Thomas R. Ireland. 2011. Historical Net Discount Rate Research 1998-2010. *Journal of Legal Economics* 17(2): pp. 99-112.

Data Points

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This is the seventh in a series of features on "Data Points" in the Journal of Legal Economics. This series focuses on empirical data, Internet sites, computer software, and other such resources useful in the practice of forensic economics. If you have an idea for a topic or paper submission relevant to the "Data Points" section, please contact Tom Hale (tom.hale@ssa.gov) or David Tucek (david.tucek@valueeconomics.com).

Historical Net Discount Rate Research 1998-2010

Thomas R. Ireland[*]

I. Introduction

This is a paper about a series of previous papers and book sections containing tables with multiple calculations of historical net discount rates.

The first publication to contain any of the Ireland tables of historical net discount rates was published in 1999 (Ireland 1999). The title of that first paper was "Total Offsets in Forensic Economics: Legal Requirements, Data Comparisons, and Jury Comprehension." That paper contains two basic tables that have continued through all papers over the years. In that first paper, Table 1 contains annual figures for six interest rates and for percentage growth in average weekly earnings and the employer cost index. The interest rates in the original paper were 3-month (91 day), 3-year, 10-year, and 30-year U.S. Treasury debt securities; the corporate Aaa rate; and the municipal bond Aaa rate. Each data series ended in 1998. Figures for the 30 year U.S. bond rate went back to 1977 and figures for the Employer Cost Index (ECI) went back to 1980. All other series contained annual data back to 1959. The second basic table was Table 3, which included the same interest rate information as Table 1, but substituted annual rates of increase in the CPI (Consumer Price Index)

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and MCPI (Medical Consumer Price Index) for average weekly earnings and the ECI index. Subsequent to that publication, Gerald D. Martin asked for permission to reprint the 1999 paper with updated information in *Determining Economic Damages* (henceforth DED) starting in 2000. That paper has been updated and reprinted with the most current tables available in each of the 10 revisions of DED since 2000 as §1261 of DED.

The second paper, "Historical Comparisons Between Various Interest Rates and Growth Rates in the CPI, MCPI, Average Weekly Earnings and Total Compensation in the Employer Cost Index", was published in 2000 (Ireland 2000). The two basic tables from the first paper became Tables 1 and 4 in the second paper, which ends with data for 1999 rather than 1988. Updates to that paper have been published in either the *Journal of Legal Economics* (henceforth JLE) or *The Earnings Analyst* (henceforth TEA) for years ending in 2001 (Ireland 2000-01), years ending in 2003 (Ireland 2002), years ending in 2005 (Ireland 2006), years ending in 2007 (Ireland 2008) and years ending in 2009 (Ireland and Tucek 2010). Unpublished updates were also produced for years ending in 2004 and 2006 and can be downloaded at www.umsl.edu/~irelandt/working.html.

There is one key difference between the sets of tables that were published in the first paper and in DED §1261 thereafter (the first set) and in the sets of tables that were published in the second paper and in its subsequent "Updates" (the second set). The first set provided average interest rates, growth rates and net discount rates in five year increments, while the second set provided the same averages in one year increments. As a result of this reporting difference, table numbering between the two sets is different; using five year increments allowed averages for each rate to be condensed into single tables in the first set but yearly averages required three tables in the second set. Table 2 in the first set contains the same information in five year increments as Tables 2, 3, and 4 in set two provide in annual increments. Similarly, Table 4 in the first set contains the same information in five year increments as Tables 6, 7, and 8 in the second paper contain in annual increments.

This paper considers the forensic economic history of the historical update tables. The second section explains the original purpose of the tables; the third section looks at how the tables have been and can be used in litigation; the fourth discusses an important change recommended by Boyd Fjeldsted (Fjeldsted 2000) in a published note in 2000 and accepted by the author; the fifth section details changes over the years in variables that have been made based on changes in the data available for creation of the tables; and the sixth section accounts the 2010 introduction of David Tucek as a co-author. The final section describes the appendix.

II. The Original Purposes of the Two Sets of Tables

The first two papers (Ireland 1999 and Ireland 2000) had very different titles and stressed two different purposes. The first paper directly addressed total offsets in forensic economics. The term "total offset" can refer to either a zero percent real discount rate or a zero percent net discount rate. In general, it has been used to refer to a zero percent net discount rate by those who employ total offset calculations. The meaning of "total offset" when applied to a typical projection of lost earnings is that the rate at which earnings will grow in the future exactly offset the discount rate. Ireland 1999 provided a summary of "the Alaska Rule" from 1967 to 1986 based on a zero percent real or net discount rate and "the Pennsylvania Rule" which has operated since the decision in *Kaczkowski vs. Bolubasz* (1980) in all Pennsylvania cases other than medical malpractice cases. While not covered in Ireland 1999, there are decisions in both Iowa, *Schnebly v. Baker* (1974), and Kentucky, *Paducah Public Area Library* (1983), that have allowed trial court decisions to stand that were based on total offset assumptions, but those decisions did not establish bright line rules that economic experts must follow. Ireland 1999 reviewed the legal requirements under the Alaska and Pennsylvania rules. That paper then used the first version of the historical net discount rate tables through and including 1998 to conclude that total offsets cannot be justified for comparisons between wage growth and the CPI on the basis of the historical record. Total offset or more-than-offset net discount rates could only be historically demonstrated by comparisons of the 3 month Treasury Bill rate with the MCPI. Finally Ireland 1999 argued that net discount rates other than total offset are not significantly easier for juries to understand than total offset net discount rates.

Ireland 2000 focused on the fact that a number of economic experts have tried to claim that both total offset and more-than-offset net discount rates represented accurate reflections of economic history. As stated in the paper:

> (T)he purpose is to provide broad based data to facilitate whatever historical comparisons any given researcher might wish to make between commonly used growth rates and discount rates. It is this writer's hope that the tables provided in this paper, particularly Tables 7 and 8, will enable good forensic economists to quickly disprove factually incorrect calculations they may confront when looking at the reports of other forensic economists.

Tables 7 and 8 provided net discount rate comparisons between "average weekly earnings of all American workers" and the total compensation index of the ECI with various discount rates. What was left

unstated was the fact that the author wanted to be able to provide evidence that total offset and "more-than offset" values used by a number of forensic economists could not be justified on the basis of the historical record. Typically, such reports would include claims about relationships over long periods that most forensic economists would not have considered in the first place. One historical claim, for example, involved an alleged comparison of wage growth rates with the 3-Month Treasury Bill rate for the fifty year period from 1948 to 1998. A qualified forensic economist would not know without extensive research that such claims were invalid. Tables 7 and 8 would not have directly addressed that period, but did include 40 year comparisons for years ending in 1999. The intent of Ireland 1999 was to have a single document that would allow claims of this sort to be addressed without extensive research.

From that perspective, the tables were an imperfect tool. One expert was arguing for a more-than-offset calculations based on the argument that any data after 1986 was atypical. No historical net discount rate tables have ever been prepared with 1986 as an ending date. Over time, however, the sheer mass of calculated net discount rates has continued to increase. In published papers, there are average rates for five year periods ending in 1998 (Ireland 1999), annual rates for up to 41 years ending in 1999 (Ireland 2000), annual rates for up to 40 years ending in 2001 (Ireland 2000-01), 40 years ending in 2003 (Ireland 2002), 40 years ending in 2005 (Ireland 2006), 40 years ending in 2007 (Ireland 2008) and 40 years ending in 2009 (Ireland and Tucek 2010). Tables were not published but also exist for annual rates of up to 40 years in the 2004 and 2006 unpublished papers identified earlier. Given that five interest rates have been continued through the most current paper, coupled with two earnings series and two CPI series, there are now thousands of available rates for many different periods that will allow claims of opposing economic experts to be checked with relatively little difficulty.

III. Boyd Fjeldsted's Correction

Shortly after the first paper in the series was published (Ireland 1999), it was used as a primary example of a paper containing an error in the calculation of a discount rate based on use of the 91 day Treasury bill for use in litigation to reduce future values to present values. Boyd Fjeldsted (2000) used the Ireland (1999) paper, a paper by Roy Gilbert (1991), and a book by Brookshire and Smith (1990) to highlight the nature of a problem that applies to calculating a discount rate from reported interest rates on 91 Day Treasury bills. Ireland (1999) and Gilbert (1991) had made no effort to deal with the problem pointed to by Fjeldsted, while Brookshire and Smith had made an adjustment determined by Fjeldsted to

be incorrect. Gilbert (1991) and Brookshire and Smith (1990) had argued that the 91 day Treasury bill rate should be used as a gross discount rate, while Ireland (1999) had included the 91 day Treasury bill rate as one rate among six other rates for which calculations were developed. Ireland had suggested that the 91 day Treasury bill rate was a plaintiff-oriented discount rate that should not be used, but which was sometimes used by plaintiff-oriented economic experts.

In his article, Fjeldsted (2000) pointed out that the 91 day Treasury bill rate is a bank discount rate for which interest is reported as a percentage of the face value of a 91 day Treasury bill, rather than as the effective yield on 91 day Treasury bills. Fjeldsted provided a formula that allows a correct conversion from a reported bank discount rate to an effective yield rate, and he gave an example of a bank discount rate on 91 day Treasury bills of 6 percent being converted into an effective yield rate of 6.3217 percent. Fjeldsted went on to point out that Brookshire and Smith (1990) had made an effort to convert reported figures for the 91 Day Treasury Bill rate to an effective yield, but that they had not offered an explanation for the adjustment they made. Further, Fjeldsted pointed out that the adjustment made by Brookshire and Smith, while in the right direction, was insufficient to fully adjust the bank discount rate they reported into an effective yield value. Fjeldsted went on to point out that the error involved was pervasive to the forensic economics community and that most forensic economists who used discount rates based on the 91 day Treasury bill rate appeared to have no awareness that any kind of correction was needed.

Fjeldsted was kind enough to explain this correction to me in time for correction to be made in Ireland (2000), which was published in the same issue as Fjeldsted's note. In effect, making the conversion properly strengthened points Ireland made in the 1999 paper. From Ireland (2000) on, and in all updates to the 1999 paper that were published in DED §1261, tables used Fjeldsted's (2000) formula to convert reported bank discount rates for the 91 day Treasury bills into effective yields.

IV. Other Uses of the Tables in Litigation

As noted earlier, the original purpose for the historical net discount rate tables was to enable refutation of false claims about historical net discount rates that had been appearing in various plaintiff expert reports. Even using the 91 day Treasury bill, correctly or incorrect, net discount rates of zero percent cannot be justified based on the historical record. An unanticipated advantage of the tables was that a wide range of net discount rates was provided, giving empirical support for net discount rates that the author already believed were reasonable. For example, this author believes that the most appropriate net discount rate for an earnings loss calculation

is 2.0 percent, that the best measure of earnings growth is annual rates of increase in average weekly earnings for private non agricultural and non supervisory workers, and that the two most reasonable gross discount rates are the 10 Year U.S. Treasury bond rate and the Aaa municipal bond rate. Using 2009 tables provided in Ireland and Tucek (2010), the relevant net discount rate values are found in Table 7 (page 97). If one looks down the column for net discount rates based on average weekly earnings in comparison with 10-year U.S. Treasury securities, one finds that a 2.0 percent net discount rate is shown for a period of 17 years ending in 2009. For that same period, a net discount rate based on the Aaa municipal bond rate is 1.98 percent. For tables ending in 2007 (Ireland 2008), a comparison using average weekly earnings in comparison with 10-year U.S. Treasury securities shows a net discount rate of 2.04 percent for 14 years. For that same period, a net discount rate based on the Aaa municipal bond rate is 1.87 percent. While most forensic economists would agree that no specific historical period must be used in projecting future net discount rates, being able to demonstrate that the net discount rate that an expert has used is consistent with data for a reasonable period in the past is often satisfying to judges and attorneys. Any projection of future damages is subject to a great deal of uncertainty. Being able to demonstrate that the net discount rate being used would have been accurate for a reasonable period in the past ending in the most recent available year provides substantial support for the rate being used.

This is also a check on the realism of an expert's own assumptions. If an expert was using a net discount rate for which there was no historical period for which that rate was accurate, this would be a good indication that the rate being used is not reasonable. Using the tables in this way provides an expert with a way of reviewing recent economic history with a focus on the accuracy of any net discount rate being used. No one historical period is the best period to consider, but if the rate being used does not fit any historical period some change in assumptions is probably warranted. Considering comparisons of net discount rates over recent historical periods provides substantial information to an expert regarding the reasonableness of the net rates that expert is using.

V. Changes in Variables Over the Years

One discipline used in the construction of the tables has been that all data used has come from annual editions of the *Economic Report of the President*. This was done to prevent questions regarding whether sources were chosen to achieve any particular desired results. Most forensic economists would not regard that is being an issue, but this discipline has been in place for the eleven year period over which historical net discount

rates have been developed. Over that eleven year period available data has changed and been revised. In the first version of the tables, six different interest rates were compared to two wage growth series and with the CPI and MCPI. One of the interest rates used was the 30 year U.S. Treasury bond rate. The U. S. Treasury stopped issuing 30 year bonds on February 18, 2002 and the interest rate on 30 year bonds was dropped from the tables thereafter. On February 9, 2006, the U.S. Treasury resumed issuing 30 year bonds, but the 30 year rate has not been re-added to the tables.

VI. Addition of David Tucek as a Co-Author

Until the current version of the tables (Ireland and Tucek 2010), Ireland was the sole author of the tables, both in the form annually updated in DED and in the separate update papers. As of the 2010 update version of the paper, David Tucek has been added as a co-author. Currently, the understanding is that Tucek will revise the update paper for years after 2009. Ireland will remain a co-author for one more edition of the paper and Tucek will become the sole author of updates issued after the next edition.

In the recent past, Tucek has been playing an increasingly important role with respect to the tables. For example, one feature of the tables the current paper has not yet discussed is that long term annual average growth and discount rates reported in the tables have been arithmetic averages and not geometric averages even though net discount rates calculated from those averages were calculated geometrically. Early testing by Ireland determined that use of arithmetic averages up to 20 years produced results that were insignificantly different from results based on geometric averages. Tucek has reproduced the results of all relevant tables in Ireland and Tucek (2010) for all time periods in the most recent tables and has determined that doing so results in differences no greater than 4 basis points for any time period. Tables based on periods ending in 2010 will be based on geometric averages at all stages in the development of the tables. Additionally, during the preparation of Ireland and Tucek (2010), Tucek checked every value in all tables and corrected several very small errors. Tucek's careful proofreading of the 2010 paper was also very thorough, resulting in a number of small changes that would not have occurred to this author, but which this author considered to be definite improvements.

VII. Related Legal Decisions

This paper's appendix provides descriptions of legal decisions regarding either the use of historical net discount rates or of instances in which zero percent net discount rates were used.

Appendix (Legal Decisions Involving the Tables or Total Offset)

A. Federal

C.M. v. United States, 2006 U.S. Dist. LEXIS 82127 (E.D. MO 2006). This is a memorandum by Judge Steven N. Limbaugh, describing his opinion in a case involving an injured minor child. In the damages section, the life care plans of Robert Voogt and Christy L. Gibson and the economic calculations of Charles Linke for the plaintiff and Thomas Ireland for the defense were described. Linke had prepared calculations based on a zero percent and 1 percent net discount rates, while Ireland had used a net discount rate of 3 percent. Judge Limbaugh indicated that the Court found "the rationale of Dr. Ireland more persuasive." Ireland's papers on "Historical Net Discount Rates" probably played an important role.

B. State

Alaska

Beaulieu v. Elliot, 434 P.2d 665 (Alaska 1967). The Alaska Supreme Court held that "justice will best be served by permitting the trier of fact to compute loss of future earnings without reduction to present value. The plaintiff is more likely to be restored to his original condition under the rule we adopt than under the prevailing rule which calls for a discounting of the award for future earnings." The Court went on to suggest that this decision was "fortified" by the fact that future wage increases will tend to offset the discount rate that would be used to reduce future earnings to present value. This decision also held that taxes should not be subtracted from awards in tort actions. The portion of this decision that deals with discounting was overruled by the Alaska legislature in the tort reform act of 1986, which also specified that the discount rate used must be a long term rate. Taxes are still not subtracted in Alaska based on *Beaulieu*, but Alaska has not required any type of total offset discounting since 1986.

Iowa

Schnebly v. Baker, 217 N.W.2d 708 (Iowa 1974). The Iowa Supreme Court upheld a trial court decision that the cost of life care for a child would increase at the same rate as the discount rate. The decision appeared to assume that the rate of inflation and the growth rate of the cost of care for the child were the same. This was a case cited in *Paducah Area Public Library v. Terry*, 655 S.W.2d 19 (1983) as having allowed a total offset assumption by the trial court. However, the essence of the decision was that inflation could be considered, but that future values should be reduced to present value. The trial court had offset future inflation with the

discount rate and the *Schnebly* court held that was permissible based on the evidence in the *Schnebly* case.

Kentucky

Calarie v. United States, 1984 U.S. Dist. LEXIS 16202 (W.D.Ky 1984). This is a decision in a Federal Tort Claims Act (FTCA) in the Western District of Kentucky by Judge Ballantine. The plaintiff claimed that damages should be calculated based on total offset based on the Kentucky state decision in *Paducah Area Public Library v. Terry*, 655 S.W.2d 19 (1983). The judge cited *Doca v. Marine Mercante Nicaraguense, S.A.*, 634 F.2d 30 (3rd Cir. 1980) in adopting what he called a 2 percent "real rate of interest" but appears in context to have been a net discount rate since he apparently did not separately consider a real growth rate.

Paducah Area Public Library v. Terry, 655 S.W.2d 19 (1983). The Court of Appeals in Kentucky held that the trial court had not erred in excluding testimony about reduction to "present worth" or the refusal to advise the jury that an award was free of federal and state income tax. The court emphasized that the emphasis of tort law in Kentucky was compensation, not retribution. It said: "The law recognizes the fundamental importance of the ability to earn, and therefore mandates that the impairment of earning power should be fully compensated." On that basis, the court held that personal consumption should not be subtracted in death cases and that federal and state income taxes, which were essentially similar to personal consumption of a decedent, should also not be subtracted. In a death case, the estate was entitled to recover for the same amount of lost earnings that a living personal injury victim could recover. The court held that awards for lost future earnings must be in the form of present worth, but suggested that juries understand both discounting to present worth and the impact of future inflation. For that reason, it upheld and favorably commented upon the decision of the trial court judge to preclude testimony about both discounting to present worth and increasing future damages because of inflation. It also said, however, that: "The injection of such matters is not prejudicial but irrelevant and non-essential; all however within the discretion of the trial court." This decision has been interpreted by some as establishing a requirement for a total offset assumption between inflation and the discount rate in projecting damages in Kentucky. The court relied heavily on a series of Alaska decisions based on *Beaulieu v. Elliot*, 434 P.2d 655 (Alaska 1967), an Iowa decision, *Schnebly v. Baker*, 217 N.W.2d 708 (Iowa 1974), and the Pennsylvania decision of *Kaczkowski v. Bolubasz*, 491 Pa. 561 (1980) to reach the conclusion that there was "expanding recognition of the total offset rule." However the court also cited *Doca v. Marina Mercante Nicaguense, S.A.*, 634 F.2d 30 (2nd Cir. 1980) to this same effect even though the Doca court had held that a 2

percent net discount rate was appropriate to reduce future values to present value.

Winston v. United States, 11 F. Supp. 2d 948 (W.D. Ky. 1998). In a federal decision interpreting Kentucky law, the plaintiff brought a motion *in limine* to preclude testimony about damages that were not calculated by total offset, as recommended in *Paducah Library v. Terry*, 655 S.W.2d 19 (Ky. App. 1983). The judge held that the Paducah Library decision was a Kentucky evidence case and thus not binding in federal court. Judge Charles R. Simpson III clearly defined what "total offset" meant and why the judge considered such calculations inaccurate. He also pointed out that he considered the logic of the Paducah Library court to be weak and that the Paducah Library court had "pulled back" from adopting its total offset recommendations as "absolute."

Pennsylvania

Helpin v. Trustees of the University of Pennsylvania, 2010 Pa. LEXIS 2911 (Pa 2010). The Pennsylvania Supreme Court renewed its commitment to its decision in Kaczkowski v. Bolubasz, 421 A.2d 1027 (Pa. 1980), holding that calculation of lost future earnings in Pennsylvania other than medical malpractice cases must be based on a zero percent real discount rate, meaning that "viewed long term, inflation rate and interest rate will completely offset each other." Justice Saylor's dissent called for normal discounting, as in other states. Justice Saylor's dissent cited Ireland (1999) in support of his position.

Kaczkowski vs. Bolubasz, Pa. Supreme, 421 A.2d 1027 (1980). The Pennsylvania Supreme Court held that damages should be based on a "total offset" between rate of inflation and discount rate in all Pennsylvania cases, but allowed Pennsylvania trial courts to have testimony about productivity gains an individual worker might have achieved over the worker's lifetime. In its analysis, the Court rejected theories that ignored the impact of future inflation, but ultimately chose between "the evidentiary approach" taken by the Court in Feldman v. Allegheny Airlines, 382 F. Supp 1271 (D. Conn. 1974), aff'd 524 F.2d 384 (1st Cir. 1975) and a modified version of the "total offset" approach taken by the Alaska Supreme Court in *Beaulieu v. Elliot*, 434 P.2d 665 (1967). *Beaulieu* did not separately consider productivity increases, which *Kaczkowski* allowed. The *Kaczkowski* court said:

> Upon proper foundation, the court shall consider the victim's lost future productivity. Moreover, we find as a matter of law that future inflation will be presumed equal to future interest rates with these factors offsetting. Thus, the courts of this Commonwealth are instructed to abandon the practice of

> discounting lost future earnings. By this method, we are able to reflect the impact of inflation on these cases without specifically submitting this question to the jury.

Justice Flaherty dissented, saying:

> (S)uch an approach is a simple one, but it does not achieve justice, and, has only been adopted in one jurisdiction, i.e. Alaska. We should simply permit expert testimony on the issues of inflation *and* productivity.

On March 2, 2002, the Pennsylvania legislature enacted The MCARE Act (PA 2002-13) requiring that ordinary discounting procedures should be applied in medical malpractice cases to projections of lost earnings, but other types of cases in Pennsylvania still require use of total offset discounting.

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