Homemade Leverage

Theory versus experimental evidence.

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According to standard economic and financial theory, investors who receive cash flows from several different sources should sum the cash flows and consider the aggregate cash flow in their decision-making. Many of the cornerstone models in finance rely on this assumption.

Modigliani and Miller [1958] show that if investors integrate cash flows from investment in the firm and from investment in the risk-free asset, then, in the absence of corporate taxes and bankruptcy costs, capital structure is irrelevant to the firm's value, because investors can create their own "homemade leverage."[1] Portfolio theory as in Markowitz [1952] and the capital asset pricing model of Sharpe [1964] and Lintner [1965] also assume that investors integrate the cash flows from all of their investments and care about the returns of their aggregate portfolio.

The idea that there is a unique equity portfolio (the market portfolio) that is optimal for all investors plays a key role in portfolio theory. It relies on the assumption that when investors optimize their portfolio they correctly integrate cash flows from the equity portfolio and cash flows from investment in the risk-free asset, and hence select efficient portfolios located on the security market line (SML). This *separation theorem* property is essential to the Sharpe-Lintner equilibrium pricing model.

Several researchers have shown that subjects may have different mental accounts for different investments, and in some cases they may fail to integrate cash flows from different sources. One of the most famous examples of subjects' inability to integrate random cash flows

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was demonstrated by Tversky and Kahneman [1981]. They asked subjects to select one of two prospects, A or B, *and* one of the two prospects C or D. Prospect A provides a sure cash flow of $240 and B provides a 25% chance to win $1,000 and a 75% chance to gain nothing; 84% of the subjects selected A. Prospect C is characterized by a sure loss of $750 and prospect D by a 75% chance to lose $1,000 and a 25% chance to lose nothing; 87% of the subjects selected D. The pair of choices A and D was selected by 73% of the subjects.

When put together, A + D provide a 25% chance to win $240 and a 75% chance to lose $760, and B + C provide a 25% chance to win $250, and a 75% chance to lose $750; hence, B + C dominates A + D by first-degree stochastic dominance, and should be preferred by all rational investors.

As Tversky and Kahneman show, their subjects failed to integrate the cash flows from the two choices, because the combination B + C was selected by only 3% of the subjects. Indeed, when Tversky and Kahneman presented the subjects with a new task, asking them to select between the cash flow corresponding to B + C and the cash flow corresponding to A + D, 100% of them selected the superior choice B + C. That is, when Tversky and Kahneman themselves performed the cash flow integration, the subjects chose the dominant combination B + C. They failed to do the integration themselves and needed the researchers to do it for them in order to notice the dominance of that combination.

For other examples of integration problems, see, for example, Tversky and Kahneman [1986, 1992] and Kahneman and Lovallo (1993). In the case of portfolio theory, Kroll, Levy and Rapoport [1988] and Kroll and Levy [1992] show that subjects do not take into consideration covariances between asset returns, so in constructing their portfolios they do not efficiently aggregate the cash flows from different assets.

While it has been clearly demonstrated that individuals have problems aggregating risky cash flows from different sources, the implications of this finding for financial markets are not obvious. First, it is possible that while individuals in the general population fail to integrate random cash flows from different sources, professional investors in the stock market may be more skilled at these tasks, and may not suffer as much from this problem.

Second, while it may be too much to expect of investors to take covariances into account when they construct portfolios, investors don't really have to know anything about covariances in order to invest efficiently. As there are many mutual funds in the market offering many stock portfolios, some of them presumably efficient, all investors need to know is how to choose an efficient fund from the set of available funds. Thus, in order for resources to be allocated efficiently it is required of investors only that they will be able to choose efficiently from a set of funds.[2]

This is a much more simple task than the construction of an efficient portfolio of risky assets, and it requires merely the use of homemade leverage to identify efficient funds. It is this simple but very important task that is our focus.

Are investors capable of integrating cash flows from one risky asset and one risk-free asset? That is, can they rationally employ homemade leverage in their decision-making? We address this question by conducting an investment experiment with financial practitioners and business school students. We ask these subjects to choose one of several risky assets, which we call mutual funds, allowing them to also borrow or lend at a given risk-free interest rate. The funds' returns are normally distributed, and this information is given to the subjects.

In the first part of the experiment, the subjects are given the expected return and standard deviation of each fund. We then find that 46% of the choices made by both practitioners and students are inefficient. That is, in almost half of the cases the subjects were *not* capable of employing homemade leverage effectively to optimize their investment. The economic cost of this inefficiency is substantial, as it involves a reduction of 1% to 3% in risk-adjusted annual average returns, a discouraging result regarding investor inefficiency.

When we introduce mixed funds that integrate the cash flows for the investors, i.e., make the investors aware of the dominating portfolios (available before with leverage, but less obvious), a much higher percentage of investors make efficient choices (98%).

In practice, investors often see a set of historical returns rather than fund means and standard deviations. To investigate the effect this may have on the results, in the second part of the experiment we replicate the first two tasks, but this time we provide the subjects with a set of historical returns for each fund, rather than its expected return and standard deviation. Subjects are told that returns are normally distributed, that future returns will be drawn from the same distribution that generated the historical returns, and that the returns are independent and identically distributed.

In this second part of the test, the percentage of efficient choices is lower overall, but we still observe a dramatic increase in efficiency when the mixed funds are

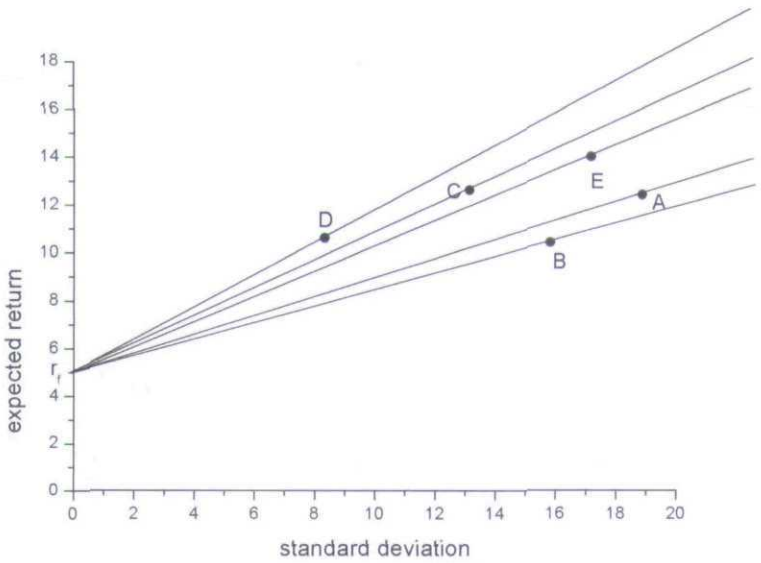
EXHIBIT 1

Five Funds in Task 1

Fund	A	B	C	D	E
Mean	12.40%	10.40%	12.60%	10.60%	14.00%
Standard Deviation	18.87%	15.82%	13.15%	8.33%	17.17%

EXHIBIT 2

Investment Alternatives in Task 1



introduced. Thus, investors are not completely irrational, but they do have difficulties using homemade leverage in their decision-making.

These results highlight the importance of mixed mutual funds—because these funds help investors achieve efficient portfolios by doing the cash flow integration for them. The results also imply fund managers should carefully consider the degree of their funds' leverage.[3] Pension plan designers should take this finding into consideration; they cannot rely on plan participants to choose efficiently unless a wide range of efficient mixed funds are offered to them (Benartzi and Thaler [2001] deal with closely related issues). Another implication is that the value of a firm may actually depend on capital structure, even in a perfect market with no transaction costs and in the absence of corporate tax and bankruptcy cost effects.

EXPERIMENT

We analyze the choices of subjects in four one-period investment tasks. In each task, the subjects are presented with a set of mutual funds, and told that the return on each fund is drawn randomly from a normal distribution.

In the first two tasks, the mean and standard deviation of the return distribution for each fund is given to the subjects. The subjects are told they have $10,000 to invest and that they can borrow or lend money at a given risk-free rate of 5%. We ask each subject to choose the portfolio that is optimal for her by selecting one mutual fund and choosing how much she would like to invest in this fund (with the rest of the money invested, or borrowed, at the risk-free rate). Subjects are not allowed to diversify across funds.

The third and fourth investment tasks are similar to the first two, but in these tasks investors are provided with a set of historical returns for each fund instead of its expected return and standard deviation. Detailed instructions given to the subjects are available from the authors on request.

Exhibits 1 and 2 describe the five funds available in task 1. As the return distributions are normal, the mean-variance criterion coincides with expected utility maximization (see Tobin [1958] and Hanoch and Levy [1969]). Therefore the efficient set in task 1 consists of fund D and its combinations with the risk-free asset (*see Exhibit 2*). Thus, if subjects are rational expected utility maximizers, they should all choose fund D in task 1, and mix it with the risk-free asset according to their preferences.

Task 2 is identical, except that we introduce four more funds, funds F, G, H, and I. These new funds are all located on the line connecting fund D with the risk-free asset, and they are constructed specifically to demonstrate the inefficiency of funds A, B, C, and E (*see Exhibits 3 and 4*).

Notice that the introduction of these funds does not offer subjects portfolios that were unavailable in task 1. For example, fund H can be achieved by borrowing 57.86% and investing 157.86% of the initial wealth in fund D.[4] Because lending and unlimited borrowing are available in task 1, the opportunity sets in tasks 1 and 2 are identical, and rational subjects have no reason to change their choices with introduction of the four new funds.

Tasks 3 and 4 replicate the first two tasks, but with historical returns replacing the distribution parameters. The subjects are told that the historical returns for each fund were drawn randomly from a normal distribution,

EXHIBIT 3
Nine Funds in Task 1

Fund	A	B	C	D	E	F	G	H	I
Mean	12.40%	10.40%	12.60%	10.60%	14.00%	17.68%	15.63%	13.84%	16.54%
Standard Deviation	18.87%	15.82%	13.15%	8.33%	17.17%	18.87%	15.82%	13.15%	17.17%

and that the next return (i.e., their investment profit or loss) will also be drawn at random from the same distribution. The historical returns are chosen so that the means and the standard deviations of the funds are exactly the same as in the first two tasks.

The purpose of these tasks is to see whether there is a significant difference in choices when the subjects visualize a set of realized returns, rather than the distribution parameters, and to examine how efficiently the subjects choose when they have to perform the extra task of estimating the funds' return parameters. That is, tasks 1 and 3 and tasks 2 and 4 are essentially the same. Still, the tasks are framed differently, and as Tversky and Kahenman [1981] show, differences in framing may yield different results.

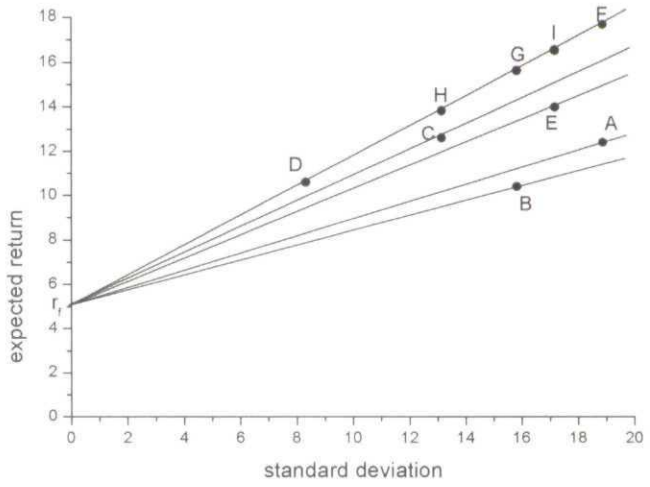
There were 122 subjects in the experiment: 58 mutual fund managers and financial analysts, and 64 second- and third-year undergraduate business school students at the Hebrew University. The students had taken at least one finance course and one statistics course. The subjects had the questionnaire for a long time (at least a week), and could make their decisions without time pressure.

The experiment did not involve financial reward or penalty to the subjects, which may be considered a drawback. While subjects have no motivation to answer untruthfully when they do not receive a performance-based reward, one might be concerned that the subjects could be completing the questionnaire randomly just to get the job done. Fortunately, in this experiment the results are very clear and significant, ruling out this possibility. Statistical analysis strongly rejects the notion of random choice.

We chose not to introduce any financial payoff because enforcing financial penalty in the case of losses would be legally difficult, and paying a reward without the possibility of a penalty induces a strong bias toward risk-taking.[5] Moreover, Battalio, Kagel, and Jiranyakul [1990] have shown that the results of experiments with and without financial payoff typically differ in their magnitude but not in their direction. Harless and Camerer [1994] also show that when financial payoff is involved, the results are less variable, but their qualitative nature does not change.

Thus we believe the absence of financial payoff does not qualitatively affect the results of our experiment. Moreover, a statistical test reveals strong evidence that the subjects did not randomly select their choices.

EXHIBIT 4
Investment Alternatives in Task 2



RESULTS

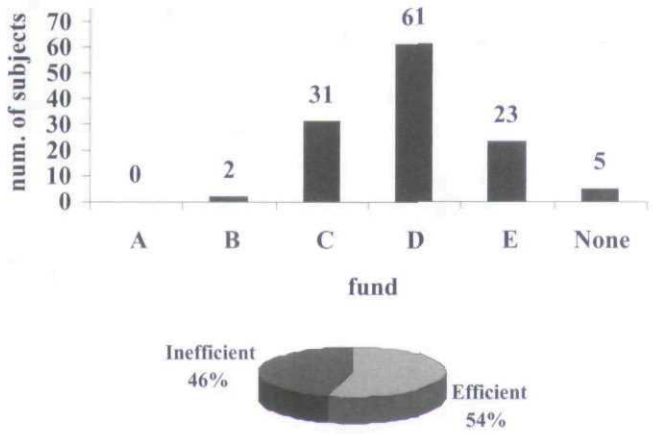
The subjects' choices in task 1 are summarized in Exhibit 5 and in the first line of Exhibit 6. As only fund D and combinations of fund D with the risk-free asset (or 100% in the risk-free asset) are efficient choices in task 1, Exhibit 5 reveals that 56 of the 122 choices made were inefficient; that is, almost half of the choices were suboptimal. (The category "none" refers to an investment of 100% in the risk-free asset.)

The first line in Exhibit 6 separates the practitioners' choices and the students' choices. Both groups make many inefficient choices. Perhaps surprisingly, the practitioners made a few more wrong choices than the students.

The economic cost induced by the inefficient choices is quite significant. For example, subjects who chose fund C could instead have borrowed $5,786 and invested $15,786 (their $10,000 plus the borrowed money) in fund D. Doing so results in a portfolio with a standard deviation of 13.15% (the same as fund C), but an average

EXHIBIT 5

Investment Choices in Task 1



return of 13.84% (1.24 percentage point more than fund C).[6] Similarly, subjects who chose fund E could have chosen fund D and with homemade leverage could have obtained a portfolio with a standard deviation of 17.17% (the same as fund E) but an average return of 16.54% (2.54 percentage points more than fund E). Thus, the errors made by many of the subjects imply a cost of about 1 to 3 percentage points in risk-adjusted average returns, which is very significant economically.[7]

The results in task 1 by no means occur because subjects make random choices. If choices were random, each fund would be selected by roughly the same number of subjects, while Exhibit 5 reveals a very different picture. Indeed, statistical analysis strongly confirms this observation. While the most popular funds are C, D, and E, funds A and B are almost completely ignored.

We test whether the subjects filled out the questionnaire randomly by using a chi-square goodness-of-fit test. To illustrate, in task 1, for example, the subjects had to choose one of five mutual funds or else invest 100% in the riskless asset. If the subjects select the asset randomly, we would expect on average $122/6 \cong 20.33$ subjects to choose each fund.[8] With the observed choices and the expected number of choices of each fund, we use a goodness-of-fit test with five degrees of freedom. Exhibit 7 reports the results.

In all four tasks, the sample statistics are substantially higher than the corresponding critical values, so we can clearly reject the hypothesis that the subjects made a random choice.[9] Thus, even though there was no financial reward or penalty in our experiment, the subjects made choices according to their preferences, and did not complete the questionnaire randomly.

According to Exhibits 5 and 7, the subjects appear to have given some thought to their choices, but many of them simply did not realize the possibility of obtaining a superior portfolio (remember they were given fund parameters as in Exhibit 1, but not shown these parameters graphically as in Exhibit 2). The inefficiency also does not arise because the subjects ignored the opportunity to borrow or lend at the risk-free rate, as 84% did employ the risk-free asset (22% were borrowers and 62% were lenders). The first graph in Exhibit 8 provides the distribution of investments in the risk-free asset in task 1. The inefficiency of the choices in task 1 is a discouraging finding, with strong negative implications for economic and financial theory, especially because we see inefficiency in both financial practitioner and business school student choices. Yet while almost half of the subjects fail to choose efficiently in task 1, the failure is not a result of a severe irrationality, but rather seems to stem from an inability to integrate cash flows and to use homemade leverage effectively. When this integration problem is alleviated in task 2, we find that almost all of the choices made are efficient.

Exhibit 9 and the second row in Exhibit 6 report the results in task 2, and reveal that 98% of the choices made there *are* efficient.[10] Thus, when we introduce mixed funds, which do the leveraging for the subjects, it is much easier for subjects to identify the superior alternatives. Recall, however, that these superior alternatives were also available to the subjects in task 1 (before the introduction of funds F-I), because the subjects could have borrowed themselves. Hence, the mixed funds perform an impor-

EXHIBIT 6

Efficient and Inefficient Choices by Subject Category

	All Subjects (122)		Practitioners (58)		Students (64)	
Task	Efficient	Inefficient	Efficient	Inefficient	Efficient	Inefficient
1	54%	46%	45%	55%	63%	37%
2	98%	2%	97%	3%	100%	0%
3	30%	70%	38%	62%	23%	77%
4	65%	35%	64%	36%	66%	34%

EXHIBIT 7

Chi-Square Test of Random Choices

Task	Chi-Square Sample Statistic	Degrees of Freedom	Critical value (p = 0.1)
1	139.2	5	15.08
2	161.3	9	21.66
3	122.3	5	15.08
4	98.3	9	21.66

tant role by helping the subjects reach efficient choices.

Similar results in a different context are reported in Benartzi and Thaler [1999]. When the subjects in Benartzi and Thaler's experiment had to choose repeated plays of 100 bets, 50%, 43%, and 75% of the three groups of subjects elected to do so. When the explicit distributions of the repeated plays were presented to the subjects, the corresponding figures are 83%, 90%, and 86%. Thus, the subjects found choices difficult in complicated cases, and helping them to process the same set of opportunities significantly changes their choices.

Note that in Benartzi and Thaler, calculating the distributions of the 100 repeated plays is quite complicated, which may explain their results. In our case, only a mix of the riskless asset and the risky asset is involved, yet helping the subjects to perform this mix affects their choices tremendously.

In practice, fund performance is often reported in terms of raw historical returns, rather than by the means and standard deviations of these returns. Tasks 3 and 4 shed light on the effect this has on subjects' choices. In tasks 3 and 4, the subjects were not given the funds' means and standard deviations, but rather a set of historical returns for each fund (with mean and standard deviation the same as in tasks 1 and 2); they had to estimate the means and standard deviations themselves.

In these two tasks, the subjects were told that the next return (their profit or loss) would be drawn at random and independently from the same normal distribution that produced the historical returns. Thus, the rates of return for each fund are independent and identically distributed over time (iid).

The subjects can simply look at the returns and make their choices, or they can estimate the means and variances, obtaining the same parameters as in tasks 1 or 2. They might not believe or might not understand the iid property. Also, in tasks 1 and 2 the subjects observe only means and variances, so using decision weights rather than objective probabilities is irrelevant (see Kahneman and Tversky [1979] and Tversky and Kahneman [1992]). In tasks 3 and 4, however, it is possible that decision weights might be used, inducing more inefficient choices.

If subjects believe the iid property and perceive randomness correctly, they assign a probability of 0.2 to each observation and face a symmetrical distribution, in which case decision weights are unlikely to affect choices (see Quiggin [1982] and Viscusi [1989]). If subjects misperceive randomness and attach disproportionate importance to short-run development, however (in our case to returns in the last one or two periods), we would expect the choices in tasks 3 and 4 to be substantially different from the choices in tasks 1 and 2 (because in tasks 3 and 4 the rates of return are given as a time series).

For evidence of disproportionate importance attached to the short run, see Arrow [1982], De Bondt and Thaler [1985], Chevalier and Ellison [1997], and Levy and Levy [2004]. For a review of misperception of randomness and decision weights, see Camerer [1995]).

No matter what decision-making process took place, there is no doubt that the choices in tasks 3 and 4 are more complicated and more confusing to both student subjects and the more experienced practitioners. Tversky and Kahneman [1981] and Benartzi and Thaler [1999] show that even a little complexity may dramatically increase the percentage of errors made by subjects. This is exactly what happened in our experiment; there is a much higher percentage of inefficient choices in tasks 3 and 4 than in tasks 1 and 2.

The last two rows in Exhibit 6 and Exhibits 10 and 11 report the subjects' investment choices in tasks 3 and 4. As expected, adding this source of complexity to the investment problem reduces the proportion of efficient choices. In task 3, which is the parallel of task 1, the percentage of efficient choices is reduced from 54% to 30%. Then, when the mixed funds are introduced in task 4 we again see a dramatic increase in efficiency to 65%. Thus, even when only historical returns are provided, the introduction of efficient mixed funds, which perform the leveraging for the investors, greatly increases the efficiency of investment choices.

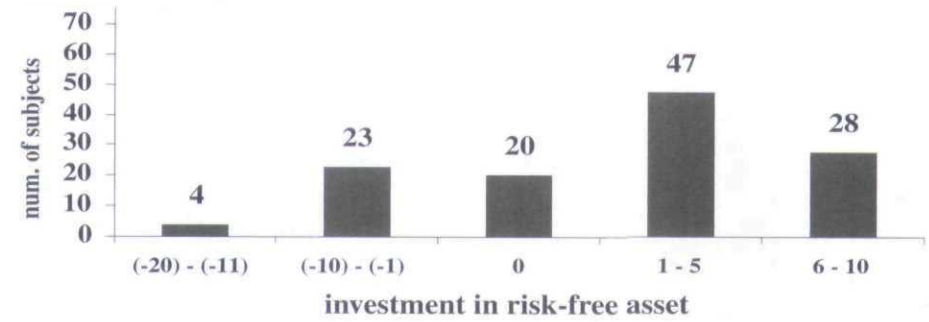
In tasks 1 and 2, the inefficient choices are made just because subjects fail to integrate cash flows from the risky and riskless assets. In practice, though, investors see historical rates of return of mutual funds (or of stocks) given as a time series, exactly as in tasks 3 and 4. They must make decisions based on such returns, as in the second part of our experiment.

Thus, in practice, there may be a relatively high percentage of inefficient choices, because investors may mis-

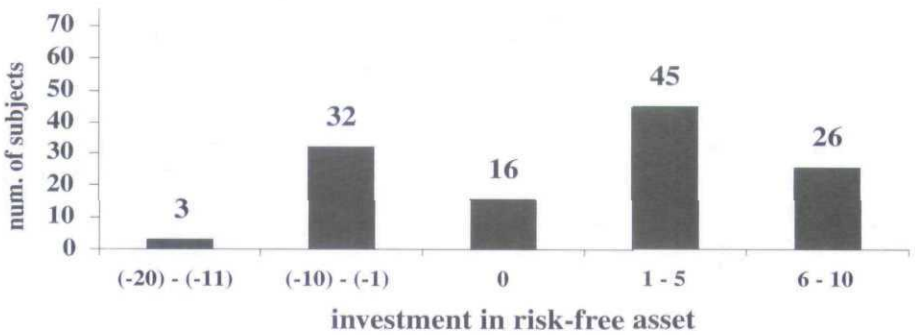
EXHIBIT 8

Investment in the Risk-Free Asset (in thousands)

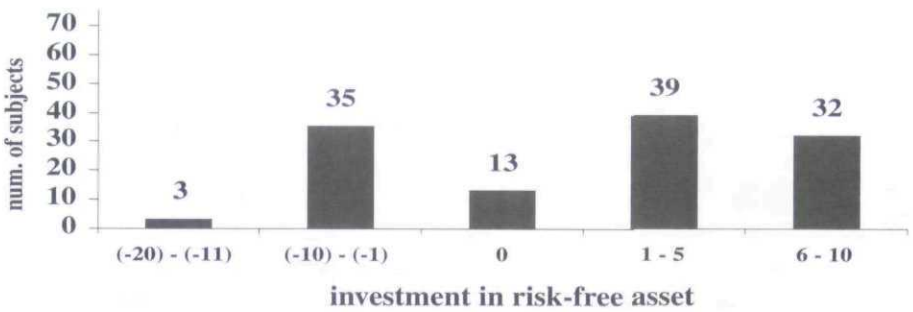
a. Task 1



b. Task 2



c. Task 3



d. Task 4

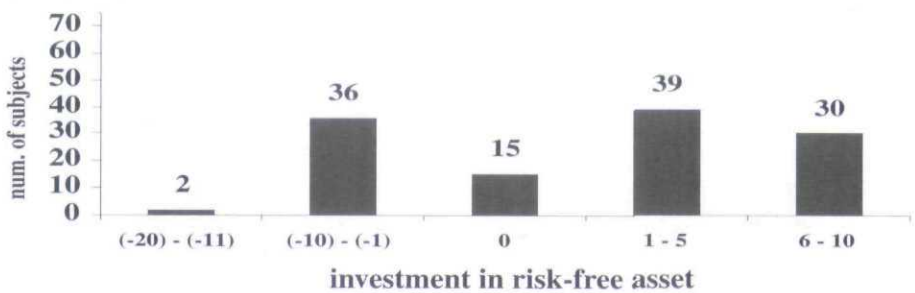


EXHIBIT 9
Investment Choices in Task 2

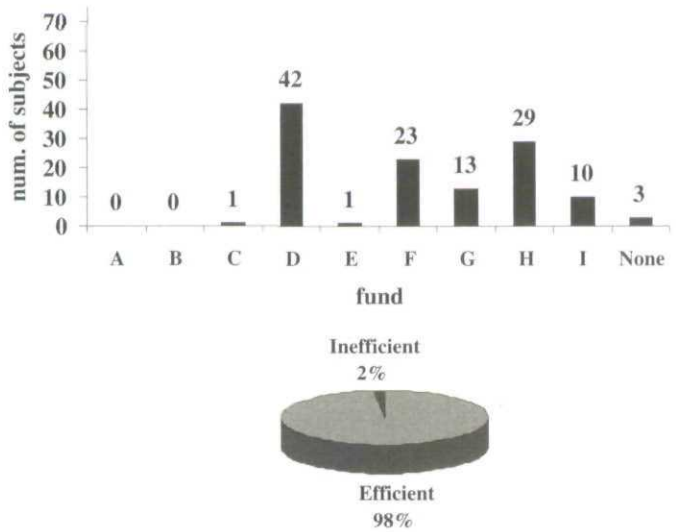
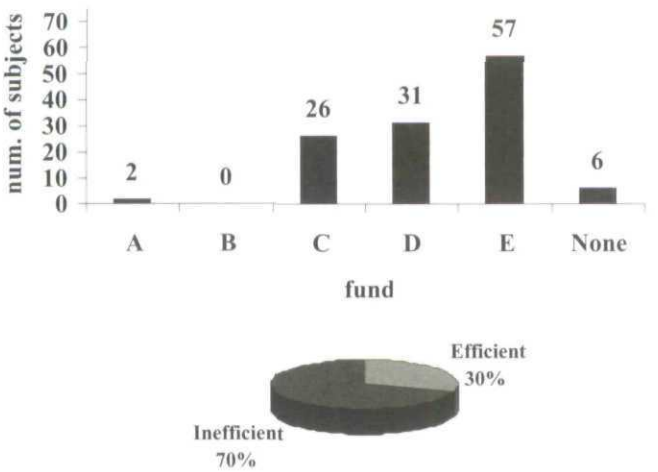


EXHIBIT 10
Investment Choices in Task 3

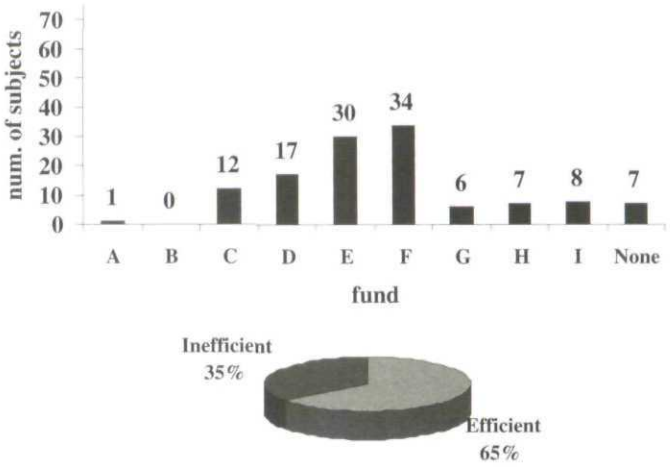


perceive randomness, employ decision weights, *and* fail to integrate cash flows induced from these returns combined with the riskless asset. With a wide spectrum of mixed funds that use leveraging by various means, however, there is a much lower percentage of inefficient choices; 65% of the subjects select efficient portfolios in task 4.

CONCLUSION

One of the fundamental ideas in finance is that investors do not need the help of fund managers or firm CEOs in deciding on the degree of leverage (or amount

EXHIBIT 11
Investment Choices in Task 4



in the riskless asset) in their portfolios. By using homemade leverage, they can increase borrowing or undo borrowing set by management, so managers should not be concerned with the degree of leverage in their fund. This idea is key to basic financial models such as the CAPM and Modigliani and Miller's theory of capital structure.

Can investors really use homemade leverage effectively in constructing their portfolios? We examine this question in our experiment. Even under ideal conditions, when we neutralize misperception of randomness and decision weights, we find 46% of the subjects fail to use homemade leverage in order to achieve efficient portfolios—and there is no substantial difference between the choices of practitioners or students. When we introduce mixed funds, which do not rely on investors to employ homemade leverage but leverage the risky asset for them, only 2% of choices are inefficient.

When historical rates of return are given instead of means and variances, the choices are more complicated, and misperception of randomness and decision weights may affect them. Here there is a higher percentage of inefficient choices. Even in this case, though, we achieve a dramatic increase in efficiency with the introduction of mixed funds. Thus, while subjects generally choose efficiently in relatively simple situations, many of them fail to do so when they are required to employ homemade leverage.

Tversky and Kahneman [1981] show their subjects fail to integrate cash flows from two random variables, and most of them select the inferior portfolio. Our results are even more discouraging from an economic point of view, because our integration of cash flows is much simpler (one risky asset and one riskless asset). The subjects in our study

moreover are business school students and financial practitioners. The practitioners are investors who make actual investment decisions very similar to those in our experiment every day; they should be well-trained in such tasks.

Our overall results imply that fund managers should not rely on investors' ability to use homemade leverage, and that they *should* carefully consider the leverage of their funds. Mixed funds, which mix equity portfolios with the risk-free asset, are theoretically superfluous in a perfect world where investors can employ leverage effectively. In the real world, however, because investors find it hard to integrate cash flows, mixed funds play an important role in helping them achieve efficient portfolios.

Our results also imply that in practice the capital structure of a firm can influence its value, even in a perfect world with no transaction costs, no corporate taxes, and no bankruptcy costs, contrary to Modigliani and Miller's theoretical results. The managers of a firm can increase the firm's value by selecting a capital structure that produces a return distribution investors find attractive. Since most investors are incapable of employing homemade leverage effectively, the task of determining capital structure is left to the firm.[11]

Finally, these results have some implications for the structuring of defined-contribution pension plans. As a tremendous amount of capital is invested in these plans, it is extremely important to structure them so as to reduce inefficient allocations of resources as much as possible.

Benartzi and Thaler [2001] show that the investment choices of pension plan participants are greatly affected by the menu of funds suggested to them. Many investors naively diversify between the funds offered, and may not choose the bond-equity mix that fits their actual preferences.

The menu offered affects not only investor choices *among efficient funds*, but also the *efficiency* of investor choices. These are separate problems, but the solution to both problems may be the same. Plans could offer participants a menu of several *efficient mixed* funds with different degrees of leverage, and could induce participants to choose only one of these funds, as in Chile. Such a plan structure might solve both the naive diversification problem and the inefficiency problem when investors are required to use homemade leverage.

ENDNOTES

The authors gratefully acknowledge the financial support of the Krueger Center of Finance and the Zagagi Fund.

[1]We use the term *homemade leverage* to indicate general mixing of a risky asset with the risk-free asset by the investor. This may involve either borrowing at the risk-free rate (increasing leverage) or investing in the risk-free asset (undoing leverage).

[2]If the homogeneous expectations assumption also holds, and some of the funds hold the market portfolio (e.g., index funds), the ability to choose funds efficiently also implies a CAPM equilibrium.

[3]Note that mutual funds can typically invest some percentage in bonds but cannot borrow money to directly lever themselves. They can invest in levered stocks, however (and hence create the leverage indirectly), or invest in derivatives, which induces a leverage effect.

[4]Recall that the expected return and standard deviation of a portfolio with proportion x in a risky asset, with mean $\overline{R}$ and standard deviation σ, and proportion $(1 - x)$ in the risk-free asset r are: $\overline{R}_p = (1 - x)r + x\overline{R}$ and $\sigma_p = x\sigma$.

[5]For example, Kroll, Levy, and Rapoport [1988] report that when a reward is involved but not a penalty, subjects take extremely levered positions. In a similar experiment where subjects could lose out-of-pocket money, they behave very differently and are net lenders (see Kroll and Levy [1992]).

[6]The expected return of a portfolio with a proportion of 1.578 in fund D and a proportion of –0.578 in the risk-free asset is: $(1.578 \times 10.6\%) + (-0.578 \times 5\%) = 13.84\%$.

[7]Of course, the cost to the subjects who choose funds A or B is even greater.

[8]There are six categories including an investment of 100% in the risk-free asset.

[9]The chi-square statistic is:

$$\chi^2_{(n-1)} = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

where $n - 1$ is the number of degrees of freedom, n is the number of categories, O_i is the observed number of choices in each category, and E_i is the corresponding expected value.

[10]As there are more efficient choices in task 2 than there are in task 1, even if the subjects chose randomly the proportion of efficient choices would be expected to be higher in task 2. Even this, however, does not come close to explaining the 98% of efficient choices. The distribution of choices also reveals that choices are clearly not random (*see Exhibits 7, 9, 10, and 11*).

[11]If there are two firms with perfectly correlated cash flows that are identical except for their capital structure, it is sufficient to have *one* rational investor who can short one firm and invest in the other to obtain Modigliani and Miller's results. In practice, however, such an arbitrage situation never exists, and rational investors will not necessarily be able or willing to drive firm prices to the Modigliani and Miller equilibrium. Thus, a firm's values can depend on leverage through a clientele effect. Note that the CAPM is not an arbitrage model. It is therefore necessary for all investors to employ homemade leverage rationally for the CAPM to hold.

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