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The Cost of Carry and Prejudgment Interest

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Abstract

A uniform application of prejudgment interest associated with tortuous financial takings by defendants has yet to be developed in the law. Legal and economic experts continue to debate the appropriate calculation of prejudgment interest and the courts have endorsed a variety of methods (see Knoll). In this paper, we offer an efficient and consistent method to assign prejudgment interest utilizing the concepts of futures and forward transactions and Keynes' cost of carry premise. While we focus on corporate litigation, the concept can be applied to financial takings between individuals. We begin the paper with the succinct legal precedent for the need of prejudgment interest. We follow by presenting a variety of traditional prejudgment interest rate approaches. Then we turn to the analysis of the cost of carry principle and its application to prejudgment interest. We conclude that applying the cost of carry principle, revealed in the plaintiff's cost of capital, leads to the calculation of prejudgment interest that creates financial parity between the plaintiff and defendant, and hence, an efficient method of assigning prejudgment interest.

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The rationale of prejudgment interest in litigation was succinctly stated Inre Pago Pago Aircrash of Jan. 30, 1974, 525 F. Supp. 1007 (C.D. Cal. 1981) as:

> "An individual who must litigate to recover damages should be placed in the same position, when he recovers, as the individual who recovered the day he suffered an injury. Otherwise, the tortfeasor benefits from denying liability and continuing to litigate, while he retains the use of money to which the plaintiff is entitled, and the plaintiff is deprived of the benefit he should have derived from an immediate recovery."

The U.S. Supreme Court in General Motors Corp. v. Devex Corp., 461 U.S. 648 (1983) defined the purpose of prejudgment interest as:

> "In the typical case an award of prejudgment interest is necessary to ensure that the patent owner is in as good a position as he would have been if the infringer had entered into a reasonable royalty agreement. An award of interest from the time that the royalty payments would have been received merely serves to make the patent owner whole, since his damages consist not only of the value of the royalty payments but also of the forgone use of the money between the time of infringement and the date of the judgment."

The 'make whole' principle stated in U.S. Supreme Court in General Motors Corp. v. Devex Corp., 461 U.S. 648 (1983) indicates that a plaintiff's damages includes two components:

1) the value of the goods not received, and 2) the foregone cost of money. While the 'make whole' principle is often cited in case law involving prejudgment interest,[1] the exact goal of prejudgment interest is inconsistently presented—prejudgment interest is awarded either to remove defendant's profits from the financial taking from the plaintiff or to restore the plaintiff's financial position.

In any case involving prejudgment interest, we can formulate the court award to a plaintiff due to a past economic harm as:

$$A = D(1+r)^n . \quad (1)$$

where, A is the award, D is the past economic damage, r is an annual prejudgment interest rate, and n is the number of years from the occurrence of the damage D to the payment of the award A. Once D is determined and the passage of time to final judgment, n, has occurred, the contested issue to compute A is the selection of the prejudgment interest rate r. Argument for the selection of the interest rate is often couched in terms of what the judgment is intended to accomplish (i.e., compensation to the plaintiff or prevention of unjust enrichment to the defendant).[2] Other precedent considerations include the past and current financial conditions of the plaintiff and defendant, prevalent interest rates in the debt market during the damage period, and the historical financial arrangements, if any, between the plaintiff and defendant.

The selected interest rate can substantially affect the dollar-level of A, especially when the economic harm occurred many years ago. Plaintiffs generally argue for high annual rates of prejudgment interest and defendants generally argue for low annual rates of prejudgment interest. A variety of interest rates are often cited by plaintiffs and defendants including the use of risk-free interest rates, interest rates paid on demand deposits, market interest rates on corporate debt (prime rates or commercial paper), the plaintiff's or defendant's own borrowing costs, and past market returns on stocks, etc.

Traditional Prejudgment Interest Views

The general approach to the awarding of prejudgment interest has been that the plaintiff should receive interest at the defendant's cost of unsecured borrowing (often referred to as the coerced loan theory). The judgment establishes an obligation from the defendant to the plaintiff that dates back to the financial injury or time-of-taking by the defendant. To justly compensate, the plaintiff is entitled to interest from the date of the harm 1) on the money the defendant improperly retained, or 2) on the lost profits that were incurred by the plaintiff. Although we cannot know specifically what the plaintiff would have done with that money if it had been received earlier, because of the taking, the plaintiff has invested it, albeit unwillingly, in the defendant. Even if the plaintiff should succeed in establishing its claims and the amount of its damages, it still might not recover all that it is owed[3]. Should the defendant declare bankruptcy, the plaintiffs' claims (judgments) are treated on par with unsecured debt. Therefore, to compensate the plaintiff for defendant's withholding of this money, the coerced loan theory states that the plaintiff should be paid the same return that would be paid to a voluntary creditor of the defendant. That return is the return on defendant's unsecured debt and assignment of prejudgment interest rates would follow the historical pattern of the defendant's cost of capital.

An alternative viewpoint exists when the infraction occurs because of a breach of fiduciary duty. There is precedent to support that the remedy for a breach of fiduciary duty affected to a trust is to restore the trust to the position that they would have occupied but for the breach of trust.[4] Additionally, the party committing the infraction is liable for any profit that would have accrued to the trust if there had been no breach, and such determination of loss should presume the most profitable of strategies for the plaintiff.[5]

Fisher and Romaine (1990) espouse the view that prejudgment interest may actually combine multiple rates if the infraction occurs over time, a discount rate for each infraction and the risk-free rate for compounding cash flows. They write:

> "The change in the profit stream brought about by each violation is discounted back to the time of that violation and then compounded forward at the risk-free rate."

Additionally, Fisher and Romaine argue for the use of the plaintiff's opportunity cost of capital in the discount factor. When prejudgment interest is set by statute or assigned automatically to the defendant's financing cost, prejudgment interest as a distinct component of the award is determined aside from the economic reality of the case[6]. Such approaches to prejudgment interest focus on what the judgment is intended to accomplish (e.g. prescribed penalty or deterrence or supposedly removing the defendant's gain from the financial taking), and these approaches seek their justification in fairness to both parties as well as encouragement of timely and efficient litigation. While these may represent ideals, they serve to dilute the objectiveness related to the loss and create the opportunity for an inefficient economic solution by avoidance of the 'make-whole' principle of restoring the plaintiff.

The Cost of Carry

John Maynard Keynes in chapter 17 of his work *The General Theory of Employment, Interest and Money* initiates the following discussion of the cost of carry:

> "It follows that the total return expected from the ownership of an asset over a period is equal to its yield (q) minus its carrying cost (c) plus its liquidity-premium (l), i.e. to $q - c + l$. That is to say, $q - c + 1$ is

[1] See Saunders v. State, 70 Nev. 480, 485, 273 P.2d 970 (1954). Royal Electric Construction Corp. v. Ohio State University, 73 Ohio St. 3d 110, 652 N.W.2d. 687, 1995 Ohio LEXIS 18905 (Ohio Sup. Ct. Aug. 15, 1995). City of Sparks v. Armstrong, 103 Nev. 619, 623, 748 P.2d 7 (1987). U.S. Supreme Court ,General Motors Corp. v. Devex Corp. , 461 U.S. 648 (1983).
[2] See Knoll (1996).
[3] Expenses related to legal proceedings such as appeals processes will offset damages.
[4] Matin v. Fielen, 965 F.2d 660,671 (8th Cir. 1992).
[5] Donovan v. Bierwirth, 754 F.2d 1049, 1053 (2d Cir, 1985).
[6] See Watts (2002) for a list of states and review of prejudgment interest rates.

> the own rate of interest of any commodity, where *q*, *c*, and *l* are measured in terms of itself as the standard."

We can equate the plaintiff's claim for lost profits to ownership of an asset. Based upon Keynes' position, the return to the plaintiff on its assets includes the cost of carry. As constructed by Keynes, the cost of carry is not general opportunity cost but is a measure of financial parity which is incorporated into futures and forward pricing equations and the application of such equations in the financial markets.

Cost of carry measures the storage cost plus the interest paid to finance the asset less the income earned on the asset. In the case of an asset claim of lost profits, the cost to finance the asset is the limited component of the cost of carry. The importance of the cost of carry premise in the prejudgment interest arena is that it transfers the discussion from what the judgment is intending to accomplish to the recognition that prejudgment interest is innately a part of the lost profits of the plaintiff. It is not a separate component warranting external rationale or determination and discussion as to what prejudgment interest rate applies. Determination of prejudgment interest under the cost of carry concept requires focusing on the actual infraction and the plaintiff's lost yield following Keynes' cost of carry function.

Cost of Carry and Beyond

Using the cost of carry concept, we extend the view of prejudgment interest to existence of an implicit trade relationship between the plaintiff and defendant similar to a futures contract. Williams (1986) argues that futures markets exist to provide an efficient means of intermediating credit risk. The futures market operates with forward and future contracts that are trade agreements that specify a future price of a transaction. The essence of a trade agreement is demonstrated where Party A enters knowingly or unknowingly into a transaction with Party B where both parties stand to benefit.

If an implicit transaction were to lock in a price between the parties, the transaction appears like a forward or futures contract. Take the example of a retailer that purchases goods or services from a wholesaler. Should the wholesaler wrongfully create excess profits by violating the contracted price of goods or services charged to the retailer, the existence of these excess profits represent a commodity and the pricing of this commodity aligns with futures and forward concepts. The premise that a parity relationship exists between the current and future prices of a commodity is the basis of futures and forward pricing models. Holbrook Working extended the cost of carry model to price futures contracts in 1949.[7] The parity premise indicates that the current price (spot) and the futures price should be equivalent except to the extent of the cost of carrying the commodity which includes the interest cost of financing the transaction plus any other expenses such as transportation or storage costs, offset by any dividends received.[8] If the parity does not hold, then an arbitrage situation exists where one party of a transaction will unduly benefit. If the goal of the assignment of prejudgment interest is to create financial parity, then the cost of carry model to price future contracts is applicable.

The futures price parity relationship is.

$$F_{0,T} = S_0 + SC_{O,T} = S_0(1 + p + i + y) \qquad (2)$$

where

- F represents the cost of the asset in the futures transaction entered at time 0, enduring until time T.
- S_0, represents the cost of the asset at time 0 (the current cost or spot price).
- $SC_{0,T}$ represents the total carrying costs and premiums received until time T associated with acquiring the asset at time 0.

SC has the components:

- p representing the time cost rate of the physical carrying costs of the asset from time 0 to T (i.e. what percent of the spot price will be required to physically carry the asset to time T);
- i representing the time cost rate of financing the purchase of the asset from time 0 to T (i.e. what percent of the spot price will be required to financially carry the asset to time T); and,
- y represents the time cost rate of the cash flows received by owning the asset during time 0 to T (i.e. what percent, positive or negative, of the spot price will be achieved by the owner of the asset as they carry the asset to time T).

In a litigation setting, the asset is the lost profit position existing for the plaintiff. The asset is created as a result of the financial taking that accrues to the benefit of defendant, referred to as *S*. The parity premise indicates that the current price (spot) and the futures price should be equivalent except to the extent of the cost of carrying the asset which includes the interest cost of financing the transaction plus any other physical carrying costs, offset by any dividend income received. Parity ensures that the plaintiff is compensated for its own cost of carry.

By an unlawful taking, a defendant willingly enters into a parity relationship with the plaintiff. Utilizing the enforcement of the law, the plaintiff seeks restoration of their parity with the defendant. Therefore, the appropriate risk-weighted compensation can be determined for both plaintiff and defendant as though they comply with the cost of carry parity equation's assumption that all parties have entered willingly. In this case, the application of economic value to determine the price of the asset today is the risk-free rate plus or minus other carrying costs or cash flows received during the transaction. However, in the event that there is risk present in the transaction, the risk-free rate requires modification to reflect those risks. According to Bodie, Kane, and Marcus (1996),

> "the futures price must exceed the spot price by the net cost of carrying the asset until maturity."

Reilly and Brown (1997) explain this further. Discussing the concepts we show in our equation 2, they indicate that

> "even if funds needed to purchase the commodity at date 0 are not borrowed, *i* accounts for the opportunity cost of committing one's own financial capital to the transaction".

[7] See Working (1949).
[8] See Bodie, Kane and Marcus (1996).

In financial litigation cases, the plaintiff has entered into a futures transaction with the defendant; plaintiff's capital is committed to uphold parity with the defendant; so, therefore, the appropriate carrying cost, or the economic damage of prejudgment interest, should be determined by assessing the cost of capital of the plaintiff. This reasoning is also intuitive. The plaintiff, albeit unwillingly, has committed their own capital as they entered into a trade agreement with the defendant. Accordingly, whether the plaintiff borrows money or not to enter into this trade agreement, they require compensation, at a minimum, at its implied financing cost. Without compensation, a speculative or arbitrage situation occurs between the defendant and plaintiff that force the plaintiff to incur further economic losses.

Arbitrage pricing theory predicts that the futures price of an item should just equal the price of the underlying item plus net carrying costs. This result is known as the cost of carry pricing relation. In the situation of plaintiff's claim for lost profits, we can rewrite equation (2) as the cost of carry pricing relation setting the physical carrying costs and cash flow income equal to zero:

$$F_{0,T} = S_0 + iS_0 . \quad (3)$$

In our situation, the plaintiff recovers its profits that the defendant held S_0, and prejudgment interest is represented as the total amount iS_0 that is reflected by the plaintiff's cost of capital.

Application

Practical application of the cost of carry parity concepts results in appropriately determining an award for plaintiff's total economic losses. Ascertaining the plaintiff's appropriate cost of carry is the crucial calculation in order to determine a suitable rate of prejudgment interest and accordingly, a sufficient award.

In Table 1, we view the effect of this approach through four scenarios with respect to both the plaintiff's cost of carry and the defendant's relative financing costs. Under each of the four possible scenarios, by awarding prejudgment interest at the plaintiff's cost of capital, we return the plaintiff to whole and their parity relationship with the defendant is maintained. However, the defendant will ultimately achieve a variety of net financial yield positions associated with their own borrowing costs.

As Table 1 demonstrates, when the plaintiff's cost of carry and the defendant's financing cost are relatively equivalent to each other (whether they are higher or lower than market norms), the defendant's yield position on the financial taking is neutral when applying the plaintiff's cost of capital to prejudgment interest. This coincides with Knoll's argument that for two publicly traded companies with ready access to capital markets the view can be taken that these transactions are forced loans and therefore use of the defendants cost of borrowing is applicable. In this coincidental situation, it can be generally inferred that the plaintiff's cost of borrowing would be nearly equivalent to the defendant's cost of borrowing.

The two remaining quadrants of Table 1 warrant further analysis as addressed in this paper. Take the case when the plaintiff's cost of carry exceeds the defendant's financing costs. This may occur when a large public corporation defendant is litigating with a plaintiff that is a smaller public or privately held company. In fact, many disputes arise from such relationships as the defendant is strategically positioned to significantly influence the economic situation of the plaintiff. A franchise or distributor relationship may have these attributes when the independent retailer or franchisee is largely dependent on the large distributor for both distribution of goods and completion of services. By applying the plaintiff's cost of carry as a direct economic loss, the plaintiff is made whole in line with Keynes' cost of carry principle and the futures parity condition. The defendant incurs a loss in excess of its own financing cost. Hence, the consistent imposition of this cost in practice serves as a deterrent to tortuous activity and provides the appropriate relief as prescribed in the General Motors v. Devex case.

Some may argue that the imposition of a rate that benefits the plaintiff may cause the plaintiff to refrain from litigating claims in a timely manner. Others may argue that the defendant should not be responsible for the business prospects of the plaintiff as it relates to the plaintiff's cost of carry. However, this reciprocal relationship deters inappropriate activity between both parties in a transaction, as neither has a net economic advantage. The application of Keynes' cost of carry condition does not separate the initial loss from the

Table 1

Applying **Plaintiff's Carry Cost** in loss calculations and the *Resulting Relative Cost to the Defendant*

If, the		then the	
Defendant's financing cost is	*High*	Defendant's net yield improves.	Defendant's net yield is neutral.
	Low	Defendant's net yield is neutral.	Defendant's net yield worsens.
		Low	**High**
		Plaintiff's Cost of Carry is	

appropriate amount of prejudgment interest. The defendant should bear the risk of the transaction because it knowingly committed the infraction, not the plaintiff. Larger firms would not benefit from engaging in infractions against smaller companies (with relatively higher cost of carry) as arbitrage opportunity is eliminated. Additionally, punitive action because of defendant's financial advantage in carrying the taking is not required because with prejudgment interest assigned at the higher plaintiff's cost of carry, the plaintiff is sufficiently 'made-whole' and the defendant is sufficiently punished according to their own knowledge of plaintiff's financial position.

Alternatively, given a higher financing cost on the part of the defendant and a lower cost of carry by the plaintiff, the defendant's net yield will improve with the assignment of the lower plaintiff's cost of carry to the parity relationship. This is demonstrated in the upper, left-hand quadrant in Table 1. Applying the risk/return attributes to determine the cost of carry, this situation occurs when the defendant's financial position is considered as more risky relative to that of the plaintiff. In this case, the defendant has an opportunity to arbitrage. They can commit the infraction and benefit from that, however, the plaintiff is able to recover its carrying costs and then have those costs restored to them in final judgment. In the end, the plaintiff is indifferent to the defendant's gain because they are whole with prejudgment interest assigned to their cost of capital.

Conclusion

Throughout this paper, we compare the traditional defendant cost of capital arrangement and statutory interest prescription to prejudgment interest with the cost of carry approach. Central to our view is the merging of Keynes' cost of carry position with futures and forward transaction parity calculations. Under this approach, we form two conclusions. First, the plaintiff's injury should couple the actual infraction with the plaintiff's carrying cost of the action. Accordingly, discussions of the reasons for prejudgment interest are not necessary. Prejudgment interest is implicit to the plaintiff's loss. Second, the carrying cost represents the implied cost of the plaintiff to fund its loss position. We argue that while the defendant's cost of capital may be equivalent to the plaintiff's cost of carry (cost of capital), which in itself is coincidental, the cost of carry argument may provide parity in other cases irrespective of whether or not penalty from tortuous behavior is considered.

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Case Study: A Simplified Approach for Equitable Distribution of an Award in a Wrongful Death Action

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Abstract

This paper outlines one approach to an equitable distribution of an award to the survivors (including parents, husband, and children) of a woman killed in a vehicular accident. The notion of equity almost implies one or more arbitrary elements, but the model has the advantage of making those elements explicit. Specifically, the cost of raising the children is determined and that amount awarded to the husband. Then, the court need only determine two parameters: *p*–the size of the award to the each parent relative to that for the husband and *q*–the award to each child relative to that for the husband. The model also provides that each child's share has equal purchasing power at the age of majority. Given an award amount and the ages of the children, alternative values of the parameters p and q could be used to provide the court with a set of alternative award structures.

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Following the death of a woman in a vehicular accident, the survivors sued for damages. The court awarded a lump-sum amount to be divided among the plaintiffs in an *equitable* fashion with the constraint that this equitable division include a share to each plaintiff reflecting his/her personal loss and an additional component to the husband to account for the cost of raising the children.[1] [2] Obviously, the term equitable has a variety of interpretations, and there is no single answer as to what constitutes an equitable distribution. However, we developed an approach based on a simple algorithm that satisfied the court and may be of interest to economists facing similar situations.

The Utah law regarding such allocations is fairly eclectic as indicated by this from a state Supreme Court ruling:

> Generally speaking, there are two methods used by courts when making such a distribution [i.e., from the proceeds from an award

[1] The amount of the actual settlement and the number and ages of the children have been changed to insure the confidentiality of the actual distribution.

[2] As the husband probably would have had to bear the cost of raising the children in any event, an award for that component might be considered as double-counting and a windfall to the father. Thus, it might be more logical instead to have included a damage component for the cost of replacing the wife's household services. In this case, however, the court dictated that part of the award be assigned to cover the cost of raising the children and not household services. As shown below, the model outlined could easily accommodate either or both components.

or settlement in a wrongful death action]. The first is in accordance with the particular statutes on descent and distribution in probate proceedings. The second is by a proportional method, the proportion being determined by the loss suffered by each heir. (117 Utah 151, *157, 213 P.2d 657, **660)

In the instant case, the issue of general support during childhood is taken care of with the award to the father for the cost of raising the children. Beyond that, it is not obvious how one would determine differential losses among the children.[3] It was finally decided that an approach that provided equal real wealth upon attaining adulthood was at least one that would be difficult to be deemed unfair.

The Problem

Consider a hypothetical set of survivors, including the parents of the deceased, the surviving husband, and four children who have received an award that is to be divided as per the court directive mentioned above. It was assumed that each would be dependent on his/her father to age 21. Thus, the first step is to determine the amount to be awarded to the father to cover the cost of raising the children to age 21. Using data on "estimated annual expenditures on a child by single parent families" as shown in Table 1,[4] [5] an inflation rate of 2.5 percent, and a discount rate of 6.0 percent, these costs are projected annually and then discounted back to present value. In the example used in the next section, the ages of the children are 9, 12, 15, and 18. As shown in Table 2, the present value cost of raising these children is $228,953. Obviously, this is a straightforward exercise that is done routinely by forensic economists.

Of greater interest is the next step, which is to determine an "equitable" distribution of the balance of the fund to partially compensate each plaintiff for his/her loss. Following the assumption of dependence on the father to age 21, we opted for a method that would provide each child an equitable share that would translate into an equivalent wealth at age 21. Therefore, each child receives a different amount initially, but based on the projected interest and inflation rates each amount would translate into equivalent real wealth at age 21. We also decided to make this future real wealth a percentage of the personal loss compensation paid to the husband. Further, we assumed the award to each of the parents of the deceased mother, who were parties to the action, also would be a percentage of the husband's personal compensation.

With the algorithm developed below, the calculation of the amount paid to each of the surviving family members, is a function of three parameters: (1) the total award net of the cost of raising the children, (2) the size of the parents award relative to the size of the husband's personal award, and (3) the size of the children's award relative to the size of the husband's personal award. Determination of these three parameters are left to the discretion of the court and then used in the algorithm to determine the award to each survivor.

Table 1. Average Cost of Raising a Child, Rural United States 1999 (Lino, 1999)

Age	Annual Cost (1999 $)
0	$ 7,930
1	7,930
2	7,930
3	8,170
4	8,170
5	8,170
6	8,200
7	8,200
8	8,200
9	8,230
10	8,230
11	8,230
12	8,960
13	8,960
14	8,960
15	9,140
16	9,140
17	9,140
18	9,140
19	9,140
20	9,140
21	9,140

The Model

Define the cost of raising the four children as y and the total award as z; then the net award available for personal loss compensation is ($n = z - y$). Further let x represent the amount paid to the husband as compensation for his personal loss (which is determined by the model), q is the award to each parent relative to the husband's personal compensation (expressed as a proportion), and p is the award to each child relative to the husband's personal compensation (also expressed as a proportion).[6]

Now, we express the n award, (i.e., the gross award less the cost of raising the children) as a function of all the individual personal loss awards

$$(1) \qquad n = (z-y) = x + qx + qx + px/(1+r)^a + px/(1+r)^b + px/(1+r)^c + px/(1+r)^d,$$

where a = (21 – age of child A)
b = (21 – age of child B)
c = (21 – age of child C)
d = (21 – age of child D),

and r = real interest rate = $((1+i)/(1+g) - 1)$

[3] The authors considered using the number of childhood years lost with the mother as a possible basis for such differential losses but could not find any *a priori* reason why a childhood year is worth more or less than an adult year with a parent.

[4] See Lino (1999).

[5] The basic data are reported for a family with a single parent and two children. Various adjustments are called for when there are more or fewer children. These adjustments are described in detail in Lino (1999). Essentially, if there are more than two children, the expenditure is multiplied by 0.77. If there is only one child, the expenditure is multiplied by 1.24.

[6] The value of the parameters p and q would be dictated by the court, or, alternatively, possibly after hearing testimony from the economist. Of course, several distribution structures each based on different (p,q) combinations could be presented to the court.

Table 2. Inflated Annual Costs of Raising Each Child and Reduction to Present Value

	Child A			Child B			Child C		
Year	Age at 1-Jan	Inflated Expenditure times Family Size Adjustment Factor	Discounted Expenditure	Age at 1-Jan	Inflated Expenditure times Family Size Adjustment Factor	Discounted Expenditure	Age at 1-Jan	Inflated Expenditure times Family Size Adjustment Factor	Discounted Expenditure
2000	9	$ 8,436	$ 8,436	12	$ 9,184	$ 9,184	15	$ 9,369	$ 9,369
2001	10	8,647	8,157	13	9,414	8,881	16	9,603	9,059
2002	11	8,863	7,888	14	9,649	8,588	17	9,843	8,760
2003	12	9,890	8,304	15	10,089	8,471	18	10,089	8,471
2004	13	10,137	8,030	16	10,341	8,191	19	10,341	8,191
2005	14	10,391	7,765	17	10,600	7,921	20	10,600	7,921
2006	15	10,865	7,659	18	10,865	7,659	21	10,865	7,659
2007	16	11,136	7,406	19	11,136	7,406			
2008	17	11,415	7,162	20	11,415	7,162			
2009	18	11,700	6,925	21	11,700	6,925			
2010	19	11,992	6,697						
2011	20	12,292	6,475						
2012	21	12,600	6,262						

Child D						
Age at 1-Jan	Inflated Expenditure times Family Size Adjustment Factor	Discounted Expenditure	Total Expenditure	Total Discounted Expenditure	Family Size Adjustment Factor	Adjusted Total Discounted Expenditure
18	$ 9,369	$ 9,369	$ 36,357	$ 36,357	0.77	$ 27,995
19	9,603	9,059	37,266	35,156	0.77	27,070
20	9,843	8,760	38,197	33,995	0.77	26,177
21	10,089	8,471	40,157	33,716	0.77	25,962
			30,820	24,412	0.77	18,797
			31,590	23,606	0.77	18,177
			32,594	22,977	0.77	17,693
			22,272	14,812	1.00	14,812
			22,829	14,323	1.00	14,323
			23,400	13,850	1.00	13,850
			11,992	6,697	1.24	8,304
			12,292	6,475	1.24	8,030
			12,600	6,262	1.24	7,764
					Sum	**$ 228,953**

Table 3. Compensation of Each Plaintiff

Parameters:	Total of award to be distributed =	**$1,000,000**
	Cost of raising children =	**228,953**
	Remaining award to be distributed =	**771,047**
	Nominal interest rate =	**6.00%**
	Inflation rate =	**2.50%**
	Real interest rate =	**3.41%**
	Percentage of husband's compensation to be paid to each of the parents (q) =	**25%**
	Percentage of husband's compensation that each of the children receive at age 21 adjusted for interest and inflation (p) =	**100%**

				AWARD			
Family Member	**Date of Birth**	**Age at Accident Date**	**Real Discount Factor**	**Cost of Raising Children**	**Equitable Share**	**Total Share**	**Equitable Real Award at Age 21**
Husband	1-Jan-55	45.0		$ 288,953	$ 166,559	$ 395,512	N/A
Child A	1-Jan-82	18.0	0.90	N/A	150,599	150,599	166,559
Child B	1-Jan-85	15.0	0.82	N/A	136,168	136,168	166,559
Child C	1-Jan-88	12.0	0.74	N/A	123,120	123,120	166,559
Child D	1-Jan-91	9.0	0.67	N/A	111,322	111,322	166,559
Mother				N/A	41,640	41,640	N/A
Father				N/A	41,640	41,640	N/A
				SUM		**$ 1,000,000**	

i = nominal interest rate
g = inflation rate.

Solving equation (1) for x yields

(2) $x = (z\text{-}y)/[1+q+q+p/(1+r)^a+p/(1+r)^b+p/(1+r)^c+p/(1+r)^d]$,

which represents the nominal size of the husband's personal award as a function of the size of the total award, the cost of raising the children, and the distributional parameters selected. As the award to each family member is a function of the amount awarded to the husband, the court need only specify the sizes of the award to each child and parent relative to the size of the award to the husband; that is, the court need only specify q and p.

In this case, the award to each plaintiff is:

Husband:	$x+y$
Mother:	qx
Father:	qx
Child A:	$px/(1+r)^a$
Child B:	$px/(1+r)^b$
Child C:	$px/(1+r)^c$
Child D:	$px/(1+r)^d$

It is a straightforward matter to modify the algorithm for any family structure.

While the mathematics are not difficult, they may exceed the understanding of the average judge or lawyer, the court in this case found the concept intuitively appealing, in that once the total award was decided upon, the equitable distribution was only dependent upon parameters p and q.[7]

Hypothetical Example

Recall our hypothetical set of plaintiffs including a husband, four children age 9, 12, 15, and 18, and the deceased's parents. Assume that a lump-sum award of $1,000,000 after expenses is to be distributed, and that each child is to receive 100 percent of the husband's share (i.e., $p = 1.00$) and each parent is to receive 25 percent of the husband's share (i.e., $q = 0.25$).

Table 3 shows the computed personal compensation to each survivor. In this example, we assume the award is $1.0

[7] Of course, an assumption will have to be made about the inflation and discount rate, obviously, these parameters are within the purview of the economist.

million net of the litigation costs. The husband receives $395,512 (i.e., the sum of the cost of raising the children, $228,953 plus an equitable share of $166,559), and each parent is assigned $41,640 (i.e., 25 percent of the husband's share). The initial amount to each child varies, as shown in Table 3, but if that amount is invested at the assumed nominal discount rate, it will grow to an amount that has equal purchasing power ($166,559) at age 21 for each child.

Summary

This article has described a computational approach to the equitable distribution of an award to family survivors in a wrongful death action. While any concept of equity necessarily has one or more arbitrary elements, the model described offers the advantage of making the "arbitrariness" explicit in the selection of parameters p and q, and providing a modicum of logic in conferring equal wealth on each child at the age of majority. Further, the court is only asked to determine three things: the total amount of the award; the share to each parent of the deceased relative to that for the husband/father; and the share to each child relative to that for his/her father. Obviously, each case will have its own number of plaintiffs and the algorithm will have to "fine-tuned" accordingly, but the general approach is offered as one reasonable way to resolve the equitable distribution question.

A particularly appealing aspect of the model is the ease with which alternatives can be developed about the relative size of the distribution to individual family members. Conceptually, the court could be provided with an array of possible awards based on varying combinations of p and q for its consideration.

References

Lino, Mark. 1999. "Expenditure in Children by Families." *Family Economics and Nutrition Review*. U.S. Department of Agriculture. 1999 Annual Report, Washington, D.C.