Journal of Legal Economics, 2000-01, 10(3): 53-58

Comment: **Confusion about "Inflation Risk"**

This comment focuses on an error made by many forensic economists relating to the meaning of "inflation risk." It was prompted by statements in the last paragraph of a note by James E. Payne and Michael J. Piette, "Comment: A Critique of the Joint Probability of Life, Participation and Employment Approach," this journal (2000). They said on page 83: "The use of a non-risk-free rate involves two fundamental risks: default risk and unanticipated inflation. In the landmark case, *Jones & Laughlin Steel Corporation v. Pfeifer* (1983), the Supreme Court wrote: the discount rate should be based on the rate of interest that would be earned on "the best and safest investments." As stated by Brookshire and Smith (1990, 39), "The investment alternative closest to the 'ideal' of a risk-free investment is a three-month U.S. Government bill..."
This passage contains two misunderstandings: (1) that the *Pfeifer* decision is concerned about "inflation risk" in its discussion of the

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selection of a discount rate; and (2) the intimation that inflation risk can be analytically handled like default risk.

The first point can be considered quickly. A careful reading of the *Pfeifer* decision gives no suggestion that the Court was concerned with any risk posed by inflation in its discussion of discount rates. The "best and safest" language is taken from *Chesapeake & Ohio R. Co. v. Kelly* (1916) which refers, in context, to returns on savings accounts and municipal bonds. There is no indication in *Kelly* or in *Pfeifer* that "inflation risk" was being considered. The issue was to find assets that a worker could easily use for investments of his award without needing sophisticated financial advice or bearing undue risk of default. The *Pfeifer* Court was quite concerned about how inflation affected the accuracy of damages projections.

The second point is that "inflation risk" is quite different from "default risk." Default risk pertains to a binary event. "Inflation risk," as that term is used by Payne-Piette, Brookshire-Smith and many authors, is not binary but is instead a measure of variance around the expected rate of inflation. Put simply, the primary risk of inflation is not whether inflation will or will not occur. The primary risk lies in the inability to predict exactly what the future rate of inflation will be, and thus to insure that a precisely measured future stream of future purchasing power will be delivered to an injured person.

At any given time, one can infer from the Fisher equation what rate of inflation is expected by buyers and sellers of financial securities. Inflation that is higher than expected will harm an injured worker. Inflation that is lower than expected will benefit an injured worker. Default always imposes harm. Inflation, however, can provide a windfall gain or a downside harm with nearly equal probability. The risk is that the actual rate of inflation will be higher or lower than the expected rate of inflation. The key distinction is that an increase in inflation risk always has both an upside and downside effect. It is as likely to benefit an injured worker as to harm that worker. If inflation is less than expected, the worker will receive a windfall benefit. If inflation is more than expected, the worker will be harmed because the real value of his award will be lowered below that needed for restitution.

A Formal Restatement of the Argument

In more formal terms, the event "default" is a random variable that assumes values 0 or 1[1]. The phrase "default risk" refers to the expected value of this random variable. This sense of the word "risk" is therefore based on the first moment of the distribution. So when most people say that a debt instrument now has a higher default risk than before, what they mean is that the probability of default has risen.

Inflation risk does not result from the fact that inflation may or may not happen. Inflation almost certainly will happen, so people tend to focus on the size of inflation and its level of unpredictability rather than its existence. Inflation risk therefore properly refers to the randomness of the level of inflation, the size of the spread possible inflation values weighted by probability — its variance. This sense of risk therefore refers to the second moment of the distribution. The reason why this distinction matters is that if one says there is a reduction in default risk, the probability of default has fallen by definition, but if one says there is a reduction in inflation risk, the expected value of inflation need not fall. All that need happen is for the variance of expected inflation to fall. Indeed, a risk neutral agent would pay more for an instrument that carried with it a lower default risk but the same agent would not pay more for an instrument that carried with it the same expected level of inflation but a lower inflation variance (what is commonly referred to as "inflation risk").

An Important Concluding Observation

The fact that inflation risk always has both an upside and a downside components does not mean that there is not a loss to an injured worker who may deserve to be compensated. A simple example may help clarify this point. Assume that the starting expected rate of inflation is 3% based on a one third chance that inflation will be exactly 2%, a one third chance that inflation will be 3% and a one third chance that inflation will be 4%. Now suppose inflation risk rises, that, for example, there is a one third chance that the rate of inflation will be 1%, a one third chance that the rate of inflation will be 3% and a one third chance that the expected rate of inflation will be 5%. The variance around that expected rate has increased, but the expected rate remains 3%. If one assumes that an injured worker is risk averse, the injured worker will be worse off with the increased variance even though the expected rate of inflation has not changed.

The fact that a worker might be made worse off by increased variance around the expected rate of inflation is arguably a basis for some small amount of additional compensation. However, the increased variance increases potential benefits to the same degree that it increases potential harms. For full restitution, what is needed is only a payment for the utility loss due to the effect that an increase in variance has on a risk averse agent.

Endnotes

1. Technically, there could be a series of partial defaults with different degrees of probability, but this is not a serious problem for the current note.

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Payne, James E. and Michael J. Piette. 2000. "Comment: A Critique of the Joint Probability of Life, Participation, and Employment Approach." *Journal of Legal Economics* 10(2):81-84.

Reply: **Confusion about "Inflation Risk"**

The comment by Ireland and Rose, "Confusion about 'Inflation Risk,' " suggests that many forensic economists misinterpret the meaning of "inflation risk." Specifically, Ireland and Rose make two points. First, the *Pfeifer* decision was not concerned with inflation risk in the discussion of discount rates. Second, inflation risk is quite different from default risk. Default risk is a binary event, either default or not, while inflation risk is the variance associated with the expected rate of inflation. With respect to inflation risk, Ireland and Rose indicate: "Inflation that is higher than expected will harm an injured worker. Inflation that is lower than expected will benefit an injured worker. Default always imposes harm. Inflation, however, can provide a windfall gain or a downside harm with nearly equal probability."

The first point made by Ireland and Rose with respect to the *Pfeifer* decision was taken out of context. The statement made on

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page 83 of our original comment did not refer to inflation risk in the context of the *Pfeifer* decision. The reference to anticipated inflation refers to the statement by Brookshire and Smith (1990, 39). However, in the reading of the *Pfeifer* case (page 2555), the following ideas are discussed.

> First, by its very nature the calculation of an award for lost earnings must be a rough approximation. Because the lost stream can never be predicted with complete confidence, any lump sum represents only a 'rough and ready' effort to put the plaintiff in the position he would have been in had he not been injured. Second, sustained price inflation can make the award substantially less precise. Inflation's current magnitude and unpredictability create a substantial risk that the damages award will prove to have little relation to the lost wages it purports to replace. Third, the question of lost earnings can arise in many different contexts. In some sectors of the economy, it is far easier to assemble evidence of an individual's most likely career path than in others.

As we read the *Pfeifer* decision, the phrase "sustained price inflation can make the award substantially less precise," in essence, is referring to inflation risk.

Second, with respect to the variance of expected inflation, we agree with Ireland and Rose with regard to "who wins and loses" in the presence of unanticipated inflation. Yet, the notion that inflation can provide a windfall gain or a downside harm with nearly equal probability is largely an empirical question. Moreover, as indicated by Ireland and Rose, "Inflation risk does not result from the fact that inflation may or may not happen. Inflation almost certainly will happen so we tend to focus on the size of inflation and its level of unpredictability rather than its existence." The reality is that forecasts of inflation will result in error. However, the constant forecast variance assumption in traditional econometric models may be an implausible assumption, especially in the forecasting of time series that exhibit periods of greater volatility than others.

In recognition of the possibility of a time-varying variance in the error terms, Robert Engle (1982) introduced the autoregressive conditional heteroscedasticity (ARCH) model. In the use of traditional econometric models, an unequal variance of the error terms, is said to suffer from heteroscedasticity, yielding unreliable inferences. The ARCH models and the generalized version, called GARCH models, explicitly model the variance, providing a prediction of the variance for each error term. The class of ARCH and GARCH models are useful in situations where the amplitude of the time series varies over time, called "volatility clustering." These data. With regard to inflation, Engle (1982) and Bollerslev (1986) applied the ARCH and GARCH approach, respectively, to modeling the variance of inflation, demonstrating an improvement in predictions for inflation over traditional econometric models. Thus, the idea that inflation can provide a windfall gain or a downside harm with nearly equal probability is in part dependent on the presence of ARCH effects associated with the variance of inflation. The article by Engle entitled, "GARCH 101: The Use of ARCH/GARCH Models in Applied Econometrics," in the Fall 2001 issue of the *Journal of Economic Perspectives* provides an excellent overview of the ARCH/GARCH modeling approach.

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