A Touching Belief in the Market: Comment on "A Derivative Approach to Endangered Species Conservation"

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Abstract

In a recent paper in this journal, Mandel, Donlan and Armstrong (2009) proposed a derivative intended to incentivise private enterprise to improve populations of selected species. Government would issue a bond to investors, who would receive interest on the bond, depending on the species population. Should the population fall below a threshold, the investors would lose the principal to government, which could then use the money for restoring the species.

We commend the authors on their creativity, and we support the intent to use markets on behalf of the environment. Unfortunately, we find a range of difficulties in their proposal, including confusion about the nature of the contract, problems of market design, excessive cost, and perverse incentives.

The nature of the proposed contract

The contract has two intended functions, to incentivise protection of the species and insure the government against risk of species decline.

As an incentive, the bond must target the bond holder's capability. This capability differs from person to person, and in most cases must be quite specific to be effective. For example, a contract with a land-holder with the targeted species on his or her land will incentivise that landowner to protect the species there. Contracts with people who have such direct control are likely to be more effective than contracts with people who do not have direct control.

As risk mitigation, the proposed financial instrument protects against risk, but that risk is *not to the species*. The government guarantees species protection by law. A species becomes endangered, finds its way to the endangered species list, and the government initiates recovery. The proposed bond insures the government in case the cost of protecting the species is surprisingly high. "…it transfers the risk of listing a species to the market, thereby stabilizing its costs for listing and protecting species over a set time period." This is true. The government stabilizes but also raises its cost on average. The U.S. government has no trouble raising funds, does so at lower cost, and has deeper pockets for risky ventures, than any other institution. Hence, the government should be minimizing expected cost, not avoiding risk.

In the authors' words, "FWS could argue that issuing biodiversity derivatives is the procurement of third party services to assist in recovery efforts for threatened or endangered species…" This is correct. The true nature of the authors' proposal is for an investor to put up a high collateral – ten or twenty times the annual cost of the recovery work – against non-performance of a poorly specified ecology-enhancing contract.

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Problems of market design

The proposed bond cannot be easily valued by investors for several reasons.

First, no underlying market in the endangered species exists. By contrast, a hedge on electricity prices relies on the underlying electricity market. The contract is insurance for the holder in case the price moves the wrong direction. But the U.S. has no underlying market in species populations, and hence nothing to inform bond valuations, especially for secondary trading of the bond. ("Intrinsic value" is not necessarily a good indicator of market value.)

Second, the authors add conditions that would prevent the market form working, such as forbidding short sales and re-selling the contract (Keim 2009). Despite common wisdom, short selling reduces volatility (Ho 1996, Jones & Lamont 2002, Taulli 2008). Prohibiting re-selling would reduce liquidity considerably. An investor in financial trouble for reasons other than the contract would have no ability to sell the contract to another, greatly increasing the investor's risk. The above flaws may be repaired by allowing full tradability.

Third, we expect that the market for the proposed bonds will be quite thin. Bonds that are location-specific will be virtually untradeable. It is difficult to imagine who would buy a bond written for a specific land owner, other than the land owner.

Other mechanisms

The parties that might be interested in the bond will prefer a different mechanism.

Farmers that might invest are not likely to put up capital in order to get paid to protect species on their property. They would rather take the payments directly, as they do now under various conservation programs. As already noted, a farmer could not easily re-sell the contract (if re-selling were allowed), because the buyer would still need control over the farmer's property. So this is the wrong type of contract for such a simple problem.

The contract may be purchased by pure speculators, who simply enjoy betting. Lacking connections to farmers or land owners, such speculators would have no impact on the species, and would therefore demand a higher return. Given the speculators' lack of control, they might prefer a game of pure chance, which would be simpler to play.

The contract may be purchased by philanthropic environmental groups, which have personal interest in endangered species, and may have a network of people who could knock on farmers' doors and try to bargain with them. The proposed bond does nothing to reduce these transaction costs (as with wetlands markets mentioned in the article). The investor would have to find trading partners and verify their behavior. But why not just donate the money directly toward conservation work?

Excessive cost

The authors state, "…the cost of issuing derivatives should not increase the total amount FWS spends on recovery initiatives." But this must be false, because government is paying extra to avoid risk. "…FWS would roughly break even on the derivatives over time, because the amount of principal that investors forfeit will be roughly equal to the amount of interest paid by FWS." Again, this means that investors net zero, so that statement must be false, too.

Let us carry forward on the hope that philanthropists will buy the bonds. How much will the bonds cost? First, the government must estimate the cost to restore the species, if the species population were to fall below, say, P=10,000 animals[2]. Suppose this restoration cost were $2 million per year for 10 years, for a

[2] We could not understand the authors' example in their Panel 1.

total of about $20 million. The government then offers a deal to the market, "We, the U.S. government, will create a contract with you as follows. First, you pay us $20 million. Second, we watch the population of the endangered species. Third, if the population falls below P = 10,000 animals, the contract ends and we keep your $20 million. If instead the population stabilizes or rises, we will pay you $20,000,000*$Y$% interest for the next 10 years, when we will return the $20 million to you. Now, let's bargain for the value of Y%."

The investor would demand an interest rate sufficient to cover:

(1) $2 million/year, the cost of restoring the species, which the investor now doesn't have the capital to do, plus

(2) 5%*$20 million/year, the opportunity cost of the money, which is at least the U.S. government bond rate, plus

(3) 5%*$20 million/year, compensation for the risk of losing the principal if restoring the species proves excessive (we are guessing at this value), plus

(4) some positive number, a profit margin for taking on all this trouble.

So the investor puts $20 million up front, and needs some Y% return to cover the $4 million/year. The value of Y% would have to be at least 20%. The total is higher than the cost of recovery. The insurance of part (3) and the investor's profit of (4) are unnecessary losses to government.

Perverse incentives

In the proposed contract, the investor would have the right *not* to protect the species, which raises serious incentive problems. Suppose the investor decides that the population is too expensive to save. A rational government agent would realize that the cost to save the population is now strictly increasing. The government would want to declare the contract failed, and take the investor's money. At this point, to maintain interest payments, the investor could claim that the restoration simply needed more time. The investor still has the right to interest payments until the independent agent decided that the population had indeed fallen below the threshold, which the investor now would want to litigate. If the government concedes and waits, the species faces higher risk. Other parties, state governments or NGOs, may try to step in to save the species. This would improve the investor's returns, but the incentives would be misplaced, as investors are tempted to sit on their heels doing nothing, knowing that someone else will pay the recovery cost. This moral hazard is similar to that faced by government when financial institutions make bad bets – the bankers can rely on government bailouts.

A simpler and cheaper alternative

Government can offer a simpler contract at lower cost. "We, the U.S. government, will create a contract with you as follows: we watch the population of the endangered species. If the population P stabilizes or rises, we will pay you $$Z$ (or $$P$*$Z$, or some other formula) per year. Now, let's bargain for the value of Z." This simpler contract does not require an investor to put up capital, so the transaction cost will be lower, and contractors will be easier to find. The expected cost of ecological improvement is the same as under the authors' proposal, but total cost to government is lower because the contractor has far less risk. Such instruments would be readily tradable.

Conclusion

"Because derivatives are zero-sum instruments, ie [sic] one party's gain is necessarily the other party's loss…" "Despite structural precautions and regulation, the market is likely to be volatile: there are winners and losers in any market." Such statements may tempt some readers to discredit the authors entirely. People buy insurance because they cannot afford catastrophe. Insurance companies spread the costs of

catastrophe among many people, and make money doing so. When we buy insurance, we have an increase in utility, and that utility has economic value. Derivatives therefore cannot be zero-sum instruments. Rational people trade because both sides are better off, and do not trade when they will not be better off. We cannot see why either the American people nor any endangered species will be better off with implementation of the authors' proposal.

Again, we think the authors deserve credit for attempting some creativity in market methods to improve the environment. We hope they continue in their pursuits.

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