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Essay

Negative Interest Rates and Positive Time Preference?

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"A bird in the hand is better than two in the bush." - Proverb

Why should zero be a lower bound on nominal interest rates? Traditionally, the literature has held that negative rates imply infinite money demand, which cannot sustain an equilibrium. For instance, consider money demand models, using a cash-in-advance constraint. Once this constraint no longer binds, the nominal interest rate falls to zero—but it cannot fall any further, because individuals prefer holding money that pays zero to lending at a lower rate. Similarly, Eggertsson and Woodford (2003) posit that real money balances enter into the utility function, and that marginal utility from money is exactly zero once balances exceed some satiation level. Again, rates can fall to zero, but no further: once the marginal utility from money is zero, holding wealth in the form of money is indistinguishable from holding it in the form of bonds, and if bonds pay a lower rate there will be an unbounded shift to money. Many traditional models of money demand similarly embed this zero lower bound.

In the aftermath of the financial crisis the role of monetary policy has been widely discussed among economists and central bankers. The use of unconventional policy tools decreased transparency of central banks and increased discretionary actions. The extraordinary events of the past decade have encouraged intense debates on the optimal monetary policy and strategy. Such debates are important for both, central banks and markets, to reassure that the mandates of the central bank are carried out in the best possible way.

Recently, negative interest rates became a relevant monetary policy tool. The aim of applying negative interest rates is to make it expensive to hold cash, increase economic activity and get rid of low or even deflationary levels of inflation. As it becomes costly to

park money, incentives to borrow and invest increase. The Swiss National Bank (SNB) is currently executing a negative low of -0.75% with an expanded three-month Libor to -1.25% to -0.25%. At such a rate, agents are still not willing to hold cash.

Figure 1 http://www.misesde.org/?p=10274#jump_no1

No central bank has yet experienced such negative rates and its outcome is still uncertain and harmful side effects might occur instead. Worth mentioning, there exists an effective lower bound, where negative interest rates become counterproductive, which implies that this monetary policy tool can only be applied temporary. Nevertheless, the SNB has not made any announcement so far of stepping away from this method.

The intuition behind negative interest rates remains alien, even bizarre when considered from a time preference point of view. It seems natural for humans to have a positive time preference. Time preference theory, more than any other theory, has been very successful in explaining interest rates. However, in recent years, an important issue with the time preference theory of interest has occurred.

Let us develop the case step by step. First, we will consider two types of interest rates. There exists a distinction between the *market interest* rate and the *originary interest rate.* The market interest rate is the outcome of the supply of and demand for savings in the market. It can be observed, for instance, in the deposit, bond, or loan market for different maturities and credit qualities. A price of a consumption good is determined by the preferences consumers have for them, expressed in their demands for the goods. In a money economy, individuals' time preferences are realized through the supply and the demand for money. Put differently, interest rates aim to bring savings and investments in line, which might also require a negative interest rate.

On the other hand, the originary interest rate stands for the impatience of agents and the different valuation of consumption today compared to consumption tomorrow, i.e. *time preference*. According to Mises namely, the idea of negative time preference is unthinkable. That would mean that there are individuals who prefer the satisfaction of

their wants later than sooner, which directly runs against the axiom of human action. Man acts, and as the act of pursuing a goal this would imply that there is a temporal gap between means and ends. It seems impossible to assume that this gap could be inverse, that time would run backwards, that ends come before means, or, in short: that human action altogether would not even occur. So the conclusion, from Mises' point of view had to be that time preference can only be positive.

If the originary interest rate was close to zero, this would imply that two bananas available in, say, 10 weeks are preferred to one banana available today. This would only make logical sense if an agent's planning horizon is infinitely long, or equivalently if an agent lives forever. This seems a rather strong and unrealistic assumption. However, by pushing this argumentation even further, one might reason that with some negative time preference future attainments are preferred over current goals. And as an infinitely living agent she would never act but push the attainment of any goal into the future. In reality, agents do not live over an infinite time horizon. Temporal living individuals prefer a certain satisfaction sooner to the same satisfaction later. Consuming a warm dinner tonight has a greater value than consuming the same dinner in two weeks. Another example might come from borrowers that pay interest in order to buy present assets. This impatience can be characterized by positive time preferences.

Other examples can be retrieved from most macroeconomic models. The key decision for agents is how much to consume today versus how much to consume in the future. The resulting *Euler Equation* constitutes the backbone of these models and relates current consumption to future consumption. In other words, how much of today's consumption is an agent willing to give up in order to consume some units plus interest rates in the future. And at this point we already tripped over the essence of this equation. An agent is only willing to give up some units of consumption today if she will be compensated by (*1+ interest rates*) more units tomorrow.

Another mentionable example, which sometimes leads to confusion, refers to the issue of *saturation*. We assume that an agent has two bananas, and eats one of them. Her appetite is now satisfied, so that she prefers eating the remaining banana tomorrow over eating it today. Does this prove that agents may value future goods more highly than present goods, that time preference and the originary interest rate may be

negative? No, it does not. Non-consumption of the second banana today can easily be explained by the law of diminishing marginal utility. This law states that the marginal utility of eating the banana now is lower than eating it tomorrow or the next day, even when the future marginal utility is discounted by a positive originary interest rate.

By now we have argued that market interest rates may become negative in real terms. In a difficult market environment for instance, the central bank can push the real market interest rate into negative territory. However, this does not represent an equilibrium, as time preference and thus the originary interest rate cannot become negative. Should a central bank really succeed in making all market interest rates negative in real terms, savings and investment would come to an immediate stop. As time preference and the originary interest rate are always positive, the accumulation of goods designed for improving the production process would come to an end. Capital accumulation and consumption would no longer be possible. It would be the end of the market economy.

However, there are economists that express skepticism about the very existence, or at least the positivity of time preferences. Others have explicitly stated that a rational consumer may have either positive or negative time preference.

It is fair to say that the assumption of positive time preference is far from being universally accepted among economists. In the remainder of this subsection we show that negative, and zero, time preference is a normal and quite a rational pattern of behavior to be expected under a wide variety of common situations.

To assume time preference to be always positive would lead to the bizarre conclusion that a man who cannot invest most of his salary, in order to guarantee higher consumption later, should consume it all on the first day of the month. Another instance of widespread negative time preference in capitalist countries has been uncovered by high rates of inflation. Recall that the Fisher equation equates the real interest rates to nominal interest rates minus inflation. The real interest rate can reach very low negative numbers when inflation keeps on increasing, ceteris paribus. Many consumers kept on

saving in interest-bearing accounts even when the real expected rate of interest was clearly negative for certain years.

Furthermore, it is commonly observed that a consumer tries to at least maintain the past level of consumption to which she is accustomed. Her present sense of satisfaction or level of utility is a function not only of her present level of consumption but also of her expected future consumption compared with expected future needs. These two hypotheses taken together would lead us to expect that a certain group of consumers have negative rates of time preference. Namely, those who expect a future decrease in income because of approaching retirement, or because current income is temporarily high. Or those who expect a future increase in their needs with income remaining constant, e.g. sending a son to college, or getting a daughter married. More generally, all those who expect fluctuations in income to be out of step with anticipated needs may well have negative rates of time preference among some time periods. One main weakness of the assumption of positive time preference is that it disregards any changes in needs or desired level of consumption, i.e. it implicitly assumes needs to be constant. On the other hand, it disregards the possibility of constancy or decline in expected income, and assumes it to be always rising.

Furthermore, since the future is never certain, we must consider the impact of uncertainty as such on time preference. The most likely effect of uncertainty about future income and needs, given risk aversion, is that the consumer would try to play it safe. This she can do by preparing herself, partially or fully, for the worst eventuality, i.e. a sudden reduction in income or increase in needs. Such *precautionary* behavior should reduce the rate of time preference, making it less positive or more negative. Suppose a consumer is certain that her income will increase. Her rate of time preference should therefore be positive. Now, we introduce uncertainty by letting her expect that her income increases with, say, 70 per cent probability. This leaves 30 per cent probability for a decrease or no change in income, and should reduce the rate of time preference, or may even make it negative if the consumer is excessively averse to risk. We thus conclude that the introduction of uncertainty about the future or the increase in the level of uncertainty should, ceteris paribus, increase the proportion of agents whose time preference is negative. It is in fact observed that people increase savings and

reduce consumption during crises when uncertainty increases, reflecting precautionary savings motive or prudence.

Previous psychological work on time preference has focused almost entirely on the tradeoff that arises when two outcomes of different dates and different values are compared. The premise was that such judgments will reveal an individual's "raw" time preference, from which one can then synthesize preferences over more complex objects, e.g retirement plants and intertemporal income profiles. However, as soon as an intertemporal tradeoff is embedded in the context of two alternative sequences of outcomes, the psychological perspective, or "frame" shifts. An individual then becomes more farsighted, usually wishing to postpone the better outcome to the end. The same person who prefers a good dinner sooner rather than later, if given a choice between two explicitly formulated sequences, one consisting of a good dinner followed by an indifferent one, the other of the indifferent dinner followed by the good one, may well prefer the latter alternative. Sequences of outcomes that decline in value are greatly disliked, indicating a negative rate of time preference. A byproduct of the sequence frame is that subjects who are given a time interval, within which to schedule some enjoyable activity, may schedule it later on average than people who are given no time frame at all. Apparently, as soon as the relevant interval is specified, a person becomes concerned with shifting the good events out to the end.

This result has implications for life cycle choices. It suggests for example the possibility that some individuals would choose an earlier retirement in the absence of a mandated retirement point. The sensitivity of time preference to the sequence "frame" points new light on the often-repeated charge that certain groups of people (consumers, managers, members of a particular nation or culture) have an excessively steep rate of time preference. Such a claim is a psychologically imprecise definition of the problem, at best. The differences that do prevail should instead perhaps be traced to different styles of mental bookkeeping, which will alone produce different degrees of impatience even with a common underlying rate of time preference. Any operation, custom, or habit that causes the stream of purposeful activity to fragment into a series of isolated choices, each involving a simple intertemporal tradeoff, and each unrelated to a larger plan, encourages impatient choices. Whereas the integral sequence frame, by fusing events

into a coherent sequence, promotes concern for the future, thereby creating an appearance of negative time preference.

We have now analyzed the concept of time preference, together with the concept of marginal utility. It says that individuals will always prefer to achieve their ends sooner than later and that interest therefore can be understood as a discount on the future, accounting for this difference. The more an individual prefers present goods above future goods, the higher her time preference will be, and hence the higher the interest she will charge and/or be willing to pay. Vice versa, the less an individual prefers present goods above future goods, the lower her time preference, and the lower the interest she will charge and/or be willing to pay.

It seems fair to conclude that positive time preference is neither a principle of rationality nor an empirically established predominant tendency among consumers. It is simply one of three patterns of intertemporal choice where the other two being zero and negative time preference, each of which is rational and observable under its own conditions. Finally, central banks should remain open to ways of addressing future challenges and keep many instruments that may be necessary in stressful situations.

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