conditions satisfied, a then-current market rate point estimate might be replaced by a superior estimate.

It is noteworthy that *Jones & Laughlin* was decided when rates had been rising rapidly, and (in fact) were near their peak. In an earlier paper by Mitenko & O'Hara ("Applying Geometric Returns During Interest Rate Changes: Interest Rate Timing Volatility Variations" http://cba.unomaha.edu/faculty/mohara/web/AEF07_Applying_Geometric_Returns.pdf [underscores, not spaces, in URL] presented to the Academy of Economics and Finance in 2007) it was shown that while, in the world of *ceterus paribus*, the **geometric mean** (i.e., n^{th} root of a

1 Delusional exactitude arises when one: [a] confuses a metric with the true state of a thing being measured; or, [b] confuses extraordinary efforts to gain minimal improvements in a metric with a worthwhile expenditure of effort. In this context, both forms of delusion exactitude can come into play; but, the latter is a greater risk.

product of n items) is superior measure of central tendency for an annuity; once reality intrudes in the form of interest rates that change during the period of the annuity the **arithmetic mean** (i.e., sum of set of n items divided by n) is superior. That AEF 2007 paper explored the difference in end of period value to a plaintiff of an annuity under the assumption of [a] constant interest rates versus [b] volatile interest rates. For the plaintiff the geometric mean is inferior in covering the volatility of rates when rates are rising. The geometric mean favors defendants when rates are rising and favors plaintiffs when rates are falling. It is noteworthy that *Jones & Laughlin* was decided when rates had been rising rapidly, and (in fact) were near their peak. Clearly, the point estimate used makes a difference. This AAEFE paper extends that prior AEF paper by exploring whether laddering captures more of that volatility; this paper also shifts its focus from valuing an annuity at end of term to examining a judicially required (speaking statistically) biased FE tool.

A necessity of authoring an expert's report is that it be written on a specific date. However, the date of authoring might not be the date used for making an estimate. Three dates are typical for making point estimates: [a] the date of report; [b] the (expected) start date of trial, and [c] the (expected) date of testimony. These three dates (typically) are sufficiently close in time that none would have an appreciable impact on the method of rate estimation if an FE's practice is to use a then-current market determined rate or on laddering.

Two frequently used point estimates are the then-current tax-free muni bond market rate and the 10 Treasury bonds market rate. The muni rate presents an array of distinctive difficulties such as State specific tax free status and intensely local and illiquid markets (see, Marlin "The Problem of Discounting with an After-Tax Rate of Return in Cases of Personal Injury or Wrongful Death" in JLE v14i1). The 10 year T-bond presents its own array of distinctive difficulties, but fewer of the problems presented by muni bonds. At the heart of the problem with both of these rates, however, is that the emphasis on "safest" is so intense as to ignore diversification benefits both as to duration of investment and risk/reward tradeoffs for investments.

This paper will address the simplest of differences in duration (i.e., a ladder of T-bonds of durations of 1 year, 5 years, and 10 years). The rates for the intermediate years are calculated by using a pro rata extrapolation. Simple extensions would add more duration intervals (e.g., 3 months; 30 years) as well as differences in risk/reward tradeoffs (e.g., corporate bonds and an equities index). A long term diversified portfolio of investments outside of the context of litigation damage estimates certainly would include both corporate bonds and equities. If this simplest ladder does not offer clear advantages, then more complex ladders will run an even greater risk of delusional exactitude and/or erasing the courts' intentionally plaintiff (speaking statistically) biased FE tool.

The Federal Reserve Board provides a variety of statistics for download. http://federalreserve.gov/datadownload/ One such file provides the rates for constant maturity Treasury securities. The frequently updated file FHB_15.csv contains nearly daily data from January 1, 1962 through "last week" for the Treasury bonds of 1 year, 3 years, 5 years, and 10 years. Shorter data runs are provided for the Treasury bills of 1 month, 2 months, 6 months, and Treasury bonds of 2 years, 7 years, 20 years, and 30 years. This paper will test a simple duration laddering by using a data set made up of the first trading day's rate in 1962 through 2007 using the 1 year, 5 years, and 10 years Treasury bonds. See Table 1.

The ladder was built as follows. Each year's 1 year, 5 years, and 10 years T-bond was used. A pro rata weighting of was used with extrapolation used to fill in interest rates for the years 2, 3, 4, 6, 7, 8, and 9. The longer duration was used as the start point (e.g., year 9's rate was found by subtracting the fractional extrapolation of between year 5 and year 10 from the year 10 rate). Use of the longer duration start point has no impact on calculated ladder rates relative to using the shorter duration (e.g., add to year 5's rate rather than subtract from year 10's rate) except when the yield curve contains an inversion at year 5. Thus, use of the longer duration start point smooths out yield curve inversion. Extrapolation rather than use of actual 2 year and 3 year T-bond rates was done both for simplicity and to avoid more pronounced yield curve inversions.

Some things are very clear from Table 1.

If, as it appears obvious, the purpose of the "best and safest" standard is to create a forensic estimator that is (speaking statistically) biased in favor of the plaintiff, then a forensic economist ought ***not*** use any then-current market interest rate. Over the 1962 through 2007 period, in this data set, the low then-current market rate was 1.31% on a 1 year T-bond and the high rate was 14.19% on a 10 year T-bond. That 10.8-fold difference in the high/low spread runs the clear risk of failing to pass constitutional muster with respect to substantive due process. A jury's greater than 10-fold spread in between its punitive damage award and its conjoined compensatory damage award failed to meet constitutional muster. Surely, FE experts will be held to a higher standard of consistency.

Some measure of central tendency is called for. But which measure?

Again, taking a simple approach, one can use the immediately preceding **rolling 10 year** arithmetic **average** and one will get a low rate (i.e., 3.84%) versus high rate (i.e., 10.53%) **spread of 2.7-fold** difference in the high/low spread; while the 10 year **ladder has a 4.7-fold difference** based upon a low rate of 2.95% and a high rate of 14.01%. It is quite noteworthy that the ladder's greater high/low spread is based upon a blended duration while the rolling 10 year average was a high on 10 year T-bonds and a low on a 1 year T-bond. That diversification increased that measure of volatility. Based upon the high/low spread, the immediately preceding rolling 10 year arithmetic average is superior to the ladder; but the ladder is superior to the then-current market rate.

Interest rates between 1962 and 2007 were volatile. Because of that volatility, the geometric mean was smaller than the arithmetic mean for each measure (i.e., current rates, immediate preceding rolling 10 year arithmetic average; and the 10 year ladder) and for each duration (i.e., 1, 5, and 10 years). However, that smaller was minute, ranging between 1 basis point and 4 basis points (did you circle [a] as your answer?). If the "best and safest" is to be a plaintiff (speaking statistically) biased estimator, then, at a minimum, the FE ought to use the geometric mean rather than the arithmetic mean.

Unlike a mean, the median is not influenced by outliers. If rates are volatile, then a median could be a superior measure of central tendency. It is noteworthy that the laddered median was *larger* than both the laddered arithmetic mean and the laddered geometric mean. In contrast, for all other measures and durations the median was *smaller* than the arithmetic and geometric means. Accordingly, the forensic economist **ought to use the median rather than the geometric mean**, and not use laddering.

The median values for the 1, 5, and 10 year T-bond durations are 5.71%, 6.29%, and 6.58%; and the median value of the immediately preceding 10 year arithmetic averages of those three durations are 6.21%, 7.00%, and 7.25%. Again, if the "best and safest" is to be a plaintiff (speaking statistically) biased forensic tool, then the FE **ought to use the 1 year T-bond median** (e.g., 5.71% covering the 1962 through 2007 period).

The rate calculated above will be used to reduce the damage award involving future dollar values to a lump sum. One motive for structured settlements is for the defendant to negotiate with the plaintiff and obtain the plaintiff's voluntary surrender of the "best and safest" (speaking statistically) biased standard. The plaintiff ought to agree if the defendant's proposal for a structured settlement will [a] hold the plaintiff harmless relative to investment quality risk (e.g., annuity offered by a secure provider), as well as [b] hold the plaintiff harmless relative to interest rate risk. Given the magnitude of the "best and safest" standard's (speaking statistically) bias there ought to be sufficient gains from trade between the plaintiff and the defendant that they ought to be able to reach a mutually agreeable arrangement. Of course, defendants will seek legislation mandating structured settlements both because [a] the lack of trust between (some? many? most?) plaintiffs and (some? many? most?) defendants will prevent (some? many? most?) appropriate structured settlements from coming into existence; and [b] (regardless of how one completes the parentheticals in [a]) lobbyists are a profitable investment relative to waiting for and obtaining voluntary agreements.

Lastly, recall that *Jones & Laughlin* refused to reject a total off-set as a patently incorrect discount rate. Using the median recommended above might be inappropriate if the FE is forecasting deflation. In the presence of deflation, the "best and safest" discount rate would be negative.

Table 1: Comparison of different measures of "safest and best" using Treasury Bonds' rates on year's first day of trading 1962 through 2007

Date	1 year	5 years	10 years	Rolling Ten Years Average: 1 year	Rolling Ten Years Average: 5 years	Rolling Ten Years Average: 10 years	Ten Year Ladder using pro rata extrapolation
1/2/1962	3.22	3.88	4.06				3.77
1/2/1963	3.04	3.53	3.82				3.49
1/2/1964	3.84	4.07	4.14				4.03
1/4/1965	3.96	4.12	4.20				4.10
1/3/1966	4.94	4.88	4.63				4.82
1/3/1967	5.00	4.84	4.69				4.84
1/2/1968	5.71	5.68	5.63				5.67
1/2/1969	6.42	6.29	6.04				6.25
1/2/1970	**8.28**	**8.19**	**7.86**				8.11
1/4/1971	4.92	5.98	6.46	4.93	5.15	5.15	5.86
1/3/1972	4.49	5.55	5.94	5.06	5.31	5.34	5.40
1/2/1973	5.72	6.29	6.43	5.33	5.59	5.60	6.19
1/2/1974	7.38	6.86	6.94	5.68	5.87	5.88	7.01
1/2/1975	7.27	7.34	7.42	6.01	6.19	6.20	7.35
1/2/1976	6.20	7.54	7.77	6.14	6.46	6.52	7.27
1/3/1977	4.88	6.16	6.84	6.13	6.59	6.73	6.04
1/3/1978	7.00	7.58	7.83	6.26	6.78	6.95	7.51
1/2/1979	10.58	9.33	9.18	6.67	7.08	7.27	9.60
1/2/1980	11.89	10.52	10.50	7.03	7.32	7.53	10.86
1/2/1981	14.06	12.61	12.42	7.95	7.98	8.13	12.92
1/4/1982	13.56	14.15	14.19	8.85	8.84	8.95	14.01
1/3/1983	8.62	10.02	10.32	9.14	9.21	9.34	9.76
1/3/1984	10.11	11.59	11.86	9.42	9.68	9.83	11.30
1/2/1985	9.19	11.22	11.70	9.61	10.07	10.26	10.86
1/2/1986	7.64	8.51	9.04	9.75	10.17	10.39	8.45
1/2/1987	5.86	6.75	7.18	9.85	10.23	10.42	6.66
1/4/1988	7.15	8.35	8.83	9.87	10.31	10.52	8.19
1/3/1989	9.11	9.25	9.23	9.72	10.30	10.53	9.21
1/2/1990	7.81	7.87	7.94	9.31	10.03	10.27	7.88
1/2/1991	6.74	7.59	7.97	8.58	9.53	9.83	7.49
1/2/1992	4.13	5.98	6.78	7.64	8.71	9.09	5.76
1/4/1993	3.56	5.90	6.60	7.13	8.30	8.71	5.53
1/3/1994	3.67	5.29	5.92	6.49	7.67	8.12	5.07
1/3/1995	7.23	7.88	7.88	6.29	7.34	7.74	7.72
1/4/1995	7.15	7.81	7.82	6.24	7.27	7.62	7.65
1/2/1996	5.17	5.39	5.60	6.17	7.13	7.46	5.40
1/2/1997	5.63	6.30	6.54	6.02	6.93	7.23	6.20
1/2/1998	5.46	5.63	5.67	5.66	6.56	6.87	5.60
1/4/1999	4.58	4.57	4.69	5.33	6.23	6.55	4.61
1/3/2000	6.09	6.50	6.58	5.27	6.13	6.41	6.42
1/2/2001	5.11	4.76	4.92	5.37	6.00	6.22	4.90
1/2/2002	2.28	4.52	5.20	5.24	5.87	6.08	4.16
1/2/2003	1.42	3.05	4.07	5.01	5.64	5.90	2.95
1/2/2004	1.31	3.36	4.38	4.42	5.19	5.55	3.15
1/3/2005	2.79	3.64	4.23	3.98	4.77	5.19	3.60
1/3/2006	4.38	4.30	4.37	3.91	4.66	5.07	4.34
1/2/2007	5.00	4.68	4.68	3.84	4.50	4.88	4.76
Arthimetic Mean	6.16	6.73	6.96	6.72	7.30	7.53	6.65
Geometric Mean	6.12	6.70	6.93	6.70	7.29	7.52	6.62

1 year	5 years	10 years	
1.31	3.05	3.83	**low**
7.69	8.60	9.01	**middle**
14.06	14.15	14.19	**high**
5.00 & 7.15 (x2)	5.98 & 6.29 (x2)	4.62 (x2)	**mode**
5.71	6.29	6.58	**median**
6.16	6.73	6.96	**arithmetic mean**
6.12	6.70	6.93	**geometric mean**

Rolling Ten Years Average

1 year	5 years	10 years	
3.84	4.50	4.88	**low**
6.86	7.41	7.71	**middle**
9.87	10.31	10.53	**high**
5.33 (x2)	all	all	**mode**
6.21	7.00	7.25	**median**
6.72	7.30	7.53	**arithmetic mean**
6.70	7.29	7.52	**geometric mean**

Laddered Ten Year	
2.95	**low**
8.48	**middle**
14.01	**high**
10.86 (x2)	**mode**
6.78	**median**
6.65	**arithmetic mean**
6.62	**geometric mean**