Is a 95-year copyright time-limited?

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Overview

In the USA, the constitution gives Congress the authority to grant a copyright for a limited time. The purpose of this is clear from the context: economic benefits. An economic benefit can be regarded as a sequence of cash flows. In finance, the duration of a sequence of cash flows is not measured directly in years; rather, duration is calculated via a formula involving interest rates. At present, Congress has granted copyrights to corporations for terms of 95 years. The duration of 95 years seems not significantly different from the duration of perpetuity. Hence, 95-year copyright terms seem effectively not time-limited. Thus, such terms might well violate the constitution.

Duration and significance

Suppose that we will receive one dollar at the end of each year for the next n years, and assume that interest rates are fixed at 6% for all maturities. The *duration* of cash flows is commonly defined to be the weighted-average maturity of the cash flows; the weights are the present values of the cash flows divided by the total of all the present values. (In our case, the formula for the duration is thus $\sum_{i=1}^{n} i 1.06^{-i} / \sum_{k=1}^{n} 1.06^{-k}$.) For example, if $n = 95$, then we calculate that the duration is 17.29 years.

Some bonds never repay the principal; instead, they pay interest for perpetuity. With interest rates at 6%, if the interest payments (i.e. cash flows) were for perpetuity, then the duration of the cash flows is 17.67 years. (To calculate this, we take the limit, in the duration formula, as $n \to \infty$.)

Imagine now some sequence of cash flows whose duration is 17.6699999999999999999 years. Reasonable people would agree that this is not significantly different from 17.67 years (indeed the two durations cannot be distinguished with currently-available instruments). A duration of only 2 years, though, obviously is significantly different from a duration of 17.67 years. This leads to the following question: is a duration of 17.29 years significantly different from one of 17.67 years?

The convention used in most of science is to say that something has *significance* when it reaches the level of 95.4%. (This percentage is not arbitrary: it is the area within two standard deviations of the mean for the normal distribution.) Our situation is different from a scientific one, because we are not doing a replicable experiment. Nonetheless, it might be reasonable to choose 95.4% as the cut-off point between significant and insignificant. If so, then, because 17.29/17.67 = 97.8%, we can conclude that *95 years does not have a significantly shorter duration than perpetuity*.

The above analysis makes some simplifying assumptions. In particular, the cash flows were assumed to be constant: this seems extremely conservative. Additionally, all interest rates were assumed to be 6%: this seems a reasonable approximation. As long as the yield of the 95-year and perpetual corporate bonds is above 4.95%, the ratio of their nominal durations is above 95.4%.

Discussion

The constitution states that a copyright must be for a "limited" time. Reasonable people, though, would agree that a copyright of a trillion years, while time-limited in a purely technical sense, would violate the constitution (a trillion years is believed to be greater than the age of the universe). A one-day copyright obviously is time-limited. Thus, somewhere between one day and a trillion years must lie a threshold where time changes from limited to unlimited. Where is this threshold? The constitutionality of the 95-year copyrights crucially depends on the answer to that question.

The answer proposed here is founded on considering time to be limited exactly when its duration is significantly different from the duration of perpetuity. The use of (financial) duration seems justified by the economic context of copyrights in the constitution. The definition of "significance", derived from science, might be debated for copyrights—though other definitions seem arbitrary in comparison. Given that foundation, the threshold depends only on the choices of interest rates and cash flows. Even with very conservative choices, the threshold would be less than 95 years.