

**TOOLS FOR FINANCIAL INNOVATION:  
NEOCLASSICAL VERSUS BEHAVIORAL FINANCE**

**BY**

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# Tools for Financial Innovation: Neoclassical versus Behavioral Finance

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## Abstract

The behavioral finance revolution in academic finance in the last several decades is best described as a return to a more eclectic approach to financial modeling. The earlier neoclassical finance revolution that had swept the finance profession in the 1960s and 1970s represented the overly-enthusiastic pursuit of only one model. Freed from the tyranny of just one model, financial research is now making faster progress, and that progress can be expected to show material benefits. An example of the application of both behavioral finance and neoclassical finance is discussed: the reform of Social Security and the introduction of personal accounts.

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## 1. Introduction

It has seemed that the history of financial theory over the last half century can be summarized in terms of two distinct revolutions. The first was the neoclassical

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revolution in finance that began with the capital asset pricing model and efficient markets theory around the 1960s, and with the intertemporal capital asset pricing model and arbitrage-based option-pricing theory in the 1970s.<sup>1</sup> The second was the behavioral revolution in finance which began in the 1980s with questions about the sources of volatility in financial markets, with the discovery of numerous anomalies, and with attempts to incorporate into financial theory Kahneman and Tversky's 1979 prospect theory, and other theories from psychologists.

The two revolutions came at different times and largely from different people, and so it may naturally be assumed that the two approaches are incompatible. Those who are most impressed with the neoclassical finance sometimes seem to regard behavioral finance as an uprising of the heathens. In fact, however, the two revolutions in finance have always been intertwined, and some of the most important applications of their insights will require the use of both approaches.

## 2. The co-evolution of neoclassical and behavioral finance

In 2005, Paul A. Samuelson, one of the greatest economists of all times, celebrated his 90th birthday. This is a good occasion to recall that he was one of the originators of the canonical intertemporal model that underlies much of the theory of neoclassical finance, but also, at the same time, anticipated a good deal of the progress of behavioral finance. This means that in an important sense both maximizing finance and behavioral finance were born together; they are sisters.

In his classic 1937 paper, "A Note on the Measurement of Utility," published when Samuelson was only 22 years old, we see one of the earliest expositions of the now-ubiquitous model that represents people as maximizing the present value of utility subject to a present-value budget constraint (Samuelson, 1937). The equations exactly as Samuelson wrote them are:

max

$$J = \int_0^b U(x)e^{-\pi t} dt$$

subject to :

$$S = \int_0^b x(t)e^{-rt} dt.$$

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<sup>1</sup> The term "neoclassical economics" has more currency than "neoclassical finance." While definitions seem to vary today, the term neoclassical economics generally refers to the introduction into economic theory in the late 19th century by W. Stanley Jevons, Alfred Marshall, Carl Menger, and Leon Walras of the concept of utility maximization subject to constraints and of general equilibrium consequences of such maximization. These concepts also define neoclassical finance. In his 2005 book *Neoclassical Finance*, Stephen A. Ross gives as achievements in neoclassical finance the no-arbitrage theory, pricing kernel theory, and efficient markets.

Here  $J$  is the present value of instantaneous utility  $U$  of the individual's consumption  $x$  discounted at rate  $\pi$ ,  $S$  is the individual's wealth today at time 0,  $r$  is the market interest rate, and  $b$  is the presumed date of death. These equations, or variations on them, are everywhere in theoretical finance. His paper was truly a great achievement.<sup>2</sup>

It is curious, then, to note that Samuelson, in the same article that presented these equations for the first time, was his own harshest critic. In fact, he practically condemned this model of human behavior in the concluding paragraph of the 1937 paper (p. 161):

“In conclusion, any connection between utility as discussed here and any welfare concept is disavowed. The idea that the results of such a statistical investigation could have any influence upon ethical judgments of policy is one which deserves the impatience of modern economists.”

This is a remarkably harsh judgment on his own model. Given that his model has been received doctrine for intertemporal finance, maybe there is a lesson here for researchers. It would appear that it is best to be up front about the weaknesses of one's model. Doing so not only substantially defuses all subsequent criticism, it may even inspire researchers through its candor.

The reasons he gave for this harsh judgment on his own model anticipate some important themes in behavioral finance that were to follow decades later. Samuelson noted that this was a model of time consistent human behavior: if people at any time  $t$   $0 < t < b$  reconsidered the maximization problem from that date forward, they would not change their plans. But, real people are in fact *not* time consistent, and show some tendencies to live for the present each day as if it were the most special day in one's life.

Samuelson gave as evidence the fact that people sometimes try to control themselves by binding their future decisions. He referred to the “behavior of men who make irrevocable trusts, in the taking out of life insurance as a compulsory savings measure, etc.” These are the same points that were made decades later, in rather more detail, by Hersh Shefrin and Richard Thaler in their 1981 paper “An Economic Theory of Self Control” (Shefrin and Thaler, 1981).

The weakness of human self-control has come up repeatedly in consideration of the personal savings rate, which swings up and down through time for no obvious reason, and which at times is very low, only around 1%, in the United States at the present time. It appears as if people are vulnerable to complacency, at least from time to time, about providing for their own future. This complacency is part of the sense of urgency about Social Security reform, which I will discuss shortly.

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<sup>2</sup> A 1928 paper by Frank Ramsey “A Mathematical Theory of Saving” was the first to discuss a present value of utility function, but Samuelson's paper was a major step in establishing the implications of this utility function. Samuelson considered the lifetime utility as finite, while in his 1928 paper Ramsey considered infinite lives ( $b = \infty$ ). Samuelson's model implies a depletion of savings over the life cycle; it was particularly influential in that it led to the overlapping-generations model.

Some important trends in behavioral economics have been to seek refinements in Samuelson's model to take account of the time inconsistency of preferences. George Loewenstein and Drazen Prelec in 1992 proposed that a number of changes in Samuelson's model should be made, notably that his exponential discounting should be replaced with a generalized hyperbolic discounting, that is,  $e^{-\pi t}$  with  $1/(1 + \alpha t)^{\beta/\alpha}$ ,  $\alpha, \beta > 0$ . David Laibson in 1998 proposed replacing Samuelson's utility function with

$$J_t(x_0, x_1, \dots, x_b) = E_t \left[ U(x_t) + \beta \sum_{\tau=1}^{b-t} U(x_{t+\tau}) e^{-\pi \tau} \right].$$

The similarity of these alternatives to Samuelson's original 1937 model should be apparent. They are not time-consistent models, but their basic structure is the same. While the Loewenstein and Prelec and the Laibson models are widely viewed as in the realm of behavioral economics, they owe an obvious debt to Samuelson, and, their contributions are in fact quite similar to his model.

The distinctions between neoclassical and behavioral finance have therefore been exaggerated. Behavioral finance is not wholly different from neoclassical finance. Perhaps the best way to describe the difference is that behavioral finance is more eclectic, more willing to learn from other social sciences and less concerned about elegance of models and more with the evidence that they describe actual human behavior.

Let us turn now to an example of the application of both neoclassical finance and behavioral finance: the introduction of private accounts for Social Security.

### 3. Private accounts for social security

A number of countries have created private accounts in place of traditional defined-benefit old age insurance for social security. The United States has not yet done so, but there is considerable momentum toward private accounts. In 2005, President George Bush proposed that individuals be allowed to invest some of their Social Security contributions in personal accounts. In 1999, President Bill Clinton had a somewhat similar proposal too.

One motivation for such proposals seems to begin with the concept of the "ownership society." President Bush reiterated the ownership society theme throughout the 2004 reelection campaign. The idea here is that people take care of their own lives, and are better citizens too, if they are both owners of financial assets and homeowners as well. There appears to be some truth to the idea that ownership has these effects. For example, Edward Glaeser and Denise DiPasquale found evidence that homeowners are better citizens, even after controlling for demographic and social characteristics.

The idea that there are such benefits to the ownership society goes back in history long before the 2004 election, and is essentially behavioral. The most significant exponent of this idea appears to be Michael Sherraden, in a book he wrote in 1991 (Sherraden, 1991). Michael Sherraden is not a finance theorist. He is not even in

a business school or economics department. He is in the School of Social Work at Washington University in St. Louis.

Sherraden's argument that the best way to improve the lives of the less advantaged in our society is to teach them how to be capitalists has had enormous impact already. Notably, his asset-based welfare has had substantial results in the United Kingdom, where the government of Tony Blair in April 2005 started a program whereby newborn babies are all given a birthday present from the government in the amount of £250 (£500 if in a low-income family). The parents can choose among a number of investment alternatives to invest the fund until the child comes of age, and they and others can make additional gifts to the trust fund. All this is designed to make the parents feel connected with investing and with the modern economy.

I have found that few among my finance or economics colleagues have even heard of Michael Sherraden. The thought that any good ideas for financial economics would emerge from a school of social work seems anathema to some of the most devoted neoclassical theorists. Perhaps the biggest difference between neoclassical finance theorists and behavioral finance people is in their willingness to listen to people from other social sciences. I believe that this is why behavioral finance has the vitality that it does. It pays to learn from others who have different perspectives.

The ownership society is a vision for our future that has great promise. We need to learn behavioral finance in order to put the ownership society in the proper perspective. We need to consider whether the impetus for the ownership society reflects the success that we have recently been experiencing in the stock market and the housing market. I have argued (*Irrational Exuberance*, Shiller, 2005a) that much of this enthusiasm reflects patterns of social contagion that might be described as a speculative bubble. The exuberance was helped along by influential books by Ibbotson and Sinquefeld (1977) and Siegel (1994). The ownership society appears very attractive when we all seem to be getting rich off our investments. It appeared a lot less attractive in the 1930s, after drops in both stock prices and real estate prices, when the Social Security System was created in the United States.

We need also to consider behavioral finance as a major reason to justify government involvement at all in the investing decisions of individuals. The failure of millions of people to save properly for their future is a core issue of behavioral finance. Theorists in the neoclassical tradition, using Samuelson's overlapping generations model, have pointed out that the pay-as-you-go Social Security System that we now have may work as a disincentive to saving.

The most distinctive feature of the President's 2005 plan for personal accounts was, in my opinion, its proposal for *life-cycle* accounts under the charge of the Federal Government. The life-cycle fund, which would be among the options that workers will be offered to invest their personal accounts, would be a fund that adjusts the portfolio allocation between stocks and bonds to be appropriate for the age of the worker. The advice of many financial advisors is that people should be heavily in the stock market when they are young, and that they should gradually reduce their exposure to the stock market as they age. The conventional rule has been that one

should have one hundred minus one's age as the percentage of one's portfolio in stocks, though the President has not referred to this rule, nor yet announced how he would manage a life-cycle fund.

The President's life-cycle fund was central to his plan in two ways. First, if we are offered an array of choices of funds to invest in and one of them is a fund that claims to be a collection of the other funds that is designed to be appropriate for our age, then clearly it ranks above the others in that it is designed to stand alone, and not be combined with the others. It would thus come across as the default fund, the fund of choice for most investors. Second, and perhaps more important, the President proposed that workers automatically be shifted into the life-cycle fund when they reach the age of 47, unless both the worker and the worker's spouse sign a waiver indicating that they understand the risks of not doing so. Thus, the life-cycle plan was really the centerpiece of the President's proposal.

The attention in the President's plan to the default option, to what happens when people do not make active decisions, reflects another strand of the literature from behavioral finance. A major theme in behavioral finance is that human attention is often capricious, focusing very heavily at some times on financial calculations, and subject to distraction and dissipation of attention at other times. Thus, the specification of default options, what happens when people do nothing, is absolutely central; see for example, Choi, Laibson, Madrian, and Metrick (2003).

Default options can also be part of self-control mechanisms, if designed properly. Benartzi and Thaler (2004) have developed a "save more tomorrow" plan that individual employers have been adopting to encourage their employees to save, by making it extremely easy for them to enter the plan without any immediate consequences for their expenditure, and leaving the plan in place as a default option indefinitely. Employees can cancel the plan at any time if they choose to do so, but in actual practice few do so; they just stick with the default option that they chose.

Bush's life-cycle plan for the U.S. appears to be unique. While other countries have personal accounts and among them choices for accounts with life-cycle adjustments promised, there appears to be no other country that takes charge of the individual investment decision and that diverts people into a life-cycle fund automatically.

It would appear that the life-cycle fund aspect of the Bush proposal had its roots, and its best possible expression, in a literature within neoclassical finance that has been brewing for some decades now. The question has intrigued theorists: what should an intertemporal optimizer do to manage his or her portfolio over the lifetime?

Samuelson started the literature by arguing in 1969 that someone who wished to maximize the expected value of his intertemporal utility function by managing the allocation of the portfolio between a risky high-yielding asset and less risky assets would not actually change the allocation through time. If the instantaneous utility function  $U(x)$  does not change through time, then neither does the allocation.

Finance theorists pointed out that in fact, however, people have labor income, and for young people the present value of their labor income ought to be considered as part of (indeed, most of) their portfolio. This has led to a lively literature within

the neoclassical finance tradition that derives optimal life-cycle portfolios. Recently, a number of papers have been written that show how we can use calibrated models to come up with concrete advice about optimal allocation within such portfolios; see for example, Viceira (2001), Campbell and Viceira (2002), Benzoni, Collin-Dufresne, and Goldstein (2004), and Lynch and Tan (2004). These papers show substantial uncertainty about just what the optimal life-cycle portfolio really is. The papers as a group suggest that one could make a case for life-cycle portfolios that deviate widely from the traditional 100–age rule. The papers consider a range of plausible parameter values for calibration of these models, and, over this range, we see “optimal” portfolios where young people hold 300% of their investable assets in the stock market (borrowing 200%) as well as portfolios where young people are short the stock market.

While neoclassical finance theorists appear to be nowhere close to a consensus on the optimal life-cycle portfolio, it does appear that we are into a meaningful discussion of the issues relating to such a portfolio. The discussion initiated by President Bush in 2005 for life-cycle portfolios within Social Security reflects our emerging understanding of optimal portfolio design, and this discussion will lead to important applications eventually. Neoclassical finance appears highly relevant to such a discussion, in that it offers the appropriate theoretical framework for considering what people *ought* to do with their portfolios, if not what they actually *do* do.

#### 4. Conclusion

Ross (2005, p. 66), in his book *Neoclassical Finance*, says that “at present, behavioral finance seems to be more defined by what it does not like about neoclassical finance than what it has to offer as an alternative.” But, that is just not true. The fact that behavioral finance is beginning to play an important role in public policy, such as in social security reform, belies this. In fact, behavioral finance draws on a wide expanse of knowledge from all the social sciences that offer real and tangible alternatives.

Ross complains of those in behavioral finance who “at their most strident, proclaim the death of neoclassical finance and the rise of a new finance based on the psychological vagaries of Everyman.” But that is not what most of those of us who work in behavioral finance intend either. Neoclassical finance has an obvious relevance.

What behavioral finance offers can be thought of as in fact the salvation of neoclassical finance. By putting the neoclassical model into its correct perspective, it becomes possible to apply that model much more constructively. Those who adhere too religiously to one model run the risk of making themselves irrelevant by losing sight of when it is that their model is appropriately applied and when not.

The kinds of changes that have been proposed for Social Security are most likely one example of a general development of our financial institutions to a much higher level. As I argue in my book *The New Financial Order: Risk in the 21st Century* (Shiller, 2003), the revolution in electronic computing and communication that is the most significant event of our era promises to utterly transform our financial

institutions in the future. We must make use of our entire arsenal of scholarly endeavor to make sure that this transformation leads to better lives for us all, and this means that we must apply both neoclassical finance and behavioral finance.

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