A Quant's View of Negative Interest Rates, Part II

Negative Interest Rate Policy has the potential to explode the banking system.

In publishing *A Quant's View of Negative Interest Rates* a year ago, we noted that the European Central Bank (ECB) as well as the central banks of Switzerland, Sweden, and Denmark had all imposed negative deposit rates in their respective currencies. Though there have been no striking, unambiguous consequences – good or bad – of negative deposit rates over the past year, negative rates have deepened in Europe, spread to Japan, and curried favor in the U.S.

We see two remarkable risks in this "negative interest rate policy" (NIRP) of global central banks. Let's call these the "quantitative model" risk and "depositor behavior" risk.

Quantitative Model Risk

As we wrote previously, in the time-honored sense of what we call a "quantitative model" or a "stochastic process," prospects are dim for modeling negative interest rates. The dominant core principles of interest rate modeling of the past decades have been that: (i) interest rates don't go negative; (ii) there must be consistency with current bond prices; and (iii) there must be parametric consistency with historical data. Clearly the first principle is gone (forever?) and there is no intuitive and convincing lower bound to replace zero. Also, all historical data now strikes us as irrelevant to the current paradigm in which central banks dictate the yield curve. There is no history to guide an appropriate contemporary model approach.

In addition, models may contain errors in handling negative interest rates. Some money market funds in Japan, for example, do not function appropriately without software upgrades to accommodate negative rates. In this link and the table below, we show "correct" yield curve calculations with negative German bond yields. Though not surprising upon reflection, one finds negative *forward* rates and discount factors *increasing*, rather than decreasing, over time.

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Forward Time (years)	Forward 6-month Rate (% pa)	Discount Factor
0.0	−0.55	1.000
0.5	−0.48	1.003
1.0	−0.53	1.005
2.0	−0.47	1.011
3.0	−0.33	1.015
4.0	−0.06	1.019
5.0	0.04	1.019
7.0	0.70	1.016
10	0.53	0.985
20	1.30	0.900
30	2.15	0.758

Depositor Behavior Risk

The greater and less tangible risk of NIRP is the impact on depositors. Central bankers and politicians hope that NIRP will prod banks to lend money that they currently hold in reserve deposits. The idea is that increased lending should, all else equal, boost a country's economy. But depositors, whether private citizens or corporations, may withdraw *their* funds from the banks as negative rates act like punitive fees to reduce wealth.

If these "fleeing deposits" simply become accelerated spending for consumers and businesses, then this spending achieves NIRP's goal of boosting current economic activity (at the expense of future activity). But there's also the possibility that depositors would simply hold their cash (see news for Japan and Germany) outside the banking system. This cash hoarding is arguably the worst possibility since it creates a run on the banks and diminishes the money supply.

Banks rely strongly though implicitly on the stability of depositor funds. It is a tremendous boon to banks that depositors accept a low yield commensurate with short-term lending while leaving their money with banks as effective long-term funds. NIRP has the potential to explode this stability. Consumers have grudgingly accepted near-zero deposit rates for years. But "zero" is a strong psychological barrier. Vague threats of monetary

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authorities to "eliminate cash" to prevent depositors from avoiding the sting of negative rates may only hasten the hoarding.

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