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"Interest-Bearing Securities When Interest Rates are Below Zero"

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Negative interest rates have evolved, over the past few years, from a topic of modest academic interest [1] to a practical reality. Short- and intermediate-term sovereign debt of several European countries, including Germany, Denmark, the Netherlands, Sweden, Austria, and Switzerland, now trades at negative yields. [2]

[1] See, for example, Stephen Cecchetti, "The Case of the Negative Interest Rates: New Estimates of the Term Structure of Interest Rates during the Great Depression," *Journal of Political Economy* 96, no. 6 (December 1988): 1111-41; Marvin Goodfriend, "Overcoming the Zero Bound on Interest Rate Policy," *Journal of Money, Credit and Banking* 32, no. 4, part 2 (November 2000): 1007-35; and Michael Fleming and Kenneth Garbade, "Repurchase Agreements with Negative Interest Rates," Federal Reserve Bank of New York *Current Issues in Economics and Finance* 10, no. 4 (April 2004).

[2] "Apple in Maiden Swiss Franc Debt Issues," *Financial Times*, February 11, 2015, p. 20. See also "Government Debt Yields Go Subzero," *Wall Street Journal*, January 15, 2015, p. C4.

This post discusses some of the challenges that may be encountered as money and capital markets adjust to negative rates. We suggest that issuing interest-bearing securities at negative yields might raise some difficult design problems. (A related post published earlier on *Liberty Street Economics* examined institutional innovations and behavioral changes that could blunt the policy impact of negative rates.[3])

Single-payment securities, like commercial paper, do not present any unusual problems when interest rates are negative. Investors simply pay more for the securities at purchase than the securities promise to pay at maturity. The reduction in nominal value over the life of an instrument reflects the negative yield on the instrument.

Interest-bearing securities, like fixed-rate bonds and floating rate notes, are a different matter. Because a marketable note or bond can be widely dispersed among many holders and held in relatively small amounts, it would be challenging to directly collect periodic interest payments from holders.

One possible work-around is for the issuer of a fixed-rate bond to set the coupon rate to zero, making the bond a single-payment security, and to sell the bond at a (possibly nontrivial) premium to its principal value. For example, a ten-year zero-coupon bond sold at a yield of -1.00 percent, compounded semiannually, would have a price of 110.545 percent of principal.

Alternatively, an issuer could sell a bond with a negative coupon rate by providing that, in the absence of timely payment of interest, the omitted interest payment would be deducted from the principal due at maturity. In this case the bond would be redeemed for less than par, depending on the number of unpaid coupons and the magnitude of the (negative) coupon rate.

Giving bondholders the option to omit interest payments introduces two problems. First, an issuer would have to track how many coupons had not been paid on which bonds. Since not all bondholders will make the same decisions, different bonds of a given series will not necessarily be fungible following issuance, resulting in impaired liquidity.

Second, giving bondholders the option to skip interest payments requires identifying the compensatory principal reductions. Reducing principal by exactly the amount of an omitted payment would be tantamount to assuming a zero rate of interest over the time remaining to maturity, which is obviously inconsistent with the negative rate environment in which the bond

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[3] Kenneth Garbade and Jamie McAndrews, "If Interest Rates Go Negative ... Or, Be Careful What You Wish For," *Liberty Street Economics*, August 29, 2012.

was originally issued and is virtually certain to be inconsistent with whatever level of interest rates happens to prevail when the decision to omit a payment has to be made.

An issuer could assess the value of an omitted interest payment using forward rates prevailing at the time the bond is issued, but that would endow the bond with option-like features: a holder would likely want to omit a coupon payment if interest rates had increased (algebraically) since issuance, and would likely want to make the payment if rates had fallen further.

To illustrate this optionality, consider a one-year bond with a coupon rate of -2 percent per annum, payable annually. Suppose a holder of $1 million principal amount of the bond has to decide whether to make or omit the current interest payment. If she makes the current payment she will pay $20,000 now and receive $980,000 (which equals $1 million of principal, less the interest payment at maturity) in one year. If she omits the current payment the principal will be reduced to $980,400 and she will receive $960,400 in one year, where $960,400 equals $1 million principal, less a $20,000 interest payment at maturity, less $19,600 in compensation for omitting the current payment ($19,600 equals $20,000 compounded for one year at -2 percent per annum).

Now suppose that interest rates rise to -1 percent when the holder has to make her decision. In that case, the present value of making the payment is $969,898.00 (or -$20,000 + $980,000/(1 + R), where R = -.01) and the present value of omitting the payment is $970,100.01 (or $960,400/(1 + R), where R = -.01), so she will choose to omit the current interest payment to the issuer.

By contrast, if interest rates are -3 percent when the holder has to make her decision, the present value of making the payment is $990,309.28 (or -$20,000 + $980,000/(1 + R), where R = -.03) and the present value of omitting the payment is $990,103.09 (or $960,400/(1 + R), where R = -.03), so she will choose to make the current interest payment to the issuer.

The optionality associated with prospective nonpayment of interest can be eliminated by providing that nonpayment, and the compensatory reduction in principal, is mandatory. However, that would effectively render the bond a single-payment security, so the issuer might as well issue a zero-coupon, single-payment security from the get-go.

Alternatively, the economic value of optionality can be suppressed, even while preserving a choice between payment and nonpayment, if the issuer assesses the value of an omitted payment using market yields prevailing at the time the decision is made. This would be analogous to a call option

on common stock where the exercise price of the option is equal to the market price of the stock at the time of exercise; such an option has no economic value. However, since those yields are uncertain at the time the bond is issued, the principal to be paid at maturity, even given the number and timing of nonpayments, will be uncertain. That uncertainty might reduce the attractiveness of the bond for market participants investing to satisfy future cash needs (as in the case of pension funds and life insurance companies).

The problem of uncertainty of principal to be paid at maturity is more significant for a floating rate note (FRN), which is typically issued at par and pays interest periodically according to a rule designed to make it likely that the price of the note will stay near par as market rates rise and fall. Since the interest payments on an FRN vary through time, the amount deducted from principal as a result of a failure to make an interest payment will also vary. That is, some of the uncertainty over future interest rates is shifted from the periodic interest payments to the amount due at maturity.

Optional nonpayment of interest presents more fundamental problems in the case of mortgage-backed securities (MBS). A mortgagor whose mortgage backs an MBS might want to receive negative interest payments, even while some holders of the MBS might want to omit payment. Those incompatible preferences can only be reconciled by providing for mandatory nonpayment of interest and mandatory reductions in principal, thereby converting mortgages into single-payment securities.

Structuring interest-bearing securities in a world where interest rates are below zero is challenging because negative rates are terra incognita. Issuers faced a similar problem of issuing securities in a novel interest rate environment in the late 1970s and early 1980s when interest rates reached historically high levels. They responded by issuing single-payment zero-coupon securities and strippable securities (to mitigate the problems of reinvestment risk and duration drift as a function of yield changes). If negative interest rates persist, we can reasonably expect comparable design innovations.

While there may be a number of ways to design interest-bearing securities that avoid the need for an issuer to collect interest when rates are below zero, the real challenge may be to choose a design that suits investors as well as issuers. There is a long history of seemingly minor tweaks in security design that materially enhanced investor acceptance of a new security, including the

elimination of onerous recordkeeping requirements on early Treasury bills,[4] the provision of fungible Treasury interest STRIPS for stripped interest claims payable on the same date,[5] and the provision of a reconstitution facility for stripped Treasury interest and principal payments.[6] Designing securities in a negative rate environment may require similarly close attention to investor preferences.

Disclaimer

The views expressed in this post are those of the authors and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System. Any errors or omissions are the responsibility of the authors.

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4 Kenneth Garbade, *Birth of a Market: The U.S. Treasury Securities Market from the Great War to the Great Depression* (Cambridge: MIT Press, 2012), 214-15.

5 "Treasury Announces Change to Generic CUSIPs for STRIPS," *Treasury News*, June 14, 1985.

6 "Treasury Announces Date for Reconstitution of Securities in STRIPS Program," *Treasury News*, March 31, 1987.