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Hersh Shefrin; Meir Statman

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## The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory and Evidence

HERSH SHEFRIN and MEIR STATMAN\*

### ABSTRACT

One of the most significant and unique features in Kahneman and Tversky's approach to choice under uncertainty is aversion to loss realization. This paper is concerned with two aspects of this feature. First, we place this behavior pattern into a wider theoretical framework concerning a general disposition to sell winners too early and hold losers too long. This framework includes other elements, namely mental accounting, regret aversion, self-control, and tax considerations. Second, we discuss evidence which suggests that tax considerations alone cannot explain the observed patterns of loss and gain realization, and that the patterns are consistent with a combined effect of tax considerations and the three other elements of our framework. We also show that the concentration of loss realizations in December is not consistent with fully rational behavior, but is consistent with our theory.

IT HAS BEEN WELL-KNOWN for over thirty years that individual decision makers do not behave in accordance with the axioms of expected utility theory. The famous Allais paradoxes [1] have made this point abundantly clear. Recent work by Kahneman and Tversky [15], Machina [19], and others has sought to provide a theory which describes how decision makers actually behave when confronted with choice under uncertainty. One of the key findings by Kahneman and Tversky concerns decision makers whose recent gambling history reflects losses. They indicate that their

analysis suggests that a person who has not made peace with his losses is likely to accept gambles that would be unacceptable to him otherwise (p. 287).

Kahneman and Tversky's finding was obtained in a controlled experimental situation. Economists tend to treat experimental evidence with some caution and are reluctant to conclude automatically that similar features will be exhibited in real-world market settings. Indeed, it is important to look at market behavior in order to ascertain whether such behavior patterns can be discerned in actual trading.

In this paper, we examine decisions to realize gains and losses in a market setting. Specifically, we focus attention on financial markets and seek to determine whether investors exhibit a reluctance to realize losses (disposition to "ride

\* University of Santa Clara, Leavey School of Business. We would like to acknowledge the helpful remarks made on earlier versions by Peter Bernstein, Fischer Black, Ben Branch, Ivan Brick, Werner De Bondt, Edward Dyl, Avner Kalay, Seymour Smidt, and Richard Thaler. Special thanks go to George Constantinides whose incisive discussion led to major improvements that are reflected in this version of the paper. We retain full responsibility for all errors.

losers") even when the precepts of standard theory prescribe realization. In this respect, we draw on the work of Constantinides [6, 7], who has studied the character of a (normatively) optimal strategy for realizing gains and losses. This strategy is designed to exploit the fact that the U.S. tax code distinguishes between short-term gains (losses) which are taxed as ordinary income and long-term gains (losses) which are taxed at a lower rate. While the specific actions recommended by Constantinides depend on the circumstances at hand, his strategy generally requires immediate realization of any losses, whenever transaction costs are absent. When transaction costs exist, loss realization should follow a pattern in which the volume of realizations steadily increases, peaking in December, and then falling off drastically. Gains on medium and high variance stocks should be realized when they become long-term.

We will develop a positive theory of capital gain and loss realization in which investors tend to "sell winners too early and ride losers too long" relative to the prescriptions of Constantinides' normative theory. We shall refer to this tendency as the "disposition effect." The disposition effect is part of the general folklore about investing, yet does not arise within the standard neoclassical framework. Indeed, it does not even appear in the alternative positive theories of decision-making under uncertainty (Machina [19], Chew [4], and Chew and MacCrimmon [5]).

The theoretical framework we employ is an extension of the behavioral model described in our earlier work on dividends (see Shefrin and Statman [21]). That model has four major elements: prospect theory; mental accounting; regret aversion; and self-control. This paper uses these same ideas to study the disposition effect. Each of these elements contributes something distinctive to the analysis. Prospect theory predicts a disposition to sell winners and ride losers when the proceeds realized are held, as opposed to being rolled over into another gamble. Mental accounting places the prospect theoretic treatment into a broader framework, by clarifying conditions under which the disposition effect holds when realization proceeds are reinvested in a "swap." Aversion to regret provides an important reason why investors may have difficulty realizing gains as well as losses. Finally, self-control is employed to explain the rationale for methods investors use to force themselves to realize losses. In addition, we introduce a fifth element, the potential gain to be had from exploiting the Constantinides strategy, and consider its interaction with the other four. The theory that emerges should be understood as being descriptive (positive), as opposed to prescriptive (normative).

After presenting the elements of the theory in Section I, we introduce empirical evidence which casts some light on the prevalence of the disposition effect in practice. This is the subject of Section II. Section III contains some concluding remarks.

### **I. A Positive Theory of Selling Winners and Riding Losers**

In this section, we proceed by setting out the main elements of the theory in sequence.

### A. Prospect Theory

In a pioneering article, Kahneman and Tversky developed prospect theory as a descriptive theory of choice under uncertainty. Prospect theory suggests the hypothesis that investors display a disposition to sell winners and ride losers when standard theory suggests otherwise. This disposition emerges from a combination of several features. First, decision makers frame the choices before them in a particular way. Kahneman and Tversky refer to this as the "editing stage." Significantly, the editing phase frames all choices in terms of potential gains and/or losses relative to a fixed reference point. In the second stage (the "evaluation stage"), decision makers employ an S-shaped *valuation* function (meaning a utility function on the domain of gains and/or losses) which is concave in the gains region, and convex in the loss region. This reflects risk aversion in the domain of gains and risk seeking in the domain of losses.

To see how the disposition to sell winners and ride losers emerges in prospect theory, consider an investor who purchased a stock one month ago for \$50 and who finds that the stock is now selling at \$40. The investor must now decide whether to realize the loss or hold the stock for one more period. To simplify the discussion, assume that there are no taxes or transaction costs. In addition, suppose that one of two equiprobable outcomes will emerge during the coming period: either the stock will increase in price by \$10 or decrease in price by \$10. According to prospect theory, our investor frames his choice as a choice between the following two lotteries:

- A. Sell the stock now, thereby realizing what had been a \$10 "paper loss".
- B. Hold the stock for one more period, given 50–50 odds between losing an additional \$10 or "breaking even."

Since the choice between these lotteries is associated with the convex portion of the S-shaped value function, prospect theory implies that B will be selected over A. That is, the investor will ride his losing stock.<sup>1</sup> An analogous argument demonstrates why prospect theory gives rise to a disposition to realize gains.

Given that the preference of B over A in the above discussion is strict, it follows that the investor would be willing to accept B even if the odds of breaking even were something less than 50–50. Of course were the odds in B to become sufficiently unfavorable, then the investor would prefer to realize the loss.<sup>2</sup>

### B. Mental Accounting

While the preceding discussion of prospect theory explains the reluctance to sell a stock and realize a loss, it does not explain the reluctance to engage in a tax swap. To see why, consider an investor who believes that markets are efficient.

<sup>1</sup> Commenting on this phenomenon, Kahneman and Tversky state: "The well known observation that the tendency to bet on long shots increases in the course of the betting day provides some support for the hypothesis that a failure to adapt to losses or to attain an expected gain induces risk seeking."

<sup>2</sup> Prospect theory accords extra weight to trivial gambles which involve no risk. This feature is called *subcertainty* and reinforces the choice.

Assume that this investor does not plan to disavow from his portfolio, and transaction costs are zero. Then this investor will only sell stocks to exploit the difference between short- and long-term tax rates. Suppose that this investor purchased a stock that experienced a price decline during the following month. Think about the following scenario. The IRS requires that thirty days pass before a stock can be repurchased, if the tax advantages stemming from its sale are to be enjoyed. As is well known, wash sale regulations can be neutralized through a "swap" by replacing a stock sold for tax purposes (such as Chemical Bank) with a stock featuring an identical returns distribution (such as Citicorp). The crucial point here is that the swap reduces the investor's tax liability, and yet leaves him facing an equivalent gamble. Therefore, the tax swap offers an alternative which stochastically dominates the decision to continue holding Chemical Bank. It is this feature which underlies Constantinides' strategy.

Clearly, violations of dominance are suboptimal in standard theory. However, prospect theory does recognize that individuals may select dominated lotteries. Kahneman and Tversky argue that the selection of dominated lotteries is not achieved knowingly, but is a consequence of a particular frame being employed which obscures the dominance property.

The discussion of prospect theory emphasizes the importance attached to the editing phase (framing) as well as to the location of the reference point. In order to provide a foundation for the way that decision makers frame gambles, Thaler [23] has constructed a framework known as *mental accounting*. The main idea underlying mental accounting is that decision makers tend to segregate the different types of gambles faced into separate accounts, and then apply prospect theoretic decision rules to each account by ignoring possible interaction.

Mental accounting also serves to explain why an investor is likely to refrain from readjusting his reference point for a stock. When the stock is purchased, a new mental account is opened. The natural reference point is the asset purchase price. A running score is then kept on this account indicating gains or losses relative to the purchase price. Recall the tax-motivated swap involving the stocks of Chemical Bank and Citibank. Consider how this swap might be framed. A normative frame (implicitly used in Constantinides) recognizes that there is no substantive difference between the returns distributions of the two stocks, only a difference in names (i.e., in form). However, a swap that involves selling the Chemical Bank stock at a loss, and using the proceeds to buy Citicorp, might be framed as *closing* the Chemical Bank mental account at a loss, and opening a Citicorp mental account. In a forthcoming study entitled "The Break Even Effect," Thaler and Johnson [25] argue that decision makers encounter considerable difficulty in closing mental accounts at a loss.

In his manual for stock brokers, Gross [12] describes many features which illustrate mental accounting. The following quotation illustrates his appreciation of the difficulty of loss realization.

Many clients, however, will not sell anything at a loss. They don't want to give up the hope of making money on a particular investment, or perhaps they want to get even before they get out. The "getevenitis" disease has probably wrought more destruction on investment portfolios than anything else. Rather than recovering to an original entry price, many investments plunge sickeningly to even deeper losses.

Investors are also reluctant to accept and realize losses because the very act of doing so proves that their first judgment was wrong . . .

Investors who accept losses can no longer prattle to their loved ones, "Honey, it's only a paper loss. Just wait. It will come back." Investors who realize losses must admit their folly to the IRS, when they file that itemized tax return. For all those reasons and more, investors as a whole are reluctant to take losses, even when they feel that to do so is the right course of action . . .

When you suggest that the client close at a loss a transaction you originally recommended and invest the proceeds in another position you are currently recommending, *a real act of faith has to take place*. That act of faith can more easily be effected if you make use of some transitional words that I call "magic selling words."

The words that I consider to have magical power in the sense that they make for a more easy acceptance of a loss are these: "*Transfer your assets*" (p. 150; Emphasis added).

. . . The two separate transactions (moving out of the loss and moving into a new position) are made to flow together by the magic words "transfer your assets." The prospect thought he was making a single decision, switching one investment into another. He was not being asked to think in terms of selling XYZ and collecting the proceeds, then having to think of many different ways to reinvest the proceeds (pp. 150-152, emphasis added).

Gross' suggestion to "transfer your assets" seeks to overcome the major obstacle standing in the way of loss realization, namely, the need to close a mental account at a loss. A client who *transfers* his assets does not *close* his original mental account, and therefore does not have to come to terms with his loss. The "trick" of framing the transaction as a transfer (without a closure) is not an easy one, and Gross seems to suggest that it requires help (counselling) from an astute broker. This is why *an act of faith* has to take place, with the opening of a new mental account (Citicorp) without the closure of an old one (Chemical Bank) at a loss. In other words, the fundamental reluctance is not so much loss realization as the closure of a mental account at a loss. Note that the well-known practice of tax swaps serves to overcome the reluctance to close mental accounts at a loss.<sup>3</sup>

### C. Seeking Pride and Avoiding Regret

In the above quotation, Gross suggests that investors may resist the realization of a loss because it stands as proof that their first judgment was wrong. Moreover, the regret at having erred may be exacerbated by having to admit the mistake to others (spouse, the IRS). This feature has been discussed by Thaler [22], Kahneman and Tversky [16], and Shefrin and Statman. Regret is an emotional feeling associated with the ex post knowledge that a different past decision would have fared better than the one chosen. The positive counterpart to regret is pride.

<sup>3</sup> This discussion may also explain why investors insist on a swap during the year-end season, even though receiving the tax benefit only requires the sale of a losing stock. Peter Bernstein indicated to us that in his experience, investors resist the suggestion to sell a losing stock and keep the proceeds in cash, rather than complete the swap, even when they agree that the market is likely to turn down.

While closing a stock account at a loss induces regret, closing at a gain induces pride.

The quest for pride, and the avoidance of regret lead to a disposition to realize gains and defer losses. Yet as Kahneman, Tversky, and Thaler all argue, an asymmetry between the strength of pride and regret (regret is stronger) leads inaction to be favored over action. Consequently, investors who are prone to this bias may be reluctant to realize both gains and losses. For example, consider an investor who sells a particular stock, say GM, at a gain, but continues to monitor its progress. Should the price of GM continue to rise, then the initial feeling of pride will be tempered by the regret at having sold too quickly.

#### *D. Self-Control*

In a study of professional futures traders, Glick [11] commented that the reluctance to realize losses constitutes a self-control problem. He states:

[C]ontrary to the dictates of rationality, traders are very much prone to let their losses "ride" . . . At the same time traders frequently voice the view that when profits are involved they and their colleagues are more hasty to offset their position and to get out of the market with their profit. . . . "Small profits and large losses" is an expression often repeated by traders, emphasizing what they see as one aspect of their work problems . . . [I]t is the control of losses which constitutes the essential problem . . . It is likely that many of the ideas referred to in the above comments are best summarized by the notion of "self-control," and the feeling that losses become (and/or are) a problem to the degree that a trader is deficient in this personal quality. This notion, and the way in which it is considered an occupational problem, refers more to the *form* than to the *content* of decision making . . . (pp. 131–138).

In what respect is the disposition effect a self-control problem? To address this question, consider the Thaler-Shefrin [24] framework which treats self-control as an intrapersonal (agency) conflict between a rational part (the planner or principal) and a more primitive, emotional, myopic part (the doer or agent). Because of the doer's strength in influencing individual action, the planner is seen as exhibiting willpower or employing precommitment devices. To adapt the planner-doer model to an analysis of the disposition effect, let doer utility be a function of the status of the various mental accounts. In our view, investors ride losers to postpone regret, and sell winners "too quickly" because they want to hasten the feeling of pride at having chosen correctly in the past. Thus, it is the doer which embodies the emotional reactions associated with regret and pride. For reasons discussed in Thaler and Shefrin, the (rational) planner may not be strong enough to prevent the (emotional) reactions of the doer from interfering with rational decision making. For example, the traders studied by Glick were clearly aware that riding losers was not rational. Their problem was to exhibit sufficient self-control to close accounts at a loss, thereby limiting losses!

Investors (or their planners) use a variety of precommitment techniques to control their doers' resistance to realizing losses. Here are some examples. Professional traders often adhere to iron-clad rules that mandate the realization of a loss, once it reaches a predetermined percentage (e.g., ten percent) of the

original purchase price. The following excerpt from a professional trader (quoted in Kleinfield [18]) illustrates the technique and its rationale.

I have a hard and fast rule that I never let my losses on a trade exceed ten percent. Say I buy a ten-dollar stock. As soon as it goes to nine dollars, I must sell it and take a loss. Some guys have a five per cent rule. Some may have fifteen. I'm a ten man. The thing is, when you're right you're making eighths and quarters. So you can't take a loss of a point. The traders who get wiped out hope against hope. I've seen a good hundred come and go since I've been here in 1964. They're stubborn. They refuse to take losses . . . When you're breaking in a new trader, the hardest thing to learn is to admit that you're wrong. It's a hard pill to swallow. You have to be man enough to admit to your peers that you're wrong and get out. Then you're alive and playing the game the next day. (pp. 17, 18, and 30)

Stop-loss orders provide another example. These are usually promoted as devices to limit risk, but their main advantages may be in allowing an investor to make loss realization at a predetermined point automatic.

There may also be particular times and circumstances in which investors find that less willpower is needed in order to realize a loss. For instance, realizing a loss in order to fund an emergency medical expenditure or a child's tuition payment may be easier than realizing a loss for tax purposes alone. In fact, while some emergencies are real, others may be contrived to render tax-loss selling less difficult. December 31 constitutes a case in point. Tax-motivated transactions at year-end have generated much interest in recent years. Most of the existing work focuses on the relationship between year-end selling and the seasonality in stock returns [see Branch [3], Keim [17], and Givoly and Ovadia [10]]. However, some work focuses specifically on the volume of trading in the month of December relative to the volume of trading year round. In particular, Dyl [8] examined the volume of trading in the month of December relative to the volume of trading in other months. He has found that

. . . there is significant abnormal trading volume in December in common stocks that have undergone a substantial price change during the preceding year. The data reveal abnormally low volume for stocks that have appreciated during the year, presumably reflecting the year-end capital gains tax lock-in effect, and abnormally high volume for stocks that have declined in price during the year, presumably reflecting year-end tax loss selling" (p. 174).

Constantinides has argued that concentrated tax-loss selling will occur in December when transaction costs exist, and this is consistent with Dyl's evidence. However, we shall argue that standard theory provides no basis for this finding. Rather, we postulate that concentrated December tax-loss selling reflects a self-control strategy. The argument is as follows:

In the presence of transaction costs, Constantinides' results predict heavy December tax-loss selling for stocks purchased during the preceding July. However, what about stocks purchased after that, such as in November? Given that the short-term period for such a stock extends beyond the following December 31, it is not at all clear that Constantinides' theory predicts December tax-loss



selling for this stock. In fact, it seems that, if anything, his theory predicts that any such selling would largely occur during the subsequent April because the six-month period for November purchases expires in May. According to this reasoning, Constantinides' theory would explain December tax-loss selling only if stock purchases were concentrated in July.

Since a regular concentration of purchases in July seems unlikely, we are led to ask: What is the rationale for a heavier volume of loss realizations in December than in other months? Indeed, empirical evidence suggests that the volume of loss realization is higher in December. Constantinides (as well as Branch, Givoly and Ovadia, Dyl, and Keim, all cited earlier) seem to believe that this feature is consistent with rational behavior, presumably because it is better for an investor to take a loss "this year" rather than "next year" because of the additional (year's) interest involved.

However, we believe that December has no special role in models based upon rational behavior. Consider the following. A rational individual wage earner (or a self-employed individual) can be expected to forecast his income and deductions at the beginning of the year, and set the number of exemptions (or estimated tax payments) accordingly.<sup>4</sup> A rational individual would consider the realization of losses expected during the year, and increase his exemptions. This way, the tax benefits of these realizations would accrue *early* in the year, because less tax would be withheld, rather than after the following April 15. Loss realizations would be concentrated close to the six-month deadline in accordance with Constantinides' analysis. As December comes along the rational individual may find that he has underpaid his taxes because he has realized fewer losses than his earlier forecast, possibly because the stock market went up unexpectedly during the year. He may wish to realize losses on stocks bought in October or November before the end of the year to bring his tax liability in line with his tax withholdings. However, why would a rational individual be expected to overestimate *consistently* the opportunities for loss realization available during the year? Does learning not take place? Moreover, this individual can change, with only a little trouble, the number of exemptions during the year. Therefore, the tax rebate that accompanies low realization arrives almost immediately in the form of lower tax withholding.<sup>5</sup>

Consider the contrast between the rational individual in Constantinides' theory and the individual in our behavioral framework. Like the rational individual, the individual in our framework is aware of the tax consequences of gain and loss realization. The desire of our individual to take advantage of these tax laws is no less than that of the rational individual. However, our individual is affected by elements of mental accounting, regret aversion, and self-control that do not affect a rational individual. Because of its *perceived* deadline characteristic, our individual regards December as significant for tax planning. For instance, financial

<sup>4</sup> This remark needs to be qualified by taking account of IRS requirements on minimum withholding rates as a function of the previous year's income.

<sup>5</sup> This argument is reinforced by the strong tendency of individuals to overwithhold on their income tax (see Thaler and Shefrin [24]). After all, why is it so important to claim the loss on *this* year's return, when too much is being deducted for tax purposes (and interest is being foregone) anyway?

service firms frequently remind investors about the importance of not leaving tax planning decisions until December. We conjecture that tax planning in general, and loss realization in particular, is disagreeable and requires self-control. Should this be the case, then it is reasonable to expect that self-motivation is easier in December than other months because of its perceived deadline characteristic. Thus, a concentration of loss realizations in December is consistent with our behavioral framework, but inconsistent with Constantinides' rational individual.

In the next section, we shall consider empirical evidence concerning the above issues. Our specific concern is to test whether available data conform with Constantinides' original predictions, or suggests that his predictions should be modified to reflect a disposition to sell winners and ride losers.

## II. Empirical Evidence

In this section, we consider empirical evidence pertaining to our theory. This evidence concerns the time that passes between the point when an investor buys a stock and the point when he sells it. Our major interest is in ascertaining whether investors time the realization of their losses differently from their realization of gains, and if so what the nature of the difference is. In this respect, observe that tax considerations suggest that losses should be realized while they are short-term, while gains should be realized only when they are long-term. However, the disposition to sell winners too early and ride losers too long operates in the opposite direction. Consequently, the major questions concern the strength of the two effects, taken both separately and together. To address these questions, we shall make use of data drawn from two sources. The first source is a study by Schlarbaum et al. [20] dealing with the stock trading history of individual investors, where transaction costs exist. The second source is aggregate data on mutual fund trades, where transaction costs are negligible.

In analyzing the empirical evidence, we take note of the fact that the investors studied are likely to be composed of heterogeneous clienteles. For example, some investors may realize losses soon after they occur throughout the year, and encounter no difficulty in doing so. Others may be aware of the tax benefits from realizing losses quickly, but be unable to exploit them because of the disposition effect. These investors sell winners too early and ride losers too long. Still a third group may find it difficult to sell securities, be it for gain or loss. In this last respect, Feldstein and Yitzhaki [9, p. 25] point out that more than half of all stockholders in their sample did not sell any stock in their study period of 1963–1964. This same feature has been found by Blume and Friend [2, p. 67], who note that fully half of all stockholding families that had ever bought or sold mutual fund shares did not engage in such transactions over the period 1973–1975.

We begin with Schlarbaum et al. who provide panel information about individual trades by selected investors between 1964 and 1970. Their article describes the data set in detail and uses this set to analyze realized returns on common stock investments. A *round trip duration* denotes the length of time that an investor holds a stock before selling it. Consider a partition of the trades in the authors' data set according to round trip duration. In particular consider these

**Table 1**

Expected Capital Gain and Loss Realizations Under the Assumption that Trades are Primarily Motivated by the Tax Option in Contrast with Actual Realizations Data

Expected Capital Gain and Loss Realizations Under the Assumption that Trades are Primarily Motivated by the Tax Option				Actual capital gain and loss realizations in the Schlarbaum et al sample
Round-Trip Duration (Months)	(1)	(2)	(3)	(4)
	No. of Transactions where a Gain is Realized	No. of Transactions where a Loss is Realized	Ratio of the No. of Transactions where a Gain is realized to All Realizations	Ratio of the No. of Transactions where a Gain is Realized to All Realizations
0-1	Very low	Average	Low	0.58
2-6	Very low	High	Very low	0.57
7-12	High	Low	High	0.59

categories: one month or less; one month to six months; and six months to one year. Significantly, the authors found that no matter which value for round trip duration they selected, approximately forty percent of all realizations corresponded to losses. What inferences does this finding suggest about the hypothesis that realizations are predominantly tax-motivated as opposed to an alternative hypothesis in which realizations are tempered by the disposition effect?

Suppose that investors trade primarily to take advantage of the tax option discussed by Constantinides and are not subject to the disposition effect. Then, we should find that few gains are realized when they are short-term. This is because of two reasons. First, the tax rate on such gains is high, and second, transaction costs involved in frequent trading serve to discourage realization. Thus, the number of transactions where a gain is realized should be very low for round trip durations of six months or less. However, gains on high and medium variance stocks should be realized as soon as they become long-term. So, the number of realizations of gains during the seven- to twelve-month duration category should be high. See column 1 of Table I. Realization of a loss within the first month is advantageous from the tax perspective, but transaction costs will serve to deter it, so the number of such realizations would be "average." However, as the short-term deadline nears, we should find that losses are realized lest they become long-term. So, the number of loss realizations for the two-to-six-month round trip duration category should be high. Few losses should be left to realize in the seven-to-twelve-month category. See column 2 of Table I. This implies that the ratio of the number of transactions where a gain is realized to all transactions should display a pattern where it is low for the less-than-one-month category, very low for the two-to-six-month category, and high for the seven-to-twelve-month category. See column 3 of Table I. Is this what the Schlarbaum et al. data show? The answer is no. Schlarbaum et al. found no significant differences in the ratios associated with the three duration categories. Roughly speak-

ing, forty percent of the realizations in every category correspond to losses (see column 4 of Table I).

What are we to conclude from this? One possible inference is that tax-induced trades form a minor portion of all trades. (It might well be that most trades are motivated by considerations of liquidity and/or information.) Another possible inference is that the significant contribution of investors who engage in tax-motivated trades is offset by those who typify the disposition effect. However, it cannot be argued that investors are ignorant of the tax option, since we know from Dyl and others that investors are generally aware of this tax option.

We turn next to the analysis of evidence on the realizations of gains and losses in mutual funds. Mutual funds provide a very useful vehicle for analysis because the realization of gains and losses is possible with negligible transaction costs. Data on purchases and redemptions of mutual fund shares were provided to us by the Investment Company Institute [14], the trade organization of mutual funds. The institute classifies funds into three categories by the method of distribution, or sale, of the fund shares; Broker/Dealer, Direct Sellers, and No-Load funds.<sup>6</sup>

The Investment Company Institute publishes an annual Statistical Workbook that contains data on monthly purchases and redemptions of mutual fund shares separated according to the three fund classifications discussed earlier. We have used monthly data from January 1961 through December 1981, a total of 252 months. We have used only data from January 1961 through December 1973 for No-Load funds.<sup>7</sup>

The data we have are aggregate monthly purchases and redemptions for each of the three fund categories. We do not have data for transactions by individual investors (as in the Schlarbaum et al. study) or even fund by fund data in

<sup>6</sup> Broker/Dealer funds, such as the family of funds by Massachusetts Financial Services (e.g., Massachusetts Investors Trust, Massachusetts Investors Growth Stock, Massachusetts Income Development funds, etc.) act as wholesalers sponsored by brokers and dealers who act as retailers, selling the fund shares to investors. Brokers and dealers receive a commission, or load charge, of up to 8.5 percent of the amount invested in the fund. Direct Seller funds (such as the family of funds by John Hancock advisers (e.g., John Hancock Bond Fund, John Hancock Cash Management Trust, John Hancock Growth Fund, etc.) combine the functions of wholesaler and retailer. They employ their own sales force and charge commissions similar to those of Broker/Dealer funds. No-Load funds, such as the family of funds by Vanguard Group Inc. (e.g., Vanguard Index Trust, Vanguard Municipal Bond, Wellington Funds, etc.) do not charge any sales commission. They are sold directly to investors who contact the fund. Purchases and redemption of No-Load funds do not involve commissions. Broker/Dealer and Direct Seller funds actually offer possibilities that are similar to those of No-Load funds for the purpose of switching from fund to fund. Generally, the sales commission has to be paid only with the initial purchase into a particular family of funds. Subsequent switching to another fund of the same family can be made either at no cost or at a minimal fee (typically \$5). Thus, all three types of funds offer the possibility of free (or practically free) switching from fund to fund.

<sup>7</sup> Post-1973 data includes money market funds, and these have characteristics that make them more similar to an interest-bearing checking account than to other mutual funds. Specifically, the accounting methods used for most money market funds are such that a loss (due to an increase in interest rates) is impossible because they use an accrual method rather than a mark-to-market method.

purchases and redemptions. However, we believe that significant inferences can still be drawn from aggregate data.

We also need data on monthly capital gains and losses. We have used the figures for capital appreciation of common stock from Ibbotson and Sinquefeld [13], Exhibit B-3). The assumption used is that, in aggregate, the capital appreciation of mutual funds will closely follow the appreciation of the market as a whole.

Consider the ratio of redemptions (dollar amounts) of a fund in month  $t$ , say February, to purchases (dollar amounts) of the fund in the preceding month. If trades are primarily motivated by the tax option, we should find that losses in January and February would induce the January purchasers to redeem in February. Similarly, gains in January and February would deter January purchasers from redeeming in February. Therefore, we would expect a high level of the ratio when losses occur, and a low level when gains occur. We begin our analysis with No-Load funds. We have selected sixty observations, thirty corresponding to the highest gains, and thirty corresponding to the highest losses. Our rationale for focusing on these two groups. Gains (losses) were calculated in three ways: (1) gain in month  $t$  only; (2) gain in month  $t - 1$  only; and (3) gain in months  $t - 1$  through  $t$ . These three ways were used because we do not know the exact time during the month when a purchase or redemption was made. We note that the mean one-month gain and loss in our groups is greater than five percent, a significant amount. What do the data show? The mean ratio of redemptions to purchases associated with gains is higher than the mean ratio associated with losses in two of the three cases, although the differences between the means are not statistically significant. Similar comments apply to the Broker/Dealer funds and the Direct Sellers funds (see Table II). These results are virtually the same as the findings on stock trading discussed above, and the same conclusions therefore apply.

### III. Conclusions

One of the most significant and unique features in Kahneman and Tversky's approach to choice under uncertainty is aversion to loss realization. This paper is concerned with two aspects of this feature. First, we place this behavior pattern into a wider theoretical framework concerning a general disposition to sell winners too early and hold losers too long. This framework includes other elements, namely mental accounting, regret aversion, self-control, and tax considerations. Significantly, we argue that the tendency to concentrate loss realizations in December is not normatively based; however, it is consistent with our descriptive theory. Second, we discuss evidence which suggests that this disposition shows up in real-world financial markets, not just in contrived laboratory experiments. In particular, we find that tax considerations alone cannot explain the observed patterns of loss and gain realization, and that the patterns are consistent with a combined effect of tax considerations and a disposition to sell winners and ride losers. Our conclusion can be taken only as tentative. There is a clear need to analyze more detailed data on loss and gain realization. Such data

Table II  
Mutual Funds Redemption Ratios Associated with Capital Gains and Capital Losses

	Mean ratios of redemptions (dollar amounts) in month $t$ to purchases (dollar amounts) in month $t - 1$ in the capital gains group, $\bar{X}_G$ , and in the capital losses, group, $\bar{X}_L$ *		$t$ -Statistic of the difference between $\bar{X}_G$ and $\bar{X}_L$ **	Mean of capital gains (percent) in the capital gains group and mean capital losses (percent) in the capital losses group.	
	Capital Gains	Capital Losses		Capital Gains	Capital Losses
No-load, Funds (January 1961–December 1973)					
Capital gains or losses in month $t - 1$ only	0.53 (0.18)	0.53 (0.23)	-0.09	5.2	-5.3
Capital gains or losses in month $t$ only	0.61 (0.25)	0.53 (0.19)	1.32	5.1	-5.3
Capital gains or losses in months $t$ and $t - 1$	0.62 (0.25)	0.59 (0.21)	0.42	7.8	-7.4
Broker-Dealer Funds (January 1961–December 1981)					
Capital gains or losses in month $t - 1$ only	0.93 (0.50)	0.74 (0.34)	1.69***	7.0	-6.9
Capital gains or losses in month $t$ only	0.90 (0.47)	0.86 (0.42)	0.39	7.0	-6.8
Capital gains or losses in months $t$ and $t - 1$	0.92 (0.49)	0.91 (0.43)	0.04	9.9	-9.9
Direct-Seller Funds (January 1961–December 1981)					
Capital gains or losses in month $t - 1$ only	0.92 (0.55)	0.66 (0.43)	1.62	7.0	-6.9
Capital gains or losses in month $t$ only	0.86 (0.49)	0.79 (0.44)	0.43	7.0	-6.8
Capital gains or losses in months $t$ and $t - 1$	0.90 (0.50)	0.84 (0.46)	0.47	9.9	-9.9

\* The thirty ratio observations with the highest capital gains are in the capital gains group. The thirty ratio observations with the highest capital losses are in the capital losses group. Standard deviations are in parentheses.

\*\* The hypothesis tested is  $H_0: \bar{X}_G = \bar{X}_L$   $H_1: \bar{X}_G > \bar{X}_L$ . The  $t$ -statistic was calculated as

$$t = \frac{\bar{X}_G - \bar{X}_L}{\sqrt{\frac{N_G S_G^2 + N_L S_L^2}{N_G + N_L - 2}}} \sqrt{\frac{N_G N_L}{N_G + N_L}}$$

where  $N_G = N_L = 30$ , and  $S_G$  and  $S_L$  are the standard deviations of the ratios of redemptions in the capital gains and capital losses groups, respectively.

\*\*\* Denotes statistically significant at the 0.05 level.

may be available from the IRS and from the Purdue observations on individual investor behavior. In addition, it will also be important to look at other reasons for realization: examples include consumption and trading on information (public or private).

While this paper has focused upon stocks and mutual funds, the general tendency to treat sunk costs as relevant has much wider application. For example, both corporate managers and shareholders are well aware of a tendency "to throw good money after bad" by continuing to operate losing ventures in the hope that a recovery will somehow take place. The case of Lockheed's decision to terminate

(finally!) its well-known L-1011 white elephant was greeted with joy by the investment community. The price of Lockheed stock jumped 18 percent in the day following the formal announcement of cancellation. Other examples abound.

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