HOW ECONOMISTS COMPUTE LOST EARNINGS AND OTHER ECONOMIC DAMAGES IN PERSONAL INJURY CASES
How Economists Compute Lost Earnings and Other Economic Damages in Personal Injury Cases

By
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I. Introduction

§1:01 Economics Overview
Economics was at one time called “the dismal science,” a reaction by Thomas Carlyle to the theories of Parson Malthus suggesting cycles of poverty and starvation as food production failed to keep up with population growth. Economic graduate students used to wonder if that was really the source of the dismal science term or a reaction to Malthus’ policy suggestion of abstinence as a solution to the problem. Advances in productivity have forestalled Malthus’ predictions (1798).

Today’s economists are still concerned however with issues of value and distribution and how market forces operate to price scarce resources like labor, land, machines and more recently information and time. The field is generally divided into two areas: macroeconomics and microeconomics. Macroeconomics is concerned with large flows of spending by consumers, governments, and companies; trade; price stability; economic growth; and employment and capital utilization. Microeconomics is concerned, as the name suggests, with economic decisions made by individuals and firms and associated outcomes like individual earnings and company profits. Economists who estimate economic damages do so primarily with the analytical methods and data found in microeconomics. Economic thinking is key.

A story may help understanding. Apparently in 18th century Germany, it was common for armies passing through the villages on their way to battle to acquire beef by paying the farmer the market rate for a cow. The market rate was determined by the forces of supply and demand to set a going sales price for the cow, an asset to the farmer. Conscription was also common in which case the army would draft the men of the farms, pay them a low stipend, and if, they were killed, pay the family a sufficient sum to cover burial expenses.

From an economic thinking point of view, the two practices were inconsistent. For the one resource, the cow, the market price would reflect the future stream of income from milk, net of upkeep cost, and perhaps a terminal value for sale as beef. For the draftee, the army pay was below what the individual could earn as a farmer, and if killed, the promised burial costs were less than the future stream of earnings the draftee could have expected, less maintenance for shelter, food, clothing, and medicine.

§1:02 Role of the Economist in Damages
Leaving aside any comparisons regarding the compensation of soldiers then and now, the point is that economists today view individuals as assets that can generate a stream of current and future earnings. Some factors like age, education/training, geographic location, gender, race, occupation, industry, union membership, and health can impact this future stream. So too can the individual’s injury or death. If the individual owns or plays a significant role in a company, then the injury or death can impact future company profits or even the entire company value. This is the arena of the forensic economist.
The main goal of the damages expert in personal injury, wrongful death, and similar types of tort cases, is to calculate damages as a lump sum today that exactly matches the economic losses the plaintiff has incurred in the past and will reasonably incur in the future. This assessment is made as of the trial date, which implies several challenges.

First, because future damages are unknown, how does the expert provide an estimate that is economically reasonable or economically likely, meaning better than a fifty percent chance of taking place in the future? This is not the same thing as saying there is a fifty/fifty chance of being correct or incorrect; in fact, the damages expert cannot opine regarding the probability of his/her analysis being correct without undermining his/her credibility and facing possible impeachment as an expert witness. Second, what sort of data is needed to make a damages argument? Third, how does the economist deal with inflation, union status, partial year payments, fringe benefits, and a host of related issues? Fourth, how does the expert compute an appropriate lump sum at trial date?

The role of the economic expert is to assist the trier of fact and to be objective in estimating economic damages. This means that the expert’s opinions should not vary depending on whether the expert is working from the plaintiff or defense side, an ideal that unfortunately sometimes varies in practice. Experts are paid time and expenses and do not share in the financial awards of the case. That is unethical and may even be illegal in some venues.

§1:03 Choosing a Damages Expert

Attorneys typically choose an economist, accountant, or finance expert in estimating damages. Regardless of who is chosen, the expert should have knowledge and experience that uniquely qualifies him/her as a specialist or expert in the field. This typically means holding graduate degrees such as a Ph.D. or D.B.A. (Doctor of Business Administration), or a CPA or MBA. In addition to advanced degrees, the expert’s credentials may also include memberships in professional societies; a relevant publication record, especially in peer-reviewed journals; academic positions; and past experience in providing expert witness testimony. This last issue is most important because credibility as a witness is crucial to courtroom success and that largely depends on demeanor, dress, and non-verbal behavior rather than a long curriculum vitae or use of clever words or knowledge of technical jargon. This is not to say that credentials and an excellent analysis are unimportant, but as these are becoming increasingly common, skill in courtroom presentation may be the critical element.

As to the question of which damages expert to use, economist, accountant, finance expert, or some other discipline, the answer depends on the nature of the case and may involve hiring more than one expert. Economists are typically retained when the case involves lost wages or income, which involves dealing with economic data on occupations, industries and the use of statistics, forecasts and economic analysis. They are also used in questions involving market assessments and commercial cases involving business disruption, intellectual property infringement, and antitrust issues. Accountants and financial experts typically get involved in commercial matters involving analysis of
company financial records and tax issues. On large and complex commercial cases, it is not unusual for an analysis team to include input from two or even three disciplines.

§1:04 Key Issues in Damages Assessment
To reach an assessment of loss, the damages expert finds it useful to construct a model that contrasts what would have been a likely economic outcome, such as a stream of future earnings or income, with what is likely to happen due to some event causing an earnings or income disruption. The disruption may have arisen from an event like an accident causing an injury or death, a contract dispute, or employment termination; in general, some event occurs that leads to a claimed loss of financial benefits.

For example, “but-for” the explosion and fire one night in a dental lab located on the ground floor of a two-story office building that was totally destroyed, the dentist owner of the building presumably would have continued to receive an uninterrupted stream of future income from his practice and rent from building tenants. Similarly, “but-for” the airplane crash of Korean flight 007, nearly 270 passengers and crew who died would have had future earnings and incomes. In the first example, the income loss is temporary and can be partially mitigated, or offset, by temporarily re-locating the dental practice until the original office building is re-built. In the second example, the loss is permanent with no mitigation possible. The common task for the damages expert in each instance is to assess predicted earnings and income streams vis a vis past and predicted actual earnings or income.

§1:05 Framework for Analysis
Damages can be addressed by answering a series of six supporting questions.

1. **Base Earnings:** What were earnings (or income) just before the limiting event took place? (Note: “earnings” will be used below to represent either earning or income.)
2. **Fringe Benefits:** Similarly, what were fringe benefits just before the limiting event? Sometimes this is included in ‘compensation.’
3. **Earnings Growth:** What rate of growth in earnings was expected “but-for” the event that limited earnings?
4. **Loss Duration:** How long are earnings expected to be limited?
5. **Mitigation:** During the loss duration period, can any earnings reasonably be expected in spite of the limiting event?
6. **Discounting:** What is the value of lost earnings at the trial date? Lost earnings are the sum of net lost earnings for the time after the event to the trial date, called the “past damages” and “future damages,” meaning the net lost earnings for the loss duration period after the trial.

The table below is another way to express economic damages. Total damages are comprised of past and future damages, meaning “but-for” past and future earnings, less mitigation, and adjusted for prejudgment interest and discounting if the venue permits such adjustment. Most damages assessments include these components. [“Summary” in
A key premise throughout this discussion is that liability has already been established. The defendant did something harmful or caused something harmful to happen which has reduced the plaintiff’s future earnings or a company’s profits or value.

### Damages Components

<table>
<thead>
<tr>
<th>Past Damages (damages before trial)</th>
<th>“But-for” earnings after the event before trial - Actual Earnings before trial + Prejudgment Interest (if applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Future Damages (damages after trial)</td>
<td>“But-for” earnings after the trial - Actual Earnings after trial + Discounting (if applicable)</td>
</tr>
</tbody>
</table>

= TOTAL DAMAGES

A typical presentation on economic damages begins left to right using these damages components. In this chapter, however, we begin with discounting mainly because it affords a convenient framework of the analytical steps involved in estimating damages and to a lesser extent it is the one area which attorneys generally find most daunting, so let’s deal with it first.
II. Discounting

A. Overview

§2:01 Deriving Future and Present Values
Future economic damages are expressed as the present value of future lost earnings, sometimes referred to as discounted future losses. The key issue is that dollars today and dollars in the future have different values. Specifically, most individuals, if offered the choice of a $1.00 today and a $1.00 at the end of one year, would choose the dollar today because it is more certain (less risk of nonpayment) and because interest rates are above zero (positive investment opportunities exist).

Let’s say interest rates are 5.00% per year; this means we could invest the $1.00 today and at the end of a year have the original $1.00 plus $0.05 in interest, or $1.05 in one year, not just $1.00 we have now. This process is called accumulation and asks “What is the future value (FV) of some amount of money (e.g. $1.00) invested today for a certain period of time with a known rate of interest (e.g. 5.0%)?” Discounting is related to accumulation but works in the opposite direction and asks “What is the present value (PV) of some money promised in the future after a period of time?” As with accumulation, interest plays a key role in discounting.

§2:02 Accumulation
We can express these ideas as follows: Present Value (PV), Future Value (FV), and Interest Rate, which we refer to as a discount rate, r, when computing present values.

To use a simple example, let’s assume we have $1.00 now, thus the PV is $1.00 and further assume the Interest Rate (r) is 0.05. We solve for the Future Value (FV) as follows: $\text{FV} = \text{PV} \times (1+r)$, or $\text{FV} = $1.00* (1+.05) = $1.05. At the end of one year, given the values shown, the future value of $1.00 today is $1.05. In general, with each added year in the future, FV grows by a factor of (1+r), or (1 + 0.05). That is, FV of $1.00 today after 2 years if r = 5% is $\text{FV} = $1.00*(1+.05)^2 = $1.05* (1+.05) = $1.1025. In general, a FV which is t years in the future would be equal to

\[ \text{Equation (1)} \quad \text{FV} = \text{PV} \times (1+r)^t, \quad \text{where} \ t = 1\ldots n \text{ future years or periods.} \]

§2:03 Discounting
Having solved for the future value at various times of $1.00, we can ask a related question; namely, “What is the present value (PV), the value now, of $1.00 to be delivered in the future?” To answer this question, we re-arrange the terms in equation (1):

\[ \text{Equation (2)} \quad \text{PV} = \frac{\text{FV}_t}{(1+r)^t}, \quad \text{where} \ \text{r is the interest (discount) rate} \]

\[ t = 0, 1, 2, n, \text{is years in the future} \]

\[ (1/(1+r)^t) \text{is the “discount factor” for each year} \ t \]
Using the example where $t$ represents year one, we find $PV = \frac{1}{1.05} = 0.9524$. That is, the value today of $1.00$ to be received one year in the future is about 95 cents. The purchasing power of $1.00$ after one year is below $1.00$ today due to fact there are 5 percent investment opportunities available. To prove this, we may use Equation (1) to note that the FV of $0.9524$ today with interest of 5 percent is $0.9524 \times (1.05) = 1.00002$, which is $1.00$ except for rounding.

To compute the discounted present value of a stream of future earnings, we repeatedly compute the elements in Equation (2), one for each year, and sum the total. The Greek letter sigma, $\sum$, mathematically means to add up each element in a series. Thus we can show the PV for an entire stream of future earnings as follows:

$$\text{Equation (3)} \quad PV = \sum FV_t \times (\frac{1}{1+r})^t$$


§2:04 Discounted Economic Damages Example

We relate the discussion on discounting to a litigation context by offering an example of economic damages in Table 1.

<table>
<thead>
<tr>
<th>Year</th>
<th>Age</th>
<th>Lost Pay</th>
<th>Discount Rate</th>
<th>Time Period</th>
<th>Discount Factor</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past</td>
<td>2012</td>
<td>31</td>
<td>$10,000</td>
<td>5%</td>
<td>-1</td>
<td>1.05</td>
</tr>
<tr>
<td>Future</td>
<td>2013</td>
<td>32</td>
<td>$12,000</td>
<td>5%</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Future</td>
<td>2014</td>
<td>33</td>
<td>$15,000</td>
<td>5%</td>
<td>1</td>
<td>0.95238095</td>
</tr>
<tr>
<td>Future</td>
<td>2015</td>
<td>34</td>
<td>$20,000</td>
<td>5%</td>
<td>2</td>
<td>0.90702948</td>
</tr>
<tr>
<td>Future</td>
<td>2016</td>
<td>35</td>
<td>$23,000</td>
<td>5%</td>
<td>3</td>
<td>0.8638376</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>$80,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The data offered in Table 1 are facts assumed for illustrative purposes. Let’s say an individual, Sue Jones, was injured in an accident in 2012 and she was unable to work at all for four years after which she was able to resume her career with no residual effects on her future earnings growth. Her income loss in 2012 was $10,000. Trial is set for January 1, 2013. A damages expert is asked to compute her past and future earnings loss.1

1 For now, to keep this example simple, we assume total work loss in 2012 and for the following four years, 2013-2016. Real events and trial rarely happen on the first or last day of a year and a individual may be partially rather than totally unable to work. These factors complicate but do not change the essentials.
**Past lost earnings** might be stated as simply $10,000; however, the logic of discounting suggests that because she didn’t have this sum after the accident, she sacrificed not only that amount but also interest she could have earned. Some jurisdictions allow this as part of damages and it is referred to as “prejudgment interest”. With a 5% prejudgment interest rate, the Discount Factor in Col. {6} is computed by the formula for FV of $1.00. In this way, past lost earnings are computed as $10,500. Let’s assume we are in a jurisdiction that allows such. (If not, then the discount factor for 2012 is 1.0 and Present Value is $10,000.)

The damages expert has been told, presumably by other experts such as a medical expert and/or a vocational rehabilitation expert, that the loss period is four years, until the end of 2016. Research also determines that a reasonable schedule of future annual lost earnings is shown in Table 1; Col. {3} and 5% is an appropriate discount rate. We are now ready to compute **future lost earnings** using the formula in Equation (3). We do this on a year by year basis as follows:

- For 2013, because pay is received on the first of the year and the trial date is January 1, there is no discounting. Losses for 2013 are exactly $12,000, assuming the injured party would have gotten a raise in 2013 of $2,000 over 2012 pay rate.
- For 2014, future losses need to be discounted into present values as of January 1, 2013. This is done by multiplying $15,000 by the discount factor, 0.95238…to obtain $14,286.
- For years 2015 and 2016 the same process is followed as for 2014.

The discounted present value of past and future earnings losses for Sue Jones, expressed in January 1, 2013 dollars, is $74,795. This is the exact total needed to pay Ms. Jones each year, the lost earnings shown in Col. {3} with nothing left over. The reason it is less than $80,000 is because during the four year loss period in which “payments” would have been made, it is assumed that the remaining balance each year would earn a 5% annual return or interest payment.

**B. Impact on Discounted Future Earnings of Different “Facts”**

§2:05 Overview
In order to estimate economic damages, we made certain assumptions in the context of this hypothetical case. We then estimated damages by using these assumptions in Equations (1) and (3). At this point, we re-examine these assumptions in terms of the impact on discounted damages of a different set of facts; namely, we consider a different discount rate, alternative growth rate in earnings, and add inflation to the analysis. In addition, we consider the impact on discounted earnings of some state laws that limit
computation of discounted earnings loss. As we review each of these issues, we will also note data sources needed to make the analysis credible.

1. Impact of a Different Discount Rate

§2:06 Effect of Lower Discount Rate
In Table 2, we have made only one change from Table 1; namely, the discount rate is changed to 2%, not 5%. The result is that economic damages are greater than before by $3,008 dollars ($77,803-$74,795). The basis for this result comes exactly from Equations (1) for FV for past damages which are now lower, because 2%<5%, and Equation (2 or 3) for the present value of future damages which are now greater for the same reason. PV of future damages must be greater with a lower discount rate because the discount rate is in the denominator of Equations (2) and (3). This main point bears repeating because it is very important: a lower discount rate generates greater discounted present values of future earnings and vice versa.

Table 2. Computation of Economic Damages
Example
Assuming Loss Period is Five Years and Interest Is Two Percent

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th>Discount Rate</th>
<th>Time Period</th>
<th>Discount Factor</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>Age</td>
<td>Wages</td>
<td>Rate</td>
<td>Time</td>
<td>Period</td>
<td>Factor</td>
</tr>
<tr>
<td>Past</td>
<td>2012</td>
<td>31</td>
<td>$10,000</td>
<td>2%</td>
<td>-1</td>
<td>1.02</td>
</tr>
<tr>
<td>Future</td>
<td>2013</td>
<td>32</td>
<td>$12,000</td>
<td>2%</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2014</td>
<td>33</td>
<td>$15,000</td>
<td>2%</td>
<td>1</td>
<td>0.98039216</td>
<td>$14,706</td>
</tr>
<tr>
<td>2015</td>
<td>34</td>
<td>$20,000</td>
<td>2%</td>
<td>2</td>
<td>0.96116878</td>
<td>$19,223</td>
</tr>
<tr>
<td>2016</td>
<td>35</td>
<td>$23,000</td>
<td>2%</td>
<td>3</td>
<td>0.94232233</td>
<td>$21,673</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The technical role of discounting is to express future dollars in value today. Given its importance in computing discounted future earnings, what criteria should a damages expert use in choice of a discount rate?

§2:07 Principal Criteria in Choice of Discount Rate
In a litigation context, a discount rate should be chosen that enables interest to offset future payments once the award is invested but not so high a bond rate as to risk default. There is considerable debate among forensic economists as to how best to make this choice. The following issues typically arise in these debates:

- Minimize default risk by choosing a combination of short term, medium term, and long term US Treasury bonds with one set to mature each year of the expected loss period.
- Minimize default risk and inflation risk by choosing very short term US Treasury notes and assume the plaintiff reinvests the principal every 90 days. US
government Treasury bills of very short duration have the least risk of default and reduce the risk of unanticipated inflation. In 2012 the average yield on 3-month Treasury bonds was 0.09%. (vs. 11.09% in 1982.)

- Choose a US Treasury bond rate with maturity equal to the length of loss period.

To clarify this last point, e.g., the bond-term-match-loss-duration argument for a 20-year loss, one should choose a 20-year bond. For 2012, the 20-year US Treasury constant maturity bond rate was 2.54%. A refinement of this argument for a 20-year loss period is not to select a fixed discount rate for the entire period but to choose a one-year rate for the first year, and so forth, up to a 20-year rate for the 20th year. The computations are the same as offered in Tables 1 and 2, but the discount rate varies.

A recent survey of forensic economists [see Frank Slesnick, Michael L. Brookshire, Michael R. Luthy “A 2012 Survey of Forensic Economists, Their Methods, Estimates and Perspectives” in Litigation Economics Review, Vol.24 No.1: 67-99] provided additional information on criteria used by forensic economists in selecting a discount rate:

- Q. Which maturity length of bonds would you use if the plaintiff has 30 years of future work life expected? Ans. Short: 10.3%, Intermediate: 13.9%, Long: 30.9%; Mixed 32.1%; Other 12.7%.
- Q. Current vs. historical rates: When determining interest rate for PV purposes over a 30-year loss period, which do you use? Ans. Historical Average: 44.6%, Current Rates: 38.6%, Other 16.8%.

In general, the longer the maturity, the greater the bond rate, which enables more interest to be generated, and, as we saw from Equations (2) and (3), lowers the PV of future damages. How this point is handled in practice is something cross-examining attorneys should note carefully because of the efficacy of a small change in discount rate in causing a significant impact on PV estimation.

If the economist uses some historical average an important question is how far back in history to go. Unfortunately, there is no generally accepted guideline. The main issue is what will be a reasonable future yield on bonds that are low default and inflation risk yet provide interest to cover future payment draws. In conclusion, choice of discount rate can greatly impact discounted future earnings; the expert should exercise care in choosing a bond yield and be prepared to provide evidence supporting the choice. [See “Risk, Discounting, and the Present Value of Future Earnings”, Brian C. Brush, in Journal of Forensic Economics, Volume XVI, No 3, Fall 2003, at pp.263-274.]

§2:08 Other Criteria in Choice of Discount Rate

Individual circumstance in the stream of lost earnings is another criterion for the expert to consider, especially if the lost earnings stream historically had risk elements. For example, if the plaintiff’s past earnings were derived in part from stock options, then this should call for an analysis of the company’s stock price changes and require a discount rate that reflects greater risk.
Similarly, if the injured person owned a company and derived earnings in the form of salary and profits, then the expert should select a discount rate that reflects the weighted average cost of capital (WACC) of the enterprise to match the risk facing the plaintiff’s past earnings stream. In such cases, for example, using the capital asset pricing model (CAPM), the expert might reasonably choose a discount rate of 10%, 15%, or even more.²

§2:09 Final Points of Caution in Choice of Discount Rate
First, the role of the expert is to assist the trier of fact, not to become an advocate for one side or another. As we just demonstrated, choosing a very low discount rate can increase the damages estimate considerably. In Tables 1 and 2, we saw that choosing a 2% vs. a 5% discount rate increased total damages by $3,008, more than 4% difference. While the forensic economist has the capacity to alter damages via subjectively choosing a client-favoring discount rate, it is hoped that does not happen.

Second, whatever choice is made, the expert needs to justify his/her selection of a discount rate. If records are produced of “flip-flopping” by the expert in discount rate choice, the expert’s credibility will be sharply damaged.

Third, one need not just use federal bonds. Some experts seeking a balanced view of default risk and interest yield use municipal bonds yields as a source for a discount rate. [See Federal Reserve Bank Web, http://www.federalreserve.gov/releases/.]

2. Impact of Different Earnings Growth Rate

§2:10 Actual Earnings or Statistical Averages?
In Table 1, Col {3}, only past earnings, $10,000, is known. In future years, earnings are forecast by the expert. This sets up several choices. Does the expert rely on past actual earnings of the individual and make a forecast or does the expert instead rely on published statistics that show earnings average by occupation, industry, full-time/year round employment, education, gender, race, and other wage-impacting factors that are likely to affect the earnings capacity of the injured person. If past actual earnings history is not available, as in the case of a child, a student, or episodic worker, then an earnings capacity approach might be preferred.

Care should be exercised regardless of which approach is used. For example, if the person had worked in San Jose, California as an engineer developing software in a high tech firm in the period from 1998 to 2000 and was wrongfully terminated in 2001, it would be questionable to merely extrapolate past earnings into the future given the fact that the 2001-2004 period was marked by relatively high unemployment for software

engineers in high tech firms in the San Jose area. Instead, an expected earnings approach would be more reasonable in which the factors listed above were considered in addition to life cycle, productivity, and business cycle effects.

In Tables 1 and 2, earnings growth shown in Col. {3} showed the following percentage growth from year to year.

<table>
<thead>
<tr>
<th>Period</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 2012 to 2013</td>
<td>20% (= (12,000-10,000)/10,000*100)</td>
</tr>
<tr>
<td>From 2013 to 2014</td>
<td>25%</td>
</tr>
<tr>
<td>From 2014 to 2015</td>
<td>33%</td>
</tr>
<tr>
<td>From 2015 to 2016</td>
<td>15%</td>
</tr>
</tbody>
</table>

Average Annual Change 23.25 Percent

While hypothetical, these data should raise serious questions to the reader. Specifically, what evidence supports an assumed average rate of future annual earnings growth of more than 23% per year? If the expert cannot provide this evidence in a convincing manner, then his/her credibility is seriously undermined. The expert may claim that past actual earnings growth or future contracts made these rates reasonable, but that is a stretch if not supported by data. An opposing attorney might point out that the US Labor Department, Bureau of Labor Statistics, publishes rates of compensation growth by occupation, industry, and location in its Employment Cost Index (ECI). For the period from 2001 to 2nd Quarter 2012, the ECI for all workers, private industry, total compensation was at most 4.0% per year and for years 2009-2012 was at most 2.2%, rates well below 23.25%. [See Web Site for Bureau of Labor Statistics, http://www.bls.gov/bls/wages.htm .]

§2:11 Fixed or Variable

It should be obvious that choosing a higher (or lower) rate of earnings growth, if nothing else changes, will raise (or lower) the computation of economic damages. Growth rates may be fixed or variable. The example shown in Tables 1 and 2 allowed varying rates of earnings growth. What is frequently assumed by testifying damages experts, however, is a fixed rate of future earnings growth for each time period in the overall loss duration. In a personal injury or death case, this may or may not be appropriate depending on when in a person’s earnings history the earnings-limiting event takes place.

§2:12 Typical Age-Earnings Profile

The figure below shows a typical age-earnings profile for an expected work life without a period of disruption. The figure shape is generally in accordance with cross-sectional US Census earnings data, meaning data for a single moment in time, for a wide variety of individuals of varying education, gender, or race. Those with more education tend to start work at an older age, show a steeper rate of earnings growth once they start working (at a “career job”), and retire later in life. The “inverted J” shape for some groups may look more like a forward leaning “S” and the downward sloping portion of the curve just before retirement for some may actually be a flat line with very low to no earnings increase.
The cross-sectional age-earnings profile in the chart is an indicator, but not a specific future career path for an individual because of likely biases involved if one projects a moment in time profile exactly into the future. At lower earnings levels some individuals will have been working for several years whereas others coming from university training will just be joining the work force, thus mixing experience and wage levels in an overall average. In the pre-retirement years, the highest paid workers may quit first thus leading to the observed downward path as relatively more low-paid workers remain.

The main point is that a straight line forecast may be reasonable for a relatively short time period, especially if the person is not at a point in his/her expected age-earnings profile that is likely to have some curvature. The challenge is explaining life cycle earnings profiles to a judge or jury. These issues and the convenience of computing with a fixed rate of future earnings increase are reasons for assuming a straight-line earnings growth rate. It may be reasonable in some cases, however, for the forensic economist to make life cycle adjustments by varying future earnings growth rates to reflect the changing pattern of earnings growth expected by demographic, educational, and productivity influences.

\section*{2:13 Computing Net Discount Rate}
For now, assuming a fixed rate of future earnings growth is reasonable, we use this information to modify the key equation for computing the present value of future earnings. If future earnings increase at a rate of \(g\) percent per year, then we may re-write Equation \{3\} as follows:
Equation \( \{4\} \) \( PV = \sum (FV_t (1+g)^*(1/r)^t) \) where \( g \) is the wage growth rate, 
\( r \) is the rate of interest 
\( \sum \) is a summation sign adding up all future years of earnings, \( t = 1...n \).

With Equation \( \{4\} \) we now have a situation in which future earnings are rising at a fixed rate and being discounted (reduced) at a fixed rate. Some states, notably Alaska, have established a so-called “total offset” method. In terms of Equation \( \{4\} \) they have assumed that \((1+g)\) equals \((1+r)\), the rate of earnings growth will exactly match the interest rate on safe investments. In such a state, there is no need to do discounting or project future wages; lost earnings are simply the product of base period earnings per year times the number of years in the loss period. This is very simple and unlikely to require a damages expert. The empirical accuracy of this method however is debatable. This is one reason most other states have not operated as though wage growth matched interest rates and have relied instead on the expert to select economically reasonable rates of each.

A related step is a so-called “partial offset” method which borrows from applied finance. In the “Gordon” model of a growing perpetuity (a bond that pays forever) with a constant growth rate in earnings, \( g \), and a fixed interest rate, \( r \), we may express the present value (PV) as follows (forgetting for the moment period-specific adjustments):

Equation \( \{5\} \) \( PV = 1/(r-g) \)

To generalize for all lost earnings periods, some economists merely re-write Equation \( \{4\} \) as follows:

Equation \( \{6\} \) \( PV = \sum (FV_t / (1+(r-g))^t) \)

In this model, the expert discounts future earnings by the difference between the interest rate and the earnings growth rate. Some experts refer to this as a “net discount rate.” If interest rates are 6% and earnings growth rates are 4%, then the expert discounts future earnings by a discount rate of 2%. While convenient and widely-used, Equation \( \{6\} \) is not exactly correct.

In *Determining Economic Damages*, Dr. Gerald Martin points out that the correct way to determine the impact of earnings growth on a discount rate is to compute a net discount rate, \( d \), as follows:

Equation \( \{7\} \) \( d = ((1+r)/ (1+g))-1 \)

Which in the example given yields the following value, \( = ((1+.06)/ (1+.04))-1 = (1.06/1.04) – 1 = 0.01923 = 1.92\% \)


In the 2012 survey conducted by Professor Brookshire, et.al, 189 forensic economists answered essentially the following: “I would use ___% per year as the average net...”
discount rate over 30 future years” as follows: Mean 1.61%; Median 1.50%. Net discount rate was defined in this question as the difference between the interest rate and the general rate of wage increase for all U.S. workers. [See Frank Slesnick, Michael R. Luthy, and Michael L. Brookshire “A 2012 Survey of Forensic Economists, Their Methods and Perspectives” in Litigation Economics Review, Vol.24, No.1: 67-99].

3. Impact of Inflation

§2:14 Adjusting for Inflation
The discussion up to now has ignored inflation, which may be defined as a general increase in the average prices of goods and services. Economists refer to wages and interest rates with no inflation adjustment as “nominal” wages and nominal interest rates in contrast to “real” wages and real interest rates where inflation has been removed. In Jones & Steel Corporation v. Pfeifer, 462 U.S. 523(1983), the Supreme Court said it was acceptable for damages to be assessed with nominal or real analyses.

To adjust for inflation, many forensic experts simply subtract an estimated inflation rate from each future wage and each future interest rate. Thus, if inflation is measured by \( p \), many forensic experts replace nominal interest, \( r \), with \( r' = r - p \) as a measure of real interest and similarly adjust nominal earnings growth, \( g \), to obtain \( g' = g - p \), as a measure of real earnings growth. Again, however, while intuitively appealing, relatively easy to explain to a jury, and widely-used, this short-cut is biased. The correct method for computing inflation-adjusted earnings growth rate and inflation-adjusted interest rates is as follows:

Equation \( 8 \) \[ r' = \frac{(r-p)}{(1+p)} \] for real interest and,

Equation \( 9 \) \[ g' = \frac{(g-p)}{(1+p)} \] for real wage growth

We can now re-write Equation \( 4 \) with these inflation-adjusted values, as follows:

Equation \( 10 \) \[ PV = \sum (FV_t (1+g') * (1/(1+r'))^t) \]

§2:15 Choosing Between Real or Nominal Values
The choice of presenting economic damages in real or nominal values is largely up to the forensic expert and attorney. While the Supreme Court [Jones & Laughlin Steel Corp. v. Pfeifer, 462 U.S. 523,103 S. Ct. 2541 (1983)] said both methods are acceptable, it also expressed a preference for real methods and favored discount rates in the range 1% to 3% above earnings growth [loc.cit.p.10]. Some experts may prefer to remove the effect of inflation on future wages so as to not shock a jury. For example, earnings loss 20 years in the future with a $50,000 per year base earnings level and a 5% annual rate of nominal earnings growth, is $132,665, a figure that may seem very large to some jury members; whereas if future inflation is 3% per year, real wage growth is only 1.942%, e.g., real wage growth solved as \( = \frac{(.05-.03)}{(1+.03)} \), then real earnings level in 20 years is $73,457, which may appear as a more modest level of future earnings.
4. Impact of Changing Payment Periods

§2:16 Partial Years
Two issues arise involving the role of time in computing economic damages. First, up to now we have assumed full years in discounting computations. However, partial years frequently occur in actual cases when the damages expert considers the time from an injury to the trial date or from the trial date to the end of the loss period. The end of the loss period may be the end of work life expected expressed in partial years. Making an adjustment for partial years is straightforward. One simply replaces the \( t \) in Equations \{3\} and \{10\} with a partial year. Let’s say, at the time of trial the injured person was 51.3 years old and had an expected work life of 62.4 years. In this situation, the forensic expert would compute future discounted damages for 11.1 future years by use of 11 full years followed by a fractional period of 0.1 years in duration, that is, for the partial year, \( PV = \frac{1}{(1+r)^{11.1}} \).

§2:17 When Discounting Is Done
A second way in which time enters discounting is \textit{when} discounting is done. Associated with when discounting is done is when future payments are assumed to be received. Making an adjustment for when discounting is done, for example semi-annual vs. annual payments is straightforward; one simply divides future earnings and interest rate by two and multiplies the number of time periods by two. If annual earnings were $10,000, interest rates 5.00% and there was one payment received at the end of a year, then \( PV \) would be equal \( (1/1.05)*10,000=9,523.81 \); but if payments are made on a semi annual basis then each payment would be $5,000, interest is 2.5% and \( PV = (1/1.025)*5000 + 1/1.025)^2*5000 = 9,637.12 \).

While there is a slight increase in economic damages estimated via more frequent pay periods, the tradeoff is that with relatively long loss periods the analysis time needed to compute shorter time period damages may not be warranted in terms of making a significant difference in the present value of future damages. If one re-computes discounted losses in the above example, viz. replace annual with semi-annual earnings payments, then the damages estimate changes by about 1%. Similarly, re-computing discounted present values assuming monthly payments, the result is $9,734.33, which is about 1% more than a semi-annual payment assumption.

The added level of apparent precision associated with taking shorter and shorter time periods may or may not be practically worthwhile. The significant issues in damages analysis involve issues like loss duration, choice of discount rate, and earnings growth, and less in terms of fine-tuning the frequency of discounted payments. As Robert Kaplan, an esteemed professor of managerial accounting at Harvard University once observed, it is better to reasonably correct than precisely wrong. The same advice could well apply to the forensic economist in computing discounted future earnings.
III. Determining and Measuring Base Earnings

§3:01 Overview
While other issues in assessing economic damages, such as discounting, or projecting growth rates, may draw more attention by attorneys and experts due perhaps to being more complicated and technical, the foundation for an appropriate measure of damages begins with defining and measuring base earnings, the earnings at the time of an event which disrupted the earnings flow and gave rise to a complaint. This section considers different measurement standards, types and sources of base earnings, various adjustments which may be needed to measure typical base earnings, and special situations such as those in which the person was not earning when the event took place.

A. Standard of Earnings Measure

§3:02 Expected Earnings vs. Earning Capacity
Which earnings loss standard to use, expected earnings or earnings capacity, may be a legal issue and if so should be told to the expert by the attorney. Earnings capacity, sometimes called potential earnings is what the individual had the potential to have earned, whereas the expected earnings are what the individual would have earned. The author was an expert economist for defense counsel in a Connecticut wrongful death case in which this issue was very important.

Specifically, the plaintiff’s economic expert considered that the decedent had been a chauffer and relied on BLS area wage survey data which included the wage rates of drivers for the prior year to estimate base earnings by multiplying this wage by 2080 to indicate year-round, full-time employment. For computational ease, let’s assume the hourly wage of drivers in Connecticut at the time was $11/hour. This implies base earnings of $22,880 per year using an earnings capacity standard. The economic expert for the defense also used the same occupational information and wage data but went further by also considering the individual’s health, actual work history, and related factors. In particular, it turned out the decedent was overweight, a smoker, a convicted felon, heroin user, and even more importantly, had only worked 6 months out of the prior 10 years! Expected earnings, in view of this unstable and limited actual work history, were less than earnings capacity. In this situation, the defense expert conservatively computed expected earnings as potential earnings for only six months, or $22,880*0.50=$11,440.

Unless state laws stipulate use of earnings capacity, most economists use expected earnings. The exceptions are for situations in which there is no recent actual work history such as a young person who is still a student, a homemaker, or person who has retired from the work force. For all individuals, the expert should check regarding possible past work history to determine gaps in work experience or labor force attachment and adjust potential earnings accordingly.
§3:03 Need for Consistency in Standard Use
A second point is for the expert to be consistent and not mix the earnings capacity and expected earnings standards because errors can arise this way. Assume that the above example involved a personal injury not a death, and the injury means actual earnings are only $10,000 in the year after the injury. Plaintiff expert says earnings loss is $22,880 minus $10,000 or $12,880. Let’s assume that the Defense expert offers a different opinion: if the person had worked full-time, year-round after the injury he could have made $15,000. Defense expert further opines that because expected earnings are $11,500 there are no net lost earnings ($11,440-$15,000 = - $3560). Who is correct? Answer: both are incorrect because each has mixed the capacity/expected earnings standard before and after the injury. Consistency would require that earnings capacity standard would mean net loss is $22,880 minus $15,000 or $7,880, whereas a consistent expected earnings standard would mean $11,440 minus $10,000 or $1,440.

B. Measuring Base Earnings

§3:04 What to Include
The damages expert should include any and all sources of earnings at the time of the event that gives rise to the loss. The emphasis is to measure earnings from activities of the plaintiff. This means that passive income, yields such as stock dividends, interest on bonds, pension payments, or related income are excluded. While the final list of earnings types will vary from case to case, the following list is representative of what should be considered:

a. Regular pay and salary
b. Overtime pay
c. Commissions, bonuses and stock grants or stock options
d. Income from second jobs
e. Self-employment Income
f. Fringe benefits from all jobs, including health insurance, retirement, etc (considered in a later section). Perquisites such as use of a company car, club memberships or similar benefits of a job should also be considered.
g. Non-market income, primarily the value of productive uses of time in so-called household production. See §§7:02-7:06.

§3:05 Sources of Information
Sources of data for base earnings measurement may include the following:

a. IRS and State Tax records, W-2, W-4 forms, or if the person is self-employed, Schedule C, or perhaps corporate income tax forms.
b. Company employment records for the plaintiff that show rates of pay, hours or weeks worked, promotions, disciplinary actions, in short, anything that might help understand pay variability in the past.
c. Pay check stubs.
d. Social Security Administration earnings history.
e. Union contracts.
f. Earnings of individuals of similar age, education, gender, location, occupation, industry, or union status may be available from federal or state public organizations, trade associations, or private source. In particular, each state maintains a department which provides labor market information, and the federal government’s Census Bureau, Bureau of Labor Statistics provide free and detailed information on earnings.

C. Adjustments to Base Earnings

§3:06 Trends
A key issue confronting the expert economist is to make sure that earnings at the time of the disrupting event were representative or typical. For work involving a high degree of seasonal employment or for a pre-event earnings history marked by a trend up or down, or a partial year’s worth of earnings, adjustments may be needed to measuring base earnings. The goal of this section is to surface the issue and offer adjustment suggestions in the context of several hypothetical examples. The main point however is that the attorney and damages expert need to proceed with attention both to details and to factors that a judge or jury would understand, especially if not considered or pointed out by opposing counsel.

We begin with a set of examples. In the table below are shown five years of earnings history of three individuals with the assumption that only part of the last year’s income is available because an event took place on October 1 that led to no more work in that year. What is the appropriate measure of pre-event income for each person?

Presumably, the economist will have already considered any and all sources of income. We assume that has already been done and that annual earnings are shown for the period 1999 to 2003 and partial earnings for the last year. A quick measure for base earnings would be to use all the available information and compute average pre-injury earnings as $20,333 for Person A, $18,817 for Person B, and $19,465 for Person C. However there are serious limitations in each instance to the use of this information as a basis for making a projection of what future earnings would have been “but-for” some event.

§3:07 Pre-Event Earnings Trends
In the first place, there are only five years of annual data which limits statistical analysis methods, like regression analysis, that might help detect trends. Second, the pattern of each person’s past earnings should raise questions leading to added information gathering and analysis. For instance, a next step might be to consider year to year percentage changes in earnings. This is done and shown in Table 3. Consider Person A. In 2009, earnings fell by more than 14% but rose in the next year by 27.8%. What’s going on? What type of job did Person A have that accounted for such volatility in earnings? Was pay highly variable due to changing geographic location, industry, occupation, typical work hours, variable commissions, or some other reason? Perhaps Person A was not even working for part of 2011 due to work-limiting injury, hospitalization, or incarceration (all
pre-2012 injury) or not working in 2011 because he lost a job working as an engineer in a company that crashed that year? The expert economist needs to know these things.

The underlying point to noting Person A’s earnings changes from year to year can be generalized to Persons B and C. Specifically, it is typical for earnings of US workers to increase each year but, according to the Bureau of Labor Statistics, the hourly increase in wages and salaries in the 2007 to 2012 period was more typically below 1% per year, not a low level without the large swings. The growth pattern for Person B seems to show a pattern of steady upward growth. Person C on the other hand, not only fails to show any increase but instead demonstrates a decline in earnings over the 2007-2012 period. Such a pattern might indicate the person was in a declining industry. Again, the expert needs to probe and find out if there are reasons to believe the negative decline would have continued into the future without the event that led to the earnings loss. (This point is considered more fully in §§2:09-2:12.)

Table 1. Trends in Earnings of Three Hypothetical Individuals

<table>
<thead>
<tr>
<th>Year</th>
<th>Person A</th>
<th></th>
<th>Person B</th>
<th></th>
<th>Person C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Income</td>
<td>Growth</td>
<td>Income</td>
<td>Growth</td>
<td>Income</td>
</tr>
<tr>
<td>2007</td>
<td>$20,000</td>
<td></td>
<td>$18,000</td>
<td></td>
<td>$22,000</td>
</tr>
<tr>
<td>2008</td>
<td>$21,000</td>
<td>5.0%</td>
<td>$18,100</td>
<td>0.6%</td>
<td>$20,000</td>
</tr>
<tr>
<td>2009</td>
<td>$18,000</td>
<td>-14.3%</td>
<td>$18,500</td>
<td>2.2%</td>
<td>$19,500</td>
</tr>
<tr>
<td>2010</td>
<td>$23,000</td>
<td>27.8%</td>
<td>$18,900</td>
<td>2.2%</td>
<td>$18,900</td>
</tr>
<tr>
<td>2011</td>
<td>$24,000</td>
<td>4.3%</td>
<td>$19,400</td>
<td>2.6%</td>
<td>$18,888</td>
</tr>
<tr>
<td>2012</td>
<td>$16,000</td>
<td>-33.3%</td>
<td>$20,000</td>
<td>3.1%</td>
<td>$17,500</td>
</tr>
<tr>
<td>Average</td>
<td>$20,333</td>
<td>-2.1%</td>
<td>$18,817</td>
<td>2.1%</td>
<td>$19,465</td>
</tr>
<tr>
<td>Average (excluding 2012)</td>
<td>$21,200</td>
<td>5.7%</td>
<td>$18,580</td>
<td>1.9%</td>
<td>$19,858</td>
</tr>
<tr>
<td>Annualized 2012 (=9 months pay/.75)</td>
<td>$21,333</td>
<td></td>
<td>$26,667</td>
<td></td>
<td>$23,333</td>
</tr>
</tbody>
</table>

§3:08 Partial Year Earnings Adjustments

The expert also needs to pay particular attention to the year in which the earnings limitation took place. As noted above, in 2012 earnings for Persons A, B, and C were $20,333, $18,817 and $19,465, respectively; however, these averages are not correct because they included all of 2012 and we know work that year stopped on October 1. One adjustment is to re-compute the averages excluding 2012 entirely, a method that is sometimes followed by expert economists who measure base earnings as the last full year of earnings prior to the year of the injury or death. The problem, as indicated with these three examples, is that 2011 may or may not have been typical of pre-injury average earnings. Also, if there were some events like a wage increase, promotion, or job change in early 2012, that would be missed. A second adjustment is to use 2012 data but to recognize that it is only for a partial year. This adjustment seems straightforward, but must be done with caution.
We have assumed an event took place on October 1, assuming from January 1 to September 30, the person was working. We also assume October 1, 2012 marks the onset of the loss period. With earnings data for 2012 shown in the table, it is a simple matter to compute annualized 2012 data by dividing shown 2012 entries by 0.75 for 9/12 months of work. Thus, for Person B, for example, 2012 earnings are really $26,667, not $20,000 as indicated. If we replace $20,000 with $26,667 for 2012 and take as the loss period, Oct 1-Dec 31, 2012, if no mitigation, we may say loss in 2012 was $26,667*.25 or $6,666.75.

But perhaps we went too far. What if part of earnings reported on Person B’s W-2 for 2012 really reflected some unique compensation received after the event on October 1? In particular, what if Person B received a lump sum check on November 1, 2012 for $1,200? In that case, the expert should deduct $1,200 from the reported $20,000 and re-compute annualized 2012 earnings as $25,067 (= ($20,000-$1,200)/0.75). Average earnings are now $19,661, but wait a second. When we make this change for 2012, we are also suggesting that earnings rose in 2012 by 3.1% from $19,400 in 2011. Is this credible especially in view of the fact that in each year prior to 2004, earnings for Person B increased by at most 2.6% per year? Perhaps we made a mistake in data handling or there was an error in earnings reporting. Or, perhaps it just might be that in early 2012, before the October 1 event, a major job change took place, such as promotion from a line worker in a factory to a junior management position. If so, then the expert should rely on re-computed 2012 earnings as base earnings and not use earnings from 1999-2011 because to do so would bias downward future earnings loss measures. (Of course, earnings loss for 2012 would exclude the time up to October 1, 2012).

So what is the point to all this? There are several issues but the main one is to be very careful in making a decision regarding earnings loss and be sure to consider when the event took place, anything else aside from the event that could have made base earnings higher or lower, and to make sure year-over-year earnings growth is considered as per economic factors and the job and anything else that could have impacted wage change.

§3:09 Adjustments for Past Earnings
Earnings of most workers increase each year due to a combination of inflation and productivity. The latter is due to individual human capital expressed as individual education, general knowledge, job-specific experience, augmented by economy-wide additions of newer and better capital. As the worker grows older or stops working for a time, his/her human capital stops increasing and labor productivity may even decline if physical and mental capabilities diminish. Person C above may be experiencing this pattern. Even if we make an appropriate partial year adjustment for Person C, we are left with how to handle this negative trend which appears in four of the prior five years. Computing a five year average would be too high. In this situation, the expert might rely on an annualized 2012 figure but it is $23,333 and if used would likely be challenged because it means a sudden jump of more than 20% in an earnings trend that was otherwise declining from year to year. There is no clear best answer.

Let’s next turn to Person A. In this situation, there is no clear trend upward as with Person B or downward as with Person C. We could argue that with such a mixed set of
past earnings levels that one should simply take the average and this would be one reasonable way to proceed. That approach however would give equal weight to each year’s earnings and because wages in general tend to increase we may want to give greater weight to the time just prior to the event on October 1. One way to do this is to re-compute prior earnings data in terms of 2012 dollars and to take the average of the adjusted figures. We may make this adjustment using either the Consumer Price Index (CPI) of the Bureau of Labor Statistics (BLS) or the Employment Cost Index (ECI) also published by BLS. There are certain advantages to the latter to adjust earnings because the ECI measures wages and salary changes, whereas the CPI measures average changes in the prices of goods and services that consumers purchase. Also, arguably the CPI does not directly capture productivity gains, only inflation, and an adjustment which may be appropriate for an older worker but not a person still gaining human capital.

In the Table below we adjust 2007 earnings of Person A to 2012 equivalent values by multiplying 2007 earnings times one plus the ECI for each year from 2007 to 2012. We proceed in a similar manner with other years. We then adjust the partial year for 2012 by dividing $16,000 by 0.75 = $21,333, and determine that wage loss in 2012 was 0.25*$21,333 or $5,333.25.

<table>
<thead>
<tr>
<th>Year</th>
<th>Income</th>
<th>ECI</th>
<th>Adjusting to 2004 Values</th>
<th>Adjusted Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>$20,000</td>
<td>3.3%</td>
<td>$20000 x 1.04 x 1.036 x 1.032 x 1.029 x 1.024</td>
<td>$24,206</td>
</tr>
<tr>
<td>2008</td>
<td>$21,000</td>
<td>4.0%</td>
<td>$21000 x 1.036 x 1.032 x 1.029 x 1.024</td>
<td>$24,604</td>
</tr>
<tr>
<td>2009</td>
<td>$18,000</td>
<td>3.6%</td>
<td>$18000 x 1.032 x 1.029 x 1.024</td>
<td>$20,278</td>
</tr>
<tr>
<td>2010</td>
<td>$23,000</td>
<td>3.2%</td>
<td>$23000 x 1.029 x 1.024</td>
<td>$25,011</td>
</tr>
<tr>
<td>2011</td>
<td>$24,000</td>
<td>2.9%</td>
<td>$24000 x 1.024</td>
<td>$25,289</td>
</tr>
<tr>
<td>2012</td>
<td>$16,000</td>
<td>2.4%</td>
<td></td>
<td>$21,333</td>
</tr>
<tr>
<td>Average</td>
<td>$20,333</td>
<td></td>
<td></td>
<td>$23,453</td>
</tr>
<tr>
<td>Average (excluding 2012)</td>
<td>$21,200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annualized 2012</td>
<td>$21,333</td>
<td>(=9 months pay/.75)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

D. Special Circumstances

§3:10 Lack of Work History

In a number of situations, the plaintiff may not have been working when the limiting event took place. For individuals with a job but on vacation, sick leave, or similar absence, the damages expert proceeds as above. But in a number of situations the plaintiff may not have any work history or any recent work history. The following list is a few of such circumstances:
a. very young, no work experience at all, still a student;
b. young, still a student, but some work experience and career choice indicators emerging via type of education or training program;
c. unemployed;
d. discouraged worker, would look for work if believed such available;
e. homemaker, primary activity is work at home;
f. older individual who is retired and no longer works in the labor market
g. individual who is too ill, or too physically or mentally handicapped, or institutionalized.

A reasonable approach in such cases is to first determine if the earnings capacity or expected earnings standard is applicable. If the former and the individual is young, the damages expert may work with a vocational expert to estimate future education levels and career choice. Data on earnings by age and education level from the Bureau of the Census are then used to construct a projected earnings profile over the work life and economic damages derived from comparisons made between lifetime earnings capacity with and without the event. [See www.census.gov.] Expected earnings computations are similar but more complex because of the need to adjust for gaps over the expected work life in time spent working in the labor market. Damages experts in such cases, especially those involving young women, may for example, forecast and make adjustments for future marriage, presence and number of children, and associated time out of the labor market to care for such “hypothetical children.” Another source of damages for persons without a work history may be foregone home production. This potential damages source is explored below in §§7:02-7:06.

§3:11 Gaps in Work History
Adjustments for gaps in work history or temporary periods not working when a limiting event takes place are similar to those made by the damages expert if there is no work history. Contingent workers, those who did not expect their job to last, made up about 4.5% of the U.S. work force in the 1995-2001 period. [See Contingent Work Supplements February 1995-2001, Current Population Survey (CPS), Bureau of Labor Statistics, http://www.bls.census.gov/cps/suppmain.htm.] Such workers, including those working for temp agencies, may have gaps in their work history. Similarly, a customary pattern was for women to take time out of labor market work to stay at home and care for young children.

§3:12 Additional Special Cases: Farm Workers, Self-Employed, and Temporary Military Personnel
Each of these cases has unique or special circumstances associated with defining and measuring base earnings. Farm work can be difficult and hazardous and lead to injuries and yet many farm workers such as migrant workers may be employed by many different farms in many locations during season. Some are paid hourly and others paid on a piece-rate and each needs be adjusted for seasonality. Fortunately, the damages expert has available information from the US Department of Agriculture and Department of Labor in terms of special reports on the US Agricultural Work Force that show annual earnings
by race, sex, age, education and days worked. [See Determining Economic Damages, Gerald D. Martin, Costa Mesa, CA, James Publishing, Inc., Ch. 2.]

According to the Bureau of Labor Statistics, in 2003 there were 10.3 million self-employed workers representing 7.5 percent of the workforce. [“Self-employment in the United States: an update”, Steven Hipple, *Monthly Labor Review*, July 2004, at p.13.] Measuring self-employed worker damages depends on the quality of the accounting information kept by the individual. Sometimes the expert will need to probe to determine what the person does or makes and check appropriate industry data. Reliance on Schedule C in income tax returns may help determine net income. In general these types of cases call for special efforts and research to determine the net loss, adjust for factors such as special bonuses paid the business owner, and determine if loss is permanent or temporary, total or partial.

Military pay during a temporary period, such as a tour of duty in the National Guard working full time, would not normally be considered as typical of baseline earnings because of the expected compensation gap between military and civilian pay.

In conclusion, there is no simple set of guidelines to use in defining and measuring baseline earnings. The Supreme Court wisely noted “The most obvious and most appropriate place to begin is with the worker’s annual wage at the time of the injury. Yet the estimate of the loss need not be based solely upon the wages which the plaintiff was earning at the time of the injury.” [Jones & Laughlin Steel Corp. v. Pfeifer, 462 U.S. 523, 103 S. Ct. 2541 (1983).]

### IV. Fringe Benefits

**§4:01 Overview**

Company-provided fringe benefits are a component of total compensation. Wage and salary payments, commissions, production-bonuses, extra pay for overtime and late shifts, and stock grants comprise direct pay. Fringe benefits include employer contributions to Social Security, disability insurance, unemployment insurance, workers’ compensation, health insurance, pension, profit-sharing, stock options, and paid time not working due to sick leave, travel, rest periods, and holidays.

**§4:02 Why Include Fringe Benefits?**

Arguments for including fringe benefits in economic damages include the fact that if the person cannot work due to an injury or job termination or death, he or she loses a large share of total compensation in the form of fringe benefits, generally between 20-30% of pay. Secondly, if the worker did not receive fringe benefits from an employer, the replacement cost as an individual would be considerably higher. Employers provide benefits due to competitive or market forces that operate to set competitive levels of total pay, not just wages and salaries.
Challenges for the forensic economist include what fringe benefits to include, how to value them, and how to estimate future growth in fringe benefits.

§4:03 What to Include?
One way to answer what to include is to consider what not to include. Pay for time not worked is already included in annual measures of pay such as a W-2 or IRS Income Tax Return and should not also be included in fringe benefits to avoid double-counting. Another way to answer what to include is to ask the plaintiff or employer what benefits were provided by the employer? Sometimes the employer has a pamphlet of fringe benefits, even adjusted and printed for the individual worker. A union contract may also specify what is included in fringe benefits. In general, fringe benefits include the following:

<table>
<thead>
<tr>
<th>Employee Benefits by All Industries</th>
<th>Percent of Payroll %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legally-required</td>
<td>8.7%</td>
</tr>
<tr>
<td>Federal payroll taxes</td>
<td>7.2%</td>
</tr>
<tr>
<td>Unemployment compensation</td>
<td>0.4%</td>
</tr>
<tr>
<td>Workers’ compensation</td>
<td>1.1%</td>
</tr>
<tr>
<td>Payments for Time not worked</td>
<td>11.6%</td>
</tr>
<tr>
<td>Holidays</td>
<td>3.2%</td>
</tr>
<tr>
<td>Breaks</td>
<td>0.6%</td>
</tr>
<tr>
<td>Sick leave</td>
<td>2.0%</td>
</tr>
<tr>
<td>Vacations</td>
<td>4.0%</td>
</tr>
<tr>
<td>Other paid time off</td>
<td>1.6%</td>
</tr>
<tr>
<td>Family and Medical leave</td>
<td>0.1%</td>
</tr>
<tr>
<td>Medical and Medically-related</td>
<td>15.2%</td>
</tr>
<tr>
<td>Sickness insurance</td>
<td>0.2%</td>
</tr>
<tr>
<td>Disability insurance</td>
<td>0.2%</td>
</tr>
<tr>
<td>Medical insurance</td>
<td>11.6%</td>
</tr>
<tr>
<td>Dental insurance</td>
<td>0.4%</td>
</tr>
<tr>
<td>Vision care</td>
<td>0.0%</td>
</tr>
<tr>
<td>Retiree Medical</td>
<td>2.0%</td>
</tr>
<tr>
<td>Life and death insurance</td>
<td>0.2%</td>
</tr>
<tr>
<td>Retirement and Savings</td>
<td>6.2%</td>
</tr>
<tr>
<td>Defined Benefits</td>
<td>4.2%</td>
</tr>
<tr>
<td>Cash Balance or Hybrid Plan</td>
<td>0.2%</td>
</tr>
<tr>
<td>401k or similar plan</td>
<td>1.5%</td>
</tr>
<tr>
<td>Profit-sharing</td>
<td>0.2%</td>
</tr>
<tr>
<td>Stock bonus/ESOP</td>
<td>0.1%</td>
</tr>
<tr>
<td>Miscellaneous Benefits</td>
<td>0.6%</td>
</tr>
<tr>
<td>Severance Pay</td>
<td>0.2%</td>
</tr>
<tr>
<td>Child care</td>
<td>0.0%</td>
</tr>
<tr>
<td>Training and education</td>
<td>0.2%</td>
</tr>
<tr>
<td>Discounts</td>
<td>0.1%</td>
</tr>
<tr>
<td>Other</td>
<td>0.6%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>42.3%</td>
</tr>
</tbody>
</table>

§4:04 How to Value?

If a union contract specifies exact dollar amounts provided per hour or per month to various types of fringe benefits, like pension or health insurance, the forensic economist may be able to compute fringe benefits values for those components. However, it is unlikely that sufficient information will be available to do this for all fringe benefits. Many economists simply search for fringe benefit information as a percent of pay and multiply this figure times the plaintiff’s earnings to estimate fringe benefits. Two widely-used sources of valuing fringe benefits by forensic economists are the US Chamber of Commerce’s annual Employee Benefits Study and the US Department of Labor, Bureau of Labor Statistics (BLS).

The Chamber of Commerce conducts a national survey and publishes the results by industry, region, and firm size. Data are available in annual dollars by employee and as a percent of payroll. For instance, in the above table, Employee Benefits by All Industries, we note that Total Benefits as a Percent of Payroll is 42.5%. If we then deduct pay for time not worked, 11.6%, the net fringe benefit rate is 30.9%. If the injured party was paid $20.00/hour many forensic economists would simply estimate fringe benefits as $20.00 times .309 or $6.18 and total pay as $26.18. An advantage of this procedure is it is easy for a jury to understand and easy to compute. Possible disadvantages include fact that the list of benefits in the table may not exactly match those of the plaintiff or the value implied by taking a percent of pay based on a national sample may be quite different from those received by this individual. How to reconcile these competing interests calls for judgment. However, experience suggests few attorneys spend much time questioning economists on fringe benefits.

A second widely-used information source on fringe benefits is the BLS Employer Costs for Employee Compensation (ECEC) [see BLS Web site http://data.bls.gov/cgi-bin/surveymost for ECEC trends]. ECEC also provides wages and salaries and benefits with each expressed as a percent of total compensation. The following data from BLS is for all occupations, private industry, for 2004Q3.

<table>
<thead>
<tr>
<th></th>
<th>Cost of Compensation</th>
<th>Percent of Total Compensation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Compensation</td>
<td>$23.76</td>
<td>100.0</td>
</tr>
<tr>
<td>Wages and Salaries</td>
<td>$16.96</td>
<td>71.4</td>
</tr>
<tr>
<td>Total Benefits</td>
<td>$6.80</td>
<td>28.6</td>
</tr>
</tbody>
</table>

An adjustment is needed in the BLS data because the fringe benefits rate, 28.6%, is for total compensation, including wages and salaries. To compare the results with those for the Chamber of Commerce and to use in the way suggested above as a multiple of pay, we need to make the following computation:

Equation (11) Fringe Benefits as Percent of Pay = ($6.80/$16.96) * 100 = 40.09%

This figure may seem high but it includes pay for time not worked; moreover, this 40.09% for 2004Q3 from BLS is roughly similar to the Chamber of Commerce 2002 survey results published in 2003 for all companies, 42.3%. Both surveys are used by forensic economists and each has advantages. Differences include fact that BLS has
replaced the Standard Industrial Classification (SIC) of industrial coding in favor of the newer North American Industrial Classification System (NAICS), whereas the Chamber still uses the SIC. A major difference in the benefit surveys is that the BLS sample consists of more than 35,000 units in 154 geographic areas and BLS publishes standard errors of its estimates whereas the Chamber’s sample is much smaller, e.g. 372 companies in 2002, and does not report standard errors. Standard errors arise when a sample is taken from an entire population, in this situation, a census of firms. In general, a larger sample means smaller standard errors, meaning less possibility that observed results are due to chance.

Other fringe benefit valuation issues, such as how to estimate the value of non-vested stock options, Social Security payments, or the value of company car, call for special analyses beyond the scope of this discussion yet may be required depending on the case.

§4:05 Estimating Growth Rate in Fringe Benefits
In forecasting fringe benefits, the forensic economist should consider several factors. First, one may look at historical fringe benefit patterns from the BLS or Chamber of Commerce sources cited above and project these into future. In some situations, the changes in pay are tied by contract to an escalator clause, sometimes called a “cost-of-living-adjustment” (COLA) which in turn is based on the annual percentage change in the BLS Consumer Price Index (CPI). Thus, projecting fringe benefits becomes an exercise in projecting the CPI for some or all elements in the fringe benefit package. In making these or any projections, the analyst needs to aware of earnings limits such as that for Social Security contributions and possible variation in profit-sharing or production bonuses due to future declines in company net income.

One of the best sources for projecting future fringe benefits by type of industry and occupation again comes from BLS. The Employment Cost Index (ECI) is published quarterly on a national and regional basis and reflects employment counts as of 1990, which makes it a type of “fixed-basket” index, somewhat similar to the CPI. The ECI measures total compensation, wages and salaries, and benefits, for various segments of the US workforce. For example, assume the plaintiff worked in a service-producing industry like banking; in this case the 12 month percentage change in benefits for 4th Quarter for the period from 1994 to 2004 for private industry from BLS might be useful.
<table>
<thead>
<tr>
<th>Year</th>
<th>Benefit growth rate for 12 month, Qtr4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>3.8%</td>
</tr>
<tr>
<td>1995</td>
<td>2.4</td>
</tr>
<tr>
<td>1996</td>
<td>2.0</td>
</tr>
<tr>
<td>1997</td>
<td>2.9</td>
</tr>
<tr>
<td>1998</td>
<td>3.0</td>
</tr>
<tr>
<td>1999</td>
<td>3.4</td>
</tr>
<tr>
<td>2000</td>
<td>5.8</td>
</tr>
<tr>
<td>2001</td>
<td>5.6</td>
</tr>
<tr>
<td>2002</td>
<td>4.5</td>
</tr>
<tr>
<td>2003</td>
<td>5.9</td>
</tr>
<tr>
<td>2004</td>
<td>5.5</td>
</tr>
</tbody>
</table>


As with forecasting future earning growth, just how many past years to consider is a judgment of the analyst. Some forensic economists believe it more appropriate to routinely include a very long past period, up to 50 years or more, in choosing an average interest rate, growth rate for earnings or fringe benefits, or CPI. Opposing experts and attorneys should be on the alert for such practices because they can be used to increase or “hype” damages. For example, in the above series on fringe benefits from BLS, the 12 month changes for 1980 and 1981 were 12.5% and 11.5%, respectively. In a small sample, including only a few double-digit figures can sharply increase the arithmetic mean. A more reasonable practice is to select a past period for economic data that is likely to be representative of the future and/or a past period that is approximately the same length of time as that being projected.

V. Mitigation and Loss Period

§5:01 Overview
Mitigation refers to the requirement of plaintiffs to minimize damages they incur. Most jurisdictions require mitigation but sometimes a plaintiff may choose not to work after being terminated from a job or released from medical restrictions that prevented return to work. In the extreme, a death case or permanent (and total) disability case shown in the Figure below, there is no mitigation and economic loss is the entire future earnings stream from the date of death. In the disability situation, however, the economist may wish to use the opinion of a medical expert regarding ability to return to work and the opinion of a vocational rehabilitation expert regarding exactly what sort of jobs the plaintiff could do. If there are jobs the plaintiff could reasonably do the situation changes.
If the plaintiff can do some work, key questions are when it begins and what it pays. Also, one might consider if training and job search costs are involved. In the chart below, after the injury the plaintiff has one period when he can do no work followed by a second period in which some work is possible. It happens that the time from “return to work” until retirement is the same retirement date as if there had been no injury. It also happens in this case, that the trial date is before the return to work date, a not uncommon situation. Projecting future alternative work requires the same sort of analytical challenges as projecting base earnings. Adjustments may have to be made for factors that could conceivably impact current and expected earnings, including age, education, health, occupation, industry, economic and labor market conditions, especially in the region.

§5:02 Fundamental Part of Mitigation
The fundamental part of all this is deciding on periods of loss and pinpointing the various events on the timeline after the injury. The following is a list of possibilities:

- Alternative income after training exceeds the projected trend in pre-injury wage so there is no loss of future wages after a period of recovery and recuperation. This actually happened in a recent case in which the plaintiff, who had only one course to complete college and get a teaching license, was severely-injured in a fork lift accident. During recovery he completed college, although in a wheel chair, and then took a job as a teacher paying a lot more than he received driving a fork lift.

- Return to work date is not known at the date of trial. In some wrongful termination cases, for example, the plaintiff may not have found another job or found one paying a wage much lower than abilities and past experience would suggest. Damages in such a situation are difficult to pinpoint so the expert may
wish to offer an array of damages estimates each associated with a different length of time not working or working well-below expected future earnings.

- Return to work may involve transitioning from working for a company to becoming self-employed or starting a new business. In such a situation, the analyst may consider a period of no work compared to past job and a period of future work in which the future involves a comparison between what would have been done with a new business vs. what could actually be done due to the injury.

**Economic Loss if can do Some Future Work**

To summarize, in the chart below, economic loss is the sum of two future periods: one period in which the plaintiff has no ability to work (a fully disrupted income period) and a second period in which some work is possible (a mitigated income period). As before, each future period is discounted to present value as of date of trial using an appropriate discount rate. The remaining question is just how long future losses last.
§5:03 Estimating Loss Period Length
Future earnings are not certain and yet we have been discussing future earnings as though they were certain. Companies start up and companies fail, economic cycles take place with expansion and contraction, and on a personal level individuals become ill, get displaced or injured, die, or simply become unemployed via layoff. There are risks that these things can happen in the future even if the event leading to the lawsuit never took place. Economists who estimate damages need to take these risks into account. The question is how best to do so. Three primary solutions are usually followed.

- The first method is just to assume some fixed date, say age 65 for retirement based, perhaps on a defined benefit program, Social Security retirement age, or similar argument.
- The second method is to use published work-life tables originally developed by the US Department of Labor, Bureau of Labor Statistics and subsequently updated in a number of journal articles published after BLS published its last work life expectancy tables in 1986. [Worklife Estimates: Effects of Race and Education, Shirley Smith, Bulletin 2254, US Department of Labor, Bureau of Labor Statistics, 1986.] A common feature in these studies is the analysis of entry and exits from the labor market, including “increment-decrement” and Markov transition probability models. In general, these models use actuarial methods to consider the risk of non-work by age, gender, race, and work status (active or inactive at time of death or accident). Data studied in these models is individual-specific data on labor market status obtained from the Current Population Survey, a monthly household survey conducted by the U.S. Census Bureau for BLS. To use this approach, the forensic economist simply looks up the appropriate future work life period in a published table and uses that number as a future loss period. Variations within this approach include different ways to adjust for periods of
nonwork during the individual’s work life before the individual is expected to finally leave the labor force. (For a very thorough review of these issues and many tables of expected worklife by age, education, gender, race, Hispanic origin, occupation and even smokers/nonsmokers US Department of Labor, Bureau of Labor Statistics (BLS).

- In the third approach, the forensic economist separately considers the three probabilities for each future year: (1) the probability of living (L), (2) the probability of participating in the work force, e.g., working or seeking work (P), and (3) the probability of having a job (E). This method is called the LPE method for determining the length of the future loss period.

Each method is used by economists, and each has advantages and possible drawbacks worth noting in some detail.

§5:04 Methodological Choices about Loss Period Measurement.
According to the 2012 survey of forensic economists by Professors Slesnick, Luthy, and Brookshire [loc.cit. 2013, at p. 33] here are responses to the question regarding determining work life expectancy:

- Use of Tables published by BLS 4.8%
- Use LPE method 3.0%
- Fixed Period 7.8%
- Tables in Forensic Journals 62.7%
- Years to Separation 4.2%
- Combination 17.5%

While BLS began publishing work life expected estimates for the US population in 1950, it did so with the assumption that individuals simply worked then retired with no intervening periods of not working. In contrast to what was known about non-work periods due to unemployment, sickness, child-bearing, training, etc., BLS maintained these publications until 1982. Perhaps due this analytical shortcoming, some early forensic economists simply chose a date-certain retirement age, like 65 years. If, in an accident, a 40 year old died, the loss period expected would be 65-40= 25 years. After all 65 was the age that Social Security payments began in full and many companies had in place retirement policies at that age. The problem, as pointed out by cross-examining attorneys, is there usually was little evidence to support this particular age for an individual plaintiff. Still, as noted above, 7.8% still use this fixed period approach.

An improvement came in 1982 when BLS published a series of papers using “increment-decrement” tables to measure periods of time when an individual transitioned into and out of the labor force. The problem was that according to BLS nomenclature to be in the labor force means one is either working or unemployed, the latter meaning essentially actively seeking work. This meant BLS published the number of years of labor force participation, not the years of expected employment. Still, this one publication series,
published in February 1986 remains used by 4.8% of forensic economists to estimate work life expected even though it used 1979/80 labor force data which are more than 30 years old. For many groups, such as women who have had sharp increases in work likelihood in this period, the information out of date. Therefore, those economists using BLS tables will, in cases involving single women, use BLS work life tables for men.

The LPE method of estimating expected work life allows for separate estimates of viability, labor force participation and working. There are several advantages to using the LPE method including the use of more current data on participation and unemployment and the ability to distinguish participation from unemployment. Also, for some groups like single females, participation may be more like those for males rather than be included with other women who have had periods of non work due to time taken from the work force to raise children. The LPE method allows for flexibility to make this P switch. The challenge remains however for the forensic economist to explain to the court not just probability theory but the joint conditional probability distribution of multiplying three probabilities, L time P time E, and summing each of these joint conditional probabilities for each year until some terminal year, usually age 75 for LPE practitioners.

§5:05 Years to Final Separation.
An update using BLS 1992/93 work force data was published in 1997 by three forensic economists. [“Median Years to Retirement and Worklife Expectancy for the Civilian U.S. Population”, Tamorah Hunt, Joyce Pickersgill and Herbert Rutemiller, Journal of Forensic Economics Vol 10, No 2, at pp.171-205.] In their paper they estimate both work life expectancy and what they called “median years to retirement”. “Median years to retirement” is defined as the age at which 50% of those in the base age group would have permanently left the labor force. By including death of active workers, Hunt, et.al. do in fact measure median years to final separation, including retirement or death. The work life expectancy is the total number of years a person of a particular age will participate in the labor force over the person’s remaining life.

Years of Work Life Remaining for Active Men, Age 45, Different Sources

<table>
<thead>
<tr>
<th>Source</th>
<th>Expected Work Life</th>
<th>Median Years to Final Separation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLS 1986</td>
<td>15.7</td>
<td></td>
</tr>
<tr>
<td>Hunt et.al.</td>
<td>16.5</td>
<td>16.8</td>
</tr>
<tr>
<td>Skoog Ciecka 2003</td>
<td></td>
<td>20.10</td>
</tr>
<tr>
<td>Skoog Ciecka 2004</td>
<td></td>
<td>16.64</td>
</tr>
</tbody>
</table>

§5:06 Combination Methods
One way to add more “reality” to the expected work life method is to multiply the likelihood of unemployment to each future year of the earnings loss period in expected work life models. Another way to enhance each method is to separate earnings into wage and hours worked and to consider changes, presumed reductions, in hours worked as individual’s age, especially for older workers.

§5:07 Loss Period, Standards of Compensation, and Possible Biases
The goal of the forensic economist is to compute the present value of future earnings. In an earnings capacity approach, this means assuming only involuntary periods of future nonwork which means taking the number of uninterrupted years of work from age of injury or death until retirement. For some individuals, such as those strongly attached to the workforce or those adhering to some defined benefit program, this may be appropriate. The choice is not arbitrary but “reasonably certain,” a key phrase to a testifying economist. In practice, one measures earnings capacity in years by use of fixed work periods or “median years to final separation.” One problem with the fixed period approach is that it does not allow for the likelihood of being disabled or deceased in the projected future worklife. Median years to separation may be adjusted for probability of death, but not for periods of any earnings prior to final separation from the work force.

Most economists use some type of work life expectancy approach even when “capacity” is the legal standard. The drawback to most such studies however is that they assume all periods of nonwork come at the end of the worklife. While various “combination methods” attempt to offset this issue, the forensic economist using the work life expectancy tables is likely to overestimate PV of damages because all earnings are assumed to take place in the early years when discounting is least.
VI. Commercial Losses Arising From Personal Injury or Death

§6:01 Overview
Commercial litigation can arise via civil lawsuits involving an injury or death of a person who owned a business or played a significant role in a company. Financial damages may involve a temporary or permanent interruption to the business profits or loss of the entire company value. The commercial litigation field is quite broad and discussion here will focus on just a few key issues. Estimating damages in commercial cases is similar to estimating damages in personal injury cases in that the economist considers economic outcomes “but-for” some event and calculates present values of past and future losses as of trial date. Differences include (1) how losses are measured, earnings vs. profits; (2) the discount rate used, low risk vs. explicit adjustment for various types of business risk; and (3) added emphasis on considering economic, industry, and competitive market trends. Assuming the last point is understood, we consider the first two.

§6:02 Damages as Lost Profits
Two economic loss models in commercial litigation involve lost profits and lost value and we next consider each. Lost profits are defined as lost revenues due the actions of some other party, less the incremental costs associated with producing those revenues. Economists define profits as follows:

Equation (12) \[ \text{Profits} = \text{Revenue} - \text{Costs} = \text{Revenue} - (\text{Variable Costs} + \text{Fixed Costs}) \]

In this equation, Costs are divided into those that vary directly with production levels, Variable Costs (V), plus Fixed Costs (FC) which remain relatively constant, such as rent, utility bills, insurance premiums, etc. Let us consider equation (12) as a normal period without disruption and contrast that with a period of profits with a disruption. Denoting each of these periods as “n” and “d” we may rewrite equation (12) for each period as follows:

Equation (13) \[ \text{Profits}_n = \text{Revenue}_n - \text{Costs}_n = R_n - V_n - F_n \]
Equation (14) \[ \text{Profits}_d = \text{Revenue}_d - \text{Costs}_d = R_d - V_d - F_d \]
Equation (15) Lost Profits = Profits\(_n\) – Profits\(_d\) = (R\(_n\) – V\(_n\) – F\(_n\)) – (R\(_d\) – V\(_d\) – F\(_d\)), which is
Equation (16) Lost Profits = (R\(_n\) – R\(_d\)) – (V\(_n\) – V\(_d\)) because fixed costs cancel out.

The definition of Lost Profits in Equation (16) is a good working model, but in actual practice it may need to be adjusted if the injured party incurs extra costs due to the disruption.\(^3\) For example, in a case of disruption to a commercial fish market operation in

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\(^3\) The underlying assumption in equation (16) is that revenue loss, specifically a decline in quantity sold, drives revenue loss and hence lost profits. Actually, lost profits may arise due to the event causing a mix of several factors: such as a price decline, extra fixed costs, or loss of goods sold. See "Computing Lost Profits in Business Interruption Litigation: A General Model" by Stanley Stephenson, David Macpherson,
San Francisco’s Fisherman’s Wharf, extra costs were incurred in trucking crabs to the company because ships could not offload at the fish market after its loading dock was shut down. Similarly, a dentist whose Connecticut office burned down incurred extra costs in printing and mailing notices to his patients of the location and new phone number of his temporary offices. In each case, these added costs were included in damages.

Challenges to the forensic economist in using Equation (16) in litigation involving disruption involve determining if the loss period is temporary or permanent, forecasting “but-for” revenue, and conducting an analysis of costs to determine which are variable vs. fixed. Because company data is likely to follow accounting conventions, converting to economic measures may require a detailed cost analysis using econometric methods to separate fixed vs. variable costs. {Note: accountants measure profits in various ways such as gross profits, which is revenue less costs of goods sold, or operating profits, which is gross profits less operating expenses before interest and taxes, or net operating profits, which is operating profits less interest and taxes. These financial measures are widely-reported in financial reports; however, none of them are exactly appropriate measures of lost profits due to business disruption.} Once lost profits are computed ala Equation (16) and forecast for a loss period, damages are computed as of date of trial as with a personal injury lawsuit using discounting methods. {“Computing Losses in Business Interruption Cases”, Carroll B. Foster and Robert R. Trout, Journal of Forensics, Vol.6, No.3, at pp 179-183, and Measuring Business Interruption Losses, Patrick A.Gaughan, Hoboken, NJ, John Wiley & Sons, 2004, at pp. 192-193.}

§6:03 Damages as Lost Business Value
If an injury or death leads to a company being driven out of business, then the forensic economist should consider a measure of damages that reflects lost value, sometimes called the lost asset value. In such a model, the economist needs to determine expected future net cash flows of the company and measure the present value terms as follows:

Equation (17) Value = \( \sum (CF_t)/(1+i)^t \), where \( CF_t \) is expected cash flows in period \( t \), \( i \) is the discount rate, and \( t = 1, \ldots, n \), is the period of future lost value. (Note: in such models if the last period is not certain, one may add a terminal or horizon value.)

If the company is not actually driven out of business but some action by the defendant is claimed to cause of diminution of value, then one would compute two versions of Equation (17), one for normal operations value and a second for disrupted business value similar in concept to Equation (16). Net value loss is the value difference.4


4 There is an argument to be made not to double count both lost profits and lost business value but to include the former up the point where operations cease and lost value from that point forward. Several excellent books are available on the topic. See Patrick Gaughan, Measuring Business Interruption Losses, 2nd ed. John Wiley & Sons,2009; James Hitchner, Financial Valuation, 3rd ed, John Wiley & Sons, 2011; Shannon Pratt, Valuing a Business, 5th ed., McGraw-Hill, 2008.
§6:04 Choice of Discount Rate
In commercial litigation involving lost profits (or company valuation) it is appropriate to
discount future profits (or free cash flows) by a risk-adjusted cost of capital instead of the
yields on relatively low-risk bonds that are more typically used in personal injury,
products liability or wrongful death cases. But what exactly is a cost of capital?
Basically, it is the opportunity cost of employing funds provided by
shareholders and long-term lenders in support of the company’s
asset base. It is used to value the company as a going business, as
well as for valuing new investments. The cost of capital is affected
by the firm’s capital structure proportions and by the degree of risk
associated with the firm. We next discuss this concept and consider an example in
the context of a lawsuit.

To understand capital structure, let’s assume that an individual owns an entire
corporation, including all of the debt and all of the equity. All proceeds flow to this
person. The cost of capital is thus a weighted average of the expected returns on debt and
equity which in turn is the expected return on assets. Let’s imagine the following
extremely simple, consolidated balance sheet for the company
stated in market values, not recorded cost.

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities plus Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Value</td>
<td>200</td>
</tr>
<tr>
<td>Debt Value (D)</td>
<td>20</td>
</tr>
<tr>
<td>Equity Value (E)</td>
<td>180</td>
</tr>
<tr>
<td>Asset Value</td>
<td>200</td>
</tr>
<tr>
<td>Firm Value (V)</td>
<td>200</td>
</tr>
</tbody>
</table>

(Values in $000)

[See Brealey and Myers, loc.cit., at 189-191. and Techniques of Financial Analysis, 11th

The value of the company (V) is equal to the value of debt (D) plus
the value of equity (E). Let’s further consider the expected return of
investors in the company. Let’s say that debt holders, such a
commercial bank, might expect a 12% return but equity investors
expect a 20% return because of risk factors associated with this
company and the fact that the expected return in the market for
investments of the same risk is 20%. In this case, the cost of capital
based on these expectations is as follows:

\[ r_{assets} = \frac{D}{V} r_{debt} + \frac{E}{V} r_{equity} \]

\[ = \frac{20}{200} \times 12\% + \frac{180}{200} \times 20\% = 19.2\% \]

This is called the weighted average cost of capital (WACC). One key adjustment remains and that is to consider the tax benefits of paying interest on debt. Assuming that combined federal and state company tax rates are 40%, the after-tax cost of debt is $(1-.4)\times 12\% = 7.2\%$. Therefore we recompute WACC as

\[
\text{Equation (19) WACC} = \left(\frac{20}{200}\right) \times (1-.4)\times 12\% + \left(\frac{180}{200}\right) \times 20\% = 18.72\%
\]

Before we apply WACC in a commercial litigation context, we need to draw attention to the expected return on equity, a subject on which considerable research has been made. Two main ways to estimate \(r_{\text{equity}}\) are the Capital Asset Pricing Model (CAPM) and various build-up methods. Both CAPM and build-up models are ways to develop risk-adjusted interest rates in order to discount future values as of date of trial.

Let’s next assume the owner of a small corporation, ABCO, are involved in litigation. The company is located in San Francisco and the owner claims injuries sustained in a car accident have caused damages to his start up contracting business. His attorney retains an expert economist and both the attorney and the economist regard this as a personal injury case with lost income. In such a case, a low-risk bond yield is generally used as a discount rate, but the defense economic expert disagrees, noting that income from this business has risks that must be included. We explain by way of an example.

In this example, we use a build-up model which has the advantage of not requiring ABCO be publicly-traded. In this example, the risk-adjusted cost of equity is measured as the sum of several factors:

1. **Risk-free Rate** 2.41%
   This is based on the average 20-year bond for which the yield to maturity as of December 21, 2012 was 4.8%

2. **Equity Risk Premium** 6.70%
   Based on arithmetic average equity risk premium in Ibbotson Associates 2013 Yearbook (SBBI) which was 6.7%

3. **Size Premium** 6.03%
   The SBBI 2013 shows that the size premium for the smallest 10% of New York Stock Exchange stocks, with AMEX and NASDAQ included, over and above rate base on CAPM to be 6.03%

4. **Company-Specific Risk Premium** 4.00%
   We assume ABCO is considerably smaller than the smallest 10% of NYSE stocks. Also, a report from Bizminer.com for other companies in the same industry, metropolitan area, and SIC shows a 16.32% failure rate over the next two years for start ups that began in 2009 when the year ABCO began. Further assume the CEO of ABCO has no experience running a corporation, only a high school education, an apparent dependence on one main customer, and the CEO has been hospitalized for two heart attacks and numerous angina attacks since 1999.
5. Industry Adjustment Factor

SBBI for 2013 lists an industry adjustment factor for the same Standard Industry Code (SIC) as ABCO as 1.36%.

Cost of Equity Capital for ABCO

(Defined as sum of five factors above)

If we are informed that ABCO pays $2400 per year in interest and we assume a commercial debt rate of 12%, and no other liabilities, this means ABCO carries debt of $20,000. If owner’s equity and tax rates remain as above, we compute ABCO’s WACC as follows:

\[
\text{WACC} = \frac{D}{V} r_{\text{debt}} + \frac{E}{V} r_{\text{equity}}
\]

\[
= \left(\frac{20}{200} \times 12\% \times (1-0.4)\right) + \left(\frac{180}{200} \times 20.50\%\right) = 19.17\%
\]

This is the appropriate discount rate to use in calculating the present value of lost profits. If one is measuring the lost value of the business, then WACC is used to discount future free cash flows plus a terminal value of the business.


§6:05 Consider Sensitivity Analysis

As two final points, it is useful to conduct sensitivity analysis and to note income tax treatments. First, there is a degree of subjectivity and analytical judgment in such analysis and it may be important to measure the impact on the computed WACC of changes in these judgments.

Let’s say, for example, that we ask if the 4% company-specific risk premium is too high and question if a 2% rate might be more appropriate. In that case, we re-compute the equity return expected as 18.50% and the WACC as 17.37%. Depending on the case, this change may or may not be material. Still, it may be important for the damages expert to prepare two models, one with each WACC estimate.

Another way to do sensitivity analysis is to add risk to future cash flows. In the above example, we note a 16.32% failure rate over a two-year period for similar startups, so we may test the impact of this failure rate by multiplying each free cash flow by \((1-(.163))=0.837\), at least for the first few years of the firm’s existence. A second point pertains to income taxes. In personal injury cases income taxes on damages are ignored in state courts. In this example, income taxes on the CEO/owner/officer’s compensation and any other pay to the CEO of ABCO are not included; however, ABCO is a separate entity and as such we should consider the income taxes on the company in estimating WACC.
VII. Adjustments to Basic Damages Model

§7:01 Overview
To recap, calculating economic damages with a basic model consists of six parts: (1) base earnings and (2) fringe benefit levels, projected over a (3) future loss period with (4) earnings and fringe benefit growth assumptions, adjusted for (5) mitigation pay, and (6) discounting the net loss to present values as of trial date. Beyond this basic model, depending on the circumstances of the case, the forensic economist may need to make additional adjustments. This section briefly discusses several of these adjustments.

§7:02 Household Production Value
Let us consider the allocation of an individual’s time, which we may divide into time spent working in the labor market and other time. So far, we can focus entirely on economic losses due to lost labor market economic returns, but that may underestimate full losses depending on how the other time is used. Let’s divide this other, nonmarket time, into two periods, leisure which includes a set of maintenance and “pure leisure” activities like sleep, eating, grooming, play, and a second set of activities which include fixing the car, cutting grass, cleaning the house, preparing meals, cleaning clothes and similar things. For some people the dividing line between the two sets of activities may seem blurred so let’s just refer to the second set as things you would be willing to pay someone else to do for you. Economists refer to this set as generating nonmarket or household production value. [“Which Estimates of Household Production are Best?” Journal of Forensic Economics, John B. Douglas, Genevieve M. Kenney and Ted R. Miller, Vol. IV, No.1, Winter 1990, pp.25-45; and more recently, "Determining the Value of Lost Household Production," by Stanley P. Stephenson Valuation Strategies, May/June 2006, pp. 2-7.]. For forensic economists the challenge is to identify these things and then value them. We first consider an example.

Suppose a woman has two pre-school children and wishes to care for them. She can either work in the market using her earnings to pay for child care or stay at home and provide this care herself. Assume that if she works in the market, she gets $20,000 and pays the same $20,000 to someone else to care for her children. In this case, the value of child care is $20,000. However, what if she decided to stay at home, not work in the labor market and provide care to her children herself. The home production value argument is that the value of her providing this child care herself is $20,000 in foregone earnings.

§7:03 Approaches and Steps to Estimate Household Production Values
One main approach to measuring household production value is the market opportunity costs method and the second is the replacement cost method. In concept, while including some adjustment to lost earnings is credible to many observers, exactly how to do so has led to considerable debate among forensic economists. Analysis of this type of damages typically involves three steps: (1) estimating how much time is spent at productive non
market activities, (2) valuing each activity, and (3) updating the activity list to allow for changing future circumstances. We next consider each of these steps.

§7:04 Step One: How Much Time?
The amount of time in non market activities can be found in various special surveys of time allocation in various activities by individuals for a period of time. One of the first such special, nonrandom surveys was conducted at Cornell University of husband-wife families living in and around Ithaca, New York in the 1967-68 period [William H. Gauger and Kathryn E. Walker, *The Dollar Value of Household Work*, Ithaca, New York: College of Human Ecology Cornell University, 1980, Bulletin 60]. Activities such as house cleaning, clothes washing and meal preparation were then “priced” in the market place and multiplied by the hours spent in each activity. For example, in the original 1967-68 Cornell study, white married women, 30 years old, with “2.5” children at least 5 years old, averaged 37 hours per week of household production if they were employed vs. 50 hours of household production if not employed. In an article comparing several such studies expressing each in 1987 annual values, these household production values were $11,559 for employed 30 year old women vs. $16,279 if not employed. Other such values were developed depending on the individual’s age and the age and number of children. [See “Which Estimates of Household Production are best?” John B. Douglas, Genevieve M. Kenney and Ted R. Miller, *Journal of Forensic Economics*, Vol.4, No.11, at pp.25-45.] The primary criticism of the Cornell study was the limitation in time, place, and family make-up. For instance, a single mother living in Chicago in 2005 is unlikely to match a married woman with two children living in Ithaca in 1967.

Since the original Cornell study, other academic researchers, including those at the University of Michigan’s Institute for Social Research, The Pennsylvania State University, and The University of Maryland have conducted time-use diaries of individuals in various household and labor market situations, e.g., non-working single person, single parent with children ages 2 and 5, two-spouse household with both working in the labor market, and so forth. In perhaps the most detailed of these studies, that done by economists Kurt Krueger and John Ward, using time-use data from the Bureau of Labor Statistics, account for all time and list activities according to household production, viz., providing care, personal care, leisure, and employment of educational activities.[Expectancy Data, *The Dollar Value of a Day: 2007 Dollar Valuation*, Shawnee Mission, Shawnee Mission, Kansas, 2008.]

The table below lists sub-groups of the first three.

<table>
<thead>
<tr>
<th>Average Hours of Activities in a Week by Persons Employed Full-Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of Activity</strong></td>
</tr>
<tr>
<td>Housework</td>
</tr>
<tr>
<td>Food Cooking &amp; Cleanup</td>
</tr>
<tr>
<td>Shopping</td>
</tr>
<tr>
<td>Pets, Home &amp; Vehicles</td>
</tr>
<tr>
<td>Travel for HH Activity</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td><strong>Household Production</strong></td>
</tr>
<tr>
<td>Child Care</td>
</tr>
<tr>
<td>HH Adults</td>
</tr>
<tr>
<td>Transporting Members</td>
</tr>
<tr>
<td>Providing care to others</td>
</tr>
<tr>
<td><strong>Providing Care</strong></td>
</tr>
<tr>
<td>Hygiene &amp; Personal Care</td>
</tr>
<tr>
<td>Sleeping &amp; Resting</td>
</tr>
<tr>
<td>Eating</td>
</tr>
<tr>
<td><strong>Personal Care</strong></td>
</tr>
<tr>
<td>Employment or Education</td>
</tr>
<tr>
<td>Commuting to Work or Edu</td>
</tr>
<tr>
<td><strong>Employment or Edu.</strong></td>
</tr>
</tbody>
</table>


Results shown for females in multiple adult households with and without children indicates more time in household production for the former group, 19.5 hours per week, vs. 17.6 for the latter. When providing care is included however those with children spend an added 10.9 hours vs. 0.5 hours for those without children. This table is but a small part of the very rich set of tables and information contained in this study. Further results are available for by a wide variety of demography characteristics, such as sex, age, age of children, employment and retirement status, single persons with and without children, and disability status. Moreover, the above table may also be useful because in some cases, the injured or deceased person may have provided care to a child or elderly relative living at home and not be able to do so due to the event in question.

While the information reported in the Kreuger/Ward study and other studies cited above is quite detailed, some forensic economists simply estimate the total time spent in household production without disaggregating into sub-categories. Regardless of which study is cited or used, the first step is to consider how much time is spent in household production and possibly care activities.

§7:05 Step Two. How to Value?
The next step is to value household production activities. The opportunity cost method multiplies all household production time by the after-tax, after-commuting cost of working in the market. There are several problems with doing so however. For example consider a home-cooked meal. Time needed for this meal is likely to take about the same food shopping and preparation time for a brain surgeon or a school teacher. Yet if the surgeon has a take home pay of $100/hr vs. $20/hr for the teacher, the opportunity cost approach to household production suggests the value for the surgeon’s family of the meal is five times that for the teacher. Computing net take home pay is also difficult, given the various ways in which taxes and commuting costs can vary. The replacement cost method values household production time either by a single wage applied to what it would cost
on average to have someone do all the household production tasks, or finds task-specific average wage rates for each sub-activity. Most economist favor the replacement cost method.

Economists Ward and Krueger, for example, applied task-specific wage rates from US Department of Labor, Bureau of Labor Statistics wage information from the Occupational Employment Statistics (OES) survey to the above table entries to obtain the following:

2007 dollar value of a day using activities in a week by persons employed full-time

<table>
<thead>
<tr>
<th>Type of Activity</th>
<th>Multiple Adult Household Females – Children LT 13</th>
<th>Multiple Adult Household Females without Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housework</td>
<td>$2.9</td>
<td>$1.9</td>
</tr>
<tr>
<td>Food Cooking &amp; Cleanup</td>
<td>3.9</td>
<td>2.5</td>
</tr>
<tr>
<td>Travel for HH Activity</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Pets, Home &amp; Vehicles</td>
<td>8.0</td>
<td>9.8</td>
</tr>
<tr>
<td>Purchase Goods &amp; Services</td>
<td>3.7</td>
<td>3.4</td>
</tr>
<tr>
<td>Household Production</td>
<td><strong>23.77</strong></td>
<td><strong>23.78</strong></td>
</tr>
</tbody>
</table>

[From Table 2. 2007 dollar value of a day based on hours of activities in a week by persons employed full-time, youngest child less than 13, Expectancy Data, The Dollar Value of a Day: 2007 Dollar Valuation, Shawnee Mission, Shawnee Mission, Kansas, 2008, at p. 20; Note: the exact numbers may vary due to rounding.]

To express these values in annual terms, merely multiply by 365.25 days. Thus the 2007 average value of household production for a female who worked full-time in the labor market with children living in a multiple adult household was $8,682 vs. $8,685 if no children.

Choice of which wage rate or rates to use in weighting household production time using the replacement method may vary by expert economist because it is largely a judgment call. In the Dollar Value of a Day, the authors relied on a national, cross-sectional, occupation-specific survey conducted by each of the 50 states with technical guidance provided by BLS. OES wage data are available nationally, by state, and for major metropolitan statistical areas. As such, the expert can use the task-specific time measures from the source used by Ward and Krueger and update these using the OES results since 2007, say for Chicago area in 2013.

§7:06 Step Three: How to Update?
Updating household production values is the third step in bringing household production value up to date. If feasible, using recent occupation-specific data such as BLS-State OES survey results is one way. Other valuation updates that are widely-used are the Consumer Price Index (CPI) and the Employment Cost Index (ECI), each produced by BLS. Using the BLS home page, under “inflation calculator” we see that $9.95 in 1999 has the same buying power as $11.28 in 2004. (See www.bls.gov) Alternatively, using the ECI for wages and salaries, private industry, service occupations, we compare 2004Q4 of 160.6 to 1999Q4 of 139.6 to obtain 1.15. Therefore, $9.95 * 1.15 = $11.44, which is $9.95 in
1999Q4 expressed in 2004Q4 value. Because the ECI is designed to measure compensation increases, it is generally preferred for updating hours of work over the CPI which measures changes in the average prices of goods and services consumers purchase.

How long to forecast lost household production values and what adjustments to make for changing circumstances are two issues that sometimes arise in legal disputes involving damages. Some surveys provide information on the age of individuals and specify the presence and age of children. To use such surveys, the forensic economist needs to develop year-specific values depending on the age of the plaintiff, family size, and composition. In terms of length of loss period, many economists simply forecast all or some of the lost household production value for the individual’s life expectancy or for whatever period and to what extent (e.g. 0-100%) a medical authority says such home work is limited. If the time survey used shows reduced household production for older workers, this is one way to capture expected reductions in household productive value. Another way comes from research by Kurt V. Krueger using survey data from the US Department of Health and Human Services to measure health life expectancy (HLE) and years of healthy life (YHL) of the US population. A 40 year old white female, for example, has a life expectancy of 41.58 years, a HLE of 32.34 years and an interim measure, Full Function Life Expectancy FFLE of 36.46 years. [From Table 6, “Healthy life tables for the white female population: United States, 2001”, Expectancy Data, Healthy Life Expectancy: 2001 Tables, Shawnee Mission, Kansas, 2004, at pp. 21] While this is very promising research, difficulties remain in measuring health and morbidity of individuals by survey methods, a challenge being addressed by staff at BLS and US Census Bureaus along with researchers at leading universities. This study circumvents this issue by basing health status on non-institutional vs. institutional status of the individual, and assumptions about the health status of individuals in institutions such as long-term care hospitals, nursing homes, prisons, military, and residential care facilities. [Ibid at pp.4-5].

§7:07 Personal Consumption Adjustment
In wrongful death cases and many personal injury cases, damages should be adjusted for amount of lost income the decedent would have consumed. For example, if a deceased family member would have made $10,000 but $8,000 of this would have been consumed by the individual for clothing, food, medicine, and other personal items, the net loss is only $2,000, not $10,000. Most states apply one of two standards to this issue and the attorney should make it clear to the economist which rules apply. The key issue is whose loss is it? Many states have wrongful death statutes in which survivors of the decedent sue to recover their own losses. In other states, so-called, “loss-to-survivor” states, the estate of the decedent sues for losses of the decedent which are to be passed on to survivors. Some states have elements of each standard in their statutes. In the next sections, we focus on how to estimate and adjust for personal consumption of the decedent. The computation of lost earnings, fringe benefits, and household production value remains essentially unchanged from the previous discussion.
§7:08 Challenges in Estimating Personal Consumption

Economists have struggled for years to understand and explain how much any one individual in a household consumes. There are several challenges.

- First, few families keep individual-specific income and consumption records. This means the economist will need to use some secondary source data and statistics to estimate individual consumption.
- Second, living standards and spending customs are likely to vary by family income level, geographic location, education and factors such as individual greed or generosity, health, family structure and age of members.
- Third, many goods consumed in a household are “indivisible” or “family” goods that are hard to attribute to any one person. Economists consider these as public goods within the family because the consumption of the services of these goods by one person does not reduce the consumption of the same services by persons in the same family. Consider for example, the following list of such goods: telephone service, mortgage or rent, home insurance, household repairs, electricity bills, appliance costs, pet food, etc. While Mr. Jones enjoyed the benefits of a refrigerator, this does not detract from the use of refrigerator services by other members of the Jones family. There is no exact or best way to adjust for the decedent’s share of each of these family expenses. Economies of scale in purchasing are another complicating factor because they can enable savings in per person consumption costs. It isn’t that two can live cheaper than one, but that two can generally live cheaper than twice consumption expenditures for one person.

The problem being raised is actually a rather old one in applied economics, the search for equivalency in welfare between families of different income and size. Knowing such an equivalency scale, enables the economist to estimate the actual loss to survivors. This loss is the decedent’s income, net of his/her expenditures, or the net income that would not have aided survivors. Estimating this net loss is a judgment by the damages expert but one that should rely on available published guidelines and up-to-date research.

We next consider that research in terms of how much of an adjustment to make in damages arising from the death of an individual.

Because a wide variety exists in measuring the consumption of any one individual, due to differences in data, analytical methods, when done, and the fact that the field continues to grow as new studies emerge, rather than attempt to detail and evaluate all prior studies, we present a summary table of 15 studies from *Determining Economic Damages* and focus on how to use these results.

**Consumption Factors and Income Support Required Following Death Of a Parent or Spouse**

<table>
<thead>
<tr>
<th>Number of Children</th>
<th>Invisible Expense Item</th>
<th>Parent Factor of Consumption</th>
<th>Child Factor of Consumption</th>
<th>Support Factors for single loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>38.0</td>
<td>31.0</td>
<td>0.0</td>
<td>69.0</td>
</tr>
<tr>
<td>One</td>
<td>38.0</td>
<td>23.9</td>
<td>14.2</td>
<td>76.1</td>
</tr>
<tr>
<td>Two</td>
<td>38.0</td>
<td>20.1</td>
<td>10.9</td>
<td>79.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Three</td>
<td>38.0</td>
<td>15.1</td>
<td>10.7</td>
<td>84.9</td>
</tr>
<tr>
<td>Four</td>
<td>38.0</td>
<td>12.4</td>
<td>9.3</td>
<td>87.6</td>
</tr>
<tr>
<td>Five or more</td>
<td>38.0</td>
<td>10.7</td>
<td>40.5*</td>
<td>89.3</td>
</tr>
</tbody>
</table>

(*for 5+ children, divide 40.5 by the number of children to find the factor for each child.)

[From Table 22c: Support and Consumption Factors, Determining Economic Damages, Ch. 5, Gerald D. Martin, Costa Mesa, Ca, James Publishing, Inc.]

The results in this table suggest that if a parent in a family of four dies, the deduction is 12.4%. Alternatively, if the parent in a family with one child dies, the deduction is nearly twice as much, 23.9%, an adjustment reflecting economies of scale, and indivisible goods discussed above.

§7:09 Data Needed by Forensic Economist to Estimate Consumption

An added consideration to the personal consumption allowance estimate is that the forensic economist should know ages and birthdates of all dependents. In addition, the expert should know if there are any special family situations regarding health care or other unusual or abnormal expenditure factors. For example, the expert needs to be prepared to select different support factors in the above table to account for when the children leave home. Specifically, for each year, the expert needs to compute family size according to the table: if there are three children living at home when a parent dies and the oldest is 16 years, then the expert may need to reduce the children number to two when the oldest child would leave home and to decide when this happens, e.g., age 18 or 21 depending, and so forth. Similar adjustments need to be made until the last child would have normally left home.

In some states, it is the income of the family that is considered in determining personal consumption deductions. In such states the expert needs to impute a future family income, not just that for the decedent. The difference can be substantial. Consider a situation in which the husband dies and he was making $100,000 and his wife $50,000. Let’s assume that the support factor is 80%. If the state requires family income to be considered, then the deduction is $30,000 for his consumption. In other states like California, income of the surviving spouse is not to be considered, so the deduction would be $20,000. With family income as the basis, net loss is $70,000 (= $100,000 - $30,000) and in the second situation, with only the decedent’s own income as the basis, the net loss is $80,000 (= $100,000 - $20,000). The attorney needs to advise the expert on exactly which statute applies and to be prepared to challenge the opposing expert on exactly what assumptions were made regarding the personal deduction for self-consumption.

A final reminder is that the expert may need to adapt his/her approach to self-consumption allowance using case-specific circumstances rather than proceed rigorously to adhere to some statistical studies, especially if there are large earning differences between working household members. What if for example, the husband and wife both were working and she dies due to the actions of some defendant. Assume he was making $100,000, she was making $15,000, family income is the basis for analysis and the self consumption factor of the wife was 20%. In this case, her personal consumption
allowance would equal $23,000 (= $115,000 * .20) which yields the absurd conclusion that net damages are a minus $8,000. In this case, the expert may need to drop the lost earnings argument entirely and simply use household production as the basis for damages.

VIII. Medical Care and Rehabilitation Damages

§8:01 Overview
In many personal injury cases, the forensic expert is asked to compute the present value of the future costs of medical care as part of damages. This may include goods and services such as counseling, physical therapy, occupational therapy, medicines, surgeries, and similar costs, even including retro-fitting a home to accommodate a wheel chair or purchase of a specially-equipped van if the person’s physical limits require such. Severe cases, such as those involving traumatic brain injuries may require the services of a home nurse or even institutionalization. The key issues are determining what is needed in terms of care both now and in the future, what these current and future care goods and services are expected to cost, and what is the present value as of trial date of the care costs.

Strictly speaking, the role of the forensic economist is with the last step, computing present values of future care costs. Determining future care components and a possible rehabilitation plan are roles of medical doctors and rehabilitation/vocational specialists, respectively. Still, the economist will often need to advise the attorney on what the economist needs to estimate medical damages. This section outlines the most important factors.

§8:02 Issues Economist Needs to Address
In personal injuries involving disability, the attorney needs to make sure medical opinion addresses four issues:

1. Is the injured plaintiff’s condition permanent and stationary? If so there is no likelihood of improvement, but this need not mean total inability to work and that needs to be clarified vis-à-vis past and future jobs. If permanent and stationary and totally disabled, then that needs to be spelled out by the doctor.

2. If the condition is not permanent and stationary, an implication may be that the individual can return to work. This issue may involve statements such as Mr. Jones can return to his prior job but for 3 months he should lift no more than 15 lb. objects; afterwards he can resume normal work activities.

3. What, if any, future care needs will plaintiff require, including future therapies, medicines, surgeries, and what will these cost?

4. What is the life expectancy of the plaintiff, with and without the event giving rise to the lawsuit?

The economist has little credibility in offering opinions about these four issues but needs these medical opinions as supporting evidence to help determine the future lost earnings period, components of medical care costs, and life expectancy. In a recent case, for
example, the plaintiff had a serious heart condition plus juvenile onset diabetes before being struck by a car. The plaintiff expert economist developed an estimate of medical care damages but did not consider the plaintiff’s pre-existing medical conditions and life expectancy. The opposing economist, after reviewing medical evidence and finding item (4) missing, asked his client/attorney to obtain a medical opinion on plaintiff’s life expectancy given his prior health issues. The result was a medical opinion of three to five added years of life after the accident, an opinion which limited the much longer estimates of life care provided by plaintiff’s expert economist without regard to life expectancy limits.

Item (4) is a particularly thorny yet significant issue because it can directly impact the size of future medical care costs. For instance, how does defense counsel tell a jury that the actions of the defendant which limited the future life expectancy of the plaintiff, for that reason should lower the damages award?

Sometimes the damages expert can develop an opinion from the medical expert’s testimony or reports if each of the above four items are found. In many cases however a vocational rehabilitation expert uses the medical reports to develop a plan for future care and possible rehabilitation. These reports can be quite detailed and useful inputs for the damages expert because they typically spell out exactly what type of care or treatment is needed, when it is needed, who is to provide this care, the location of the care, and the cost of each item.

Aside from making sure that the attorney has provided the proper set of medical and rehabilitation reports and opinions, the economist’s main task in estimating medical damages is to do two things: (1) estimate the rate of increase in each cost of care component and (2) calculate the present value as of trial date of all such care costs. The mechanics of discounting in the context of increasing medical care prices are identical to the procedures discussed above for discounting future earnings with rising future wage rates and will not be discussed here. Instead we focus on how to estimate future medical care costs.

§8:03 How to Estimate Future Medical Care Costs
Projecting future medical costs involves looking at each component of care. According to information contained on the BLS Web site (www.bls.gov), medical care is one of the major item groups within the Consumer Price Index (CPI). This major group consists of medical care commodities and medical care services. Medical care services, the dominant component of medical care, is organized into two expenditure categories (EC’s), professional medical services and hospital and related services. (An additional expenditure category for health insurance is part of medical care services but is not published separately.) Medical care commodities comprised of prescription drugs and nonprescription medical equipment and supplies is the other major component of medical care.
Relative Importance of Components in the Consumer Price Index December 2004

<table>
<thead>
<tr>
<th>Component</th>
<th>2004 Relative Importance</th>
<th>2001 Relative Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical care</td>
<td>6.132</td>
<td>5.014</td>
</tr>
<tr>
<td>Medical care commodities</td>
<td>1.484</td>
<td>1.126</td>
</tr>
<tr>
<td>Prescription drugs and medical supplies</td>
<td>1.092</td>
<td>.789</td>
</tr>
<tr>
<td>Prescription drugs and medical supplies</td>
<td>1.084</td>
<td>.784</td>
</tr>
<tr>
<td>Unsampl ed rent or repair of medical equipment</td>
<td>.008</td>
<td>.005</td>
</tr>
<tr>
<td>Nonprescription drugs and medical supplies</td>
<td>.392</td>
<td>.337</td>
</tr>
<tr>
<td>Internal and respiratory over-the-counter drugs</td>
<td>.276</td>
<td>.256</td>
</tr>
<tr>
<td>Nonprescription medical equipment and supplies</td>
<td>.115</td>
<td>.082</td>
</tr>
<tr>
<td>Medical care services</td>
<td>4.649</td>
<td>3.888</td>
</tr>
<tr>
<td>Professional services</td>
<td>2.767</td>
<td>2.270</td>
</tr>
<tr>
<td>Physicians’ services</td>
<td>1.555</td>
<td>.341</td>
</tr>
<tr>
<td>Dental services</td>
<td>.722</td>
<td>.578</td>
</tr>
<tr>
<td>Eyeglasses and eye care</td>
<td>.236</td>
<td>.198</td>
</tr>
<tr>
<td>Services by other medical professionals</td>
<td>.254</td>
<td>.153</td>
</tr>
<tr>
<td>Hospital and related services</td>
<td>1.516</td>
<td>1.276</td>
</tr>
<tr>
<td>Hospital services</td>
<td>1.452</td>
<td>1.261</td>
</tr>
<tr>
<td>Nursing homes and adult daycare</td>
<td>.063</td>
<td>.015</td>
</tr>
<tr>
<td>Health insurance</td>
<td>.366</td>
<td>.343</td>
</tr>
</tbody>
</table>


There are two points to showing this much detail in the medical care component of the CPI. First, BLS publishes CPI by subcategory and the results may differ by which category is used by the damages expert. Second, choices such as which years of CPI data and how many years of past CPI data, where past CPI price changes are used as the basis for making a projection of future care prices, can make a very large difference in the rate assumed of future medical care price increases, and thereby a great impact on damages. We make these points by reference to CPI data in the table below.

U.S. City Average: Medical Care Components, 12 month percentage change
(Source: U.S. Department of Labor, Bureau of Labor Statistics)

<table>
<thead>
<tr>
<th>Year</th>
<th>Medical Care</th>
<th>Professional Services</th>
<th>Physician Services</th>
<th>Services by other medical professionals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>5.2</td>
<td>4.2</td>
<td>4.4</td>
<td>4.0</td>
</tr>
<tr>
<td>1995</td>
<td>5.1</td>
<td>4.4</td>
<td>4.5</td>
<td>1.8</td>
</tr>
<tr>
<td>1996</td>
<td>3.7</td>
<td>3.6</td>
<td>3.6</td>
<td>1.9</td>
</tr>
<tr>
<td>1997</td>
<td>2.9</td>
<td>3.4</td>
<td>3.0</td>
<td>3.5</td>
</tr>
<tr>
<td>1998</td>
<td>3.2</td>
<td>3.2</td>
<td>3.0</td>
<td>2.4</td>
</tr>
<tr>
<td>1999</td>
<td>3.4</td>
<td>3.2</td>
<td>3.0</td>
<td>2.1</td>
</tr>
<tr>
<td>2000</td>
<td>4.3</td>
<td>3.7</td>
<td>3.7</td>
<td>2.0</td>
</tr>
<tr>
<td>2001</td>
<td>4.8</td>
<td>3.7</td>
<td>3.6</td>
<td>3.3</td>
</tr>
<tr>
<td>2002</td>
<td>5.1</td>
<td>3.0</td>
<td>2.8</td>
<td>2.7</td>
</tr>
<tr>
<td>2003</td>
<td>4.5</td>
<td>2.9</td>
<td>2.7</td>
<td>3.1</td>
</tr>
<tr>
<td>2004</td>
<td>5.0</td>
<td>3.9</td>
<td>4.0</td>
<td>2.7</td>
</tr>
</tbody>
</table>
A damages expert typically uses information like that contained in this table to compute average price changes for the past few years and makes a projection of future price increases accordingly. For example, for the period 2000-2004, average medical care prices rose by an average annual equal to 4.75%. An economist might therefore assume that future medical care prices would increase by this amount per year in the future. While there is nothing particularly incorrect about this procedure, the careful attorney can note on cross examination that the annual average for the period 1995-1999, was only 3.66% and ask why not consider 10 prior years instead of just 5. Moreover, if the professional care needed was not for a physician, dentist, eyeglass or eye specialist but some “other medical professional” the 2000-2004 average annual increase was only 2.76%, a figure much lower than the overall medical care average, 4.76%. The expert should always choose the best and most relevant data available; if not, the expert risks having his/her credibility attacked.

The above point is that not all medical care components increase at the same annual rate because they are measuring different goods and services. Choice of how many past CPI years to include in estimating future price increases can also be significant. In a recent case in California, the defense expert became suspicious when he noticed that the plaintiff expert used the past 10 years of CPI information to estimate price increases for some goods and services but 25 years of past CPI information for physician services. During the early 1980’s such services were rising very sharply, e.g., 1980 10.5%, 1981 11.0%, 1982 9.4% vs. 2002 2.8%, 2003 2.7%, and 2004 4.0%. The point is not to suggest that the deposing attorney should argue with a damages expert, but to point out that what the expert has done by including the CPI components for the early 1980’s is consistent with increasing overall damage calculations.

IX. Income Taxes and Damage Awards

§9:01 Overview
Income taxes are not usually considered in liability cases because most such cases take place in state superior courts and most states do not consider income taxes on such awards. In contrast, in federal courts and some state courts, the United States Supreme Court has stated that state and federal income taxes owed against lost income should be subtracted for future earnings loss. An exception is in federal employment law cases, where taxes are owed on lost earnings awards so the economist should not subtract taxes. [James D. Rodgers in “Handling Taxes in Employment Law Cases” Journal of Forensic Economics, Vol.16, No.2, 2003, at pp. 225-256, notes that the strategy of ignoring taxes in employment law cases, made mainly on the assumption that taxes on awards and taxes on future earnings will offset each other, is a mistake resulting in underestimated damages because the likelihood is taxes on awards will exceed those on future wages.]

The main point on income taxes and damages awards is the attorney should advise the expert on which rules apply in the particular venue.
§9:02 How to Make Income Tax Adjustments
There are two steps to making tax adjustments. First, the future earnings loss is computed on after-tax basis. Data are available from the U.S. Department of the Treasury, Internal Revenue Service, “Statistics of Income Bulletin” for average income tax rates. [This information is available from IRS or related agencies. For example see Table No. 466 Individual Income Tax Returns-Number, Income Tax, and Average Tax by Size of Adjusted Gross Income: 1998 and 1999, Statistical Abstract of the United States: 2002, U.S. Census Bureau, at p.316.] Some economists use this source because it saves time. However, because the period of future loss may extend for several years and because of progressive income tax rates, the preferred way to compute future tax rates is to use the marginal tax rates. Marginal income tax rates can also be found in the Statistical Abstract of the United States albeit with some lag. [ibid. Table 470 Federal Individual Income Tax-Tax Liability and Effective and Marginal Tax Rates for Selected Income Groups: 1990 to 1999, at p. 318.] An exception in which average tax rates could be used is when the plaintiff is permanently and totally disabled with no future work expected. [“Reference Guide for Valuing Economic Loss in Personal Injury, Wrongful Death and Survival Actions” Thomas Ireland, Stephen Horner, and James Rodgers, Expert Economic Testimony, Tucson, AZ: Lawyers & Judges, Publishing Co. Inc, 1998, at p.41.]

The second step in making an income tax adjustment is more complicated. After the first step, computing after-tax future income and expressing the results in present values as of trial date, the award is then presumed to be invested so that interest on the award will help offset reductions in principal needed to replace the lost future earnings. While the award is free of tax, the interest on this award is taxable. This means that the economist must now re-compute each future year’s payout in terms of interest and principal. Taxes to be paid each year on interest earned on the investment should be computed and the award increased by amounts which exactly offset these future tax payments. Failure to make this adjustment means double taxation of the plaintiff, because the income taxes were already considered in the first step.

§9:03 Comments on Making Tax Adjustments
• Reverse Tax Effects. Income tax adjustments would seem to benefit the defense since after tax awards are below pretax awards and for this reason the defense bar fought for these in some states. However, the inclusion of income taxes also reduces the interest income on the amount invested, thus increasing the present value of the award needed to offset the lost future earnings. This interest income effect became known as the “reverse tax effect”. [“Estimating Damages in Injury and Wrongful Death”, M.L. Brookshire, C.W. DeSeve, and F.L. Slesnick, Litigation Economics, Patrick Gaughan and Robert Thornton editors, Greenwich, CT: JAI Press, 1993, at pp.34-35.] These two factors to some extent may offset each other.

• Municipal Bond Use. A second comment involves the use of municipal bonds by some economists because these bonds are free of state and federal income taxes (vs. Treasury bonds which are taxable). Reverse tax effects are thus avoided.
However, opposing attorneys pointed out that use of tax-free municipal bonds with lower yields than taxable securities thus raised the present value of damage claims. Also, municipal bonds have greater default risk than Treasury bonds although this can be offset to some extent by only considering the yields on highly rated municipal bonds.

- **Other Possible Complications.** Which taxes should be considered? Federal and state income taxes are fairly clear but arguments can be made to offset local income taxes and payroll taxes. Forecasting income tax rates for periods of many years into the future is clearly fraught with uncertainty, given likely changes in state and federal tax policy over say 30 years in the future. Also, the plaintiff’s tax status in the future may change as the number of dependents changes, or the amount of earnings changes, or other income changes in the future. Unfortunately, there is no clear guidance on how best to address each of these situations aside from raising warning signs and suggesting that the economist and attorney be aware that these issues may be raised in some venues.

X. **SAMPLE**

§10:01 Demonstrating Key Points Via an Earnings Loss Example  
So far, we have provided the reader with a number of key points which we now pull together in hypothetical example. In doing so we make a number of simplifying assumptions as follows:

- Lost earnings begin at $40,000 in year 2013 when the plaintiff is 50 years old.
- Expected retirement is at age 64, which means work life is expected through age 63, when plaintiff is estimated to have received $55,140 in earnings.
- Earnings growth in the future is expected to be 2.5% per year.
- As shown in Table 3, yield on risk free, nontaxable bonds is 4%\(^6\) and this rate is used to derive discount factors such that the sum of the products of successive discount factors times successive earnings is the PV as shown above in eq.3; or $510,412 as shown in Co. [5] total.

At this point, defense counsel might ask: “Why make it complicated? “Wouldn’t it just be easier to award the client $400,000, get a return of 10% per year until age 64 and have his principal, $400,000 left over at that time?”\(^7\) (Caution should be exercised before answering this trick question, which is probably just trying to cut the damage award by $110,412 if answered in the affirmative.)

\(^6\) Treasury bonds are tax exempt at the state level but not the federal level
Consider the other entries in Table 3 starting with Column [7]. Each year, earnings are paid out to exactly match the earnings that would have been made by the plaintiff and not one cent more. How do we know this? Answer: sum of column [8], $660,758, the sum of annual earnings paid out, matches the PV sum of Col.[5] for lost earnings, plus the sum of Col.[10], earnings on the award. Furthermore, had plaintiff invested at 10%, default risk would have been added.8 Instead of Mongolia, the more conservative assumption made is an investment in US Treasury Bonds which have provided low risk yields on say 20 year constant maturity bonds in the 5 to 3% range for the past 10 years.9

Table 3. Example of PV of Earnings, 2013-2026, plus offset to tax on interest on Award

<table>
<thead>
<tr>
<th>Year</th>
<th>Age</th>
<th>Earnings</th>
<th>Discount Factor</th>
<th>Present Value</th>
<th>Cumulate</th>
<th>Starting Lump Sum</th>
<th>Earnings Payout</th>
<th>Lump Sum</th>
<th>Lump Sum Earnings</th>
<th>Ending Lump Sum</th>
<th>PV of Earnings plus PV of Tax on Interest on Award</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>50</td>
<td>40,000</td>
<td>1.000</td>
<td>40000</td>
<td>40000</td>
<td>510412</td>
<td>40000</td>
<td>470412</td>
<td>18816</td>
<td>489228</td>
<td>5645</td>
</tr>
<tr>
<td>2014</td>
<td>51</td>
<td>41,000</td>
<td>0.962</td>
<td>39423</td>
<td>79423</td>
<td>489228</td>
<td>41000</td>
<td>448228</td>
<td>17929</td>
<td>466158</td>
<td>5172</td>
</tr>
<tr>
<td>2015</td>
<td>52</td>
<td>42,025</td>
<td>0.925</td>
<td>38854</td>
<td>118278</td>
<td>466158</td>
<td>42025</td>
<td>424133</td>
<td>16965</td>
<td>441098</td>
<td>4706</td>
</tr>
<tr>
<td>2016</td>
<td>53</td>
<td>43,076</td>
<td>0.889</td>
<td>38294</td>
<td>156572</td>
<td>441098</td>
<td>43076</td>
<td>398022</td>
<td>15921</td>
<td>413943</td>
<td>4246</td>
</tr>
<tr>
<td>2017</td>
<td>54</td>
<td>44,153</td>
<td>0.855</td>
<td>37742</td>
<td>194313</td>
<td>413943</td>
<td>44153</td>
<td>369791</td>
<td>14792</td>
<td>384582</td>
<td>3793</td>
</tr>
<tr>
<td>2018</td>
<td>55</td>
<td>45,256</td>
<td>0.822</td>
<td>37197</td>
<td>231511</td>
<td>384582</td>
<td>45256</td>
<td>339326</td>
<td>13573</td>
<td>352899</td>
<td>3347</td>
</tr>
<tr>
<td>2019</td>
<td>56</td>
<td>46,388</td>
<td>0.790</td>
<td>36661</td>
<td>268172</td>
<td>352899</td>
<td>46388</td>
<td>306511</td>
<td>12260</td>
<td>318772</td>
<td>2907</td>
</tr>
<tr>
<td>2020</td>
<td>57</td>
<td>47,547</td>
<td>0.760</td>
<td>36132</td>
<td>304304</td>
<td>318772</td>
<td>47547</td>
<td>271224</td>
<td>10849</td>
<td>282073</td>
<td>2473</td>
</tr>
<tr>
<td>2021</td>
<td>58</td>
<td>48,736</td>
<td>0.731</td>
<td>35611</td>
<td>339915</td>
<td>282073</td>
<td>48736</td>
<td>233337</td>
<td>9333</td>
<td>242671</td>
<td>2046</td>
</tr>
<tr>
<td>2022</td>
<td>59</td>
<td>49,955</td>
<td>0.703</td>
<td>35097</td>
<td>375012</td>
<td>242671</td>
<td>49955</td>
<td>192716</td>
<td>7709</td>
<td>200425</td>
<td>1625</td>
</tr>
<tr>
<td>2023</td>
<td>60</td>
<td>51,203</td>
<td>0.676</td>
<td>34591</td>
<td>409603</td>
<td>200425</td>
<td>51203</td>
<td>149221</td>
<td>5969</td>
<td>155190</td>
<td>1210</td>
</tr>
<tr>
<td>2024</td>
<td>61</td>
<td>52,483</td>
<td>0.650</td>
<td>34092</td>
<td>443696</td>
<td>155190</td>
<td>52483</td>
<td>102707</td>
<td>4108</td>
<td>106815</td>
<td>801</td>
</tr>
<tr>
<td>2025</td>
<td>62</td>
<td>53,796</td>
<td>0.625</td>
<td>33601</td>
<td>477296</td>
<td>106815</td>
<td>53796</td>
<td>53019</td>
<td>2121</td>
<td>55140</td>
<td>397</td>
</tr>
<tr>
<td>2026</td>
<td>63</td>
<td>55,140</td>
<td>0.601</td>
<td>33116</td>
<td>510412</td>
<td>55140</td>
<td>55140</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>660,758</td>
<td></td>
<td>510412</td>
<td>510412</td>
<td>660758</td>
<td>150346</td>
<td>38367</td>
<td>556719</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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9http://www.federalreserve.gov/releases/H15/data.htm
There is another point to the entries in Table 3 and that is one made earlier about taxes. Taxes are a complicated area as regards economic damages. In general, taxes are not considered in state courts in liability cases, but there are exceptions in which the attorney should advise the expert; however, federal courts generally measure awards net of taxes. In the example provided here,

- Economic damages are shown without an income tax applied on future earnings.
- However, in case we have a situation where the interest yield on the award is taxed (and we are assuming an investment in Treasury bonds), then we show the amount of that tax Col. [12] and the addition to the award that is needed to make the award on a tax free basis, Col. [13], a total of $561,951 vs. $510,412.

XI. CONCLUDING COMMENTS

§11:01 Areas for Future Inquiry
Forensic economics and the estimation of damages awards is a relatively new field. New research is emerging as improved methods of economic analysis are developed and better data sources become available. Also, there is a change to the field in terms of who is providing the forensic damages services. Not long ago economic damages experts were usually found in academic institutions as economists, statisticians, accounting and finance professors providing forensic opinions and testimony on a part-time basis. Then some groups emerged like the National Association of Forensic Economics (NAFE), which remains an important organization.

In the 2012 survey of NAFE members, when asked the percent of earned income from various sources, faculty salaries made up 15.95% of total annual earnings with administrative salaries an added 0.88%. Yet, increasingly, damages experts are found coming from major accounting firms or management consulting firms that have divisions devoted to litigation support activities. The NAFE survey found 70.12% of income came from consulting in forensic economics. Things have changed; in the 1991 NAFE survey consulting income as a percent was about 34%.

Similarly, organizations like the National Association of Certified Valuation Analysts (NACVA), comprised mainly of Certified Public Accounts, now offer courses and certificates such as a Certified Forensic Financial Analyst, largely in response to the rapid growth of the legal community’s demand for litigation consulting. It is not unusual these days to find an opposing damages expert, not as a university professor of economics, but an MBA or CPA holder, who comes from a firm that does many, many cases and utilizes “turn-key” software to generate economic damages including those discussed in this guide. Exactly what the mix will be of providers of forensic damages services in say, 10 years, is not entirely clear at this point, but concerns are surfacing about the possible erosion of quality in services provided if these “mass-production methods of analysis” increase. The best economic analysis and testimony is that done by a seasoned expert who knows the underlying basis for economic damages and is very familiar with the data.

Glossary

**Age-Earnings Profile.** The usual shape of earnings levels over the entire life of a worker. Earnings rise rapidly for new entrants to the work force, those in their late teens or 20’s, grow more slowly in their 30’s, then peak in their 40’s and may even decline or advance very slowly for those in their 50’s and beyond. Those with more education have age-earnings profiles which start later, rise more rapidly, and peak later in life than those with less education. There is some debate among economists as to the extent of life-cycle effects and the extent to which it reflects the use of cross-sectional data. Still, it is a convenient way to consider how experience and human capital contribute to earnings levels and growth.

**Base Earnings.** The earnings level in the pre-accident period.

**But-For Analysis.** Damages are measured as what the plaintiff would have received in earnings “but-for” the actions of the defendant less presumably lower actual earnings.

**Default Risk.** When a financial instrument is sold with a promise to pay future payments to the purchaser and the seller fails to make those payments, the issuer is said to be in default. Default risk is the risk of nonpayment.

**Discount Factor.** A term given the expression, $1 / (1+r)^t$, where $r$ is the discount rate and $t$ is the time period. If $r$ is 5% and $t$ is 2, the discount factor is $1 / (1+.05)^2 = 0.907$. For example, if earnings loss in year 2 is $20,000, a shorthand way to compute PV of this future loss is to multiply $20,000 by 0.907, which is $18,140.

**Discount Rate.** The rate of interest used to discount future losses to present value.

**Earning Capacity.** Earnings capacity may be called potential earnings and is contrasted with expected earnings. It is what the individual could have earned working full time year round at their best paying alternative job. Earnings capacity also includes working full time over the future work life with no periods of voluntary non work time for things like schooling or child raising. **Expected earnings** focuses on what earnings are expected based on actual past earnings and adjustments for both voluntary and involuntary time not working. If a carpenter can only work during good weather, the earnings capacity approach would make no deduction for involuntary time not working due to bad weather.

**Expected Earnings.** Expected earnings are the earnings the injured individual would have earned in the year of an event like an injury, death, or employment termination.

**Fixed Cost.** A cost of production that does not change with the amount of goods or services produced. Fixed costs plus variable costs comprise total production costs.

**Household Production Value.** The value of goods and services produced at home (nonmarket) which have value in terms of goods and services generated in the market.
Household production includes activities like cleaning, food preparation, yard work, and related activities.

**Inflation.** A general rise in the average price of goods and services. It is commonly measured by the Consumer Price Index which the Bureau of Labor Statistics produces each month. Economic damages can be measured in **nominal terms**, without adjustment for inflation, or **real terms**, meaning after inflation effects have been removed from all key factors, especially earnings, fringe benefits, and interest.

**Life Expectancy.** The average number of years a person would be expected to live after some date.

**Mitigation.** A term referring to either the actions of the plaintiff to minimize the economic losses of some harmful event or the level of earnings of the plaintiff after the event.

**Nominal Interest Rate.** The market rate of interest with no adjustment for inflation. Interest rates quoted in newspapers like the *Wall Street Journal* are nominal interest rates.

**Prejudgment Interest.** Interest on losses that take place before trial date.

**Present Value.** The value today of earnings or income due in the past with interest added or in the future with discounting.

**Real Variables.** A variable with changes in price level removed. For example, real interest is nominal interest minus inflation rate.

**Variable Cost.** Those costs that vary directly with production or sales of a company. In business disruption cases, the economist focuses on measuring variable costs to determine lost economic profit.

**Weighted Average Cost of Capital.** In commercial cases, the discount rate used to measure PV of lost profits or diminutions in business value. It reflects the relative risk of the business, the capital structure, and the cost of debt.

**Work Life.** The number of years of participation in the work force. **Work life expectancy** is the number of years from some date to a future date when the individual is expected to leave the labor market through retirement or death.

**Years to Final Separation.** An individual may enter and exit the work force several times during the course of a work life. Years to final separation measures the time from a certain date to a later time when the individual leaves the work force finally due to retirement or death.
About the Author

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