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The *Litigation Economics Digest (LED)* specializes in presenting applied articles in the discipline of forensic economics, and useful consulting information to the forensic practitioner.

The LED is published bi-annually at a subscription price $50 a year for NAFE members, and $60 for non-members. Subscriptions should be sent to the National Association of Forensic Economics, P.O. Box 30067, Kansas City, Missouri 64112.

We are now soliciting articles in forensic economics for publication in future issues. The next issue will be Fall 1997. The *Digest* contains articles in the following arenas: Applied Forensic Economics, Law and Economics, Data Sources, Computer Programs, and Ethics in Economics. Those interested should forward two copies of their article, along with any other pertinent information, and a reviewer fee of $25 (payable to LED), to the Editorial Office as the address shown below.

<div align="center">

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The National Association of Forensic Economics expresses its thanks to the University of Missouri-Kansas City, for technical support in producing the *Litigation Economics Digest.*

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In our last issue (Vol. II, No. I, Fall 1996) a line of text of Clifford B. Hawley's article, "Where Have All the Black Pharmacists Gone? Litigation, Affirmative Action and Government Statistics" was inadvertently deleted during production.

The missing line is between the last line of text on page 9 and the first line of text on page 10. The missing line should read:

". . . years before the survey change (questions 3 and 4 above). The outcomes are as expected. The "

Litigation Economics Digest regrets the error.

Forensic Implications of Inflation-Adjusted Bonds

Thomas R. Ireland*

The U. S. Treasury's inaugural auction of inflation-indexed bonds (TIPS for Treasury Inflation-Protected Securities) took place on January 29, 1997, attracting bids totaling $37.2 million, or about five times the amount offered, and an initial yield of 3.45 percent [Zuckerman, 1997]. It's second auction on April 8, 1997, attracted bids of $8 billion, or slightly more than twice the amount offered, with a yield of 3.56 percent [Zuckerman and Harper, 1997]. The importance of these bonds is indicated by the fact that they were the subject of two papers presented at the April, 1997 meetings of the American Academy of Economic and Financial Experts (AAEFE), one by Thor Bruce and William Landsea, and the other by Edward M. Cross. The Treasury has also provided interested buyers of these bonds with a special internet home page at http://www.publicdebt.treas.gov/of/ofinflin, which should be visited by all forensic economists. A good introduction to these bonds is contained in Neeley [1997] or Wrasse [1997].

TIPS provide market based estimates of both the real interest rate and the expected rate of future inflation in a way that raises serious questions about the legitimacy of the discounting practices employed by some forensic economists. Given market demonstrations of a real rate of interest that is greater than 3 percent, net discount rates of much less than 2 percent may be hard to justify, for reasons discussed later in the paper. However, various institutional aspects of the bonds, particularly aspects relating to federal income taxation, prevent them from being a perfect measure of a default risk free, inflation risk free discount rate that can be used in damage reports without adjustment. Because of these issues, every forensic economist will need to develop a reasonably sophisticated understanding of these bonds *and their substitutes*, and to be able to explain why they do, or do not, rely on these bonds. One of the relatively unnoticed aspects of this development is that both corporate and municipal bond equivalents of TIPS have been issued, with quite important implications of their own.

This paper considers five topics relating to inflation-indexed bonds. The first is the importance of having a set of financial instruments that would be completely free of inflation risk, which depends on whether damage awards need to be free of inflation risk. The second topic focuses on problems with inflation-indexed bonds in providing a suitable measure for an inflation risk-free damage award portfolio of investments. The third topic focuses on the existence and development of substitute corporate and municipal bond instruments with inflation risk-free yields to maturity. The fourth topic is a discussion of the actual experience with rates of return of inflation risk-free bonds during the period from January 29, 1997 to May 9, 1997. The fifth topic considers the importance for forensic economists of market based tests for the size of the real interest rate and the expected rate of inflation.

The Debate over the Relevance of Inflation Risk-Free Rates

A portfolio of tax-protected, inflation-indexed and default-risk free debt instruments with maturities that exactly matched a projected future stream of losses would provide a stream of payments that would exactly replace those losses. If such a portfolio existed and were used as a standard for the development of a damage award, the injured party would be given an absolute guarantee of real purchasing power payments to replace whatever annual loss values were being projected. In the real world, no such perfect measure exists and the new TIPS bonds do not change that fact, but they do provide a mechanism for moving a few steps closer to that perfect measure. Treasury securities are not protected from federal income taxes, can only be indexed to some measurement of inflation which may not be perfect, and are not completely and absolutely free of default risk. If an asteroid destroys the east coast from Washington, D.C., to New York City, the U.S.Treasury will default on payments, at least temporarily.

Default-risk is the risk that scheduled payments on a debt instrument will not be made, or will be made late. *Inflation-risk* is the risk that the payments made will not have the purchasing power expected at the time the debt instruments were created. The *tax-protection* issue is relevant because any subtraction from a loss replacement fund for the purposes of paying required income taxes is a subtraction that must somehow be replaced in order for the fund to make all replacement payments. The *matched maturity* issue relates to the fact that a perfect replacement portfolio would make payments of exactly the right amounts at exactly the times that projected losses needed to be replaced. TIPS bonds provide an improved mechanism for addressing only the *inflation-risk* aspect of this set of four dimensions. However, these new bonds must also be considered in terms of their "fit" in terms of the other three dimensions as well, as will be considered in the next section.

An inflation indexed bond is a bond designed so that the borrower is guaranteed not to lose or gain purchasing power through unexpected changes in the rate of inflation. For such a bond to be the perfect replacement for a given loss at a specific time in the future, the bond would have to be a "zero coupon" bond that made its only payment exactly when the loss would have occurred. If that bond were also a Treasury instrument, it would also be as close to being "default-risk" free as it is possible for any debt instrument to be. If it were also tax-protected, an offsetting calculation of future tax liabilities on the payment could be avoided. While the new Treasury inflation-adjusted bonds do not meet all of those requirements, the first question to be considered is whether the inflation risk-free criterion needs to be considered in the first place for damage awards.

There is general agreement among forensic economists that default risk should be virtually eliminated from the discount rate used in personal injury and wrongful death damage calculations. This was clearly enunciated in *Jones & Laughlin v. Pfeifer* (1983) by the United States Supreme Court and is generally not a source of controversy. Given that damage calculations normally include reductions for probabilities that the individual will not survive, be a labor force participant or be unemployed, it would be inappropriate to use a discount rate with premiums to cover the possibility of nonpayment of the debt securities. To do so would be to double count the risks that the worker would not have earned projected incomes. Default risk, however, is entirely a downside risk. Damage projections are made on the basis that certain amounts of money will be needed to replace losses in the future. If default occurs, the amount of money will be insufficient to make scheduled payments, but

there are no circumstances in which the debt instruments could pay more than the scheduled amounts. They will either pay what is scheduled (non default), or pay less (default or partial default).

The same is not true with inflation risk, which can result in higher or lower than scheduled payments. At any given time, a market interest rate contains a forecast of future expected inflation in the form of an "inflation premium" for the amount of inflation forecast (the meaning of the Fisher equation). For example, if both a lender and borrower agreed to a real interest rate of 3 percent and anticipated an inflation rate of 3 percent, they would agree to a nominal interest rate of about 6 percent, which would include the real rate of 3 percent plus a 3 percent inflation premium to compensate the lender for anticipated reduction in purchasing power of 3 percent.[1] Unlike default risk, however, the risks are not one sided and apply to both sides of the debt transaction, as is shown in the comparison in Figure 1.

Figure 1
Comparison of Frequency Distributions
With Inflation Risk and Default Risk
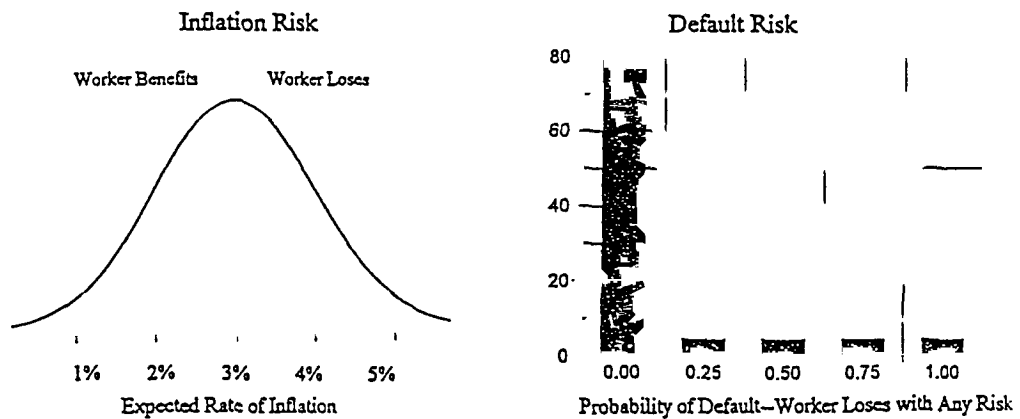
In Figure 1, there is a symmetric distribution of outcomes around a distributional mean that consists of the expected rate of inflation of 3 percent. With any outcome to the left of the mean, the rate if inflation is smaller than 3 percent, and the injured worker benefits if his award was premised on 3 percent inflation. With any outcome to the right of the mean, the rate of inflation is higher than was expected and the injured worker has real purchasing power losses relative to the forecast. While the distribution of outcomes is symmetric, the utility value of the downside risk is greater than the utility value of the upside risk, for risk averse persons. Nevertheless, any calculation of the present value of the stream of future payments would be unaffected by including such risks in the calculation since the upside and downside variances are equal. Increasing inflation risk would simply increase the spread of

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[1] Technically, the Fisher equation is somewhat more complex than this explanation, but the degree of complexity does not warrant full development in this context.

the variance without changing the expected value of the result. With respect to default risk, however, the distribution is truncated at the non-default rate of return and all of the risk is downside risk. In the example in Figure 1, the assumed outcome distribution is an 80 percent probability of full payment of an 8 percent nominal interest payment, with 5 percent probabilities of 25 percent, 50 percent, 75 percent and 100 percent defaults on the interest payments (for simplicity, the principal is assumed not to be at risk). The expected rate of return on this asset is 7 percent on a probability adjusted basis. In this case, increasing the risks of the four negative outcomes will automatically reduce the expected rate of return, and thus the present value of the asset.

This issue can be understood as follows: Default-risk on securities is roughly the analog for risks that the worker would not obtain expected future wages because of death, injury, illness or unemployment. To separately account for such risks in a damage projection and then also use a discount rate containing default risk premiums is to effectively double count the risks involved, first by reducing expected earnings and second by using a discount rate containing risk premiums. However, no similar double counting is involved with inflation-risk. Unexpected inflation might have helped or hurt an uninjured worker by raising or lowering his real earnings over his pre-injury worklife, just as unexpected inflation might help or hurt the injured worker by raising or lowering the real yields on his damage award after the injury. The inflation risks involved may not be equal, but there it is not an obvious and simple conclusion that a worker is more subject to inflation risk after his injury because of inflation risk in yields on his post-injury asset portfolio. If the levels of inflation-risk on future earnings before the injury and on asset yields after the injury are similar, there is no risk equalization argument for providing an award that is free of inflation-risk.

At the heart of the debate over whether damage awards should be free of inflation risk is the question of whether there should be a reduction in the value of the discount rate to eliminate a risk premium for a risk that may produce either more or less purchasing power than forecast. Economists who do not feel that damage awards need to be free of an inflation risk would not necessarily use a discount rate based on inflation-adjusted bonds, regardless of the problems with the fit of the bonds with respect to the other criteria considered in the next section. However, such economists might still want to use the rates on TIPS bonds to determine the appropriate real rate of interest and the current expected rate of inflation, as will be discussed in the last section of this paper.

Problems with Using Treasury Inflation-Adjusted Bonds

For economists who do want an inflation risk-free discount rate, there are five problems with the TIPS bonds. First, the development of these bonds is too recent for many aspects of the bonds to have become clear, and for secondary securities markets to provide a full set of maturity options for the purposes of matching particular loss periods. The initial bond issues were ten year notes, so that, at this point, only two periods can now be matched-- ten years and approximately 9.75 years. As time goes on, a full a full range of maturities will gradually become available. The Treasury has indicated that it will issue 5 year, 20 year and 30 year instruments as well as 10 year instruments. The July, 1997, and October, 1997, TIPS auctions will both be for 5 year instruments. As the full range of maturities gradually fills out, a great deal more about how these instruments relate to other instruments will become known. At this moment, with but two auctions for only ten year notes, what is available is two snapshots, represented by the two auctions and the several month movement

of rates on these instruments relative to 10 year Treasury notes that are not inflation indexed, as shown in Figure 2.

The second problem is that tax treatment of the bonds have consequences that affect the market determination of the rate of return on the bonds. In effect, the taxation that derives from taxes owed annually on inflation premiums paid on principle, accelerates interest income on the bonds, thus increasing current tax liability relative to non-TIPS Treasury securities. To offset this effect, the yields must be slightly higher than on non-TIPS securities with similar maturities. Using a 31 percent marginal tax rate, Wade Gafford found that this impact of tax treatment of TIPS would be a premium of no greater than 24 basis points above the true real rate of interest.[2] This tax effect is separate and distinct from the tax consequences for an individual who attempted to use TIPS bonds in a portfolio of assets to replace future damages, which is the next problem to be discussed.

The third problem is that the tax treatment of TIPS bonds creates special problems for their use in a damage replacement portfolio. The bonds themselves are coupon bonds, sold in $1000 denominations. A purchaser receives semi-annual interest payments, calculated at one half of a fixed nominal annual interest determined at the time of the auction. The inflation-adjustment occurs by adding an amount to the $1000 principle based on changes in the CPI and by calculating the interest payment on the latest indexed principle amount. The tax consequence, as determined by the Treasury, is that taxes must be paid annually on both the interest actually received and on the amount of inflation adjustment added to the principle. If inflation was high enough (estimated at above 6 percent), this would result in a bond holder paying more cash in taxes than was actually received in the form of interest in given years. This could be handled by properly timing the maturity dates of bonds in the portfolio so that returns of principle (which is not taxed as a capital gain) would be large enough to generate sufficient income to both pay relevant taxes and provide forecast real earnings, but it would require very sophisticated money management to

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[2] Correspondence from Wade Gafford, June 14, 1997. Gafford first calculated the greater yield required on TIPS securities because taxes are due when inflation premiums are added to the principle instead of at maturity when the cash is received. Gafford then calculated a second adjustment. This adjustment was to increase the new yield to reflect the fact that market participants would require a lower yield on Treasury securities because those securities are exempt from state and local taxes. Using the 31 percent federal marginal income tax rate and a 4 percent state and local tax rate, Gafford calculated the offset at 9 basis points, for a net change of 24 basis points. As alternatives, using a 15 percent marginal federal tax rate, Gafford found a net 1 basis point change, and using a 28 percent marginal tax rate, he found a net 18 point basis point change. (In the development of a net discount rate later in this paper, however, only Gafford's first adjustment to 33 basis points is needed, since state and local taxes are already excluded in a comparison with non-TIPS Treasury securities.) It is also important to distinguish the market tax effect Gafford was considering from tax effects an individual would incur due to the interest payments and inflation premium payments on the individual's own damage replacement fund. Those tax effects would depend on the individual's personal tax situation and the size of the damage replacement portfolio. These matters will be discussed in detail in a forthcoming paper by Gafford.

accomplish this. (However, this effect probably should not be a problem for structured settlements in which constructive receipt does not occur until payments are actually made, rendering these tax problems moot.)

The fourth problem is that some issue has also been raised over the fact that these bonds are "strippable" in the sense that the coupons, which represent fixed nominal amounts of payments, may be "stripped" from the underlying bonds themselves, and sold separately [Cross, 1997; Bruce and Landsea, 1997]. With a ten year note, there would be 20 coupons, representing 20 biannual fixed nominal payments scheduled to be made every six months over the ten year life of the note, at the end of which the bond holder receives back the $1000 principle plus accumulated CPI adjustments over the entire ten-year period. If the coupons are stripped from the notes and sold separately, the notes become effectively zero coupon bonds, but the tax implications of this set of transactions become highly complex. Concerns in this area will not be considered here, but the point here is that zero coupon bonds without stripping would be preferable from a portfolio construction standpoint. However, since complex tax issues exist with other types of coupon bonds as well, and since economists use those bonds without concern, this limitation should not be over dramatized.

The fifth problem is inherent for forensic economists who utilize net discount rates for wage and fringe benefit loss and for persons trying to use them in life care plans requiring substantial future medically related expenditures. The net discount rate they need to use for discounting and the real interest rate are not the same rates. They must somehow add a separate factor for cost increases above the CPI, or for real productivity increases in wage rates. And since these factors do not have market determined equivalents, the net rates being employed still contain elements projected by the economist. In other words, even though an economist using the rate on inflation-adjusted bonds can argue on a market determined basis that this is the correct real interest rate, the net rate itself still involves adjustment of the market rate based on judgements of the economist. Thus, even if an inflation-risk free rate is desired, and even if tax problems with new Treasury inflation-adjusted bonds did not exist, the existing rates on these bonds do not provide purely market based estimates of net discount rates. They allow an economist to get closer, but the economist must still use judgment based increments as well. While in recent years, average wage increases for all American workers have tended to approximately equal changes in the CPI (which may correspond to real increases of 1 percent per year if the CPI overstates inflation by that amount), historically, wages have risen faster than the CPI. For economists who believe that wages are likely to increase faster than the CPI in the future, the differential between wages and the CPI must be forecast in the same manner as before these bonds existed. The same is true of medical expenses in a life care plan if an economist believes that medical expenses will continue to rise faster than the CPI in the future. In both cases, the interest rate on inflation-adjusted bonds must be adjusted before it can serve as either a net discount rate for wages or for a medical cost projection, which reduces the allure of such rates.

Other Important Inflation-Adjusted Rates

Often overlooked in accounts of TIPS bonds is the fact that private corporations have issued such bonds in the past and that there was some increased activity of that type when the Treasury bonds were issued. And of potentially greater interest to forensic economists, municipal inflation-adjusted bonds have also been issued. From a tax

perspective in forensic applications, U.S. Treasury instruments are almost perfectly disoptimal instruments for dealing with the tax implications of interest on a damage replacement fund. They are immune from state and local tax, but liable to federal tax and thus are neither tax free nor fully tax liable rates. Corporate bonds, while having potentially greater default risk, are tax liable for both state and federal income taxes. At the time of the first Treasury auction of inflation-indexed bonds, there was a small flurry (very small) of new corporate inflation-adjusted issues, whose tax consequences may be different from those on the Treasury notes. Dreyfus has even indicated an intention to develop bond mutual funds holding only corporate inflation-adjusted bonds, with possibly still different tax consequences [Clemens, 1997].

But what is probably more important is the beginning of issuance by municipal governments of fully tax-protected inflation adjusted bonds [Zuckerman and Harper, 1997]. In April, 1997, the city of Orlando, Florida issued $40 million in inflation-protected and tax-protected "Muni CPIs," and there was discussion of other municipal governments doing likewise. The first "Muni CPIs" came out with yields of slightly more than one percent, which seems very small compared with the partially tax protected Treasure notes issued at 3.65 percent at the same time. Whether this proves to be an anomaly, as seems likely, or is something else remains to be seen. However, if a full range of municipal inflation-adjusted bonds were to develop, the tax problems with U.S. Treasury notes discussed above would not be relevant, though this would pose the question of whether municipal Aaa bonds meet the legal requirement of being default-risk free (remember that even U.S. Treasury securities are not absolutely risk free).

Three Months of Experience with Treasury Inflation-Indexed Bonds

Table 1 provides 14 weekly observations of yields on both indexed and non-indexed 10-year Treasury bonds and Figure 2 shows that information graphically. Figure 3 shows the same information on a daily basis. One concern about these bonds has been that their rates would show high volatility. The actual range to date is from 3.25 percent on February 14, 1997 to 3.65 percent on April 25, 1997. During that same period, 10-year non-indexed Treasury securities varied from 6.37 percent on February 14, 1997 to 6.92 percent on April 11, 1997, an approximately similar result. What may be more interesting is the fact that the implicit average annual estimate of inflation, based on the a geometric determination of differences between indexed and non-indexed 10-year bonds, varied in the narrower range of 2.97 to 3.21 percent over the same period.[3] While it is far too early to draw definite conclusions, the early experience does not appear to suggest undue volatility.

The coupon yield on the bonds is determined at the time of the auction and remains in effect over the life of the bonds. Once the bonds have been issued, however, their prices are free to vary on the secondary markets. The actual yield is determined as follows: The initial price of the bonds is set equal to 100 as an index value that is defined relative to the CPI index in existence at that time. If the CPI index rises 3 percent and the purchase price

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[3] A geometric difference is determined calculating $[(1 + FCM10)/(1 + F10J971)] - 1$ for each set of weekly rates listed in Table 1. This is based on the commonly understood version of the Fisher equation.

rises by more than 3 percent, the index ratio will become greater than 100, meaning that current buyers will have to pay a relatively higher price for the coupon yield than did the initial buyers. Thus the actual yield will become smaller than the coupon yield. If the purchase price rises by less than 3 percent, the index ratio will fall below 100 and the actual yield will become greater than the coupon yield. This can probably be best illustrated by looking at the listing in the *Wall Street Journal* from June 6, 1997 (page C-16).

Inflation-Indexed Treasury Securities

Rate	Mat.	Bid/Asked	Chg.	Yld.	Accr.Prin
3.375	01/07	98-11/13	+.02	3.568	1010

The rate is the initial coupon rate of 3.375 on the bonds issued in January, 1997. The maturity date (Mat.) is January, 2007. The bid price index is 98 and 11/32nds, or 98.34. The asked price index is 98 and 13/32nds, or 98.41. Change (Chg) is change since the day before. Yield equals the 3.375 coupon rate plus a 0.193 capitalization rate premium necessary to increase 98 to 100 over a 9.5 year period, or 3.568.

The Importance of TIPS as Market Based Tests in Forensic Practice

The real importance of TIPS bonds lies in the fact that they reveal, for the first time, market based tests of both the real rate of interest and the expected rate of inflation. Even though the full yield curve has not yet been revealed and even though TIPS bonds are not well suited to the specific needs of a damage replacement portfolio in most circumstances, TIPS bonds offer market determined estimates for two key variables often considered by forensic economists. The size of the rates that have been revealed gives some real indication that rates previously used by forensic economists may need to be reconsidered. We now know that the market's estimate of the real rate of interest, without accounting for the tax effect of about 32 basis points discussed earlier, is currently falling within a range from 3.26 percent and 3.63 percent over a ten year horizon. We also now know that the expected rate of inflation over the same period is very close to 3.0 percent. Since these values are being published in sources where attorneys can see them, it is likely that rates that seem inconsistent with these values may be questioned closely. The experience with TIPS bonds thus far does not allow us to know the variability that may exist over time in market estimates of these rates, but the variability thus far has been quite narrow.

If these rates do prove to be stable over a longer period of time, net discount rates for standard lost earnings estimates of much less than 2 percent may be very hard to justify. If the TIPS real rate of interest is 3.5 percent, an adjustment for market based tax effects could lower that rate to about 3.2 percent. From that point forward, there are only two sources for narrowing this rate to determine a net discount rate for purposes of a lost earnings projection: Real wage increases and premiums to be added to cover tax consequences of interest and inflation adjustments for the specific individual involved. Based on recent history, it would be hard to argue for real wage increases of more than about 0.75 percent per year. With a real interest rate subject to federal income taxes only of 3.2 percent, reduced 0.25 for shorter term yields in the early years of the fund, a real growth rate on lost earnings of 0.75 percent, and the net discount rate is 2.2 percent.

The tax factor depends on the tax position of the person whose earnings are being

The tax factor depends on the tax position of the person whose earnings are being replaced.[4] While some economists do not make tax adjustments in their discount rates, at least in states where tax liability against income is excluded from consideration in damage reports, this author believes that taxability of interest on a damage replacement fund is always relevant. Taxes owed on interest in the loss replacement fund produce only a fairly small adjustment in many cases. Assume, for example, that a given individual is totally disabled and receives an award of $500,000, and that the return on this portfolio is 6.7 percent, the most recent rate on non-indexed 10 Year Treasury Bonds. Assume further that the injured person is single (which increases his tax rate), but has no taxable income other than the earnings on his loss replacement fund. Then also make the heroic assumption that the individual takes annually from the fund only the amount in real purchasing power that has been forecast for him by his economist.

This person will have interest earnings in the first year of $32,500, which will be liable for federal income tax only, since Treasury securities are immune from state and local taxes. He or she would have been entitled last year to an exemption of $2,550 and a standard deduction of $4,000, leaving a net taxable income of $25,950. The 1996 tax tables show a tax of $4153 for a single person. As a percent of $32,500 in interest, this is an average federal tax rate of 12.8 percent. Reducing 6.7 percent by 12.8 percent yields an after tax interest yield of 5.84 in the first year of the fund. This tax effect might increase slightly over the first few years of the fund, but then would decline significantly as the fund began to decline with successive reductions in the size of the fund over the loss replacement period. This effect, overall, would be significantly less than one half of one percent. Let us assume that it is one third of one percent. Starting with a real interest rate subject to federal income taxes only of 3.2 percent, adjusted as before to 2.2 percent, adding 0.33 for individual tax effects, still generates a net discount rate of 1.87 percent. To arrive at a net discount rate of one percent, an economist would have to project real productivity gains of 1.62 percent per year. It will not seem very reasonable to make such projections if there are not significant changes in the market revealed real rate of interest or increased real wages as time goes on.

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[4] See Brush and Breedon for an excellent review of tax treatments of income taxes on earnings and on yields on damage awards. This calculation presumes that the tax effects on yields are relevant even if tax liabilities on income are to be ignored.

Table 1
Weekly Comparison of 10 Year Treasury Bond Yields with Yields on 10 Year
Inflation-Indexed Bonds*

Date	FCM10 10-Year Treasury Yield at at Constant Maturity (% p.a.)	F10J971 10-Year Treasury Note: Inflation Adjusted Yield (%)	Geometric Difference Implicit Average Annual Inflation Estimate
Feb. 7, 1997	6.46	3.29	3.07
Feb. 14, 1997	6.37	3.26	3.01
Feb. 21, 1997	6.33	3.26	2.97
Feb. 28, 1997	6.50	3.30	3.10
March 7, 1997	6.59	3.36	3.13
March 14, 1997	6.63	3.40	3.12
March 21, 1997	6.73	3.47	3.15
March 28, 1997	6.79	3.52	3.16
April 4, 1997	6.90	3.58	3.21
April 11, 1997	6.92	3.63	3.17
April 18, 1997	6.89	3.63	3.15
April 25, 1997	6.89	3.63	3.15
May 2, 1997	6.76	3.59	3.06
May 9, 1997	6.70	3.56	3.03

*Source: Research Department, Federal Reserve Bank of St. Louis.

Figure 2

Rates on TIPS and Non-Indexed 10 Year T-Bonds

Weekly Data

Percent
7.0

6.8 -

6.6 -

6.4 -

6.2 -

6.0

Percent
3.7

- 3.6

- 3.5

- 3.4

- 3.3

3.2

10 Year T-Bond

10 Year TIPS Bond

2/7 2/14 2/21 2/28 3/7 3/14 3/21 3/28 4/4 4/11 4/18 4/25 5/2 5/9 5/16

Figure 3

Yield Rates on 10 Year TIPS Bonds

Daily Data
Percent
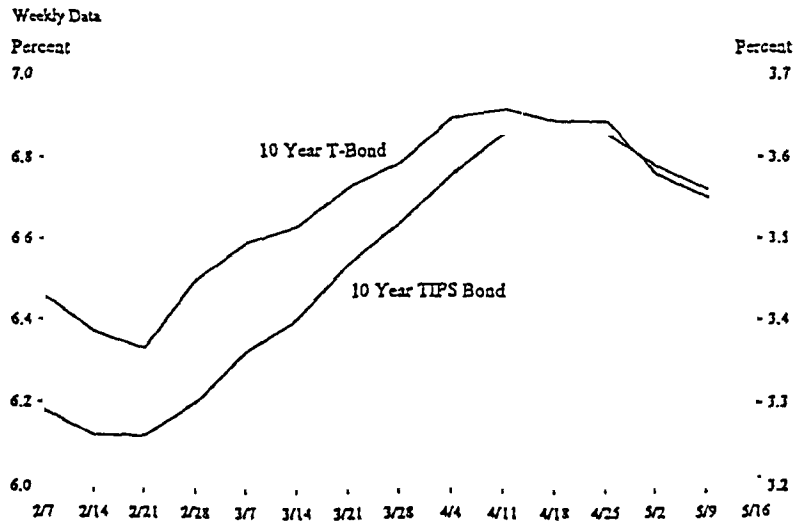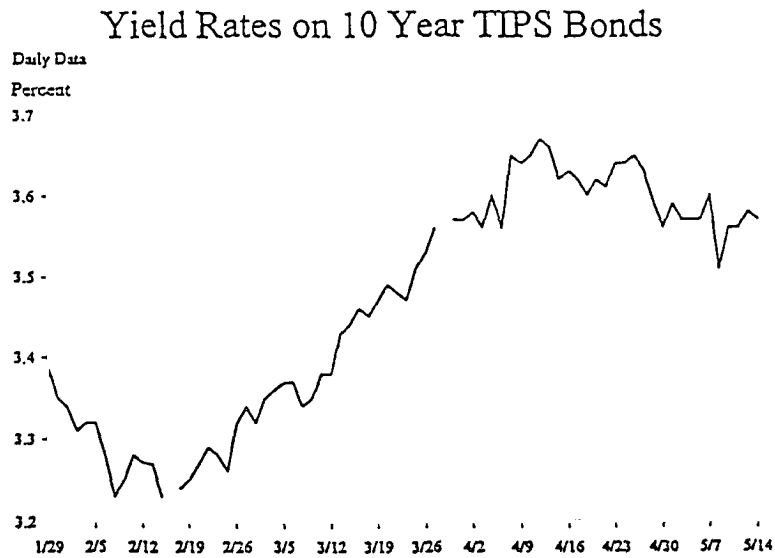
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.... and Christine Harper. 1997 "Bonds to Beat Inflation Have Better Outlook." *Wall Street Journal*, 4/14/97, page C1.

Historical Averages and The "Real Rate" of Interest

Christopher C. Pflaum, Steven S. Duncan and Eric C. Frye

Introduction

Interest rate forecasts are widely used by economists in the business community, government and forensic applications. Forensic economists practicing in the area of personal injury analysis, however, are as a group unique in their use of unadjusted, long-term averages as the basis for forecasts of future rates.[1] This is both surprising and troubling in that such a forecasting procedure is neither taught in Universities[2] nor accepted by the profession at large.

The use of this forecasting methodology relies upon the acceptance of one or both of two assumptions: the real interest rate is a constant quantity and, therefore, a statistical average is an unbiased estimator; or that a simple historical average provides as accurate an estimate as other, more generally accepted, macro economic forecasting techniques. If these assumptions are untrue, then current widespread practices in forensic economics are error prone.

In this paper, we first review historical and recent studies of the real rate of interest and its prediction. These studies refute the hypothesis that the real rate is a constant and provide forecast equations which are both accurate and well founded in economic theory.

We then use statistical findings regarding the macroeconomic determinants of the real interest rate to "backcast" the future economic climate implied by forecasts derived from historical averages. Next, we compare the historical accuracy of forecasts using historical averaging techniques to those of the Blue Chip Panel consensus. Finally, we compare current forecasts of the real rate of interest by the Blue Chip Panel to the rate of interest on Treasury Inflation Protection Securities, so-called indexed bonds or TIPS.

We find that the future economic conditions implied by real interest rate forecasts based on historical averages are unlikely and probably not defensible. We also find that the use of the Blue Chip consensus forecast has historically outperformed the historical average method by a significant margin and that the forecasts of future real interest rates implicit in the current Blue Chip Consensus are consistent with the level of real returns available from TIPS. We conclude that current practice of the majority of forensic economists in personal injury cannot be objectively justified.

Studies of The Real Rate

The real rate of interest has not been historically a matter of great concern. As illustrated in Exhibit 1, for most of American history the nominal rate of interest was stable while inflation varied substantially. For example, for the period 1800 to 1930, nominal rates of interest were relatively stable in the range of 3 - 6%, averaging 4.5% with a standard

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[1] See surveys such as that found in Brookshire and Slesnick (1993) for methods utilized by forensic economists.

[2] Hanke (1984) presents results of a survey of business schools on forecasting methods taught. Notably absent from the list are judgement and unadjusted historical averages.

deviation of 0.7%. The geometric average inflation rate, in contrast, was -0.02% and the arithmetic average 0.16% with a 6.1% standard deviation.[3]

Exhibit 1. Real and Nominal Interest Rates
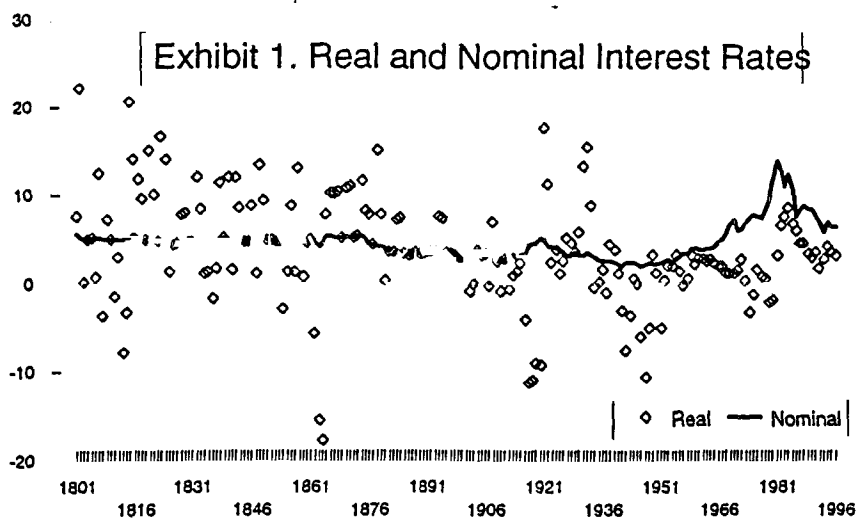
According to Homer and Sylla (1991), the explanation for this stability in interest rates likely lies in currency convertibility and an economic climate in which deflation and inflation were equally likely and largely unforecastable. Inflation was generally associated with wars and deflation followed every major war prior to World War II. In any case, the empirical conclusion is irrefutable -- prior to 1930 the real rate of interest in the United States was characterized by a great deal of variability.

This situation changed in the aftermath of the Great Depression and World War II as the Treasury and the Federal Reserve "managed" the U.S. economy to avoid deflation and the associated depressions. With the exception of post price-control inflation immediately following WW II and the Korean conflict, the U.S. economy generally experienced low,

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[3] The interest rate series was developed by tying together New England (1801-1900), Railroad (1901-1918), Treasury (1919-1962) and 10-year Treasury (1963-1996) bond rates. Bond rates were very close to one another at the switch-over points in the series with one exception. The railroad bond rate began a steady rise starting in about 1910 and the Treasury series did not start until 1919. Therefore, the increase in the average 1907-1918 period railroad rates over the average 1895-1906 period railroad rates was used to adjust downward the 1907-1918 railroad rates. This provided a smooth transition in rates to the Treasury rate in 1919. The inflation series, the CPI for all items, is from Speiser and Maher (1995) for 1801-1994 and from *Economic Report of the President* (1997) for 1995-96.

predictable inflation and interest rates for most of the 1950's and 1960's.

In the late 1960's inflation rates rose as fiscal discipline eroded and the currency was debased. With secular inflation as a backdrop, the nature of the real rate of interest became of more than passing academic interest as investors became increasingly concerned with the erosion of capital by inflation. Logic would suggest that investors would focus on real returns in such a climate. It does not follow, however, that awareness of real returns implies a Wicksellian natural rate of interest.

With the notable exception of Fama's 1975 finding, subsequently retracted in 1982, modern scholars have generally rejected the hypothesis of a stable real rate. For example Walsh (1987) and Rose (1988) tested whether the real rate is stationary (constant) or nonstationary (random walk) for the U.S. and other countries. They failed to reject the hypothesis that real rates are not stationary, implying that interest rates do not have a tendency to return to a long run average value.

In a recent article, Garcia and Perron (1996) consider regime shifts in the real interest rate. Their extensive testing confirmed three such periods since 1961: 1961 to 1973; 1973 to mid 1981; and mid 1981 to the end of the sample period, 1986. Garcia and Perron find that the real rate is constant within a regime but that when the entire period from 1961-1986 is considered, the series is not stationary due to the regime shifts, thus explaining the results of Walsh and Rose.

Determinants of the Real Interest Rate

Economists generally agree that the real rate of interest depends upon the rate of return on physical capital, which in turn depends on the value of the services that flow from physical capital. Economists also agree that the real rate of return on physical capital is affected by technological progress as well as competing and complementary factors of production such as labor. Other economic factors such as the changes in the tax code, inflation and recessions also affect the rate of return on physical capital and in turn affect the real rate of interest.

As a practical matter, economists use four major methods to forecast interest rates. Perhaps the simplest method is based on the shape of the yield curve, the curve formed by plotting the yield to maturity for a security type at various maturities. Analysts consider the shape and recent changes in the yield curve to predict changes in inflation and interest rates. Perhaps the most complex method for forecasting interest rates is based on multi-equation statistical models that capture the generation of interest rates and other economic variables in the economy. These models are typically built and maintained by large economic forecasting firms and by government and universities.

The third method for forecasting interest rates is based on single-equation statistical models. The single equation captures the important variables that drive or explain interest rate movements. This method of forecasting can be used to explain past regime shifts and to forecast future regime shifts. The model presented by Spiro (1989) is an example of this type of analysis. Spiro found that short-term real interest rates are negatively related to expected inflation, increases in money supply, and the savings rate and positively related to stock prices and cyclically adjusted government debt as a percentage of GNP. Spiro found that long-term real interest rates are positively related to short term interest rates as finance

theory predicts, positively to inflation expectations and negatively to the cyclically adjusted deficit as a percentage of GNP.

The fourth method for forecasting interest rates is univariate time series analysis. Complicated time series models such as ARIMA are used to state current interest rates as a function of past values or past errors. The study of regime shifts by Garcia and Perron provides an example of the complexity of these models.

Spiro's results can explain the regime shifts identified by Garcia and Perron. For example, Garcia and Perron identified one regime shift in 1973 about the time of the energy crisis. The oil price shock increased inflation and government deficits were relatively low. Both of these factors tend to lower real interest rates according to the Spiro's model. Garcia and Perron identified another regime shift in 1981. At that time, the Federal Reserve brought inflation down and the Reagan federal budget deficit grew quickly. Both of these factors tend to increase real interest rates.

Economists who use unadjusted historical averages as their forecast of interest rates should be able to use the results of Spiro to explain why their real interest rate forecasts are quite low. The economic climate implied by forecasts of historically low real rates of interest is one of a low level of national debt relative to GNP and a rate of inflation in excess of five percent. Given the structural budget problems imposed by an aging population and the ability and propensity of the capital markets to punish any attempt by the central bank to reflate, such an economic outlook is not well supported. Yet, only such a combination of conditions is reasonably associated with the results of historical averages.

Forecast Comparison

The most compelling question, however, is how well do historical averages perform as a forecast of future real rates. Since the use of historical averages to forecast interest rates cannot be justified on the basis of economic theory or practice, only a "result-oriented" explanation remains as to why personal injury economists use historical averages to forecast real interest rates. The question then is the relative accuracy of historical average forecasts and those of professional forecasters such as reported in Blue Chip Economic Indicators.

Twice each year, the publication Blue Chip Economic Indicators presents the long range forecasts of the professional forecasters it surveys on important economic variables such as inflation rate, Treasury bond rate, and AAA corporate bond rate. The forecasts made by individual professional forecasters as well as the consensus are provided in the reports. Forecasts for individual years are available for the next 6 years and five year forecasts are available beyond that.

In our experience, personal injury economists typically use historical averages over 15 to 30 year periods. The averaging period used is ad hoc since there are no economic theories or empirical studies to guide their choices. These two historical periods are used to compare the accuracy of forecasts from historical averages and those from professional forecasters as represented by the Blue Chip consensus.

Blue Chip forecasts of 10-year Treasury bonds are not available for an extended historical period so the AAA-rated corporate bond rate is used instead to compare forecasting abilities. The forecasting performance for the real AAA rate begins with forecasts made in 1984 and extending through to 1995. The real rate is calculated as the geometric subtraction of the nominal interest rate and the inflation rate as measured by CPI.

We compare mean forecast errors of the forecasting methods in Exhibit 2. The forecast error is defined as the actual rate less the predicted rate. The horizontal axis provides the number of years ahead the particular forecast was made, ranging from just one year in the future to 10 years in the future. By way of example, consider the forecasting ability of the three methods three years in the future. The average forecast error for the Blue Chip consensus was one basis point high, while the average for the 15-year historical average was about 113 basis points low and the 30-year historical average was about 176 basis points low.

The mean forecast errors for the Blue Chip consensus fall in a small range around zero, the sign of a well-performing forecast. The mean forecast errors for the 15-year and the 30-year historical averages are consistently positive and their average errors are quite large. Based on average forecasting error, the Blue Chip consensus forecast is clearly superior to historical averages.

Placing the forecasts in context provides another indicator of forecasting performance. Consider an individual with an annual loss of $20,000 (in 1984 dollars) for the eleven year period 1985-1995. Forecasts of the real rate over the eleven year period are made using information available in 1984. Since we know today what the actual AAA rates and the actual inflation rates were over this period of time, we can establish a benchmark by which to compare the professional and historical average forecasts. Note that the AAA corporate bond rate is used in this example because Blue Chip forecasts of Treasury Bond rates were not available as far back as 1984.

Actual and forecasted real interest rates and discounted loss are presented in Table 1. The 1984 Blue Chip Economic Indicators contained forecasts for individual years up through 1990 with a five year forecast for the years 1990-94. The forecast for 1995 was assumed to be the same as the forecast for the period 1990-94. The 15-year and 30-year historical averages using data through 1984 were 2.03% and 2.25%, respectively. Table 1 also contains the total discounted loss as calculated using the benchmark interest rates, the over- or under- prediction of loss and the percent over- or under- prediction of loss for the competing forecasting methods.

Exhibit 2. Real AAA Mean Forecast Errors
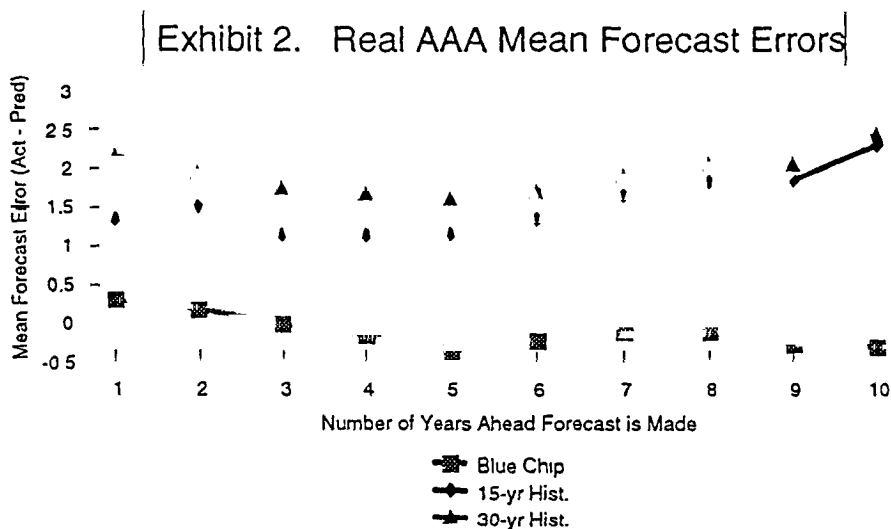
Table 1
Actual Discounted Loss and Estimates Based on Real Rate Forecasts

Year	Annual Loss	Actual Real Rate	Disc. Loss	Blue Chip Est	Disc. Loss	15 Yr. Avg	Disc. Loss	30 Yr. Avg.	Disc Loss
1985	20,000	7 54%	18,598	7 71%	18,568	2 03%	19,603	2.25%	19,560
1986	20,000	7 03%	17,376	6.43%	17,477	2.03%	19,213	2 25%	19,130
1987	20,000	5 53%	16,466	5 98%	16,462	2 03%	18,831	2.25%	18,709
1988	20,000	5 35%	15,629	5 61%	15,588	2 03%	18,457	2.25%	18,298
1989	20,000	4 24%	14,994	5.80%	14,733	2 03%	18,090	2.25%	17,895
1990	20,000	3.72%	14,457	5.33%	13,988	2 03%	17,730	2 25%	17,501
1991	20,000	4.38%	13,850	5 33%	13,280	2 03%	17,378	2.25%	17,117
1992	20,000	4 98%	13,193	5.33%	12,608	2 03%	17,033	2 25%	16,740
1993	20,000	4 10%	12,673	5 33%	11,970	2.03%	16,694	2 25%	16,372
1994	20,000	5.27%	12,038	5 33%	11,364	2.03%	16,362	2 25%	16,012
1995	20,000	4 62%	11,506	5.33%	10,789	2.03%	16,037	2 25%	15,660

Total Discounted Loss $160,781 $156,796 $195,429 $192,993
Dollar Overprediction of Loss   ($3,985) $34,647 $32,211
Percent Overprediction   -2 5%   21 5%   20.0%

         The benchmark rates yielded a total discounted loss of $160,781 in 1984 dollars. The Blue Chip consensus forecast rates yielded a discounted loss 2.5% below the benchmark. Both historical average forecasts produced estimated losses that were approximately 20% high.

         This analysis could be extended to include the wage-growth side of the equation by including professional forecasts and historical averages of the employment cost index of total compensation. If professional forecasts of compensation growth are superior to historical average forecasts, the error in predicting the total loss in the example could be even higher for the historical forecasts.

         Due to limited data, the applied problem considered here can not be re-tested at substantially different time periods. Nevertheless, the results are quite clear about the bias imposed in the recent past when using historical averages as forecasts. This analysis indicates that those personal injury economists using historical averages will have difficulty making the claim that, though their forecasting method is not grounded in good economic theory or practice, it at least performs adequately. Historical averages did not perform adequately in this example and there is no reason to believe that historical averages would be a valid, consistent predictor of actual real interest rates. Clearly, not only are historical

averages incapable of accounting for changes in relevant economic factors, they are not reasonable substitutes for professional forecasts.

Treasury Inflation Protection Securities

The US Treasury recently issued its first inflation indexed bonds, TIPS. The principal of these bonds is adjusted every six months by the change in the consumer price index thereby maintaining the purchasing power of the investment. The rate on these bonds, therefore, is a real rate of interest and is guaranteed for the ten year term of the securities.

Since the rate on TIPS is the real rate available on a ten year investment, it provides a market-based comparison for forecasts of the real rate. Since an investor can actually purchase a ten year security which guarantees a set real rate of return, any forecast of the real rate which is significantly different than the market rate is, at best, at odds with the collective judgment of the securities markets.

At the time this article was written, the yield on TIPS was 3.3%. Since the issue was greatly oversubscribed, the price of these bonds will likely fall and their yields rise when more supply becomes available. The current Blue Chip consensus forecast ranges from 3.5% for 1997 to 3.2% for the 2003-07 period[4] and the historical 15 and 30 year averages are 4.77% and 2.73%, respectively. The Blue Chip forecast is consistent with market expectations whereas the historical averages are not and the two measures are inconsistent with each other. Since interest rates observed in the capital markets provide the implicit consensus forecast of investors, the spread between the historical average and the TIPS rate demonstrates that forensic economists using this method are at odds with the market consensus as well as that of their colleagues who specialize in macroeconomic forecasting.

Conclusion

For many years a minority of economists working in forensics have criticized their colleagues for using methods not accepted by the profession at large. In this article we have demonstrated that one of the most widely used methods --unadjusted historical averages as forecasts-- is both bad science and inaccurate.

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Tax Returns as the Basis for Lost Profit
Appraisals: Possible Adjustments

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Introduction

It is common in lost profit appraisals (and sometimes in personal injury litigation) to use the business entity's historical income tax returns as the basis for estimating the loss. Unfortunately, the definitions of income and expenses specified by the Internal Revenue Service code generally are not consistent with what is required to calculate lost profits in an economic sense.[1] The forensic economist should be familiar with the basic tax law applicable to the different business tax entities in order to appropriately adjust taxable net income to a more appropriate concept of income (i.e., one that measures the true economic loss).[2]

Essentially, there are three types of legal entities under which to conduct business: corporations, sole proprietorships, and other unincorporated businesses (i.e., partnerships and limited liability companies). Corporations can be treated two separate ways for tax purposes. Moreover, sole proprietorships are treated somewhat differently and file different forms depending on whether or not they are agricultural producers. Limited liability companies may be taxed as corporations but generally are taxed as partnerships. This paper discusses adjustments necessary to convert income reported for tax purposes to an income concept compatible with measuring economic losses. We begin our analysis with the tax treatment of corporations.

Corporations

The tax treatment of corporations depends on whether the corporation elects to be treated as an S-corporation. The majority of the small, incorporated businesses that forensic economists deal with will be S-corporations.

S-Corporations

S-corporations report their income and deductions on form 1120S, the front page of which is illustrated in Table 1. Lines 1 through 6 report income, lines 7 through 19 report deductions (expenses), and the residual, line 21, reports "ordinary income." This residual

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[1] Aside from the definitional problems presented by using tax returns as the basis for lost profit appraisals are concerns about the integrity of the amounts presented on the tax returns. The focus of this paper is on the definitional problems. However, we draw attention to several areas where the appropriateness of the amount listed on the tax return ought to be questioned.

[2] The appropriate income concept, which we will refer to as net economic profits, is sales less variable costs. (See Dunn 1992.)

generally will differ from net economic profits to the extent that items of income and expense listed on form 1120S may differ from the amounts required for a calculation of economic profit.

The calculation of gross income (line 6, see Table 2) includes gains or losses from the sale of assets used in the trade or business (line 4). These gains or losses would be excluded from the calculcation of income from operations as reported on an income statement prepared in accordance with generally accepted accounting principles and should be excluded in the calculation of net economic profits in a lost profits appraisal. Generally, the amount listed as other income (line 5) also should be excluded.[3]

The compensation of officers[4] (line 7) is particularly problematic. The first issue is what part, if any, represents a variable cost. If a portion does represent a variable expense, it must be determined if the amount is correct since a common strategy for S-corporations is to underpay the owners.[5] For example, assume three brothers, A, B, and C, own and operate a chain of fast food restaurants. A is the general manager, and B and C are managers of two separate restaurants, x and y, respectively. Assume the operation of restaurant x is interrupted and the company sues for lost profits. The salary of the manager of restaurant x, brother B, is determined to be a variable cost. While corporate profits (line 21) were substantial, B was only paid $8,000 per year in wages. In calculating lost net economic profits, what amount should be deducted as the salary of the manager?

Depreciation (line 14) presents a similar problem. If it is a variable cost, is the amount reasonable? It is well-understood that tax rules allow (within limits) the expensing of assets in the year of purchase and accelerated depreciation for assets not expensed. To complicate matters, the part expensed is not included in the calculation of the S-corporations' ordinary income but rather an allocable share passes directly to each individual shareholder. Schedule K of form 1120S, line 8, gives the total amount expensed. Since the difference between tax and book depreciation is a problem across all types of tax entities, further discussion of depreciation will be reserved for a separate section of this paper.

The other deductions (i.e., expenses) on form 1120S present no additional problems beyond having to determine whether they are variable or fixed costs.

Regular Corporations

Table 2 presents the tax form (form 1120) that summarizes the income and expenses of regular corporations. Adjusting taxable income (line 23) of this type of entity presents problems similar to that of S-corporations.

Total income (line 11) includes capital gains (line 8) and gains and losses from sale

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[3] A common item would be ordinary income from partnerships of which the corporation is a partner.

[4] Officers of an S-corporation generally will be its shareholders.

[5] Wage income paid to owners is subject to the FICA tax at a combined rate of 15.30%; whereas each owner's share of S-corporation's ordinary income may not be subject to the self-employment tax.

of business assets (line 9). Generally, both should be excluded from net economic profits. Similar to the situation with S-corporations, compensation of officers presents a peculiar problem. If part of the amount is a variable cost, it must be determined if the amount is appropriate. Small businesses that operate as regular corporations often have the incentive to overcompensate owners/officers. (The other method of getting funds out of the corporation and to the owners—by paying dividends—subjects that income to double taxation.)

Both S-corporations and regular corporations must complete a Schedule M-1, which is a reconciliation of net income per books to income per tax return (see Table 3). When using tax forms as a basis for lost profit appraisals, Schedule M-1 should be analyzed carefully. For example, travel expenses may be a variable cost. Schedule M-1 will include the travel expenses not deducted on the tax return. (See line S, Schedule M-1.)

Sole Proprietorships

Schedule C

Unincorporated, nonfarm businesses owned by a single individual use Schedule C of form 1040 to report income and expenses. Table 4 shows the first page of Schedule C. Gross income (line 2), also commonly referred to as gross profits, should match gross profits per books. The tax definitions of sales and cost of goods sold are consistent with the concepts that accountants generally use and, hence, no adjustment to line 7 should be necessary in order to calculate net economic profits.

Part II (expenses) of Schedule C probably will provide the detail necessary to separate fixed and variable costs. Furthermore, the definitions of expenses generally are consistent with accounting definitions with the exception of depreciation (line 13) and meals and entertainment (line 24d) As is well-understood, only 50 percent of meals and entertainment expenses can be deducted. A discussion of depreciation is deferred until later.

Wage expense, as reported on Schedule C (line 26), also should be scrutinized when calculating net economic profits. A common strategy for a small business operating as a sole proprietorship is to "employ" spouses in order to provide the family with health insurance as an employee benefit and, therefore a deductible business expense. If the wage of the employee-spouse is a variable expense, the amount should be carefully examined.

Schedule F

Throughout the tax code, farmers are given special treatment. One important difference between farmers and nonfarmers is the accounting method[6] required by the IRS. Generally, the code requires the accrual method for determining purchases and sales when inventory is an income-producing factor. Farmers are the exception—although they may elect to report income and expenses on the accrual basis. Furthermore, there is an exception to the exception that farmers are not required to use the accrual method of accounting. That is where farmers are required to inventory items bought for resale (i.e., deduct their expense in the year of sale). The first page of Schedule F (shown in Table 5) reflects the peculiar tax

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[6] The accounting method determines the timing of income and expenses and can have a significant effect on reported profit in a given year.

treatment of farmers. The second page is for farmers who report income on an accrual basis. As the vast majority of farmers are cash basis taxpayers (page 2), accrual-basis reporting will be ignored.

Line 11 of Schedule F reports gross income (more commonly referred to as gross profits). There are at least two problems associated with this calculation of gross income. The first stems from the failure to account for inventories. Farmers can and do manipulate inventories to minimize taxes. Over a number of years, these inventory fluctuations tend to offset, but if the lost profit calculation is based on only a few years of historical data from Schedule F, an inquiry into inventory changes should be made. Farmers also may take advantage of cash basis accounting and manipulate taxable income by effectively transferring a product but not recognizing income because cash has not been received (i.e., accounts receivable are not used). For example, a farmer may sell his wheat December 20, 1996 but not recognize income until cash is received the following year. This artificially reduces reported profit for 1996 and increases it for 1997.

The second problem with gross income from line 11 of Schedule F is the exclusion of revenue from the sale of livestock used for breeding. Tax law essentially allows capital gain treatment for such sales. Hence, sale proceeds go on form 4797 and eventually to form 1040 without being entered on Schedule F. The cost of raising breeding stock, however, is entered on Schedule F. Hence, for farmers for whom raising breeding stock is significant (e.g., dairy farms and cattle ranchers), Schedule F will significantly underestimate gross sales and net profits. Careful analysis of form 4797 should be made as part or all of capital gains should be considered as on-going revenue of the enterprise with net profit being adjusted appropriately.

Farm expenses also may not reflect true economic costs due to the failure to use accrual accounting. Although there are limits, farmers can and do manipulate income through fluctuations in inventories of inputs and not having to recognize accounts payable. For example, a farmer may purchase fertilizer in December 1996 for use the following May and deduct the expense for calendar year 1996. Moreover, the depreciation rules concerning farmers are unique as discussed in the depreciation section below.

Other Unincorporated Businesses

Many small businesses operate as partnerships or limited liability companies. Although limited liability companies may be taxed as corporations, the vast majority are taxed as partnerships. Hence, this section will focus on the form used to report partnership income and expenses and possible adjustments necessary in order to calculate lost net economic profits.

Table 6 contains the first page of form 1065. A review of lines 1 through 7 indicates that line 8 may not be consistent with the notion of gross profit and, hence, line 22 (ordinary income) may not be consistent with the concept of net economic profits. Total income (line 8) includes not only the *gross profits* of the partnership in question (line 3), but ordinary income of other partnerships of which the partnership in question is a partner, net farm profit if the partnership is a farming entity (with associated problems of calculating net farm profit—see above), and gains or losses from the sale of business assets. Expenses (lines 9–20) fail to include those that flow directly to partners, namely the depreciation expense deduction for capital assets (the so-called section 179 deduction). Moreover,

depreciation presents the universal problem that the amount allowed may be inconsistent with economic reality.

Depreciation

In many instances, depreciation will be a fixed expense and, hence, safely ignored in the appraisal of lost net economic profits. In those cases, where depreciation enters into the calculation of lost profits[7] and tax returns are being used as the basis for calculating historical net profits, depreciation as reported on the tax forms should be carefully scrutinized. There are essentially three problems: (1) the possibility that a business may elect for any given year to expense certain asset purchases (the section 179 election); (2) the accelerated depreciation methods available to business entities; and (3) the inconsistent application of depreciation elections and methods both between years of a given entity and between entities. Two firms, that are identical in every way, may have significantly differerent taxable income based on their choices of legally acceptable depreciation methods.

Section 179—Expense Election

If the forensic economist making the lost profits appraisal has a large number of historical tax returns (e.g., greater than 10), perhaps the section 179 expense deduction can be ignored. However, if only a few returns are available, it might be necessary to back the 179 expense out of expense and calculate a corresponding depreciation expense.

Depreciation Methods

Although some entities may be required or elect to apply the Alternative Depreciation System (ADS), they generally use the General Depreciation System (GDS), both of which are part of the Modified Accelerated Cost Recovery System (MACRS). However, from year to year, businesses may change from GDS to ADS for property placed in service in that year. The difference is that ADS provides for longer recovery periods and slower depreciation methods (e.g., straight line method as opposed to the double declining balance method). While it is beyond the scope of this article to explain all the details of the GDS and ADS systems, an example will illustrate the problems that can arise.

Most business assets (other than real property, automobiles, and computers) are depreciated over 7 years under the GDS system and 10 or 12 years if ADS is required or elected. The number of years may or may not reflect the useful economic life of the asset. Under GDS, assets generally are depreciated using the 200 percent declining balance method if a nonfarmer, or 150 percent declining balance method if a farmer. If the ADS is required or elected, the straight line method is generally used.

Given an asset purchased in the middle of 1997 for $25,000, the depreciation expense could vary from $1,042 to $3,571 for that year depending on the method used (or $25,000 if section 179 election is made). Thus, reported profit could vary by the same

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[7] An example would be a retail store with multiple outlets suing a landlord for breach of contract on the lease for one of the outlets. The correct notion of damages would be sales less cost of performance for that outlet. Cost of performance would include depreciation on equipment specific to that outlet.

amount.

Summary

Using tax returns as the historical basis for estimating lost net economic profits presents the forensic economist with not only the problem of separating variable from fixed expenses but the additional problem that income and expenses, as reported on the tax return, may not be consistent with appropriately measured income and expenses of the businesses. Furthermore, businesses may operate as one of effectively five different tax entities. The forensic economist should be familiar with the type of adjustments necessary to appropriately measure historical net economic profits from which to forecast future lost net economic profits. A summary of these adjustments is reported in Table 7.

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Table 1. Form 1120S

Form 1120S

U.S. Income Tax Return for an S Corporation

OMB No. 1545-0130

► Do not file this form unless the corporation has timely filed
Form 2553 to elect to be an S corporation.

► See separate instructions.

Department of the Treasury
Internal Revenue Service

1996

For calendar year 1996, or tax year beginning _____ , 1996, and ending _____ , 19 ___

A Date of election as an S corporation	Use IRS label. Other- wise, please print or type.	Name	C Employer identification number
		Number, street, and room or suite no (If a P O box, see page 9 of the instructions)	D Date incorporated
B Business code no (see Specific instructions)		City or town, state, and ZIP code	E Total assets (see Specific instructions) $

F Check applicable boxes (1) ☐ Initial return   (2) ☐ Final return   (3) ☐ Change in address   (4) ☐ Amended return

G Check this box if this S corporation is subject to the consolidated audit procedures of sections 6241 through 6245 (see instructions before checking this box) . ► ☐

H Enter number of shareholders in the corporation at end of the tax year . . . . ►

Caution: Include only trade or business income and expenses on lines 1a through 21. See the instructions for more information.

Income

1a	Gross receipts or sales		b Less returns and allowances		c Bal ►	1c
2	Cost of goods sold (Schedule A, line 8)	2
3	Gross profit. Subtract line 2 from line 1c	3
4	Net gain (loss) from Form 4797, Part II, line 20 (attach Form 4797)	4
5	Other income (loss) (attach schedule)	5
6	Total income (loss). Combine lines 3 through 5 . . . . ►	6

Deductions (see page 10 of the instructions for limitations)

7	Compensation of officers	7
8	Salaries and wages (less employment credits)	8
9	Repairs and maintenance	9
10	Bad debts	10
11	Rents	11
12	Taxes and licenses	12
13	Interest	13
14a	Depreciation (if required, attach Form 4562)	14a		
b	Depreciation claimed on Schedule A and elsewhere on return . .	14b		
c	Subtract line 14b from line 14a	14c
15	Depletion (Do not deduct oil and gas depletion.)	15
16	Advertising	16
17	Pension, profit-sharing, etc, plans	17
18	Employee benefit programs	18
19	Other deductions (attach schedule)	19
20	Total deductions. Add the amounts shown in the far right column for lines 7 through 19 . ►	20
21	Ordinary income (loss) from trade or business activities Subtract line 20 from line 6 . . .	21

Tax and Payments

22	Tax a Excess net passive income tax (attach schedule) . . .	22a		
	b Tax from Schedule D (Form 1120S)	22b		
	c Add lines 22a and 22b (see page 13 of the instructions for additional taxes)	22c
23	Payments: a 1996 estimated tax payments and amount applied from 1995 return	23a		
	b Tax deposited with Form 7004	23b		
	c Credit for Federal tax paid on fuels (attach Form 4136)	23c		
	d Add lines 23a through 23c	23d
24	Estimated tax penalty Check if Form 2220 is attached . . . . ►☐	24
25	Tax due. If the total of lines 22c and 24 is larger than line 23d, enter amount owed. See page 3 of the instructions for depository method of payment . . . . ►	25
26	Overpayment. If line 23d is larger than the total of lines 22c and 24, enter amount overpaid ►	26
27	Enter amount of line 26 you want Credited to 1997 estimated tax ►		Refunded ►	27

Please Sign Here

Under penalties of perjury, I declare that I have examined this return, including accompanying schedules and statements, and to the best of my knowledge and belief, it is true, correct, and complete Declaration of preparer (other than taxpayer) is based on all information of which preparer has any knowledge

► Signature of officer _____ Date _____   ► Title _____

Paid Preparer's Use Only

Preparer's signature ►	Date	Check if self- employed ► ☐	Preparer's social security number
Firm's name (or yours if self-employed) and address ►		EIN ►	
		ZIP code ►	

For Paperwork Reduction Act Notice, see page 1 of separate instructions.   Cat No. 11510H   Form **1120S** (1996)

Table 2. Form 1120

Form **1120**

Department of the Treasury
Internal Revenue Service

U.S. Corporation Income Tax Return

For calendar year 1996 or tax year beginning .... , 1996, ending .... , 19 ...
► Instructions are separate. See page 1 for Paperwork Reduction Act Notice.

OMB No 1545-0123

1996

A Check if a.
1 Consolidated return (attach Form 851) ☐
2 Personal holding co (attach Sch PH) ☐
3 Personal service corp (as defined in Temporary Regs sec 1 441-3T— see instructions) ☐

Use IRS label. Otherwise, print or type.

Name

Number, street, and room or suite no (if a P O box see page 6 of instructions)

City or town state and ZIP code

B Employer identification number

C Date incorporated

D Total assets (see page 6 of instructions)

E Check applicable boxes   (1) ☐ Initial return   (2) ☐ Final return   (3) ☐ Change of address $

Income

1a	Gross receipts or sales	b Less returns and allowances	c Bal ►	1c
2	Cost of goods sold (Schedule A, line 8)	2
3	Gross profit Subtract line 2 from line 1c	3
4	Dividends (Schedule C, line 19)	4
5	Interest	5
6	Gross rents	6
7	Gross royalties	7
8	Capital gain net income (attach Schedule D (Form 1120))	8
9	Net gain or (loss) from Form 4797, Part II, line 20 (attach Form 4797)	9
10	Other income (see page 7 of instructions—attach schedule)	10
11	Total income. Add lines 3 through 10 ►	11

Deductions (See instructions for limitations on deductions)

12	Compensation of officers (Schedule E, line 4)	12
13	Salaries and wages (less employment credits)	13
14	Repairs and maintenance	14
15	Bad debts	15
16	Rents	16
17	Taxes and licenses	17
18	Interest	18
19	Charitable contributions (see page 8 of instructions for 10% limitation)	19
20	Depreciation (attach Form 4562) 20	
21	Less depreciation claimed on Schedule A and elsewhere on return 21a	21b
22	Depletion	22
23	Advertising	23
24	Pension, profit-sharing, etc., plans	24
25	Employee benefit programs	25
26	Other deductions (attach schedule)	26
27	Total deductions. Add lines 12 through 26 ►	27
28	Taxable income before net operating loss deduction and special deductions Subtract line 27 from line 11	28
29	Less: a Net operating loss deduction (see page 10 of instructions) 29a	
	b Special deductions (Schedule C, line 20) 29b	29c

30	Taxable income. Subtract line 29c from line 28	30
31	Total tax (Schedule J, line 10)	31

Tax and Payments

32	Payments a 1995 overpayment credited to 1996 32a	
b	1996 estimated tax payments 32b	
c	Less 1996 refund applied for on Form 4466 32c ( ) d Bal ► 32d	
e	Tax deposited with Form 7004 32e	
f	Credit from regulated investment companies (attach Form 2439) 32f	
g	Credit for Federal tax on fuels (attach Form 4136) See instructions 32g	32h
33	Estimated tax penalty (see page 11 of instructions) Check if Form 2220 is attached ► ☐	33
34	Tax due. If line 32h is smaller than the total of lines 31 and 33, enter amount owed	34
35	Overpayment. If line 32h is larger than the total of lines 31 and 33, enter amount overpaid	35
36	Enter amount of line 35 you want: Credited to 1997 estimated tax ► Refunded ►	36

Under penalties of perjury, I declare that I have examined this return, including accompanying schedules and statements, and to the best of my knowledge and belief it is true, correct, and complete. Declaration of preparer (other than taxpayer) is based on all information of which preparer has any knowledge.

Sign Here

► Signature of officer   Date   ► Title

Paid Preparer's Use Only

Preparer's signature ►
Firm's name (or yours if self-employed) and address ►

Date   Check if self-employed ☐   Preparer's social security number

EIN ►
ZIP code ►

Cat No 11450Q

Table 3. Schedule M-1

SCHEDULE M-1 Reconciliation of Income (Loss) per Books With Income per Return (See page 16 of instructions.)

1 Net income (loss) per books . . . . . .

2 Federal income tax . . . .

3 Excess of capital losses over capital gains .

4 Income subject to tax not recorded on books this year (itemize) ....
....

5 Expenses recorded on books this year not deducted on this return (itemize).

a Depreciation . . . . $ ....

b Contributions carryover $ ....

c Travel and entertainment $ ....
....
....

6 Add lines 1 through 5 . . . .

7 Income recorded on books this year not included on this return (itemize):
   Tax-exempt interest $ ....
....

8 Deductions on this return not charged against book income this year (itemize).

a Depreciation . . . . $...........

b Contributions carryover $ ....
....
....

9 Add lines 7 and 8 . . . .

10 Income (line 28, page 1)—line 6 less line 9

Table 4. Schedule C

SCHEDULE C
(Form 1040)

Department of the Treasury
Internal Revenue Service   (6)

Profit or Loss From Business
(Sole Proprietorship)

▶ Partnerships, joint ventures, etc., must file Form 1065.

▶ Attach to Form 1040 or Form 1041.   ▶ See Instructions for Schedule C (Form 1040).

OMB No 1545 0074

1996

Attachment
Sequence No. 09

Name of proprietor

Social security number (SSN)

A   Principal business or profession, including product or service (see page C-1)

B   Enter principal business code
(see page C-6) ▶ | | | |

C   Business name If no separate business name, leave blank

D   Employer ID number (EIN), If any

E   Business address (including suite or room no) ▶ ....
City, town or post office, state, and ZIP code

F   Accounting method   (1) ☐ Cash   (2) ☐ Accrual   (3) ☐ Other (specify) ▶ ....

G   Did you "materially participate" in the operation of this business during 1996? If "No," see page C-2 for limit on losses.   ☐ Yes   ☐ No

H   If you started or acquired this business during 1996 check here .   ▶ ☐

Part I   Income

1   Gross receipts or sales Caution: If this income was reported to you on Form W-2 and the "Statutory employee" box on that form was checked, see page C-2 and check here . . . ▶ ☐   **1**

2   Returns and allowances **2**

3   Subtract line 2 from line 1 . . . .   **3**

4   Cost of goods sold (from line 42 on page 2) **4**

5   Gross profit. Subtract line 4 from line 3 . . . .   **5**

6   Other income, including Federal and state gasoline or fuel tax credit or refund (see page C-2) . . .   **6**

7   Gross income. Add lines 5 and 6 . . . . ▶   **7**

Part II   Expenses. Enter expenses for business use of your home only on line 30

8	Advertising	**8**	19 Pension and profit-sharing plans	**19**
9	Bad debts from sales or services (see page C-3)	**9**	20 Rent or lease (see page C-4)	
10	Car and truck expenses (see page C-3)	**10**	a Vehicles, machinery, and equipment	**20a**
11	Commissions and fees	**11**	b Other business property	**20b**
12	Depletion	**12**	21 Repairs and maintenance	**21**
13	Depreciation and section 179 expense deduction (not included in Part III) (see page C-3)	**13**	22 Supplies (not included in Part III)	**22**
14	Employee benefit programs (other than on line 19)	**14**	23 Taxes and licenses	**23**
15	Insurance (other than health)	**15**	24 Travel, meals, and entertainment	
16	Interest:		a Travel	**24a**
a	Mortgage (paid to banks, etc)	**16a**	b Meals and entertainment	
b	Other	**16b**	c Enter 50% of line 24b subject to limitations (see page C-4)	
17	Legal and professional services	**17**	d Subtract line 24c from line 24b	**24d**
18	Office expense	**18**	25 Utilities	**25**
			26 Wages (less employment credits)	**26**
			27 Other expenses (from line 48 on page 2)	**27**

28   Total expenses before expenses for business use of home Add lines 8 through 27 in columns . ▶   **28**

29   Tentative profit (loss) Subtract line 28 from line 7 . . . .   **29**

30   Expenses for business use of your home Attach Form 8829 . . . .   **30**

31   Net profit or (loss). Subtract line 30 from line 29
    • If a profit, enter on Form 1040, line 12, and ALSO on Schedule SE, line 2 (statutory employees, see page C-5). Estates and trusts, enter on Form 1041, line 3   }   **31**
    • If a loss, you MUST go on to line 32

32   If you have a loss, check the box that describes your investment in this activity (see page C-5).
    • If you checked 32a, enter the loss on Form 1040, line 12, and ALSO on Schedule SE, line 2 (statutory employees, see page C-5) Estates and trusts, enter on Form 1041, line 3   }   32a ☐ All investment is at risk.
    • If you checked 32b, you MUST attach Form 6198.   32b ☐ Some investment is not at risk.

For Paperwork Reduction Act Notice, see Form 1040 instructions.   Cat. No 11334P   Schedule C (Form 1040) 1996

Table 5. Schedule F

SCHEDULE F
(Form 1040)

Department of the Treasury
Internal Revenue Service (6)

Name of proprietor

Profit or Loss From Farming

▶ Attach to Form 1040, Form 1041, or Form 1065.

▶ See Instructions for Schedule F (Form 1040).

OMB No 1545-0074

1996

Attachment
Sequence No 14

Social security number (SSN)

A Principal product Describe in one or two words your principal crop or activity for the current tax year

B Enter principal agricultural activity code (from page 2) ▶ | | | |

D Employer ID number (EIN), if any | | | | | | | |

C Accounting method   (1) ☐ Cash   (2) ☐ Accrual

E Did you "materially participate" in the operation of this business during 1996? If "No," see page F-2 for limit on passive losses   ☐ Yes   ☐ No

Part I   Farm Income—Cash Method. Complete Parts I and II (Accrual method taxpayers complete Parts II and III, and line 11 of Part I)
Do not include sales of livestock held for draft, breeding, sport, or dairy purposes; report these sales on Form 4797.

1	Sales of livestock and other items you bought for resale	1	
2	Cost or other basis of livestock and other items reported on line 1	2	
3	Subtract line 2 from line 1		3
4	Sales of livestock, produce, grains, and other products you raised		4
5a	Total cooperative distributions (Form(s) 1099-PATR) 5a	5b Taxable amount	5b
6a	Agricultural program payments (see page F-2) 6a	6b Taxable amount	6b
7	Commodity Credit Corporation (CCC) loans (see page F-2)		
a	CCC loans reported under election		7a
b	CCC loans forfeited 7b	7c Taxable amount	7c
8	Crop insurance proceeds and certain disaster payments (see page F-2).		
a	Amount received in 1996 8a	8b Taxable amount	8b
c	If election to defer to 1997 is attached, check here ▶ ☐ 8d Amount deferred from 1995		8d
9	Custom hire (machine work) income		9
10	Other income, including Federal and state gasoline or fuel tax credit or refund (see page F-2)		10
11	Gross income. Add amounts in the right column for lines 3 through 10 If accrual method taxpayer, enter the amount from page 2, line 51 ▶		11

Part II   Farm Expenses—Cash and Accrual Method. Do not include personal or living expenses such as taxes, insurance, repairs, etc., on your home

12	Car and truck expenses (see page F-3—also attach Form 4562)	12	25	Pension and profit-sharing plans	25
13	Chemicals	13	26	Rent or lease (see page F-4)	
14	Conservation expenses (see page F-3)	14	a	Vehicles, machinery, and equipment	26a
15	Custom hire (machine work)	15	b	Other (land, animals, etc)	26b
16	Depreciation and section 179 expense deduction not claimed elsewhere (see page F-4)	16	27	Repairs and maintenance	27
			28	Seeds and plants purchased	28
			29	Storage and warehousing	29
17	Employee benefit programs other than on line 25	17	30	Supplies purchased	30
18	Feed purchased	18	31	Taxes	31
19	Fertilizers and lime	19	32	Utilities	32
20	Freight and trucking	20	33	Veterinary, breeding, and medicine	33
21	Gasoline, fuel, and oil	21	34	Other expenses (specify)	
22	Insurance (other than health)	22	a	....	34a
23	Interest		b	....	34b
a	Mortgage (paid to banks, etc)	23a	c	....	34c
b	Other	23b	d	....	34d
24	Labor hired (less employment credits)	24	e	....	34e
			f		34f

35   Total expenses. Add lines 12 through 34f   ▶   35

36   Net farm profit or (loss). Subtract line 35 from line 11 If a profit, enter on Form 1040, line 18, and ALSO on Schedule SE, line 1. If a loss, you MUST go on to line 37 If a loss, you MUST go on to line 37 (estates, trusts, and partnerships, see page F-5)   36

37   If you have a loss, you MUST check the box that describes your investment in this activity (see page F-5) If you checked 37a, enter the loss on Form 1040, line 18, and ALSO on Schedule SE, line 1. If you checked 37b, you MUST attach Form 6198.
   37a ☐ All investment is at risk
   37b ☐ Some investment is not at risk

For Paperwork Reduction Act Notice, see Form 1040 instructions.   Cat No 11346H   Schedule F (Form 1040) 1996

Table 6. Form 1065

Form 1065

Department of the Treasury
Internal Revenue Service

U.S. Partnership Return of Income

For calendar year 1996, or tax year beginning .... , 1996, and ending .... , 19 ....
► See separate instructions.

OMB No 1545-0099

1996

A Principal business activity

B Principal product or service

C Business code number

Use the IRS label. Otherwise, please print or type

Name of partnership

Number street and room or suite no If a P O box, see page 10 of the instructions

City or town state, and ZIP code

D Employer Identification number

E Date business started

F Total assets
(see page 10 of the instructions)

$

G   Check applicable boxes   (1) ☐ Initial return   (2) ☐ Final return   (3) ☐ Change in address   (4) ☐ Amended return
H   Check accounting method (1) ☐ Cash   (2) ☐ Accrual   (3) ☐ Other (specify) ► ....
I   Number of Schedules K-1 Attach one for each person who was a partner at any time during the tax year ► ....

Caution: *Include only trade or business income and expenses on lines 1a through 22 below See the instructions for more information*

Income

1a	Gross receipts or sales	1a
b	Less returns and allowances	1b
		1c
2	Cost of goods sold (Schedule A, line 8)	2
3	Gross profit. Subtract line 2 from line 1c	3
4	Ordinary income (loss) from other partnerships, estates, and trusts *(attach schedule)*	4
5	Net farm profit (loss) *(attach Schedule F (Form 1040))*	5
6	Net gain (loss) from Form 4797, Part II, line 20	6
7	Other income (loss) *(attach schedule)*	7
8	Total Income (loss). Combine lines 3 through 7	8

Deductions (see page 11 of the instructions for limitations)

9	Salaries and wages (other than to partners) (less employment credits)	9
10	Guaranteed payments to partners	10
11	Repairs and maintenance	11
12	Bad debts	12
13	Rent	13
14	Taxes and licenses	14
15	Interest	15
16a	Depreciation (if required, attach Form 4562)	16a
b	Less depreciation reported on Schedule A and elsewhere on return	16b
		16c
17	Depletion (Do not deduct oil and gas depletion.)	17
18	Retirement plans, etc.	18
19	Employee benefit programs	19
20	Other deductions *(attach schedule)*	20
21	Total deductions. Add the amounts shown in the far right column for lines 9 through 20	21

22   Ordinary Income (loss) from trade or business activities Subtract line 21 from line 8   22

Under penalties of perjury, I declare that I have examined this return, including accompanying schedules and statements, and to the best of my knowledge and belief it is true, correct, and complete Declaration of preparer (other than general partner or limited liability company member) is based on all information of which preparer has any knowledge

Please Sign Here

► Signature of general partner or limited liability company member   ► Date

Paid Preparer's Use Only

Preparer's signature ►	Date	Check if self-employed ► ☐	Preparer's social security no
Firm's name (or yours if self-employed) and address ►		EIN ► ZIP code ►	

For Paperwork Reduction Act Notice, see page 1 of separate instructions.   Cat. No 11390Z   Form **1065** (1996)

Table 7. Summary of Possible Adjustment Necessary to Calculate
Net Profit from Tax Returns

Type of Entity	Tax Form of Schedule	Income Concepts Reported on Tax Form*	Sample of Possible Adjustments Necessary to Calculate Net Profits
S-corporation	1120S	Ordinary income (line 21)	Subtract gains/losses from sale of business assets. Adjust compensation of offices—probably upward. Adjust depreciation expense (see Schedule K of form 1120S) Subtract ordinary income from partnerships
Regular corporation	1120	Taxable income (line 28)	Subtract capital gains Subtract gains/losses from sale of business assets Adjust compensation of officers—probably downward Adjust depreciation—probably downward
Nonfarmer sole-proprietorship	Sch. C	Net profit	Adjust wage expense if spouse employed Adjust depreciation—probably downward
Farmer sole-proprietorship	Sch. F	Net farm profit (line 36)	Adjust sales for inventory changes and accounts receivable Adjust sales for sale of breeding livestock (consult form 4797) Adjust expenses for changes in inventories of inputs and changes in accounts payable Adjust depreciation—probably downward Adjust wages of spouse, if applicable
Partnership and limited liability companies	1065	Ordinary income (line 22)	Subtract ordinary income from other partnerships or farms Subtract gains and losses from the sale of business assets Adjust depreciation expense (consult Schedule K of form 1065)

*All line numbers have reference to 1996 forms or schedules.

Methodologies to Improve Economic and
Vocational Analysis in Personal Injury Litigation

Mark D. Cohen, M.S., C.E.A. and Thomas P. Yankowski, M.S., C.V.E.[*]

Part I: Contributions Vocational Experts Can Make in Determining Past and Future Lost Earning Capacity of Injured Workers

1. Introduction

The calculation of past and future earning capacity by economic and vocational experts has a substantial impact upon the amount of compensatory damages recoverable in personal injury litigation. When determining reasonable vocational alternatives following injury, economic and vocational experts must be able to present options that are reasonable and persuasive to the jury. The intent of this article is to 1) provide an overview of lost earning capacity analysis, 2) describe the existing process that economists and vocational experts traditionally follow, and 3) most importantly, describe additional sources of pragmatic information to functionally define a plaintiffs abilities and disabilities - information that can greatly enhance the quality of economic and vocational analysis when evaluating lost earnings.

2. Valuation Overview

Estimation of lost earnings in personal injury cases often requires the input of doctors, vocational experts and economists. Typically, doctors indicate the plaintiffs' levels of physical disability. This information is utilized by vocational experts who recommend alternative jobs that plaintiffs may pursue if they are too disabled to continue in prior lines of employment. The vocational experts' opinions are then incorporated into analyses of total lost earning capacity. The development of information regarding disability and its relation to vocational options therefore forms a significant part of lost earning evaluation.

3. Lost Stream of Income and Benefits

Traditionally, evaluation of income and benefits had the accident not occurred is typically analyzed by economists without the assistance of doctors or vocational experts. The economist studies the worker's education and training, employment history and earnings. The economist will evaluate the state of the worker's industry, future employment

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Thomas P. Yankowski, MS., C. VE., is a Certified Vocational Evaluator and Diplomat with the American Board of Vocational Experts. He has more than 15 years experience testifying in personal injury, wrongful discharge, and long-term disability cases. He is President of the Center for Career Evaluations in Oakland, California, and an instructor at San Jose State University.

opportunities and expected earning rates had the accident not occurred. The economist will also make assumptions concerning the plaintiff's worklife expectancy.

Yet some types of cases would be better served if vocational experts and economists consulted with one another to develop an estimate of lost income and benefits had the injury not occurred. Cases in which plaintiffs have pre-existing medical conditions, are minors, have limited work histories, or work histories and skill sets in obsolete vocations; benefit from vocational expert and economist consultation.

A. Pre-Existing Medical Conditions

In cases where the injured worker had a pre-existing disability or medical condition, the economist should question whether the worker would have been capable of continuing work in the pre-accident occupation. The economist should further question whether the plaintiff would have been able to continue working the same number of hours and schedule that had been established prior the accident. In such cases, a job analysis completed by a vocational specialist, followed by a physician's review of the worker's pre-existing condition in consideration of the job analysis, may be required to accurately assess the worker's prospects for income had the accident not occurred.

B. Plaintiff is a Minor

In cases where the accident occurred to a minor, physical and mental injuries may or may not have an impact on future earnings. The type of injury and limitations must be specifically considered by the economist when determining the potential loss of future earnings. In some cases, the physical injury may prohibit the child from working in certain occupations in the future. The child, however, may have other alternatives which are equally, if not more lucrative than the vocations no longer available to the child.

In many cases, vocational experts may provide assistance to economists who seek to determine what the minor's earning capacity would have been had the subject accident not occurred. Such professionals may identify the specific occupational alternatives and expected future earning rates had the accident not occurred. The vocational experts identify the occupational alternatives through evaluation of pre-accident, and sometimes post-accident, interests, aptitudes and achievement of the minor. Family structure, socio-economic background, education and earning capacity of parents may also provide additional insight into the minor's pre-accident vocational prospects. Pre-adolescent minors are a much greater challenge than those adolescents who have already established an observable school record, yet even they may often be tested for interest and aptitudes.

C. Plaintiff With a Limited Work History

In some cases, the injured party may not be able to furnish the economist with an established work history and record of earnings. For example, a 23 year-old woman who recently began work as a Certified Nursing Aide and contends that she would have become a Registered Nurse in the coming years would pose a challenge for the economist evaluating future lost earnings.

A vocational expert may provide an economist assistance in determining whether this woman would have been successful in pursuit of a Registered Nurse credential. Again, analysis of the injured worker's school records and work history is important. The vocational expert can test her with respect to general learning ability, aptitude and interest

which may provide additional information sufficient to provide a professional opinion regarding the plaintiffs probability of becoming a registered nurse.

Furthermore, if one determines that the plaintiff would be successful as a registered nurse, the vocational expert can provide information to the economist regarding the expected length of job training, the cost of training, the lengths of job search expected, and the opportunity costs associated with pursuing RN training and job search.

D. Pre-Accident Occupations That Would Have Been Abandoned

In some instances, prior to the subject accident, workers find themselves in occupations which are on their way to extinction. For example, typesetters, miners and some logging and milling occupations may no longer provide competitive employment opportunities in some parts of the country.

In such cases, the vocational and economic experts must determine what the alternatives would have been once the injured party was forced to leave the pre-accident occupation. The worker's income and work history, transferable skills, age, interests, aptitudes and general learning ability should be assessed by the vocational expert. This information allows the professionals to conduct a labor market analysis and opine regarding expected vocational alternatives had the plaintiff not been injured.

4. Post-Accident Expected Stream of Income and Benefits

Analysis of the present cash value stream of income and benefits that the plaintiff should earn given that the accident occurred typically requires the assistance of a medical and vocational expert. Doctors and vocational experts may coordinate if a question exists as to whether the plaintiff may return to the pre-accident occupation. The vocational specialist may develop a job analysis including physical capacity requirements for the doctor, who can then opine with authority regarding the plaintiffs ability to return to the prior job. Certain accommodations for the plaintiff, whether they be ergonomic in nature or alternative work duties, may be discussed between medical and vocational experts. The vocational expert may then conduct additional research if necessary and provide the economist with findings as to whether the plaintiff will be able to return to work, and at what level.

A. Alternative Employment for Injured Workers

In the event that plaintiffs do not have the capacity to return their pre-accident occupation, the medical specialist and vocational expert may coordinate regarding physical limitations. The vocational expert can then analyze the most appropriate alternatives for employment.

Traditionally, the vocational expert provides the economist with information on the dates when alternative vocational exploration should begin, or should have begun. If necessary, the expert will also provide information on the most appropriate training programs for the plaintiff. This information should include the date training should begin, the cost of training, the date training should end, and the expected length of job search. In many instances, the vocational expert will research the expected starting earning rate and anticipated fringe benefits. Vocational experts may also indicate the number of years the worker can expect to work before reaching a mature earning rate, and the expected mature earning rate itself.

Part II: Improvements on Traditional Personal Injury Vocational Analysis

1. Traditional Personal Injury Vocational Analysis

In order to provide the opinions necessary to develop an economic loss evaluation, in many cases a vocational analysis should be performed. The following procedural steps are typically followed by vocational experts in personal injury vocational analysis:

1) Review of records
2) Job analysis
3) Personal interview
4) Vocational testing
5) Transferable skills analysis
6) Reasonable accommodation recommendations
7) Labor market assessments
8) Vocational plan recommendations
9) Analysis of lost and fixture earning capacity
10) Analysis of job search activities

This process, however, may exclude the critical element of determining Functional Job Capabilities that are within the plaintiffs residual limitations. Functional Job Capabilities are defined as the measurable work tasks that are required in an actual work environment. Functional Capacity Assessments and Vocational Evaluations are two resources which can provide an individualized and objective analysis of how the injury has affected a person's functional ability to perform the critical demands of a job.

Functional Capacity Assessment & Vocational Evaluations are done by one or several professionals. Functional Capacity Assessments are conducted individually under the direct supervision of a qualified Work Capacity Specialist with a background in neuromuscular, cardiovascular, and bio-mechanical functioning, as well as vocational evaluation (VEWAA Standards. 1993). Vocational Evaluations are conducted by Vocational Rehabilitation Specialist with a background in job analysis, situational assessment, psychometric testing, and work sample administration.

2. Indicators for Functional Capacity Assessments

A Functional Capacity Assessment can be the cornerstone in the development of expert testimony for personal injury cases. The expert's most critical judgment will be determining the impact of residual functional capacity upon the individual's past and future vocational options. A Functional Capacity Assessment is a systematic, objective evaluation of an individual's current functional physical capacities in work-related tasks. It provides a baseline of physical functioning in critical work performance areas as defined by the Department of Labor, such as lifting, carrying, pushing, pulling, kneeling, stooping, bending, gripping, climbing and dexterity. A Functional Capacity Assessment consists of approximately 3-4 hours of short-term, structured activities that measure critical work demands in a controlled setting.

Four key issues emerge for medical and vocational experts when determining a plaintiffs residual work capacities. First, there is an important distinction to be established between the terms "medical impairment" and "vocational disability." The diagnosis of a medical impairment by a physician does not define the impact of the injury upon the individual's vocational alternatives. For example, a forklift driver with limited transferable skills who sustains a foot injury would have a more severe vocational disability than an accounts clerk with the same medical impairment. A Functional Capacity Assessment is often able to define the impact of the injury upon vocational options because the assessment is work-related. Even if physicians outline medical and physical restrictions, they (1) rarely

functionally define these limitations in terms of work and (2) rarely identify activities that the individual can perform in terms of work. A Functional Capacity Assessment can do both.

One sample case involved a 34 year-old, journey-level carpenter receiving $22 per hour who sustained nerve damage to his left, non-dominant elbow. The injury resulted in decreased grip strength as he was unable to flex the interphalangeal joints of his 4th and 5th fingers on his left hand. One of the critical issues in dispute was whether he would be able to hold numerous nails and roll them with his left hand in order to hammer nails at a fast work pace. Labor market analysis indicated this job task was essential to be competitive as a construction carpenter. Time-motion studies were then performed during the Functional Capacity Assessment which determined that he could not perform the nail rolling activity at a professional pace. Possible job modifications were also determined to be unfeasible. However, additional functional testing was conducted involving driving and gear shift simulations which revealed he could perform forklift and truck driving activities. These alternative positions were ultimately offered to him by his employer at the same rate of pay he previously received.

Second, the general work restrictions outlined by a doctor and used for a disability rating procedure can often be misleading or incomplete. The classic example is the person who is restricted to sedentary work by the doctor because they should not perform extensive walking or standing. However, the person's lifting capacity might be in the light or medium categories of physical demands as defined by the Department of Labor, which would greatly expand the number of vocational alternatives available. A Functional Capacity Assessment would specifically provide information about a person's lifting capacity under a variety of conditions. A person with a shoulder injury may not be able to lift overhead, but is able to lift 50 pounds to table height. Another person with a knee injury may not be able to lift from the floor level, but is able to lift 20 pounds overhead from the table height.

Even if medical doctors have completed a standard Physical Capacity Evaluation Form, their opinions are not based upon actual performance testing unless a Functional Capacity Assessment was completed: A recent referral involved a roofer who had sustained severe burns to over 40 percent of his body when he fell down a flight of stairs onto a floor covered with hot tar. The treating physicians, who were burn specialists, listed his restrictions as "avoid exposure to chemical solvents and extremes in temperature." However, the doctors did not address his functional losses, particularly related to his hands which had undergone multiple skin graft operations. The Functional Capacity Assessment revealed the individual was more severely restricted. Additional functional limitations were identified in the critical job demands of heavy lifting, fine manipulations activities, ladder climbing, and forceful or repetitive gripping activities.

Third, a Functional Capacity Assessment might be indicated when there are multiple medical opinions offered in the case, which is very common whenever there are opposing medical experts. As a general rule in these situations, various vocational plan alternatives are developed for each of the different medical restriction scenarios. It is not within the vocational or economic experts' expertise to determine which medical opinion is most appropriate (Siefker, 1992). However, the results of a Functional Capacity Assessment could be added to the doctor's estimate of disability to provide new vocationally-oriented information that would clarify the injured party's vocational options, often in light of conflicting medical opinions.

Finally, a Functional Capacity Assessment might be very helpful when the injured party expresses subjective complaints not substantiated by objective findings. The person's perception of their disability frequently differs from actual performance exhibited during the Functional Capacity Assessment. It is critical for the Work Capacity Specialist to report only the physical signs and symptoms revealed in the Functional Capacity Assessment, as there is no truly reliable test for "motivation" (Isernhagen, 1988). However, a Work Capacity Specialist is able to identify consistency of effort through the variety and reproduction of tests administered. The standardized testing procedures may also result in "performance-based" substantiation of the injured party's perception of their level of impairment. The purpose of the assessment, therefore, is to accurately document the individual's physical abilities as well as limitations. Experts should have a working knowledge of the equipment, protocol, terminology, and techniques used when relying upon Functional Capacity Assessments.

3. Indicators for Vocational Evaluation Services

Vocational Evaluation is another type of rehabilitation specialty which can enhance the study of economic losses. Vocational Evaluation is a comprehensive process that systematically uses real and/or simulated work to assess vocational skills, aptitudes, interests and work readiness (VEWAA Standards 1993). In addition to standardized vocational tests, procedures utilized may include work samples, simulated work activities, learning style assessments, and behavioral observations.

The key component of Vocational Evaluation programs is the use of work samples and simulated job stations. These types of assessment instruments replicate the essential work factors and tools of a job as performed in industry. They have a distinct advantage over commonly used psychometric paper and pencil tests because they simulate the real work environment. They are particularly relevant in personal injury cases because they are based on industrial norms for comparison purposes, and the plaintiffs work behaviors can be personally observed and documented.

Indicators when Vocational Evaluation services may be valuable to the expert are listed below:

1) Vocational feasibility assessment
2) Identify new vocational options
3) Transferable skills assessment
4) Learning style assessment

5) Identify possible employment barriers
6) Work behaviors assessment
7) Job modifications assessment
8) Extended physical tolerance assessment

Complete Vocational Evaluations often develop a greater understanding of the plaintiff than traditional testing procedures. In fact, standardized vocational psychometric tests do not always accurately reflect the functional deficits or strengths that accompany the symptomology of many injuries. For example, one case involved a young woman with a minor head injury who had been declared "unemployable" by a neuropsychologist, based on an interview and administration of paper and pencil tests to the subject. However, a Vocational Specialist conducted a vocational evaluation which revealed additional information. Specifically, a variety of work samples including data entry, food preparation, and cashiering tasks were administered to the young woman. She was found to exhibit social interaction skills, positive work behaviors, and above average manual dexterity. She

also demonstrated an ability to learn tasks that were not complex, but more routine in nature. After conducting a labor market survey, a vocational plan was recommended to prepare her for competitive employment as a food preparation worker following on-the-job training and supported employment for six months.

In addition to identifying additional capabilities, Vocational Evaluations may also discover additional deficits of the plaintiffs. Another case example involved a monolingual, Spanish-speaking farm worker who sustained injuries to his knee, low back, and dominant wrist. Functional testing of his lifting abilities, dexterities, and learning abilities revealed that he was not competitively employable as a result of his residual physical limitations, lack of transferable skills, and low functional academic skills. Assembly and packaging jobs were eliminated as possible vocational alternatives after he performed a variety of assembly work samples from a sedentary work position. These simulations resulted in edema and increased discomfort in his wrist. The case settled before trial, soon after completion of the vocational experts deposition testimony.

An assessment of job modifications can also be critical to the development of viable vocational alternatives. On one case, a journey level carpenter had a severe crush injury to his dominant right hand. The vocational expert retained by the plaintiffs attorney reported the injured worker could perform only light cashiering jobs at a minimum wage salary in the future. During the Vocational Evaluation, however, the injured party demonstrated an ability to write legibly for an hour using a writing aid and an ability to input data on a computer. As a result, the defense vocational expert recommended a vocational training program for him to become a construction estimator with wages starting at $15 an hour. Using a simple ergonomic aide and a functional work sample test, the future earning capacity of the injured carpenter was significantly increased.

4. Work Hardening and Adjustment Programs

A vocational or economic expert could also derive beneficial information from a Functional Capacity Assessment or Vocational Evaluation by using it as a source to recommend Work Hardening or Work Adjustment programs. These services are often recommended by professionals in the rehabilitation field for persons with chronic pain or emotional barriers to returning to work. They are highly structured, goal-oriented, individualized treatment programs designed to maximize a person's ability to return to work. Work simulation and conditioning activities are increased on a graduated basis to improve overall physical tolerances, stamina, productivity, and work behaviors (VEWAA Standards, 1993).

A Functional Capacity Assessment provides a baseline of physical functioning which documents the rationale and recommended treatment plan for a Work Hardening Program. In personal injury cases, these programs may be particularly useful to recommend when the injured party claims to be totally disabled, has been unemployed for an extended period of time, or demonstrates an ability to improve work tolerances. On a recent case, the treating doctor set a 40 pound lifting restriction for the plaintiff. However, it was the opinion of the Work Capacity Specialist that the plaintiff could increase his lifting tolerances to 50 pound following a four-week Work Hardening Program. This analysis was confirmed with the Independent Medical Examiner, which allowed the expert to recommend an increased number of alternative jobs in the "medium level" category of physical demands.

Vocational Evaluations enable the expert to develop treatment goals and time tables for

Work Adjustment Programs for individuals with cognitive or emotional impairments that preclude their return to work. Recently, a Vocational Evaluation was conducted of a person manifesting psychological problems relating to her work place. During the initial interview, she reported "no interest" in any type of job because of her depression. Her psychiatrist stated she was incapacitated from performing her usual duties or returning to work in any capacity at the present time. There was no information obtained in the plaintiffs deposition regarding possible future work options. By the end of the six-hour Vocational Evaluation, she continued to express disinterest for clerical jobs that reminded her of previous employment. However, after completing a medical technician work sample, she indicated an openness to working with people in a hospital. This vocational exploration process, as well as the behavioral observations obtained during the program, allowed the expert to present a graduated vocational plan which included an appropriate amount of rehabilitation supportive counseling. These types of programs, therefore, may be part of a vocational plan recommended by the expert to provide a reasonable methodology for severely disabled individuals to return to work.

5. Conclusion

Each lost earning evaluation is unique. Cases benefit from increased interaction between doctors, vocational experts and economists. Such professional dialogue promotes realistic and accurate assessments of earnings expected had the accident not occurred, and expected earning after the accident. Interdisciplinary consultation should be the trend in evaluating economic losses of plaintiffs.

The expert's credibility as an independent and objective source of information can be enhanced by utilizing interdisciplinary examinations of the injured person's residual functional work capacities. Economic experts who do not possess sufficient training or background in vocational rehabilitation can recommend to the attorney that a rehabilitation specialist in this area be retained. Without sufficient information regarding the injured party's residual physical limitations and functional abilities to perform work, vocational and economic experts may be required to make assumptions which have insufficient basis for support.

If the expert is retained by the plaintiffs attorney, the injured party can be directly referred to a vocational evaluation program for these types of assessments. Depending on state law, the plaintiff may not be required to submit to a defense vocational examination. However, the plaintiff's attorney often agrees to these evaluations in order to maintain all appearances of fairness. Certainly, if such an evaluation is requested and denied, a jury may make certain negative interpretations about the denial of access to the plaintiff.

Functional Capacity Assessments and Vocational Evaluations can have a definitive role in the development of an opinion by a vocational or economic expert in personal injury litigation. These types of evaluations are perceived by the jury as both realistic and objective assessment procedures that simulate actual job demands. Experts who utilize these assessment programs will have a powerful source of documentation from which to base their opinion.

A National Directory of Vocational Evaluation and Functional Capacity Assessment programs can be obtained from:

Vocational Evaluation and Work Adjustment Association
202 E. Cheyenne Mountain Boulevard, Suite N
Colorado Springs, CO 80906

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The Calculation of Lost Pension Benefits for Railroad Workers

James Ciecka and Thomas Donley*

Introduction

Damages involving railroad workers, who are injured or who wrongfully die, are determined under the Federal Employer's Liability Act (FELA) and related interpretive case law. In practical terms, this has meant that economists must consider the impact of income taxes on their calculations of economic losses since the US Supreme Court decision in Norfolk & Western Railway v. Liepelt (1980). The logic of the FELA is that, had someone not been injured or killed, his or her take-home pay would be smaller than gross earnings; and an award for economic losses ought to account for reductions in take-home pay due to taxes.[1]

In regard to pension benefits in FELA actions, or non-FELA cases as well, the most straightforward manner to compute the present value of future pension benefits entails calculating the present value of employee-paid and employer-paid pension contributions. Such a procedure seems appropriate because pension contributions are a part of the value of a person's labor. In addition, for defined contribution plans, an individual specific pension account exists in the name of each employee; and the accumulated value of the pension account directly depends on employee and employer contributions. The same

* Department of Economics, DePaul University, Chicago, Illinois. The authors wish to thank Paul McWilliams, US Railroad Retirement Board; W. Wade Gafford; and an anonymous referee for their valuable comments and for pointing out errors in earlier drafts of this paper. Sue Schoeben provided editorial assistance. Of course, any remaining errors or shortcomings are solely the responsibility of the authors.

[1] On the most transparent level, it seems intuitively obvious that consideration of taxes results in lower awards. However, under certain circumstances, awards may be larger when taxes are incorporated in economic-loss calculations. For example, investment income earned on an award may be larger than lost earnings during the initial years after an award is received; this results in larger tax liability from an award than would have occurred if a person were not injured or killed. Eventually, lost earnings are partially financed by invading the principal of an award; this results in smaller tax liability than if a person were not injured or killed. However, in present value terms, the greater tax liability at the beginning of an award period may outweigh the smaller tax liability at the end of an award period, implying that an award may have to be augmented to offset the greater initial tax liability. In addition, in the normal course of a person's life, certain employer-provided fringe benefits, like health care, are untaxed. The value of household services also is untaxed. When part of an award provides for such benefits or household services, interest income on that part of the award may be taxable, implying tax liability that would not exist under normal circumstances. The award would have to augmented to take this additional tax into account. However, whatever the impact of taxation may be, the purpose of this paper is to consider the impact of the FELA on the method used to calculate railroad workers' pension benefits.

procedure makes sense for defined benefit plans because the benefits that are ultimately paid to all pensioners must, in an overall actuarial present value sense, equal the value of all contributions made to fund benefits.[2] However, in a recent US District Court decision (Rachel v. Consolidated Rail Corporation [Conrail], 1995) involving railroad workers, the court has determined that lost pension benefits cannot be valued in this manner in FELA litigation. The logic behind the decision is that there is only a weak connection between contributions and the actual pension someone will receive. In the aforementioned case, the court quoted from an appellate court decision in Adams v. Burlington Northern Railroad (BNR) (1993) which held that "Any link between the taxes paid and the benefits is too tenuous to provide a true measure of the plaintiff's loss."

Rather than calculating the present value of pension contributions, the court requires the calculation of the difference between the present value of the pension benefits that would have been received if no injury occurred and the present value of the benefits to be received given that an injury occurred. As Taylor and Ireland (1996) indicate, forensic economists need to stay current in the case law that affects their calculations; and this paper is proffered in that spirit. The various calculations involved in computing pension benefits for railroad workers are delineated as well as some of the issues inherent in the calculations. We begin with a brief description of the types of pension benefits enjoyed by railroad workers. The next section of the paper outlines procedures for calculating pension benefits. This is followed by an illustrative example. The concluding section of the paper includes the valuation of family benefits and acknowledges the portion of pension benefits paid to railroad workers that may be considered a form of social insurance.

Pension Benefits Received by Railroad Workers

A retired railroad worker receives three distinct pension benefits: a Tier I Annuity, a Tier II Annuity, and a Supplemental Retirement Annuity. The nature of each of these annuities, as well as the maximum annuity provision, is outlined below.[3]

Tier I Annuity -- This annuity is approximately equivalent to benefits paid under Social Security. Employee and employer contributions (7.65 percent on a maximum of $62,700 of earnings in 1996) are the same as under Social Security; however, eligibility

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[2] Some workers may receive more benefits, and some may receive less, than the present value of total employer and employee contributions. However, the average payout should be correct. If more than the actuarial present value of a pension plan's assets are paid to pensioners, the plan will become insolvent. If significantly less is paid, the pension plan is making a "profit," which is not consistent with the objective of a pension plan.

[3] See *Railroad Retirement Handbook* (1995) for a detailed explanation of pension benefits accruing to retired railroad employees. Certain employees, who had ten years of railroad service prior to 1974 and retired after 1974, may qualify for dual benefits. These dual benefits, funded annually through general US Treasury revenues rather than railroad retirement payroll taxes, are not considered in this paper.

rules are somewhat different. Most notably, a railroad worker qualifies for Tier I benefits at age 60 if he or she has 30 years of railroad service; but benefits are reduced by 20 percent. In addition, a railroad worker receives unreduced Tier I benefits if he or she has 30 years of railroad service and is 62 years old at the date of retirement. Spousal benefits are equal to 50 percent of an employee's benefits while the employee is alive. If the employee dies, the spouse receives the full employee benefit, and the previously paid spousal benefit ceases. In addition, eligible children receive 75 percent of the employee's benefits and a dependent parent receives 82.5 percent in survivor's benefits.[4]

Tier II Annuity -- This annuity is the "private" part of a railroad worker's pension, although benefits are funded by tax contributions. Railroad workers with 30 years of service qualify for full Tier II benefits at age 60. For workers with less than 30 years of service, benefits may begin at age 62, subject to a reduction equal to 1/180th per month for each month younger than 65. Employees currently pay a tax of 4.9 percent of their earnings; and employers pay a tax of 16.1 percent on a maximum earnings base of $46,500.[5] Spousal benefits are 45 percent of the employee's benefits. If the employee dies, the spouse receives 50 percent of the employee's benefit, and the previously paid spousal benefit ceases. Additionally, eligible children are entitled to a 15 percent survivor benefit and dependent parents receive survivor benefits of 35 percent. Survivor benefits are capped at 80 percent of the initial Tier II employee annuity. Unlike most private pension contributions, employee-paid contributions are not tax sheltered at the time contributions are made. There is, however, a recovery provision allowing future Tier II benefits to be treated as tax-free income to the extent of employee-paid contributions. Recovery takes place at a uniform rate over the life expectancy of a person after retirement, but the recovery is less than the present value of previously paid taxes because the dollar amount of the recovery is equal (on an undiscounted basis) to the previously paid taxes.

Supplemental Retirement Annuity -- Employees do not make contributions to fund this annuity. The monthly benefit is equal to $23 plus $4 for every year of railroad service over 25 years. The maximum monthly benefit is $43, or $516 annually. This benefit requires a current connection; and railroad employees hired after October 1, 1981 are not eligible for this benefit.[6]

Railroad Retirement Annuity Maximum -- The Railroad Retirement Act of 1974 imposes a ceiling on the total amount payable to a retiree or a retiree and a spouse.[7] This

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[4] Payments to dependents must not exceed 150 percent of the employee's Tier I payments. Additionally, there is a maximum survivor's benefits cap which typically becomes binding with three or more eligible family members.

[5] The contribution rates and earnings caps have changed over time. See *Railroad Retirement Handbook* (1995).

[6] See the *Railroad Retirement Handbook* (1995) for a description of the requirements for a current connection.

[7] If the spouse is independently entitled to Social Security benefits and elects to receive those benefits under his or her account, the spouse's benefits are not counted towards the

ceiling (or "cap") is called the RRAMAX, and it is calculated as follow:

1.   Let HAMC denote the highest average monthly compensation, which is determined by adding the highest two years of railroad earnings in the ten-year period immediately preceding and including the year an annuity begins and dividing by 24.

2.   FAMC is final average monthly compensation determined as
      FAMC = min (HAMC, maximum creditable monthly Tier II amount in years with HAMC).

3.   If FAMC < (½) maximum creditable monthly Tier I amount in the year that the annuity begins, then

      RRAMAX = max (FAMC, $1,200).

4.   If FAMC $\geq$ (½) maximum creditable monthly Tier I amount in the year that the annuity begins, then

      RRAMAX = .8(FAMC) + .2(½) (maximum creditable monthly Tier I amount in the year that the annuity begins).

      The RRAMAX computation assigns a crucial role to earnings in the ten years prior to the commencement of the annuity. For example, if earnings are low (or perhaps zero for an injured person) during those ten years, then RRAMAX could easily be $1,200 even if earnings were high during the years preceding the ten years before retirement. Two final considerations are important. First, the RRAMAX cannot reduce Tier I amounts for a retiree or the spouse because Tier I amounts are Social Security guarantees. However, if the Tier I guarantees exceed the RRAMAX, then Tier II benefits are reduced to zero. Secondly, the RRAMAX formula enables us to determine the maximum benefit initially payable to an employee and spouse. As of 1996, the highest possible value of this maximum monthly amount is

      RRAMAX = .8[($45,000 + $45,300)/24] + .2(½)($62,700/12) = $3,533

where $45,000 and $45,300 are the Tier II maxima in 1994 and 1995, and the Tier I maximum is $62,700 in 1996.

RRAMAX.

Procedures for Calculating Pension Benefits for Railroad Workers

Given the ruling of the US District Court, estimation of the present value of future pension benefits requires the estimation of the future benefits themselves, rather than the present value of pension contributions. This section outlines the requisite steps for these calculations for railroad workers. Estimation of economic damages requires that these calculations be performed twice, once under the assumption of no injury and again given that the injury did occur.

1. *Calculate Tier I, Tier II, and Supplemental Annuity Benefits.*

Calculation of benefits requires a complete labor force history, including earnings and the time and timing of service. The best source for this information is the injured person's Employment Data Maintenance Record obtainable from the US Railroad Retirement Board.[8] This record contains a railroad employee's entire earnings history, including earnings subject to Tier I taxes, earnings subject to Tier II taxes, any non-railroad earnings subject to Social Security taxes, and years of railroad service. In short, it contains all of the information needed to calculate Tier I, Tier II, and the Supplemental Retirement Annuity.

Due to the complexity of the law governing Social Security benefits, it probably is prudent to calculate Tier I benefits with the aid of a computer program developed by the Social Security Administration. A computer program called "ANYPIA" and accompanying manual are available from the National Technical Information Service (1994).[9] When estimating Social Security benefits, adjustments must be made to account for earlier retirement possibilities allowed for railroad workers under Tier I benefit plans as described in the previous section.

Tier II and Supplemental Annuity Benefit calculations are relatively straightforward. The monthly pension benefits equal:

Tier II = (years of service)x(0.007)x(average of the highest 60 month's earnings, subject to maximum amount)

Supplemental Annuity Benefits = $23 + $4x(years of service -25) up to maximum of $43 per month

After computing Tier I, Tier II, and Supplemental Annuity benefits, the economist should calculate the RRAMAX for the "with" and "without" injury scenarios. When an accident occurs that only entitles the injured party to receive a deferred annuity, it is very

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[8] The US Railroad Retirement Board's address is 844 North Rush Street, Chicago, Illinois, 60611-2092.

[9] The National Technical Information Service's address is 5285 Port Royal Road Springfield, VA 22161. There is a small charge for the computer program and manual. The program and documentation can be obtained free of charge on the internet via anonymous ftp at ftp.ssa.gov.

possible that the RRAMAX will be $1,200 per month because the injured person may not be employed for several years before qualifying for an annuity.

2. *Calculate the Portion of Tier I Benefits Subject to Tax.*

This calculation follows normal tax rules for Social Security taxes which establish two sets of base amounts according to filing status (Commerce Clearing House, 1997; Hoffman, Smith, and Willis, 1996; and Internal Revenue Service, Publication 915, 1995):

Filing Status	First Base Amount	Second Base Amount
Married, filing jointly	$32,000	$44,000
Married, filing separately	$0	$0
All other taxpayers	$25,000	$34,000

Define modified adjusted gross income (MAGI) as adjusted gross income plus certain tax-exempt interest income.[10] In particular, MAGI includes taxable Tier II benefits, the Supplemental Retirement Annuity, and any other taxable income. If MAGI plus one-half of Tier I benefits exceeds the first base amount, but not the second base amount, taxable Tier I benefits are the *lesser* of the following:

(A) .5 x (Tier I Benefits)

(B) .5 x [MAGI + .5 x (Tier I Benefits) - First Base Amount]

No Tier I benefits are taxable if the value of (B) is negative, *i.e.*, if MAGI plus one-half of Tier I benefits are smaller than the first base amount.

If MAGI plus one-half of Tier I benefits exceeds the second base amount, taxable Tier I benefits are the *lesser* of the following:

(C) .85 x (Tier I Benefits)

(D) Sum of .85 x [MAGI + .5 x (Tier I Benefits) - Second Base Amount] and the smallest of (A), (B) computed above or $4,500 ($6,000 for married persons filing a joint return).

3. *Calculate the Portion of Tier II Benefits Subject to Tax.*

To make this calculation, first determine the total lifetime employee payments of Tier II taxes. The Employment Data Maintenance Record has all of the information on Tier II taxes paid. Second, determine the employee's age when benefits commence, and the number of years over which Tier II taxes may be recovered. The Simplified General Rule (Commerce Clearing House, 1997; Internal Revenue Service, Publication 575, 1995) allows

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[10] This includes interest earned on savings bonds used to finance higher education and income and interest earned in a foreign country, a US possession, or Puerto Rico that was excluded from gross income.

recovery according to the following schedule.[11]

Age at Annuity Starting Date	Number of Years for Recovering Tier II Taxes
55 and under	25.00 Years
56-60	21.67 Years
61-65	20.00 Years
66-70	14.16 Years
71 and over	10.00 Years

Once the number of years for recovery is determined, divide the total lifetime employee Tier II contributions by the number of recovery years to determine an annual recovery amount (partial years should be prorated). Annual Tier II benefits subject to tax equal Tier II benefits less the annual recovery amount.

4. Determine Tax Liability.

Once taxable Tier I, Tier II, and Supplemental Retirement benefits have been determined in Steps (2) and (3), tax liability is calculated after settling on the appropriate filing status, number of personal exemptions, marginal tax rate, and deductions for the tax payer.[12]

5. Determine Total After-Tax Benefits, and Compute Their Present Values.

We arrive at after-tax benefits by simply subtracting total tax liability in Step (4) from gross benefits in Step (1) and determine the present value of after-tax benefits.

An Illustrative Example[13]

Assume the following hypothetical facts: John Jones was born in December, 1950, and he started his railroad career in 1979. Mr. Jones is married; he lives in Illinois;[14] he was injured in December, 1995; and his life expectancy is 33 years, i.e., to the year 2028.[15] At

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[11] Distributions are taxed under annuity rules of Internal Revenue Code Sections 402(a) and 403(a)(1); however, the Simplified General Rule is allowed.

[12] Consideration should also be given to applicable state and local income taxes.

[13] In this example, all amounts (including lost earnings and future pension amounts) are kept in constant 1996 dollars.

[14] Illinois state taxes are 3 percent of adjusted gross income after a reduction of $1,000 times the number of personal exemptions. There is a provision for a tax credit which depends of the amount paid in real estate taxes. This provision of the Illinois tax code is ignored in the example calculations for simplicity.

[15] In this illustration we calculate losses until the end of life expectancy, but it could be argued that it is more appropriate to calculate the actuarial present value for life. It is not the purpose of this paper to enter into this controversy, but either life expectancy or the

the time of his injury, Mr. Jones had 169 months (14.1 years) of railroad service. Assume further that Mr. Jones is unable to perform his regular railroad occupation, but he does not immediately qualify for an occupational disability pension because he lacks the required 240 months of railroad service. Mr. Jones' work-life expectancy, had the injury not occurred, implies that retirement will occur at age 62, which would be in December, 2012. If the injury did not occur, pension benefits would have started at the beginning of 2013. All of the Jones' children will be adults and are assumed to be emancipated from the family at that time. Mr. Jones will qualify for an occupational disability at age 60 since he had between 120 and 240 months of railroad service when he was injured. Finally, assume that Mr. Jones is totally disabled and does not have earnings after the date of injury.

Table 1 shows Mr. Jones' earnings and Tier I and Tier II earnings record.[16] If earnings exceed either the Tier I or the Tier II maximum earnings base, only the maximum earnings base amounts appear in the Tier I and Tier II columns of the table. Tier I benefits can be computed with the information in Table 1 and the ANYPIA program. Mr. Jones' pre-injury earnings record would entitle him to a monthly occupational disability Tier I benefit of $1,104z at age 60, or $13,248 annually. If he had not been injured, his monthly Tier I benefit would have been $1,193 (or $14,316 per year) at age 62.[17] The highest 60 months of earnings (given that the injury occurred) are $211,316, implying a monthly Tier II pension of $347.61 = ($211,316/60) (14.1 years) (.007), or $4,171 annually. The highest

actuarial present value for life could be used. Forensic economists often use the concept of life expectancy, *e.g.*, see Hanson (1991) and Slesnick and Thornton (1994). On the other hand, see Ben-Zion and Reddall (1985) and Fjelsted (1993) for criticisms of the use of life expectancy. See Jordan (1991) for a proof that present value of a life annuity is smaller than the present value of an annuity certain for a term equal to life expectancy.

[16] Although there may be Social Security earnings from non-railroad employment prior to 1979, this example implicitly assumes there were no such earnings. If there were pre-1979 Social Security earnings, they would be counted with Tier I earnings when calculating Tier I benefits.

[17] We assume that the occupational disability payments received during Mr. Jones' 61st and 62nd year are collateral source payments and are, therefore, ignored in any lost-pension calculation. Annual Tier I benefits only differ by a little more than $1,000 under the "with" and "without" injury scenarios even though there would be 17 additional years of work if the injury did not occur. There are two reasons for such a small difference in benefits. First, Social Security benefits do not increase proportionately with years of work or with the level of earnings. Secondly, Mr. Jones receives an occupational disability pension in this example; but such a pension is not subject to an age reduction. In effect, Mr. Jones is "deemed" to be age 65 for purposes of computing his disability pension -- the same age he is "deemed" to be for calculating the pension he would have received if no injury occurred. Since neither pension calculation is subject to an age reduction, neither differs greatly from the other.

60 months of earnings (if the injury did not occur) would have been $225,300, implying a monthly Tier II pension of $817.46 = ($225,300/60) (31.1 years) (.007), or $9,810 annually.[18]

The sum of Mr. Jones' Tier I and Tier II monthly amounts (with the injury) would be $1,452 = $1,104 + $348. However, the lack of earnings (in the ten-year period prior to receiving an occupational disability annuity) implies a RRAMAX of $1,200 per month. Since the sum of Tier I benefits for Mr. Jones and an additional 50 percent of those benefits payable to Mrs. Jones exceeds the RRAMAX, Tier II benefits are reduced to zero.[19] Without the injury, the sum of Tier I and Tier II benefits ($2,010 = $1,193 + $817) plus spousal benefits is less than the RRAMAX of $3,523 = .8[($45,000 + $45,000)/24] + .2(½)($62,700/12). Therefore, the RRAMAX provision becomes a binding constraint in the "with injury" setting, but it would be non binding if the injury did not occur.

Mr. Jones contributed $18,816 for Tier II benefits before his injury; this is the amount which can be recovered (*i.e.*, tax sheltered) after Tier II benefits commence. The annual recovery is one-twentieth per year, *i.e.*, $941 per year; but recovery never occurs because Tier II benefits are reduced to zero because of the RRAMAX. If Mr. Jones had not been injured, the assumed level of his Tier II contributions is $56,301.[20] The annual recovery, under the assumption of no injury and once retirement commences, is $2,815 = $56,301/20.

Table 2 summarizes pension benefits, tax liability, and after-tax benefits with and without the occurrence of the injury. Table 2 also shows the present value of benefits at various net real after-tax discount rates.[21] With (say) a 1 percent net real after-tax discount rate, the present value of the difference in Tier I, Tier II, and Supplemental Retirement benefits is $140,245 = $305,704 - $165,459.

To put this loss amount into perspective, we calculate Tier I and Tier II benefits in an alternative manner, *viz.*, we compute the present value of employee-paid and employer-paid Tier I and Tier II contributions from the time of injury to the end of the

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[18] This amount is based upon an assumed projection of future income, until retirement, of $45,000 per year in 1996 dollars.

[19] Since Mr. Jones has less than 30 years of service, Mrs. Jones would not be eligible for an annuity until she reaches age 62; and, at that time, it would be subject to an age reduction. We assume that Mrs. Jones' Tier I annuity is immediately payable when Mr. Jones qualifies for benefits in order to simplify the calculations.

[20] The figure of $56,301 comes from pre-injury contributions of $18,816 plus assumed earnings (if no injury occurred) of $45,000 per year (in 1996 dollars) for the years 1996-2012 multiplied by the employee-contribution of 4.9 percent, *i.e.*, $56,301 = $18,816 + $45,000 (17 years) (.049).

[21] Let g and I denote the nominal growth rate in pension benefits and the nominal discount rate, respectively. Let i_a denote the after-tax discount rate. After deducting the inflation rate, the real growth rate in pension benefits and the real after-tax discount rates are g_r and i_{ar}. The net real after-tax discount rate is $i_{ar} - g_r$.

injured person's normal work-life expectancy. Noting that employees and employers separately contribute 7.65 percent of earnings to Tier I and that employee's and employer's Tier II contributions are 4.9 percent and 16.1 percent, then total Tier I and II contributions are 36.3 percent of earnings. The example assumes a work-life expectancy of 17 years (*i.e.,* the injury is in December, 1995 and retirement occurs at the end of 2012) and lost real income of $45,000 per year. The present value of 36.3 percent of $45,000 for 17 years is $255,477 with a 1 percent net real discount rate -- a sum considerably larger than the previously calculated $140,245.[22]

Conclusions

With the procedures outlined in Rachel v. Conrail and Adams v. BNR, the value of lost pension benefits was $140,245 in the detailed example in this paper with a 1 percent net real discount rate. This amount differs so dramatically from the estimate derived by calculating the present value of pension contributions that it becomes clear that the decision in Rachel v. Conrail raises a non-trivial issue in estimating economic loss. Economic intuition implies that the present value of contributions should approximate the present value of benefits, but as we have demonstrated the two approaches yield widely different estimates. There are two aspects of the decision that are built into the preceding analysis: taxes and the scope of recipiency which may account for different estimates.

Suppose one were to ignore the issue of the taxation of pension benefits. Would the measure of loss differ very much? The answer is "no" in this example. Consider that the total pre-tax annual value of Tier I, Tier II, and Supplemental Retirement Annuity income is $13,248 with the injury and $24,642 without the injury, implying a difference of $11,394 annually. The present value of $11,394 is $142,304 (with a 1 percent net real after-tax discount rate) -- an amount that differs very little from $140,245. Therefore, it may be possible to ignore taxes on pension benefits but still arrive at a loss estimate that is very close to the precise loss. This would hold when a retiree's income largely consists of Tier I and Tier II benefits because there will be very little, if any, tax liability on Tier I benefits. Tax liability will consist of taxes on Tier II benefits, but much of that liability will "wash

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[22] Let E_n denote the present value of lost after-tax earnings, after deducting employee-paid Tier I and Tier II contributions, and let T_e and T_r represent the present value of lost employee-paid and employer-paid Tier I and II contributions, respectively. Finally, P_d denotes the present value of the difference between pension benefits with, and without, injury as mandated by Rachel v. Conrail. One measure of the loss of money earnings and pension benefits is $E_n + T_e + T_r$. However, the measure of loss of money earnings and pension benefits mandated by Rachel v. Conrail is $E_n + P_d$. When comparing these two loss calculations, E_n "cancels out," revealing that $(T_e + T_r)$ should be compared to P_d. In the foregoing example, $(T_e + T_r) = $255,477$ and $P_d = $140,245$.

out" when calculating the difference between benefits with and without the injury.[23]

The effect of restricting the scope of recipiency exclusively to the plaintiff is substantial. The calculation method mandated in Rachel v. Conrail and Adams v. BNR may lead an analyst to ignore the value of other parts of the railroad retirement program, which is a comprehensive package of benefits for spouses, survivors, children, disabled children, dependent grandchildren, and dependent parents. Although the latter benefits have economic value, their value could be ignored when following the procedure prescribed in Rachel v. Conrail and Adams v. BNR. Whenever a family member is not a party to the litigation ensuing after an injury, he or she may not be able to directly recover for reduced pension benefits. However, one may argue that there is nothing in these decisions that precludes separately estimating the value of other benefits. More to the point, given that these family benefits are part of the employees' "wage bargain," the employee (and/or the employee's estate) enjoy property rights to these benefits and their value should be factored into any calculation of economic loss.

Suppose we were to ask what a reasonable measure of the value of these family benefits would be. The theoretically correct answer would be the amount of money it would cost an individual person to purchase the same benefits in the marketplace. Since it probably would be very expensive, if not impossible, to buy the same benefits as an individual and not as a member of a group, a reasonably conservative estimate of the value of these benefits might very well be as follows: it is the difference between the present value of all employee-employer contributions and the present value calculation prescribed under Rachel v. Conrail and Adams v. BNR. However, this would render the court decisions vacuous because the sum of pension benefits as prescribed by the courts and the value of other benefits would be equal to the value of employee and employer contributions, which the courts specifically rejected.

Alternatively, we can extend the methodology for the plaintiff to include the plaintiff's family members. For example, if Mr. Jones' wife were two years younger than Mr. Jones, the value of her lost pension benefits are about two-thirds of those of Mr. Jones himself.[24] Additional family benefits not included in the calculation clearly may cause the two alternative calculation methods to converge. The difficulty inherent in this alternative is the required identification of family status at the projected time of the employee's

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[23] The detailed example presented in this paper ignores any income received by the injured person's spouse, or any other family income. In effect, we assume that the spouse had no income (or the family had no other income) during the time period when pension benefits were paid; or, if there were such income, it was not relevant to the loss calculation. If other family income must be included when determining taxability of pension benefits, then Formulas (A) - (D) can be used to determine taxable Tier I benefits. Since pension funds would be commingled with other family income to determine total family tax liability, it then would become necessary to prorate total family taxes to pension benefits and other family income.

[24] We assume that Mrs. Jones would outlive Mr. Jones by approximately 8 years given her younger age and longer life expectancy. Consequently, while her annual loss is about one-half that accruing to Mr. Jones, her loss period runs longer.

retirement. Clearly, we must know the family's structure in order to estimate family benefits. In particular, we must project the employee's marital status and number of eligible dependents.

Such projections may carry with them a large degree of uncertainty. One approach would be to take current (at time of injury or trial) family status and age the family accordingly. However, this type of projection is static and does not allow for future changes (*e.g.*, marital status remains unchanged). A better approach may be to estimate family benefits by examining the actuarial record. In particular, the estimate of future family benefits should reflect the actual level of family benefits paid out under the pension plan. This information is available and published in the *Railroad Retirement Handbook*. In 1994, employee age retirement and Supplemental Annuities comprised 62 percent of total benefits paid.[25] This implies average family benefits (excluding those paid directly to the employee) equal to approximately 60 percent of direct employee benefits as estimated in the previous section.[26] This substantially closes the gap between the present value of premiums paid and the results obtained from estimating those benefits accruing directly to the employee in the illustrative example discussed above. However, the picture remains incomplete.

Benefits under the Tier I provision of the Railroad Retirement Act parrot the benefits paid under the Social Security Act. These benefits were designed to provide social insurance against poor labor market outcomes. That is, (as noted in Adams v. BNR [1993]) the benefit structure does not return dollar for dollar benefits for premiums paid. Individuals experiencing "fortunate" labor market outcomes (*i e.*, sustained high earnings) pay more in premiums than they receive in benefits. This difference is returned to those experiencing "poor" labor market outcomes as the benefits paid to such individuals exceed the value of contributions.

Two immediate questions arise with respect to this portion of benefits. What property rights does the plaintiff hold in such social, or labor market, insurance; and has the loss analysis already incorporated this redistributive aspect of the insurance? We contend that the preceding analysis used for calculating retiree and family benefits is conservative because it does not incorporate this social insurance aspect of employee benefits. Yet, we recognize that the retiree may not enjoy property rights in the portion of potential benefits that can be ascribed to social insurance. In fact, we believe that it may have been this social insurance portion of benefits that attracted the attention of the courts.

On a superficial level, the reasoning underlying the court's ruling in Rachel v. Conrail seems correct. What is wrong with calculating the present value of the difference in the "with" and "without" injury pension benefits streams? The answer is that there is nothing wrong with such a calculation as far as it goes. However, a whole new set of questions immediately flows from this ruling. Do we consider the individual family circumstances (*e.g.*, non-pension family income, marital status, number of dependents) when implementing the court's decision? Do we consider spousal annuities? Do we

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[25] Based on calculations from *Railroad Retirement Handbook* (1995) Table 3, p. 22.

[26] This excludes the estimated value of lump-sum payments made to survivors.

consider other parts of the larger benefits program funded by Tier I and Tier II contributions? If we ignore these questions, a plaintiff is very likely shortchanged.

We conclude that an accurate assessment of economic loss is not equal to the present value of premiums paid if the plaintiff does not enjoy property rights in the social insurance aspect of the pension. However, neither does it only equal the present value of benefits accruing directly to the plaintiff. An accurate assessment of benefits equals those benefits paid directly to the plaintiff plus those payable to the plaintiff's family. In practical terms, we suggest that estimates of loss (in order to be consistent with new federal case law), be set equal to the value of direct benefits plus an estimate of additional family benefits set equal to 60 percent of the value of direct benefits for younger workers whose family status at normal retirement age is quite unclear. For older workers whose family structure is more certain, a more individual-specific calculation may be more reasonable.

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Table 1
Mr. Jones' Earnings Record

Year	Months of Service	Earnings	Tier I Earnings	Tier II Earnings	Employee Tier II Rate	Employee Tier II Contributions
1979	8	$18,767	$18,767	$18,767	.0000	$0
1980	10	19,458	19,458	19,458	.0000	0
1981	10	22,356	22,356	22,200	.0050	111
1982	5	12,542	12,542	12,542	.0200	251
1983	7	14,985	14,985	14,985	.0200	300
1984	9	17,640	17,640	17,640	.0275	485
1985	10	22,548	22,548	22,548	.0350	789
1986	6	14,667	14,667	14,667	.0425	623
1987	8	17,555	17,555	17,555	.0425	746
1988	12	31,432	31,432	31,432	.0490	1,540
1989	12	36,885	36,885	35,700	.0490	1,749
1990	12	38,511	38,511	38,100	.0490	1,867
1991	12	43,640	43,640	39,600	.0490	1,940
1992	12	44,835	44,835	41,400	.0490	·2,029
1993	12	41,694	41,694	41,694	.0490	2,043
1994	12	43,322	43,322	43,322	.0490	2,123
1995	12	45,879	45,879	45,300	.0490	2,220

Months of Service: 169 Months = 14.1 Years. If No Injury Occurred: 31.1 Years of Service (= 14.1 + 17.0)

Total Tier II Contributions, Given Injury Has Occurred:	$18,816
Total Tier II Contributions, If No Injury Occurred (See Footnote 20):	$56,301
Highest 60 Months of Tier II Earnings, Given Injury Has Occurred ($39,600 + $41,400 + $41,694 + $43,322 + $45,300):	$211,316
Highest 60 Months of Tier II Earnings, If No Injury Occurred ($45,300 + $45,000 + $45,000 + $45,000 + $45,000):	$225,300
Tier II Annual Pension, Given Injury Occurred ($211,316/60)(.007)(14.1)(12):	$4,171
Tier II Annual Pension, If No Injury Occurred ($225,300/60)(.007)(31.1)(12):	$9,810

Table 2

Pension Benefits, Taxable Pension Benefits, Taxes, After-Tax Pension Benefits, and Present Value of Pension Benefits

	With Injury	Without Injury
Annual Tier I Benefit	$13,248	$14,316
Annual Tier II Benefit	$0	$9,810
Annual Supplemental Retirement Benefit	$0	$516
Taxable Tier I Benefit	$0[27]	$0[26]
Taxable Tier II Benefit	$0	$6,995
Annual Recovery	$0	$2,815
Taxable Supplemental Retirement Benefit	$0	$516
Total Taxable Benefits	$0	$7,511
Federal Tax	$0[28]	$0[27]
State Tax	$0	$165
After Tax Benefit	$13,248	$24,477

Present Value of After-Tax Benefits Received between 2013 and 2028		
Discount Rate of 0%	$211,968	$391,632
Discount Rate of 1%	$165,459	$305,704
Discount Rate of 2%	$129,740	$239,708

[27] See formula B, which is negative, in the text.

[28] Assuming a joint return , a standard deduction, and 2 exemptions.

Pricing Behavior of Video Rental Stores

Semoon Chang[*]

On April 7, 1995, Malcolm Warren et al filed a lawsuit against Blockbuster Video in the Circuit Court of Mobile County, Alabama, claiming a fraud (not a violation against antitrust laws) by the defendant in that extended viewing fees were higher than initial rental fees and the higher extended viewing fees constituted an unenforceable penalty. The fraud claim is especially interesting since Blockbuster is one of the few video rental stores that maintain fee schedules not only printed on the membership agreement, but also posted clearly inside the store.

The focus of the plaintiffs' claim is that if the initial rental fee is $3.00 for 3 evenings and the extended viewing fee is $2.00 for 1 evening, extended viewing fees are higher than initial rental fees. Plaintiffs claim either that the initial rental fee for 3 evenings should be $6.00, if the $2.00 per evening extended viewing fee is maintained, or that the extended viewing fee for one evening should be $1.00, if the $3.00 for 3 evenings initial rental fee is maintained.

This paper shows that the absence of the equality between initial rental fees and extended viewing fees is a normal pricing behavior of profit-maximizing retail rental stores in general, and for video rental stores in particular.

A Pricing Model of Video Rentals

The pricing behavior of a profit-maximizing firm with usual definitions is the following:

$$TR = PQ; \text{ where } P = P(Q) \text{ and } dP/dQ < 0$$
$$TC = TC(Q)$$

Profit (π) is the difference between TR and TC:

$$\pi = PQ - TC(Q) \tag{1}$$

Taking the first-order condition for profit maximization,

$$d\pi/dQ = [dP/dQ]Q + P - MC = 0$$
$$P = MC - [dP/dQ]Q$$
$$p = MC + m \tag{2}$$

where

$$MC = \text{marginal cost}$$
$$m = \text{markup}$$

$$m = -[dP/dQ]Q$$
$$m = P/E; \ E = -(dQ/dP)(P/Q) \text{ and } \partial m/\partial E < 0.$$

In other words, markup varies inversely with the price elasticity of demand. For a realistic range of output, average cost tends to remain stable, leading marginal cost to equal average cost. Equation (2) thus becomes:

$$P = AC + m \hspace{4cm} (3)$$

Although videos are supplied to the public by national chains, the relevant market for retail video rental is local in that one video rental store competes against other similar stores in any neighborhood. We assume that the local video rental market is monopolistic competition in which there are many sellers, barriers to entry are low, and products (i.e., rental services) are differentiated.

Product differentiation is achieved through: (a) greater selection; (b) convenient location; (c) convenience in daily hours of operation; (d) availability of drive-in boxes for return; (e) agreements available for self-service pick-up; (f) more personnel for better service; (g) posting fee schedules; and (h) family-oriented selection without X-rated videos.

The rental price of videos (P_v) has two components; the initial rental fee (IRF) and the extended viewing fee (EVF):

$$P_v = IRF_i + EVF \hspace{4cm} (4)$$

in which i is r for new releases, and c for catalogs such as old releases and new releases with slow turnovers. Also, EVF is zero if videos are returned on time. In a monopolistically competitive market such as video rental, consumers have a large number of alternative stores available to them, limiting pricing policies of individual video rental stores. This also means that the rental demand for videos is relatively price-elastic. Demand for new releases (r), however, is expected to be less price-elastic than demand for catalogs (c), resulting in a higher markup for new releases than for catalogs. That is:

$$m_r > m_c \hspace{4cm} (5)$$

$$IRF_r = AC + m_r \hspace{3.5cm} (6)$$

$$IRF_c = AC + m_c \hspace{3.5cm} (7)$$

$$IRF_r > IRF_c. \hspace{3.8cm} (8)$$

Videos due for return on Fridays and Saturdays are likely to be rented again for the weekend, but videos due for return on weekdays may not be rented again until the weekend. Since demand is greater for weekend (i.e., Friday and Saturday) rentals than weekday (i.s., Sunday through Thursday) rentals, the price elasticity of demand for videos available for weekend (n) rentals is less than the price elasticity of demand for videos available for weekday (d) rentals. This means that EVFs of videos due for return on weekends should be higher than EVFs of videos due for return on weekdays.

$$P_n = IRF_i + EVF_n \qquad (9)$$

$$P_d = IRF_i + EVF_d \qquad (10)$$

$$P_n > P_d \qquad (11)$$

IRF_i is the same as P in (3), i.e.,

$$IRF_i = AC + m_i \qquad (12)$$

in which i is r for new releases and c for catalogs. Also, m varies with the level of competition in different locations.

Combining (4) and (12),
$$P_v = AC + m_i + EVF_j \qquad (13)$$

where   i = r or c
        j = n or d.

Consider that the maximum P is externally constrained at P_0 due to market conditions characterized as monopolistic competition, and that AC in the practical range of output is likely stable at AC_0. Equation (13) then becomes:

$$P_0 = AC_0 + m_i + EVF_j \qquad (14)$$

Equation (14) suggests that EVFs can be either higher or lower than IRFs so long as the sum of the average cost (AC_0), the markup (m_i) for initial IRF, and the extended viewing fee (EVF_j) is equal to P_0. This explains why there is no unique relation between initial rental fees and extended use fees in the rental market in general, including video rentals.

Pricing Practices of Video Rentals

Since the lawsuit was filed in Mobile, Alabama, the area's profile of pricing practices of video rental stores is developed in Table 1. At the time of survey in early November 1995, there were at least 54 video rental stores in Mobile County (population 394,420) under 37 different company names. Thirty three (33) of these companies representing 48 stores responded to the survey. Rental fees are expressed in dollars per night. A striking observation is that prices vary widely for identical videos. Also interesting is the varying times of return, which range from 4:30 p.m. to 12 mid-night. The monopolistically competitive nature of the video rental market is unmistakable.

For new releases in Table 1, none of 33 stores surveyed had a clear case of higher EVFs than IRFs, five had lower EVFs than IRFs, 26 had the same fees between initial and extended viewing, and two had EVFs that were higher or lower than IRFs depending on how one views. Blockbuster's 1-night 2-evening new releases are one of the five that had EVFs lower than IRFs.

For catalog videos, Table 1 indicates that EVFs are higher when IRFs are prorated

on a 24-hour basis at two stores where EVFs are the same as IRFs but IRFs allow two night viewing; EVFs are lower at four stores; one store has a mixed policy; EVFs are clearly the same as IRFs at 22 stores; and it is difficult to determine at four stores including Blockbuster, where EVFs are lower than IRFs but IRFs cover two or more nights.

Even in catalogs, Blockbuster is not one of the stores that maintain higher EVFs than IRFs. EVFs at Blockbuster are higher than IRFs only if the customer keeps the video for two nights and if IRFs are prorated on a 24-hour basis. If the IRFs are viewed as a total package price, or if customers return the video after one night, EVFs may actually be lower than IRFs at Blockbuster.

It was suggested in equation (14) that there is no unique relation between initial rental fees and extended use fees in the rental market in general. To further test the hypothesis, a telephone survey was made during late November and early December 1995 to most, if not all, auto and equipment rental stores in the area that rent products for a week-long initial rental period, which is followed by daily late charges. Results are similar to Table 1 in that no unique relations were observed between initial rental fees and extended use fees. If at all, extended use fees were higher than initial rental fees when prorated on a daily basis.

At this writing, most Blockbuster stores, except those in the Atlanta area, had a 1-night 2-evening rental policy for new releases, which lasted for at least 3 weeks and until the turnover rate fell below 2.5 per week beyond the 3-week period. Following the drop in turnover rate, the title is placed on a 2-night 3-evening rental cycle consistent with Blockbuster's policy on catalogs which is a 2-night 3-evening rental. The averages of IRFs and EVFs of all 2,381 Blockbuster stores in the U.S. were $3.107 and $2.002, respectively, in 1995.

Also at Blockbuster, IRFs are prepaid but EVFs are due when videos are returned. When late in returning, stores attempt to collect EVFs for videos that are overdue for up to 15 days. Cases beyond 15-day delay are turned over to the collection agency after a 90-day waiting period. According to Blockbuster officials, about 25,000 cases are turned over to the collection agency every week, and approximately 55 percent of these cases are uncollectible, making them a total loss. Lost revenues include not only forgone rental fees but also lost sales of accessories that constitute at least 15 percent of Blockbuster's revenue. There are real collection costs involved in the retail video business.

Conclusion

So long as the market is monopolistically competitive in which firms can move ahead primarily through product differentiation, different prices and services are natural means of competing against one another. If these means of competitiion are stifled by judicial interference, all consumers lose in the long run. In fact, higher fees for an extended use beyond the intitial renting period are a common practice in many rental businesses. Some charge higher fees and others in the same industry charge lower fees for an extended use as video rental stores do. The main determining factor is the product differentiation that compensates customers paying higher fees through differentiated services. Incidentally, a judge's summary judgement prevented the case from proceeding to the jury trial in Mobile.

Table 1. Survey of Video Rental Stores in Mobile, Alabama

	Name of Store	Catalog		New Release		Return
		IRF	EVF	IRF	EVF	By
1	All-Star Video	1.00/1	1 00/d	2.50/1	2 50/d	6 pm
2	American Videos (2)	1.99/1	1.99/d	2 96/1	2 96/d	6·30 pm
3	The Amplified Version *	1 99/1	1.00/d	1 99/1	1.00/d	6 pm
4	Blockbuster Video (4)	3.19/1	2.00/d	3 19/1	2 00/d	12 am
5	Brian's Magic Video (2)	2 63/1	1.00/d	2 63/1	1 00/d	6 pm
6	Coleman's Video	0 99/1	0 99/d	1.99/1	1.99/d	6 pm
7	Delchamps Super Stores	0.48/1	0 48/d	0 98/1	0 98/d	8 pm
8	Drew's Raceway Video	0.99/1	1.00/d	2 50/1	2 50/d	7 pm
9	Family Video	1.00/1	1.00/d	2.50/1	2.50/d	6 pm
10	Fast-Time Video	1.29/1	1.29/d	1.29/1	1 29/d	7 pm
11	Harco Drug	1.49/1	1 49/d	1.49/1	1 49/d	7 pm
12	Holywood Video (2)	1.29/2	1 29/d	2 48/1	2 48/d	6 pm
13	Hollywood Video III	1 16/1	1 16/d	2 11/1	2.11/d	6 pm
14	J&B Grocery & Video	1 50/1	1 50/d	2 50/1	2.50/d	10 pm
15	Just Released Videos	1 95/1	1 95/d	2.75/1	1 95/d	9 pm
16	King Video	0 99/1	0 99/d	2.49/1	2 49/d	6 pm
17	Mr Video	2 50/1	2 50/d	2.50/1	2 50/d	6 pm
18	Mobile Video	1.99/1	1 00/d	2.50/1	2 50/d	6 pm
				3 50/2	2 50/d	6 pm
19	Movie Gallery (8)	2 00/2	1 37/d	2 75/1	2 75/d	10 pm
20	Movie House Video **	5 50/2		2.75/1	2.75/d	6 pm
21	Old Shell Video	1.83/1	0 91/d	2 98/1	2 98/d	6 pm
22	Phar-Mor ***	0.99/2	0 99/d	1 98/1	1 98/d	7.30 pm
23	Pick-A-Flick	1.00/1	1 00/d	2 40/1	2 40/d	6 pm
24	Prime Time Video (2)	2.50/1	1 00/d	2 50/1	2 50/d	6 pm
25	Showtime Video	2 50/1	2 50/d	2.50/1	2.50/d	6 pm
26	Sko's Video	1.25/1	1 25/d	2.50/1	2 50/d	7 pm

	Name of Store	Catalog		New Release		Return
		IRF	EVF	IRF	EVF	By
27	Star Video ****	1.49/2	2 11/d	3 99/2	2 11/d	11 pm
28	24-Hour Video *****	2 50/1	0.50/d	2 50/1	2.50/d	
29	Video Cinema	1 00/1	1 00/d	2.50/1	2.50/d	6:30 pm
30	The Video Shack	2.50/1	2 50/d	2.50/1	2.50/d	6 pm
31	TheVideo Shop	2 50/1	2.50/d	2.50/1	2.50/d	5 pm
32	The Video Garden (2)	2.00/1	2 00/d	2 50/1	2 50/d	7 pm
33	Video Village	2.98/3	2 00/d	2 98/1	2 00/d	10 pm

*   Return time is 6:30 pm on weekends
**   IRFs for catalogs are for 3 videos and EVF is simply a re-rental
***   Return time is 4:30 pm on Sundays
****   IRF for catalogs varies from $1.49 to 4.99 for two and return time is 11 pm on Sundays
*****   Return time is 24 hours after rental.

Note that the firgures in parenthese are the number of stores under the same chain.

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The Impact of Earnings Losses on Future Social Security Benefits:
Much Ado About Nothing?

David T. Fractor, Daniel L. McConaughy and G. Michael Phillips[*]

I. Introduction

The analysis of fringe benefits in wrongful injury, discharge and death matters typically focuses on such categories as health benefits, private defined-benefit or defined-contribution retirement plans, and the loss of mandatory benefits, namely social security. Forensic economists have typically valued lost social security benefits as a percent of wages, since the calculation of Actual and But For benefits has usually been a tedious task hampered by incomplete actual earnings histories. As an approximation, social security benefit losses are often computed be taking 6.2 percent of projected earning losses. But is this correct? Rosenman and Fort (1992) show that the "employer cost" method of calculating an individual's loss is by definition invalid for a retirement plan that also funds disability and survivor benefits. Indeed, if one considers the savings of the employee's share of payroll taxes that result from labor market displacement, most workers are economically "better off" (with respect to net social security benefits) than if there had been no disruption in their earnings path.

This article examines the impact (the value to the affected individual) of varying lengths of unemployment or other labor market displacement upon future social security benefits. After performing almost 200 loss simulations using the benefit calculator program (ANYPIA) provided by the Social Security Administration (available over the Internet at http://www.ssa.gov) we find that under many plausible earnings loss scenarios, there is either zero or minimal loss in the present value of future anticipated social security benefits. Indeed, for periods of up to 9 years, the loss in social security benefits may be zero. Therefore, social security benefits are a non-issue for many earnings loss analyses.

II. Background

Employees and their employers each contribute 6.2 percent of covered employee wages up to $65,400 (as of 1997) for the Old-Age, Survivors, and Disability Insurance program administered by the Social Security Administration. An additional 1.45 percent tax is levied for Medicare, with no limit on the earnings that are subject to this tax. Social security benefits are generally computed on the basis of the highest 35 years of real earnings. The benefit at the date of eligibility is the sum of a three-part formula: 90 percent of AIME (Average Indexed Monthly Earnings) up to and including the first bend point, plus 32 percent of AIME from the first bend point to the second bend point, plus 15 percent of AIME in excess of the second bend point, all up to a maximum family benefit. Social security benefits are thus a declining function of average earnings.

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Calculating such benefits by hand is cumbersome, for economists as well as for Social Security Administration employees. ANYPIA is a program developed by the Social Security Administration to automate such calculations. The software allows analysts to enter earnings histories and projections and to quickly estimate anticipated Social Security benefits. Though developed to allow Social Security Administration field offices an easy way to estimated benefits and counsel individuals, it proved itself to be a useful tool to forensic economists for estimating anticipated benefits in many other contexts.

Forensic economists should find the ANYPIA program helpful in determining the appropriate Social Security offset for defined-benefit and integrated pension plans as well as the impact on anticipated benefits from disruptions or changes to the earnings stream. Though an exact calculation may not be possible, perhaps because complete earnings data are not available, this program can be used to produce rules of thumb to help estimate possible losses. Sometimes it is helpful to know when a Social Security loss might have a significant dollar value before incurring additional discovery and expert witness expense to identify historical earnings and compute exact benefit calculations.

We employ the ANYPIA software to estimate tables relating hypothetical workers' ages at the beginning of a period of unemployment and the duration of the unemployment to the annual dollar loss in ultimate Social Security benefits. We also calculate the present values of those losses.

III. Estimates of Losses

Social Security benefits almost never matter as a tangible economic loss in most wrongful termination and personal injury cases. Further, to the extent that forensic economists routinely add predetermined benefit ratios (e.g., the 20 percent or so for Supplements to Wages and Salaries form the Economic Report of the President) which include a social security component, the resulting losses are overstated by the 5 percent-7 percent included as the employer's contribution. Simply put, in most situations, the disruption in Social Security contributions associated with unemployment spells of even many years is zero or quite small.

We found these results, presented in the following tables, through several hundred simulations of benefits based on "average" (about $27,00/year, see Table 1) and "high" (about $43,000/year) incomes using the ANYPIA software. Simulations were run for four age categories: 30, 40, 50 and 60. We assumed that, but for a disruption in earnings (due to alleged wrongful injury or wrongful discharge from employment), the individual would have remained in the labor force until the month after turning age 65.

We considered two historical and projected earnings levels that are built into the PIA program - Average, which is the Social Security average wage, and High, equal to 160 percent of the Average. Utilizing assumption I (for both wages and benefits) for the 1997 Report of the Board of Trustees of the OASI and DI Trust Funds, ultimate average annual wage increases are assumed to be 3.9 percent, while benefit increases are assumed to increase 2.5 percent per annum. For purpose of this exercise, projected benefits are discounted to present value at a nominal rate of 6 percent.

While the computed social security benefits is invariant with respect to gender, the present value of the projected benefit is obviously not, since the life expectancy of females exceeds that of males. Life expectancy was obtained from Table 6-3 of the Vital Statistics

of the United States, 1992 (published in 1996).

Our simulations indicated that for substantial periods of zero earnings, due either to labor force inactivity of prolonged unemployment, the impact on social security benefits is either small or zero. Indeed, a 30 year-old could suffer an absence of 9 years from the labor force and suffer no loss in social security benefits provided they return to their former earnings path. Permanent exit from the labor force at age 30 results in a loss of about half of social security benefits (assuming the minimum of 40 quarters of earnings to qualify for benefits has been attained).

Similarly, for a 40 year-old, 9 years of zero earnings have no impact on social security benefits, while permanent displacement reduces benefits by about one-third. For 50 year-olds, Average earners are not impacted for 8 years of zero earnings, while High earners suffer only a modest loss in benefits over s similar period. For an individual who is 60 at the time of displacement, the maximum loss is only one to two percent of total benefits.

For this experiment, we ignored any relevant spouse's social security benefit which, due to the family maximum benefit, may impact on the individual's projected benefit (Phillips and Fractor, 1990). This phenomenon only magnifies the effects we have found. Moreover, our analysis has looked only at the loss of benefits associated with labor market displacement. The associated savings in employee payroll taxes only magnifies the effects, leading to a net gain from displacement to the affected individual under most plausible scenarios (c.f. Rosenman and Fort, 1992). Finally, we have not addressed the issue of whether social security benefits can be viewed as an entitlement by today's workers since it is a pay-as-you-go program holding a promise but not a guarantee that today's employed will receive future benefits, may sometime be argued to be speculative.

IV. Implications

Given that many forensic economists value the loss of social security benefits at something approximately 6.2 or even 7.65 percent of earnings, it is clear that this particular category of "fringe" benefits has likely been seriously over-valued by most experts. Given the ease with which the ANYPIA program can be obtained and utilized, there is no reason for forensic economists to continue with incorrect valuation methods for Social Security benefits.

References

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TABLE 1: Average and Maximum Taxable Earnings

Year	Average Earnings	High Earnings	Maximum Taxable Earnings
1958	$3,674	$4,200	$4,200
1959	$3,856	$4,800	$4,800
1960	$4,007	$4,800	$4,800
1961	$4,087	$4,800	$4,800
1962	$4,291	$4,800	$4,800
1963	$4,397	$4,800	$4,800
1964	$4,576	$4,800	$4,800
1965	$4,659	$4,800	$4,800
1966	$4,938	$6,600	$6,600
1967	$5,213	$6,600	$6,600
1968	$5,572	$7,800	$7,800
1969	$5,894	$7,800	$7,800
1970	$6,186	$7,800	$7,800
1971	$6,497	$7,800	$7,800
1972	$7,134	$9,000	$9,000
1973	$7,580	$10,800	$10,800
1974	$8,031	$12,849	$13,200
1975	$8,631	$13,809	$14,100
1976	$9,226	$14,762	$15,300
1977	$9,779	$15,647	$16,500
1978	$10,556	$16,890	$17,700
1979	$11,479	$18,367	$22,900
1980	$12,513	$20,022	$25,900
1981	$13,773	$22,037	$29,700
1982	$14,531	$23,250	$32,400
1983	$15,239	$24,383	$35,700
1984	$16,135	$25,816	$37,800
1985	$16,823	$26,916	$39,600
1986	$17,322	$27,715	$42,000
1987	$18,427	$29,482	$43,800
1988	$19,334	$30,934	$45,000
1989	$20,100	$32,159	$48,000
1990	$21,028	$33,645	$51,300
1991	$21,812	$34,899	$53,400
1992	$22,935	$36,697	$55,500
1993	$23,133	$37,012	$57,600
1994	$23,754	$38,006	$60,600
1995	$24,706	$39,529	$61,200
1996	$25,831	$41,330	$62,700
1997	$26,813	$42,900	$65,400

TABLE 1: Average and Maximum Taxable Earnings

Year	Average Earnings	High Earnings	Maximum Taxable Earnings
1998	$27,569	$44,111	$68,400
1999	$28,607	$45,771	$70,800
2000	$29,706	$47,529	$72,900
2001	$30,834	$49,335	$75,600
2002	$31,999	$51,198	$78,600
2003	$33,265	$53,225	$81,600
2004	$34,570	$55,312	$84,600
2005	$35,915	$57,464	$87,900
2006	$37,312	$59,699	$91,200
2007	$38,767	$62,028	$94,800
2008	$40,279	$64,447	$98,700
2009	$41,850	$66,960	$102,300
2010	$43,482	$69,572	$106,500
2011	$45,178	$72,285	$110,700
2012	$46,940	$75,104	$114,900
2013	$48,771	$78,033	$119,400
2014	$50,673	$81,076	$123,900
2015	$52,649	$84,238	$129,000
2016	$54,702	$87,524	$133,800
2017	$56,836	$90,937	$139,200
2018	$59,052	$94,484	$144,600
2019	$61,355	$98,169	$150,300
2020	$63,748	$101,997	$156,000
2021	$66,234	$105,975	$162,000
2022	$68,818	$110,108	$168,300
2023	$71,501	$114,402	$174,900
2024	$74,290	$118,864	$181,800
2025	$77,187	$123,500	$189,000
2026	$80,198	$128,316	$196,200
2027	$83,325	$133,321	$204,000
2028	$86,575	$138,520	$211,800
2029	$89,951	$143,922	$220,200
2030	$93,460	$149,535	$228,600
2031	$97,104	$155,367	$237,600

TABLE 2: Age 30
Social Security Monthly Benefits Based on Number of Years of Zero Earnings from the Present

LEM=44 5
LEF=50 4

Years	Average	% Reduct	PV M	PVLoss M	PV F	PVLoss F	High	% Reduct	PV M	PVLoss M	PV F	PVLoss F
0	$2,918	0 0%	$34,365	$0	$50,837	$0	$3,851	0 0%	$45,353	$0	$67,091	$0
1	$2,918	0.0%	$34,365	$0	$50,837	$0	$3,851	0 0%	$45,353	$0	$67,091	$0
2	$2,918	0 0%	$34,365	$0	$50,837	$0	$3,851	0.0%	$45,353	$0	$67,091	$0
3	$2,918	0.0%	$34,365	$0	$50,837	$0	$3,851	0.0%	$45,353	$0	$67,091	$0
4	$2,918	0.0%	$34,365	$0	$50,837	$0	$3,851	0 0%	$45,353	$0	$67,091	$0
5	$2,918	0 0%	$34,365	$0	$50,837	$0	$3,851	0 0%	$45,353	$0	$67,091	$0
6	$2,918	0.0%	$34,365	$0	$50,837	$0	$3,851	0.0%	$45,353	$0	$67,091	$0
7	$2,918	0.0%	$34,365	$0	$50,837	$0	$3,851	0.0%	$45,353	$0	$67,091	$0
8	$2,918	0.0%	$34,365	$0	$50,837	$0	$3,851	0.0%	$45,353	$0	$67,091	$0
9	$2,918	0.0%	$34,365	$0	$50,837	$0	$3,851	0 0%	$45,353	$0	$67,091	$0
10	$2,860	2.0%	$33,682	$683	$49,826	$1,010	$3,807	1.1%	$44,834	$518	$66,325	$767
11	$2,801	4.0%	$32,987	$1,378	$48,798	$2,038	$3,763	2.3%	$44,316	$1,036	$65,558	$1,533
12	$2,742	6.0%	$32,292	$2,073	$47,770	$3,066	$3,719	3.4%	$43,798	$1,555	$64,791	$2,300
13	$2,683	8.1%	$31,597	$2,768	$46,743	$4,094	$3,675	4.6%	$43,280	$2,073	$64,025	$3,066
14	$2,625	10.0%	$30,914	$3,451	$45,732	$5,105	$3,630	5.7%	$42,750	$2,603	$63,241	$3,850
15	$2,566	12.1%	$30,219	$4,145	$44,704	$6,132	$3,587	6.9%	$42,243	$3,109	$62,492	$4,599
16	$2,507	14.1%	$29,524	$4,840	$43,676	$7,160	$3,517	8.7%	$41,419	$3,933	$61,272	$5,819
17	$2,448	16.1%	$28,830	$5,535	$42,648	$8,188	$3,423	11.1%	$40,312	$5,040	$59,635	$7,457
18	$2,389	18.1%	$28,135	$6,230	$41,621	$9,216	$3,329	13.6%	$39,205	$6,148	$57,997	$9,094
19	$2,330	20.2%	$27,440	$6,925	$40,593	$10,244	$3,235	16.0%	$38,098	$7,255	$56,359	$10,732
20	$2,271	22.2%	$26,745	$7,620	$39,565	$11,272	$3,140	18.5%	$36,979	$8,373	$54,704	$12,387
21	$2,213	24.2%	$26,062	$8,303	$38,554	$12,282	$3,046	20.9%	$35,872	$9,480	$53,067	$14,024
22	$2,154	26.2%	$25,367	$8,997	$37,526	$13,310	$2,952	23.3%	$34,765	$10,587	$51,429	$15,662
23	$2,095	28.2%	$24,672	$9,692	$36,499	$14,338	$2,858	25.8%	$33,658	$11,694	$49,791	$17,300
24	$2,036	30.2%	$23,978	$10,387	$35,471	$15,366	$2,764	28.2%	$32,551	$12,801	$48,154	$18,937
25	$1,977	32.2%	$23,283	$11,082	$34,443	$16,394	$2,670	30.7%	$31,444	$13,908	$46,516	$20,575
26	$1,918	34.3%	$22,588	$11,777	$33,415	$17,422	$2,576	33.1%	$30,337	$15,015	$44,878	$22,213
27	$1,860	36.3%	$21,905	$12,460	$32,404	$18,432	$2,482	35.5%	$29,230	$16,122	$43,241	$23,850
28	$1,801	38.3%	$21,210	$13,155	$31,377	$19,460	$2,387	38.0%	$28,111	$17,241	$41,586	$25,505
29	$1,742	40.3%	$20,515	$13,850	$30,349	$20,488	$2,293	40.5%	$27,004	$18,348	$39,948	$27,143
30	$1,683	42.3%	$19,820	$14,544	$29,321	$21,516	$2,199	42.9%	$25,897	$19,455	$38,310	$28,781
31	$1,622	44.4%	$19,102	$15,263	$28,258	$22,579	$2,101	45.4%	$24,743	$20,609	$36,603	$30,488
32	$1,559	46.6%	$18,360	$16,005	$27,160	$23,676	$2,000	48.1%	$23,554	$21,799	$34,843	$32,248
33	$1,493	48.8%	$17,583	$16,782	$26,011	$24,826	$1,894	50.8%	$22,305	$23,047	$32,997	$34,094
34	$1,424	51.2%	$16,770	$17,595	$24,809	$26,028	$1,784	53.7%	$21,010	$24,343	$31,080	$36,011
35	$1,353	53 6%	$15,934	$18,431	$23,572	$27,265	$1,670	56.6%	$19,667	$25,685	$29,094	$37,997

Years refers to the expected number of years of zero earnings. *LEM* and *LEF* refer to the life expectancies of males and females of the specified age. *Average* and *High* refer to workers earning average (about $24,000/Year as of 1997) and high (about $40,000/Year as of 1997) incomes. *% Reduct* refers to the percent reduction in monthly benefits associated with the years of zero earnings compared to the benefits that would have been received if the individual had not missed any work. *PVM* and *PVF* refer to the present values of expected Social Security benefits for males and females given the conditions listed. *PVLossM* and *PVLossF* refer to the present values of the losses for males and females given the conditions as calculated by the difference between the benefit received if the individual had not missed work and the benefit received after the specified absence given the other conditions specified.

TABLE 3: Age 40

Social Security Monthly Benefits Based on Number of Years of Zero Earnings from the Present

LEM=35.5
LEF=40.9

Year	Average	% Reduct	PV M	PVLoss M	PV F	PVLoss F	High	% Reduct	PV M	PVLoss M	PV F	PVLoss F
0	$2,092	0.0%	$48,775	$0	$67,930	$0	$2,761	0.0%	$64,373	$0	$89,654	$0
1	$2,092	0.0%	$48,775	$0	$67,930	$0	$2,761	0.0%	$64,373	$0	$89,654	$0
2	$2,092	0.0%	$48,775	$0	$67,930	$0	$2,761	0.0%	$64,373	$0	$89,654	$0
3	$2,092	0.0%	$48,775	$0	$67,930	$0	$2,761	0.0%	$64,373	$0	$89,654	$0
4	$2,092	0.0%	$48,775	$0	$67,930	$0	$2,761	0.0%	$64,373	$0	$89,654	$0
5	$2,092	0.0%	$48,775	$0	$67,930	$0	$2,761	0.0%	$64,373	$0	$89,654	$0
6	$2,092	0.0%	$48,775	$0	$67,930	$0	$2,761	0.0%	$64,373	$0	$89,654	$0
7	$2,092	0.0%	$48,775	$0	$67,930	$0	$2,761	0.0%	$64,373	$0	$89,654	$0
8	$2,092	0.0%	$48,775	$0	$67,930	$0	$2,761	0.0%	$64,373	$0	$89,654	$0
9	$2,092	0.0%	$48,775	$0	$67,930	$0	$2,761	0.0%	$64,373	$0	$89,654	$0
10	$2,050	2.0%	$47,796	$979	$66,567	$1,364	$2,729	1.2%	$63,627	$746	$88,615	$1,039
11	$2,008	4.0%	$46,817	$1,958	$65,203	$2,728	$2,697	2.3%	$62,881	$1,492	$87,576	$2,078
12	$1,966	6.0%	$45,837	$2,938	$63,839	$4,091	$2,666	3.4%	$62,158	$2,215	$86,569	$3,085
13	$1,923	8.1%	$44,835	$3,940	$62,443	$5,488	$2,634	4.6%	$61,412	$2,961	$85,530	$4,124
14	$1,881	10.1%	$43,856	$4,919	$61,079	$6,851	$2,602	5.8%	$60,666	$3,707	$84,491	$5,163
15	$1,839	12.1%	$42,876	$5,899	$59,715	$8,215	$2,571	6.9%	$59,943	$4,430	$83,484	$6,170
16	$1,797	14.1%	$41,897	$6,878	$58,351	$9,579	$2,521	8.7%	$58,777	$5,596	$81,861	$7,793
17	$1,754	16.2%	$40,895	$7,880	$56,955	$10,975	$2,453	11.2%	$57,192	$7,181	$79,653	$10,001
18	$1,712	18.2%	$39,915	$8,860	$55,591	$12,339	$2,386	13.6%	$55,630	$8,743	$77,477	$12,177
19	$1,670	20.2%	$38,936	$9,839	$54,227	$13,703	$2,319	16.0%	$54,067	$10,305	$75,301	$14,352
20	$1,628	22.2%	$37,957	$10,818	$52,864	$15,067	$2,251	18.5%	$52,482	$11,891	$73,093	$16,560
21	$1,584	24.3%	$36,931	$11,844	$51,435	$16,496	$2,181	21.0%	$50,850	$13,523	$70,820	$18,833
22	$1,539	26.4%	$35,882	$12,893	$49,974	$17,957	$2,108	23.7%	$49,148	$15,225	$68,450	$21,204
23	$1,492	28.7%	$34,786	$13,989	$48,448	$19,483	$2,082	24.6%	$48,542	$15,831	$67,606	$22,048
24	$1,442	31.1%	$33,620	$15,155	$46,824	$21,106	$1,954	29.2%	$45,558	$18,815	$63,449	$26,205
25	$1,391	33.5%	$32,431	$16,344	$45,168	$22,763	$1,872	32.2%	$43,646	$20,727	$60,787	$28,867

Years refers to the expected number of years of zero earnings. *LEM* and *LEF* refer to the life expectancies of males and females of the specifiied age. *Average* and *High* refer to workers earning average (about $24,000/Year as of 1997) and high (about $40,000/Year as of 1997) incomes. *% Reduct* refers to the percent reduction in monthly benefits associated with the years of zero earnings compared to the benefits that would have been received if the individual had not missed any work. *PVM* and *PVF* refer to the present values of expected Social Security benefits for males and females given the conditions listed. *PVLossM* and *PVLossF* refer to the present values of the losses for males and females given the conditions as calculated by the difference between the benefit received if the individual had not missed work and the benefit received after the specified absence given the other conditions specified.

TABLE 4: Age 50

Social Security Monthly Benefits Based on Number of Years of Zero Earnings from the Present

LEM=26.8

Year	LEF=31.6 Average	% Reduct	PV M	PVLoss M	PV F	PVLoss F	High	% Reduct	PV M	PVLoss M	PV F	PVLoss F
0	$1,461	0.0%	$68,400	$0	$89,003	$0	$1,929	0.0%	$90,310	$0	$117,514	$0
1	$1,461	0.0%	$68,400	$0	$89,003	$0	$1,929	0.0%	$90,310	$0	$117,514	$0
2	$1,461	0.0%	$68,400	$0	$89,003	$0	$1,929	0.0%	$90,310	$0	$117,514	$0
3	$1,461	0.0%	$68,400	$0	$89,003	$0	$1,929	0.1%	$90,310	$0	$117,514	$0
4	$1,461	0.0%	$68,400	$0	$89,003	$0	$1,926	0.3%	$90,170	$140	$117,331	$183
5	$1,461	0.0%	$68,400	$0	$89,003	$0	$1,923	0.5%	$90,029	$281	$117,148	$366
6	$1,461	0.0%	$68,400	$0	$89,003	$0	$1,919	0.7%	$89,842	$468	$116,905	$609
7	$1,461	0.0%	$68,400	$0	$89,003	$0	$1,915	1.0%	$89,655	$655	$116,661	$853
8	$1,461	0.0%	$68,400	$0	$89,003	$0	$1,910	1.3%	$89,421	$890	$116,356	$1,157
9	$1,461	2.0%	$68,400	$0	$89,003	$0	$1,905	2.4%	$89,187	$1,124	$116,052	$1,462
10	$1,432	4.0%	$67,042	$1,358	$87,237	$1,767	$1,883	3.6%	$88,157	$2,154	$114,711	$2,802
11	$1,401	6.1%	$65,591	$2,809	$85,348	$3,655	$1,860	4.7%	$87,080	$3,230	$113,310	$4,203
12	$1,370	8.3%	$64,139	$4,260	$83,460	$5,544	$1,836	6.0%	$85,956	$4,354	$111,848	$5,666
13	$1,336	10.6%	$62,548	$5,852	$81,388	$7,615	$1,811	7.3%	$84,786	$5,524	$110,325	$7,189
14	$1,302	12.9%	$60,956	$7,444	$79,317	$9,686	$1,785	10.2%	$83,569	$6,742	$108,741	$8,772
15	$1,267	12.9%	$59,317	$9,083	$77,185	$11,818	$1,728	10.2%	$80,900	$9,410	$105,269	$12,245

Years refers to the expected number of years of zero earnings. LEM and LEF refer to the life expectancies of males and females of the specified age. Average and High refer to workers earning average (about $24,000/Year as of 1997) and high (about $40,000/Year as of 1997) incomes. % Reduct refers to the percent reduction in monthly benefits associated with the years of zero earnings compared to the benefits that would have been received if the individual had not missed any work. PVM and PVF refer to the present values of expected Social Security benefits for males and females given the conditions listed. PVLossM and PVLossF refer to the present values of the losses for males and females given the conditions as calculated by the difference between the benefit received if the individual had not missed work and the benefit received after the specified absence given the other conditions specified.

TABLE 5: Age 60
Social Security Monthly Benefits Based on Number of Years of Zero Earnings from the Present

LEM=18.9
LEF=23.1

Year	Benefit Average	% Reduct	PV M	PVLoss M	PV F	PVLoss F	High	% Reduct	PV M	PVLoss M	PV F	PVLoss F
0	$1,083	0.0%	$105,006	$0	$127,895	$0	$1,411	0.0%	$136,808	$0	$166,630	$0
1	$1,082	0.1%	$104,909	$97	$127,777	$118	$1,406	0.3%	$136,323	$485	$166,039	$590
2	$1,081	0.2%	$104,812	$194	$127,659	$236	$1,401	0.7%	$135,838	$970	$165,449	$1,181
3	$1,078	0.4%	$104,521	$485	$127,305	$590	$1,395	1.1%	$135,257	$1,551	$164,740	$1,889
4	$1,075	0.7%	$104,230	$776	$126,950	$945	$1,388	1.6%	$134,578	$2,230	$163,914	$2,716
5	$1,071	0.7%	$103,842	$1,163	$126,478	$1,417	$1,381	1.6%	$133,899	$2,909	$163,087	$3,543

Years refers to the expected number of years of zero earnings. LEM and LEF refer to the life expectancies of males and females of the specifiied age. Average and High refer to workers earning average (about $24,000/Year as of 1997) and high (about $40,000/Year as of 1997) incomes. % Reduct refers to the percent reduction in monthly benefits associated with the years of zero earnings compared to the benefits that would have been received if the individual had not missed any work. PVM and PVF refer to the present values of expected Social Security benefits for males and females given the conditions listed. PVLossM and PVLossF refer to the present values of the losses for males and females given the conditions as calculated by the difference between the benefit received if the individual had not missed work and the benefit received after the specified absence given the other conditions specified.

Date of Injury or Date of Trial:
A Comment on Work Life Expectancy Calculations

Jules A. Townsend

A hypothetical situation that illustrates a problem recently posed by a forensic economist may be stated as follows: If the plaintiff, an otherwise healthy white male, is injured catastrophically on his thirtieth birthday, and discovery problems and a crowded trial calendar prevent his case from being tried until his thirty-fifth birthday, may the consulting economist calculate the work life expectancy of the plaintiff using his age at trial? The alternative date for the calculation of the work life expectancy of the plaintiff is the date of injury. Simply stated, does the economist have the choice to use either date for the loss calculation? For the purpose of this hypothetical, the work life expectancy of a 30 year old white male is estimated to be 29.3 years, while that of a 35 year old white male is estimated to be 24.9 years.[1]

The answer to this question lies not within the field of economics, but rather, within the field of law. It is unlikely, however, that there is any "black letter law" that holds that work life expectancy is to be calculated at a particular time; therefore, it will be necessary to apply legal reasoning to the question.

Prior to discussing the question, it should be noted that the manner of reasoning used in answering questions in economics is different than that used in law. The science of economics can be likened to the art of painting: as the economist uses inductive reasoning to generate hypotheses and then tests those hypotheses to arrive at a result, so the artist starts with a blank canvas, and with the judicious application of color finally obtains a finished product. Legal reasoning is more akin to the art of sculpture: excess material is removed from the stone until the work is finished. Thus, in the absence of "black letter law", it may be necessary to "carve away" at the question using case law until an answer is found. That answer may not quiet the controversy, but will provide the testifying economist with a tenable legal basis for his or her use of one date over the other.

A general principle of the law of damages states that "it is the function of an award of damages to place the injured party in an actual, as distinguished from a theoretical position, financially equal to that which he would have occupied had his injuries not occurred."[2] The plaintiff/victim cannot be made more than whole, make a profit, or receive more than one recovery for the same harm. That is, the "plaintiff will only be entitled to be made whole and cannot obtain more than single damages...."[3]

The conclusion that can be drawn from these statements of the legal principle is that the injured party is not entitled to be placed either in a better or worse economic position than he or she would have held had the injuries not occurred. There should be no

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[1] Ciecka, James, Thomas Donley and Jerry Goldman, "A Markov Process Model of Work-Life Expectancies Based on Labor Market Activity in 1992-93," *Journal of Legal Economics*, Winter 1995 5(1), 17-42.

[2] Hanna v. Martin, 49 So. 2d 585, 585 (Fla. 1950)

[3] Dundee Cement Co. V. Howard Pipe & Concrete Productions. Inc., 722 F2d 1319, 1324 (7th Cir. 1983).

difference between the amount of damages awarded at trial and that necessary to return the plaintiff to the economic position occupied immediately prior to the injury. The tortfeasor is obligated only to the extent of the injuries caused, neither more nor less. Any work life expectancy calculation that gives results that put the plaintiff in a better or worse economic position than originally occupied, or causes the amount of the defendant's obligation to differ from the economic position occupied by the plaintiff immediately prior to the injury, will penalize either the defendant or the plaintiff and violate the general principle of law noted above.

Many cases hint that the time of injury is the proper time upon which to calculate losses. One court said that "the calculation of damages suffered. . . by a person whose personal injuries will result in extended future disability. . . involves. . . estimating the loss of work life resulting from the injury. . . .Calculation of the lost income stream begins with the gross earnings of the injured party at the time of injury."[4] Another reference to the time of injury was made by the court in a loss of future earnings case. The court provided guidance for the method by which a loss of future earnings should be calculated. The court made the assumption that the plaintiff earned $10,000 per year, had ten years of worklife remaining, and that neither growth of earnings nor inflation would be considered. It was concluded that the defendant would owe the plaintiff $100,000 for the loss of earnings. The court then introduced the concept of discounting and noted, in dicta, that were the discounted damages to be "disbursed at the precise moment of injury,. . .this calculation would represent a fair award of damages."[5]

Both <u>Culver</u> and McCrann use the date of injury as the starting date for the calculation of damages; however, McCrann, unlike Slater Boat Co., is specific in suggesting the amount of future damages is correct when calculated from the time of injury. Neither case is dispositive of the question, however, because the statements were made in dicta, not as holdings.

A more recent decision makes clear the preference of the law for using the date of injury upon which to base work life expectancy calculations.[6] The decision involved a five year old plaintiff suffering from HIV, caused by the introduction of tainted blood during a surgical procedure. The federal court was unable to use the law of the state in which the tort occurred because the precise question had yet to be addressed by the courts of that state, but considered the issue of such importance that it opined as follows:

The first question is whether the applicable work life expectancy is that of someone in the plaintiff's present condition or that of a healthy person of the same age. . . . Using a postinjury [sic] rather than a preinjury [sic] work life expectancy to calculate lost earning capacity would violate fundamental principles of the law governing damages and would produce an absurd and unjust result. . . .Depriving a plaintiff of the right to recover for that portion of his loss attributable to a shortened work life expectancy would frustrate the objective of making the plaintiff whole. Moreover, it would permit the tortfeasor to benefit

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[4] Culver v. Slate Boat Co., 722 F.2d 114, 117 (5th Cir. 1983).

[5] McCrann v. U.S. Lines. Inc., 803 F.2d 771, 773 (2d Cir. 1986).

[6] Doe v. U.S., 737 F.Supp 155 (D.R.I. 1990)

from the consequences of his own wrongful act at the expense of the innocent victim. Such a result would be inconsistent with both law and logic. Indeed, the weight of authority is that loss of earning capacity should be measured over the course of the work life expectancy the plaintiff would have had if no injury had been sustained.[7]

While the first sentence of the cite appears in conflict with the succeeding sentences, it is clear that the court refused to accept the argument that the benefit of the reduced work life expectancy caused by the negligence of the defendant should inure to the defendant. Thus, the court required the use of the pre-injury work life expectancy for the purpose of calculating future earnings losses. The use of the date of injury as the correct point at which to calculate work life expectancy avoids an "absurd result." Were the date of trial to have been used for the calculation, the plaintiff arguably would have received no future earnings losses as he was not expected to survive to adulthood. The opinion is important, too, because it makes analogous the use of work life expectancy based on the moment immediately prior to the injury and the use of preinjury life expectancy for the purpose of calculating future losses. The court tied those expectancies together for the purpose of calculating damages.

There is an old statement that bad facts make bad law. Given the tender years of the plaintiff in this case, it is possible that the court was attempting to stretch the law to cover the problem; however, nothing in the opinion violates the general legal principle noted earlier.

Although the cited section of the case involves the attempt to use the shortened work life expectancy of the plaintiff for the benefit of the defendant, the logic of the court's position works in the opposite situation. Should the plaintiff maintain that he or she is entitled to an increased work life expectancy because he or she survived to the trial date, the defendant may legitimately argue that such losses provide a windfall to the plaintiff, where the windfall would be "inconsistent with both law and logic."

The plaintiff in our hypothetical provides an example of such a situation. If the work life expectancy is calculated from the date of injury, plaintiff's earnings would cease at age 59.3. If work life expectancy is calculated from the date of trial, however, plaintiff's earnings would not cease until age 59.9. The additional 0.6 of a year's earnings, even when discounted, provides a windfall to the plaintiff to which he is not entitled.

It may be true that the use of the date of injury rather than the date of trial for work life expectancy calculations will require the economist to discard information that affects the life earnings and work life expectancy of the plaintiff. Indeed, the notion that the economist should avoid using information that leads to a more accurate estimate of the plaintiff's losses is bothersome. It does appear, however, that the law requires the calculation of work life expectancy to be made from the date of injury. It is not immutable that this law should control, for as long as the attorney representing the injured party is informed of which date the calculations were based, and there is good reason to do so, it is ethical for him or her to argue for a change in the law. As the law presently stands, however, the answer must be that the calculations are based on the work life expectancy of the injured party at the moment immediately before the injury.

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[7] Doe @ 163.

Reference

Ciecka, James, Thomas Donley, and Jerry Goldman, "A Markov Process Model of Work-Life Expectancies Based on Labor Market Activity in 1992-93," *Journal of Legal Economics*, Winter 1995 5(1), 17-42.

Culver v. Slater Boat Co., 722 F.2d 114, 117 (5th Cir. 1983).

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Doe @ 163.

Dundee Cement Co. v. Howard Pipe & Concrete Products, Inc., 722 F.2d 1319, 1324 (7th Cir. 1983).

Hanna v. Martin, 49 So. 2d 585, 585 (Fla. 1950)

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