Mutual Funds, Part II: Fund Flows and Security Returns

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This study is the second in a two-part analysis of the mutual fund industry. The first part (Fortune 1997, referred to here as "Part I") examined the basic structure of the industry and discussed the historical relationship between mutual fund flows and returns on both short-term and long-term financial instruments. That study ended with a discussion of the role that momentum investing by mutual fund shareholders—buying in rising markets, selling in declines—might play in destabilizing financial markets. This study begins where Part I ended. The goal is to assess the historical evidence to see whether the interactions between mutual fund inflows, redemptions, and security prices are potentially destabilizing.

Any analysis of the effect of mutual funds on financial stability should, in principle, be a comparative analysis in which performance of a financial system with mutual funds is compared to performance of a system with only direct ownership of securities. If we knew the structure of financial markets and the behavior of economic agents in each world, we could examine the effects of shocks on asset prices and financial flows, allowing us to determine whether specific asset markets are more or less disturbed by specific shocks in the "mutual fund" and "*sans* mutual fund" worlds.

While some physicists subscribe to the "many universes" view of quantum theory, we do not have access to data from any universe other than our own. Our data come from a history in which mutual funds evolved in response to pressures inducing the decline of traditional financial institutions. Mutual funds played a very small role until the 1970s, before which ownership of financial instruments was dominated by commercial banks, thrift institutions, insurance companies, and pension funds. A comparison of financial market performance in that earlier world with performance in the modern financial system might shed some light on our fundamental question: Do mutual funds add to or reduce financial market volatility? But the results will not be definitive, for the financial system of the 1990s is not simply the system of the 1970s with more mutual funds. Much else has changed. Evolution in financial laws and regulations, increasing global interactions, the rise of new financial instruments, major shifts in the structure and nature of financial institutions, and a change in the locus of risk-bearing from institutions to individuals have also shaped investors' decisions. Because we have no way to compare a world with direct investments with one having pooled investment opportunities, we must resort to analysis of the world as it is, using historical information to make inferences about the connection between financial stability and mutual funds.

The first section of this study addresses some issues of shareholder behavior. Generalizations, or "stylized facts," about the sources of variation of flows into mutual funds are examined; factors relevant to shareholder redemption are reviewed; and differences between direct ownership and pooled ownership of securities are discussed. The second section reports the results of our econometric assessment of the interactions between security returns and mutual fund flows. The third section simulates our model to trace out the effect of shocks to security returns and fund flows over a 24-month period. The final section summarizes the paper.

I. Some Issues of Mutual Fund Shareholder Behavior

Historical Evidence

The analysis of mutual fund flows in Part I argued that the historical record supports several propositions about redemptions. Figures 1 through 4 provide support for two of these propositions. These figures, based on monthly Investment Company Institute data using the mutual fund classification reported in Box 1, show gross new money, net new money, and redemptions (all measured as percentages of net assets) for money market, bond, equity, and bond & equity funds.

First, the primary source of cyclical variation in net new money flowing into mutual funds is not shareholder redemptions. Rather, it is changes in gross new money—new shares sold plus net exchanges into a fund. This suggests that discussions of mutual fund exposure to fund outflows have placed too much emphasis on redemptions, and too little emphasis on the sources of variation in gross new money. Except in the case of money market mutual funds, redemptions are a small and stable share of net assets, punctuated with brief spikes.

Second, the mutual fund industry has rarely faced periods of net outflows of money that would force sales of financial assets. At bond funds, net new money was negative in 1987 and throughout 1994, both periods of rising interest rates and declining bond prices. At bond & equity funds, the period from the October '87 crash through late 1988 shows net outflows, but at other times only small and very temporary net outflows occurred. Equity funds experienced net outflows in a number of months prior to 1991, October '87 through 1988 being the most serious, but no net outflows after 1991. The infrequency of net outflows in the 1984–97 period is consistent with the longer-term perspective in Rea and Marcis (1996): From 1942 to 1995, they report, equity mutual funds showed significant net losses of funds only during the 1970s, when stocks performed poorly, and in the late 1987 to early 1989 period.

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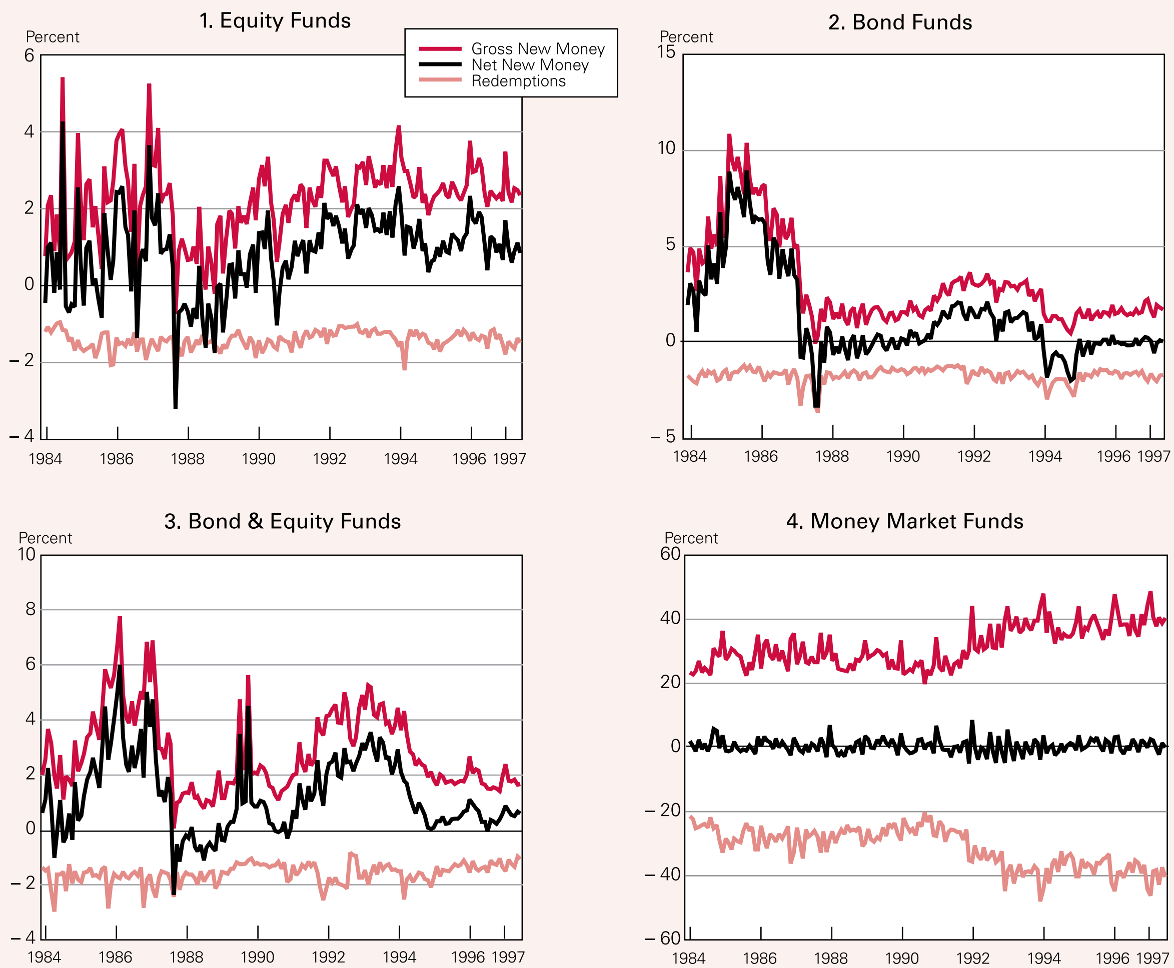
A third proposition demonstrated in Part I is that flows into both bond and equity funds are positively correlated with the contemporaneous price appreciation in those funds: When stock or bond prices are rising, flows into the respective funds increase; when security prices are falling, inflows decline or outflows occur. This is consistent with positive feedback, or momentum investing, a behavior that might exaggerate market movements. It is also consistent with other hypotheses, for example, the hypothesis that fund flows are directly related to the rate of return on the securities they hold, or the hypothesis that fund inflows directly affect rates of return. We will address the momentum investing argument in some detail. It should be noted that momentum investing, should it occur, is not limited to mutual funds; direct investors might also behave this way, although less evidence is available to demonstrate it.

Figures 1, 2, 3, and 4

Redemptions and New Money

Percent of Net Assets, January 1984 to June 1997



Source: Investment Company Institute.

Shareholder Profile

As discussed in detail in Part I, much attention has been given in the press and in the industry to the "shareholder profile" as a factor affecting mutual fund flows. One school of thought argues that the large recent inflows to mutual funds have come from investors who are less sensitive to market conditions than earlier shareholders. Particular emphasis is placed on the increased use of mutual funds for retirement purposes, through Individual Retirement Accounts (IRAs), defined contribution pension accounts like 401(k) and 403(b) accounts, and variable annuities. According to Reid and Crumrine (1997, Table 7), at year end 1996 about 35 percent of all net assets of mutual funds were held for retirement accounts. During 1996 retirement's share of net new money at mutual funds (excluding price appreciation) was about 26 percent for all mutual funds, but it was considerably higher for the Investment Company In-

Box 1: Types of Mutual Funds

The Investment Company Institute identifies 22 groups of open-end mutual funds, according to the objectives outlined in the prospectus. This box describes those groups and shows how they have been aggregated for this study into five groups: equity, bond & equity, bond, money market, and excluded. The latter group is excluded from this study because its assets are unique. The ICI data exclude closed-end funds, unit investment trusts, and hedge funds.

Equity Funds	Investing primarily in common stocks with the goal of long-term growth
Aggressive Growth	Maximum appreciation with no concern for current income
Growth	Capital appreciation with some concern for current income
Growth and Income	Capital appreciation and steady current income
Equity-International	Capital appreciation from non-U.S common stocks
Equity-Global	Capital appreciation from both U.S. and non-U.S. common stocks
Bond & Equity Funds	Investing in a mix of common stocks and long-term debt with the goal of achieving both long-term growth and income
Equity-Income	High income from common stocks with history of continuous dividends
Flexible Portfolio	Stocks, bonds, and liquid assets varying with market conditions
Balanced	Capital appreciation, current income, and stability of principal
Income-Mixed	High current income from both stocks and bonds
Bond Funds	Investing in long-term bonds with the primary goal of income
National Municipal	Municipal bonds issued by any or all states
State Municipal	Municipal bonds issued by specific states
Income-Bond	Mixture of corporate and government bonds
Government	U.S. Treasury securities
GNMA	Mortgage securities backed by Government National Mortgage Association
Global Bond	Bonds of both U.S. and non-U.S. issuers
Corporate Bond	Diversified portfolio of corporate bonds
High-Yield Bond	Maintain at least ⅔ of assets in non-investment-grade corporate bonds
Money Market Funds	Investing in short-term, highly liquid securities
Tax-Exempt, National	Short-term obligations of state and local governments
Tax-Exempt, State	Short-term obligations of state and local governments within specific states
Taxable	Short-term obligations of U.S. government and corporations
Excluded	Reported by ICI but excluded from this study
Precious Metals	Securities of firms engaged in producing and distributing precious metals
Option/Income	These were redesignated as income-equity funds in January of 1992.

stitute's "bond and income" funds (83 percent) than for equity funds (25 percent) or money market funds (22 percent). The long-term perspective of retirement investors is often cited as a reason to believe that shares in mutual funds have become more stable over time. If so, this stability should be most pronounced at our "bond & equity" funds.[1] Figure 3 does, in fact, show greater stability of net new money at those funds since 1990.

However, there are counter arguments. Almost all observers agree that institutional money—held by fiduciaries, insurance companies, and pension funds—is insensitive to short-term market fluctuations. This shift toward individually managed retirement funds has been at the expense of traditional

[1] The Investment Company Institute's "bond and income" group is our "bond & equity" group excluding global bond funds, which the Institute places in its "equity" fund group.

pension funds, as defined-benefit pension plans administered by institutions have given way to defined-contribution plans in which the employee has the power to reallocate his retirement portfolio. The deinstitutionalization of retirement money management might make the average retirement dollar less stable even while increasing the stability of the average mutual fund dollar. In short, even if mutual funds have become more stable, financial markets might have become less stable with the growth of mutual funds.

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The hypothesis that the stability of the average retirement dollar has increased is also undermined by the access employees have to information about their retirement money and by factors that make it less costly to reallocate retirement portfolios. For example, the ability to exchange funds within a defined-contribution plan, with no transactions charges or capital gains tax liability, has made defined-contribution plans an even easier way to carry out portfolio shifts than either direct investment or mutual funds held for non-retirement purposes.

Almost no empirical evidence is available on asset switching by employees in defined-contribution plans. One report by Hewitt Associates, a defined-contribution pension plan manager, indicated that during the very brief decline in the stock market in July of 1996 active switching out of equity funds occurred at its 401(k) plans between July 11 and 17. The magnitude of the switching—about 0.6 percent of net assets—was slightly more than the magnitude reported for all equity funds during the same period.[2] This report suggests that 401(k) money in equity funds is *less* stable than the average equity fund dollar.

Can Mutual Funds Mimic Direct Investments?

Is security ownership through mutual funds somehow different from direct ownership? Should we expect the sensitivity of trading by direct investors to market conditions to be different from the sensitivity of mutual fund shareholders? In this section we show that any direct investor's portfolio can be replicated by a mutual fund investor if both can invest in the same instruments. In the next section we present some reasons why direct and mutual fund investors might behave differently.

Consider two investors, each with the same asset allocation and with $100,000 in assets. Investor D holds assets directly, placing 10 percent in cash, 40 percent in bonds, and 50 percent in stocks. Investor M holds 10,000 shares, or 1 percent of the 1 million outstanding shares of a mutual fund. The mutual fund's net assets are $10 million, so the net asset value is $10 per share. Investor M's asset allocation mimics Investor D's, with 10 percent in cash, 40 percent in bonds, and 50 percent in stock.

Now suppose that, in response to new information, each investor decides to reduce the share in stocks by 10 percentage points, investing the proceeds in cash. Investor D sells 10 percent of his holdings of stocks ($5,000) and holds the proceeds in cash. His new portfolio is $15,000 in cash, $40,000 in bonds, and $45,000 in stocks, an asset allocation of 15 percent cash, 40 percent bonds, and 45 percent stocks.

Investor M is easily able to replicate Investor D's reallocation. Recalling that each of Investor M's original 10,000 shares is a claim to $1 cash plus $4 bonds plus $5 stocks, he must sell 1,000 mutual fund shares if he is to reduce his holdings of stock from $50,000 to $45,000. He will receive redemption proceeds of $10,000, of which he will reinvest $4,000 in directly held bonds and the remaining $6,000 in cash. His new portfolio has $15,000 in cash ($6,000 direct, $9,000 via the fund), $40,000 in bonds ($4,000 direct, $36,000 in the fund) and $45,000 in stocks (all through the fund). After the reallocation both investors hold 15 percent in cash, 40 percent in bonds and 45 percent in stocks.[3]

[2] See *Wall Street Journal*, "Market Bumps Rattle Nerves at 401(k)s," August 23, 1996, and *Wall Street Journal*, "Mutual Fund Withdrawals Up Sharply," July 20, 1996.

[3] The assumption of an across-the-board sale of securities to finance redemptions is reasonable because, in the long run, portfolio managers will set asset allocation goals that are not altered by

Why Should Mutual Fund Shareholders Be Different?

Investors in mutual funds might be different from direct investors for several reasons. First, direct investors have more investment alternatives than mutual fund investors because direct investors are typically wealthier and face lower transactions costs. Mutual funds allow investors to hold a broad range of assets in a diversified portfolio and to reap the benefits of professional management while enjoying economies of scale. The investors to whom mutual funds are most advantageous are those with relatively small financial net worth and with less confidence in their financial acumen. Direct investors, on the other hand, are more likely to be able to achieve the benefits of economies of scale, professional management, and diversification on their own.

Redemptions might move the portfolio of a mutual fund toward greater leverage and toward less marketable securities, giving all mutual fund investors an incentive to redeem in larger amounts than simple asset allocation would require.

Second, current orthodoxy appears to attribute more farsightedness and a better understanding of short-term security price cycles to more sophisticated investors. This would suggest that the mutual fund investors might respond to short-term market conditions and therefore trade more frequently, and that they might be more subject to swings in "animal spirits" that encourage them to overreact to new information.

A third factor affecting the behavior of mutual fund investors is that mutual funds might face a financial analog of the classic "Problem of the Commons," a problem arising from each shareholder's awareness that other shareholders have incentives to behave in ways that harm him. The Problem of the Commons is that when numerous economic agents have access to a limited resource, each knows that other agents will use too much of the resource in the short run, leaving too little available to him for future use. The result is that every agent uses too much in the short run. This has been applied to water supply use and to the extraction of depletable natural resources to demonstrate how common ownership without individual limits results in a too-rapid extraction of the natural resource. It also helps to explain bank runs and runs on commodities during periods of shortage. A potentially important, but hitherto untested, hypothesis is that each mutual fund shareholder has an incentive to redeem quickly if the volume of redemptions affects the quality of the fund. Delay means that other shareholders might redeem, forcing the slow redeemer to accept a loss in quality. We call this the "rapid redeemer incentive."

Again consider investors D and M, holding identical portfolios, one directly and the other through a mutual fund. Once again, each holds 10 percent in cash, 40 percent in bonds, and 50 percent in stocks. A general decline in stock prices has induced both investors to shift from stocks to cash. Investor M will redeem shares to achieve his new asset allocation, as described above. However, as mutual funds experience redemptions they are unlikely, at least in the short run, to pay the redeemer by selling an equal proportion of all securities. Rather, they might follow a financial pecking order, first drawing down their cash assets, then drawing on their lines of credit with banks, and finally selling securities. If they sell securities, they might "cherry pick," selling the most marketable securities first.

The implication of this pecking order is that redemptions might change the characteristics of the mutual fund, moving the portfolio toward greater leverage and toward less marketable securities having wider confidence intervals for prices and higher bid-ask spreads. Investor M, anticipating the decline in quality resulting from redemptions by others, has an incentive to redeem shares, not because he is unhappy with the asset allocation but because he does not want to hold a portfolio with more leverage and less quality.

All mutual fund investors have an incentive to redeem in larger amounts than simple asset reallocation would require, just as each farmer has an incentive to use more water than the long-term inter-

temporary cash flows. Thus, even if, in the short run, the manager pays for redemptions by drawing down his cash position, he will eventually sell securities to replenish his cash and to restore the original portfolio shares.

ests of all farmers drawing on a water aquifer would dictate. By doing so, rapid redeemers exit from the fund with cash, leaving the remaining shareholders with more leverage, less liquidity, and, perhaps, less marketability.

II. Review of the Literature

A short academic literature can be found on the dynamic interaction between security returns and mutual fund flows. This literature focuses on questions important to this study: Is "momentum trading," either direct or indirect via mutual funds, rational? Do mutual fund flows respond to either contemporaneous or lagged security returns? Do security returns respond to contemporaneous or lagged mutual fund flows, and, if they do, is there a positive feedback effect in which a shock to security returns can affect flows, which then affect returns, and so on?

Momentum Trading

The hypothesis of momentum trading by mutual fund shareholders has received considerable attention in recent years. A recent best-selling book for amateur investors, *The Motley Fool Investment Guide* (Gardner and Gardner 1994), proposes that investors should select stocks according to a number of criteria, among which is "relative strength," defined as the stock's position in the distribution of price increases during the previous year. A relative strength of 95 (the 95th percentile) or better is necessary to meet the Motley Fool test.

Momentum investing is predicated on an upward-sloping demand curve, typically attributed to "elastic" expectations. If momentum trading is not rational, it will soon die out as those who use it discover that they are buying high and selling low. But if momentum trading is rational, it can be chronic and might destabilize security prices, as demand for stocks will increase when an upward shock to stock prices occurs. Several studies bear on the rationality of momentum investing.

An axiom of basic finance theory is that stock prices are based on information about the firm's future. If so, the demand curve for stock should be horizontal—an increase in one investor's demand for reasons unrelated to the firm's prospects will lead other investors to sell at the prevailing price because their assessment of the value of the firm's stock has not changed. Schleifer (1986) examined movements in prices of stocks that were newly included in the S&P 500 Index, arguing that Standard & Poor's reasons for including a firm in the Index are independent of the firm's performance, so inclusion carried no information about the firm's prospects. Schleifer finds that the price of a firm's shares increases at the time of the announcement that they will be included in the S&P 500, and that this increase lasts for about 10 days. The conclusion is that the demand curve for stocks is downward-sloping, not horizontal, because any investor buying as a result of the inclusion must pay a higher price to induce sellers to hold fewer shares. This provides a basis for momentum investing even when there is no new information about the firm. For example, a "noise trader," who buys on whim rather than on information, can push a stock's price up, leading momentum investors to see a buying opportunity.

A motive for momentum investing can also arise from incomplete reaction to new information. Davidson and Dutia (1989) analyzed all AMEX and NYSE firms from 1963 to 1985 in an effort to determine whether investors overreact or underreact to new information. Overreaction should induce a negative serial correlation among stock returns: Investors who respond to good information by driving the price up too much should experience a subsequent decline in prices as fundamental relationships are restored. Underreaction should induce a positive serial correlation, encouraging investors to buy during days following price increases and sell after price decreases. Davidson and Dutia found a positive serial correlation using annual data; that is, unusually good (poor) returns in one year are followed by unusually good (poor) returns in the next year. This indicates a significant persistence in rates of return, supporting investor underreaction to new information and providing a long-term rationale for including momentum as a criterion in stock selection.

The Davidson-Dutia study applied to stock prices, hence it was relevant for both direct and mutual fund investors. A well-known study of relative persistence in mutual fund returns reaches the same conclusion for mutual fund investors. Hendricks, Patel, and Zeckhauser (1993) analyzed the quarterly performance of over 150 growth-oriented, no-load, open-end equity funds between 1974 and 1988, finding a statistically significant and positive serial correlation in mutual fund returns over a four-quarter horizon: Unusually good (poor) performance in the past four quarters was followed by unusually good (poor) performance in the subsequent four quarters.

Once again, performance shows a strong persistence, a persistence that is both statistically and economically significant. A shareholder who assessed his portfolio quarterly and selected randomly among those mutual funds in the top octile (top 12.5 percent) of recent performance would have earned an annual return about 1 percent per year greater than the median mutual fund with the same level of systematic risk.[4]

Warther (1995), in a widely cited study using the Investment Company Institute's monthly data for January 1984 to June 1993, with slightly different fund groupings than we employ, decomposed net new money inflows into expected and unexpected components. Expected fund flows are defined as a function of past flows into the same fund group, and unexpected fund flows are defined as the residual from the expected flow regression. Warther finds that unexpected money inflows to equity funds are positively correlated with current-month returns on common stocks, that unexpected money inflows to bond funds are positively correlated with current-month bond returns, and that both correlations are statistically significant. This result is consistent with three alternative hypotheses. The first is that momentum investing is present in the short run, with investors buying more of a mutual fund in a month when the prices of the securities it holds rise. The second hypothesis is that a feedback is present in which a rise in demand for mutual fund shares induces an increase in the prices of the securities the fund holds; that is, fund flows "cause" changes in security prices. The third hypothesis is that both fund flows and security returns respond directly to a third factor. For example, if investors become more optimistic about stocks, they will bid up stock prices through direct investments and also increase their purchases of mutual fund shares.

Momentum investing can be a relatively short-lived phenomenon, for example, a rule of "buy now if stocks are rising," or it can be longer-lived, looking to performance in past periods as a guide to the future. In the first case there should be a direct correlation between fund inflows and returns on the securities owned by the fund ("own-returns"), as found by Warther. In the second case, there should be a persistence in returns, as found by Davidson and Dutia, and by Hendricks et al. We return to the question of persistence later.

[4] Transaction costs were not considered, but the sample of funds included only no-load funds.

The "Causal" Connection between Fund Flows and Security Returns

This study is concerned with the implications of security returns for mutual fund flows, and with the possibility of a reverse transmission from mutual fund flows to security returns. In short, we would like to know whether security price changes "cause" fund flow changes, fund flow changes "cause" security price changes, or causality works in both directions. The notion of causation is inherently slippery, and economists often use a particular definition called "Granger causation," in which the direction of causation is synonymous with the existence of a lead or lag relationship (see Box 2). Variable A is said to "Granger-cause" variable B if past values of A contain information useful in forecasting B. Variable B is said to Granger-cause variable A if past values of B contain information useful in forecasting A.

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Granger causation is, therefore, determined by whether a variable is useful in predicting another variable, and not necessarily by whether a variable "causes" another in a philosophical sense. In fact, variable A might well Granger-cause variable B even though B philosophically causes A. For example, significant wage increases often precede inflation, so that wage rate changes Granger-cause inflation. But if economic agents are forward-looking, they will form expectations of future prices and the wage rate increase achieved now might reflect the correct anticipation of future price increases. Future inflation "causes" current wage increases but wage increases Granger-cause future inflation!

In spite of its limited use of the notion "causation," Granger causation has become a widely used concept. The fundamental reason is that any definition of "causation" is subject to criticism, and the definition chosen should be determined by the uses to which the

Box 2: Granger Causation

Economists are very interested in determining directions of causation: Does A cause B, does B cause A, or is there a mutual two-way causation? One concept of causation is "Granger Causation," proposed by the statistician Clive Granger in 1969. According to Granger, event A is said to cause event B if predictions of event B can be improved by using information on past occurrence of event A.

Suppose, for example, that one is interested in potential causation between the Treasury bill rate and the unemployment rate. The bill rate is said to Granger-cause the unemployment rate if, in an autoregression of the unemployment rate on its past values and the past values of the bill rate, the past values of the bill rate are statistically significant. The Granger test is simple. First, estimate the following regression:

$$(2.1) \qquad U_t = \alpha_0 + \alpha_1 U_{t-1} + \cdots + \alpha_p U_{t-p} + \beta_1 R_{t-1} + \cdots + \beta_p R_{t-p} + \epsilon_t$$

in which U is the unemployment rate, R is the bill rate, and p is the lag length (determined by prior tests, the Schwartz criterion in this study). Then estimate the same equation without the bill rate. Finally, using the residuals from both regressions, test the hypothesis that $\beta_1 = \beta_2 = \cdots \beta_p = 0$. This is the hypothesis that the bill rate does *not* provide information useful in predicting the unemployment rate, that is, that the bill rate does not Granger-cause the unemployment rate. That test can be done using the F-statistic or, as we do, the Chi-square statistic.

The same test can be applied to the reverse causation by regressing the bill rate on lagged values of itself and of the unemployment rate. Once again, the hypothesis that the unemployment rate does not Granger-cause the bill rate is equivalent to all coefficients on past unemployment rates in (2.1) being zero.

Granger causation is a very limited view of causation in several ways. First, it focuses on lead-lag relationships, which do not necessarily correspond with common notions of causation. For example, event A could be found to Granger-cause event B even if the true relationship is that B causes A. A case in point is the relationship between wage rate changes and inflation. The historical record indicates that wage increases precede (thereby Granger-causing) inflation. However, wage increases depend on forecasts of inflation, and the true relationship might be that an increase in future inflation (correctly forecasted) causes current wage increases.

A second criticism of Granger-causation tests is that they are based on linear forecasting models. If the true economic model is nonlinear, Granger tests will be based on incorrect forecasts and will be misleading. Yet another criticism, one that applies to most econometric models, is that Granger tests assume that the parameters of the model—the coefficients and the elements of the covariance matrix of residuals—are constant.

concept will be put. Granger causation is an appropriate definition for our purposes because we are concerned primarily with whether a change in security returns appears to be correlated with future mutual fund flows, and vice versa. It is in such leads and lags that signs of destabilizing behavior of economic agents may be found. However, the reader should be aware that this study uses "cause" as a code word for "leads and lags," not in the deeper sense.

Warther's 1995 study, cited above, investigated the relationship between mutual fund flows and past returns as well as the contemporaneous relationship between mutual fund flows and current returns, discussed above. He found no evidence that past own-returns influence new money flows into a group of funds: Bond fund flows were not affected by past bond returns; stock fund flows were not affected by past stock returns. Many economists, especially those who believe that security markets adjust rapidly to new information, will not be surprised by this, for if security market equilibrium is reached quickly, then all the action ensuing from a shock to markets might happen within a short period, certainly within a month, creating contemporaneous correlations but no correlations with past values. But Warther's result does support the hypothesis that mutual fund flows are not affected by security returns.

Warther also reports that he finds no statistically significant effect of past mutual fund inflows on current stock returns. In short, he rejects both sides of a feedback trading model, arguing that security returns neither lag nor lead mutual fund flows.

Remelona, Kleiman, and Gruenstein (1997) used a method similar to Warther's, involving decomposition of mutual fund flows into expected and unexpected components. However, they included returns on other securities not held by the fund ("other-returns") as well as own-returns as determinants of unexpected fund flows. Their regressions of unexpected flows into a mutual fund group on the own-returns and other-returns was estimated using Instrumental Variables methods rather than Ordinary Least Squares in an effort to correct for possible feedback from fund flows to security returns. They found that unexpected equity fund flows were not affected by *either* contemporaneous *or* lagged stock returns, and that bond fund flows (specifically, government, corporate, and municipal bond fund flows) were affected by contemporaneous bond returns but not by lagged bond returns. The coefficient measuring the effect of bond returns on bond fund flows was higher in Remolona et al. than in Warther's study, a result they attribute to the ability of Instrumental Variables estimation to eliminate biases due to reverse feedbacks.

Potter (1996), explicitly employing the concept of "Granger causation," examined the lead-lag relationship between returns and fund flows for several categories of equity funds. He reported evidence that security returns are useful in predicting flows into aggressive growth funds and growth funds, but not into growth and income funds or equity funds. Like Warther, he firmly rejects, for all four fund groups, the hypothesis that equity fund flows lead security returns.

None of the studies cited find evidence that mutual fund flows are affected by past security returns, or that security returns are affected by past mutual fund flows. In short, they find no evidence supporting a feedback in which a shock to security returns or to fund flows is associated with subsequent changes in flows or returns. However, they do find evidence that fund flows are positively correlated with contemporaneous returns on the same type of securities held by the fund, a relationship consistent with short-run momentum trading, but also consistent with other hypotheses.

III. The Interaction between Security Returns and Mutual Fund Flows

In this section we extend the notion of Granger causation discussed above to a multivariate context by estimating an unrestricted Vector Autoregression model (see Box 3). We avoid placing arbitrary restrictions on the dynamics of the model because restrictions, like those used by Warther (1995) and by Remolona, Kleiman, and Gruenstein (1997), limit the range of outcomes that a dynamic model can generate.[5] Our model is used to test hypotheses about the leads and lags between mutual fund flows and security returns.

Economic models of portfolio choice assume that investors will consider the returns on all assets when they determine their optimal portfolios. This will be true of both direct investors and mutual fund investors. Thus, we should expect that relative rates of return on securities will have value in predicting flows of money into alternative assets—a result rejected in some of the studies cited above.

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The explosive growth of mutual funds has led some observers to reverse this order, attributing the high returns on common stocks in the United States to high inflows into equity mutual funds. One encounters this view in the financial press when money fund flow data are cited as a predictor of stock prices ("because lots of cash is available") or equity fund sales are used to predict stock prices ("because they have to invest it in stocks"). If valid, this dynamic interaction could result in a feedback in which a shock to security returns leads to a change in mutual fund inflows, which leads, in turn, to a further change in security returns. If feedbacks are especially strong, a

[5] The restrictions imposed by Warther and Remolona et al. were designed to decompose cash flows into expected and unexpected components.

Box 3: Vector Autoregressions

Suppose that an endogenous variable is affected by current and past values of all endogenous variables in an economic system. If there are N endogenous variables, each labeled y_{it} to represent the ith variable (i = 1, . . . , N) at time t, and if the length of the lags describing the evolution of each variable is p periods, the system can be expressed as

$$(3.1) \qquad Y_t = A_0Y_t + A_1Y_{t-1} + \cdots + A_pY_{t-p} + \epsilon_t$$

where Y_t is the vector of values of endogenous variables at time t, ϵ_t is the vector of "surprises" in the endogenous variables, and A_k (k = 0, 1, . . . , p) is the matrix of coefficients for the effects of Y_{t-k} on Y_t. The surprise vector, ϵ_t, is assumed to be jointly normally distributed with zero mean and covariance matrix Σ. The contemporaneous covariance matrix, A_0, will have zeros where the right-side variable is the same as the left-side variable; that is, the element $a_{ii} = 0$.

The system described above can be rewritten as a Vector Autoregression (VAR) by solving for the left-side variable, expressing the vector of current values of endogenous variables as a linear function of the lagged values. The result is

$$(3.2) \qquad Y_t = B_1Y_{t-1} + \cdots + B_pY_{t-p} + e_t$$

where $B_k = (I - A_0)^{-1}A_k$ and $e_t = (I - A_0)^{-1}\epsilon_t$. This expresses the vector of endogenous variables as a linear function of the past values of endogenous variables. The new surprise vector will have zero mean and covariance matrix Σ^*. Note that even if the elements of ϵ_t are independently distributed, the elements of e_t will not be. Thus, going from the structural form in (3.1) to the VAR form in (3.2) introduces a contemporaneous correlation between residuals in different equations.

The VAR system can be easily estimated using Ordinary Least Squares, in which case each right-side variable is included in all regressions. Because this is equivalent to Seemingly Unrelated Regression, the contemporaneous correlation between residuals will be incorporated in the estimation and the estimates of the B matrices will be both unbiased and efficient. Unless certain conditions are met, the original A matrices cannot be recovered from estimates of the B matrix elements, but that is not necessary for our purposes.

Granger tests can also be applied to Vector Autoregression models. The hypothesis that one group of variables does not Granger-cause another group is simply a test that the appropriate elements in the matrices of coefficients are all zero, that is, that the "causing" variables have no value in predicting the "caused" variables. Suppose that we wish to test the hypothesis that three endogenous variables (variables 3, 4, and 5) in equation system (3.2) "Granger cause" the first two variables. This is equivalent to a test of the hypothesis that the elements in the first two rows and the third to fifth columns of each B matrix are all zero. The null hypothesis is that there is *no* "Granger causation." This hypothesis is tested by estimating the first two equations in the unrestricted VAR system (3.2), then re-estimating those equations with the third, fourth, and fifth variables removed from the right-hand side. The residuals from the restricted and unrestricted regressions are then used to form a likelihood ratio test: If the Chi-square test statistic is sufficiently high, the hypothesis of no Granger causation is rejected in favor of the conclusion that the third to fifth variables "Granger-cause" the first two variables.

snowball might result, with cycles in returns and flows getting larger over time.

The reasons for a possible feedback from fund flows to security prices are not clear. One story, probably in the mind of financial journalists, is a "price pressure" story: A rise (say) in equity fund inflows means that portfolio managers will be buying stocks, a fall in flows means that they will reduce purchases. This, of course, ignores the possibility that investors are switching from direct investment in equities to investment through mutual funds. Another possible explanation is that mutual fund investors have information that they reveal to the market when they buy fund shares, thereby inducing other investors to buy or sell securities. For example, if mutual fund investors are unsophisticated and frequently wrong, their purchases of equity funds might be a signal to sell stocks, or if they are particularly well informed, the signal might be a buy signal.

In order to investigate the potential for a snowball, we have estimated a small Vector Autoregression (VAR) model with seven variables: new money inflows for each of four types of mutual funds, each expressed as a percentage of the previous month's assets, and three rates of return. The four types of mutual funds are money market funds, bond funds, bond & equity funds, and equity funds, aggregations described in Box 1. These data, provided by the Investment Company Institute, are monthly values from January 1984 through December 1996. The three rates of return are the realized returns on the S&P 500, on long-term U.S. Treasury bonds, and on one-year U.S. Treasury bills, all provided by Ibbotson Associates. These *realized* returns, available through December 1996, are the actual rates of return experienced during the month, including both cash income (dividends or coupons) and capital value changes. It is important to note that realized returns will move inversely to the required returns on securities, a result that affects the interpretations of our results. For example, if investors require a lower return on stocks, the first effect will be to raise the price of common stocks, thereby increasing the realized return on stocks. In the long run, realized returns should match required returns, but during a transition they will move in opposite directions.

Each of the seven variables (four fund inflows and three security returns) was regressed on a constant, on 11 seasonal dummy variables, on a dummy variable for the October '87 crash (with a value of one in October-November 1987, zero otherwise), and on each of the five prior months' values for all seven variables.[6] The sample period was July 1985 through December 1996. This provides the basic unrestricted VAR model, with the same 48 variables in each equation. This model was then restricted in a variety of ways to allow tests of "block exogeneity," that is, tests of hypotheses that one subset of variables does not have value in predicting the remaining variables. Block exogeneity tests are a multivariate version of the "Granger causation" tests (see above and Box 2). If, for example, it was found that excluding lagged returns on both Treasury bonds and the S&P 500 from the equations explaining flows into bond and equity funds did not significantly affect predictions of bond and equity fund flows, then we would conclude bond and stock returns do *not* Granger-cause bond and stock fund flows. An equivalent statement is that fund flows are exogenous with respect to security returns.

We believe that this VAR method is superior to the methods used in the studies cited above. The estimation methods used by Warther and by Remolona et al. are equivalent to a restricted VAR, which is encompassed by our unrestricted VAR but with some variables arbitrarily excluded in some equations. If those exclusions are not valid, the results will be biased in favor of rejecting past returns as variables explaining mutual fund flows. Warther's paper shows this most clearly. He estimates a regression of current fund flows on lagged fund flows in the past three months, interpreting the resulting series as measuring *expected* fund flows. He then examines the correlation between *unexpected* fund flows (the residual in the first regression) and both current and past security returns, concluding that current returns are important but past returns are not. This method arbitrarily excludes past security returns from having any effect on expected fund flows, putting any influence of past returns into the residual. If current fund flows are positively correlated with current returns, as Warther finds, this will bias his results in favor of finding no effect of past returns on current fund flows.[7]

[6] The VAR was estimated for increasing lag lengths from 1 to 12 months. Both the Akaike and Schwartz criteria indicated a five-month lag for the VAR.

[7] Suppose the "true" model is $N_t = a + bN_{t-1} + cR_{t-1} + \varepsilon_t$, where N is new money at mutual funds and R is the return on the fund's securities. The parameter b is the effect of a change in the lagged fund flow *holding the lagged security return constant*; the parameter c is the effect of a change in the lagged security return *holding the lagged fund flow constant.* We would like to know the value of c, that is, how sensitive are fund flows to lagged security returns.

If one estimates this model using OLS, the parameter estimates will be unbiased and efficient. But suppose that a two-stage approach like Warther's is used. First, the equation $N_t = a + bN_{t-1} + \eta_t$ is estimated; R_{t-1} becomes an excluded variable whose effect is placed into the residual, which has the "true" value $\eta_t = cR_{t-1} + \varepsilon_t$. Second, the *estimated* residual from this first regression (call it v_t) is regressed on R_{t-1} to determine whether current fund flows are sensitive to lagged security returns; denote this regression as $v_t = c'R_{t-1} + e_t$.

The question is, how is the estimate of c′ in the second stage of this two-stage approach related to the estimate of c in the single "true" equation? If N_t and R_t are uncorrelated, c′ is an unbiased estimate of c and the two approaches are equivalent. But if N_t and R_t are correlated, this is no longer true and the two approaches differ. Suppose that, as Warther argues, N_t and R_t are positively correlated. Then it is easy to show that the estimator of b in the first-stage regression is biased upward. The reason is that the positive correlation between N_{t-1} and the excluded variable, R_{t-1}, will be partially attributed to the influence of N_{t-1} on N_t, creating an upward bias in the estimate of b. This upward bias in b in the first-stage regression will create a downward bias in the estimate of c in the second-stage regression, so the estimator of c′ will be a downward-biased estimator of c.

In short, if fund flows and security returns are contemporaneously correlated, Warther's two-stage estimation will be biased toward the conclusion that fund flows are not sensitive to lagged security returns.

Table 1
Granger Causality Tests for Persistence in Security Returns
July 1985 to December 1996

Independent (Causing) Variables	Dependent (Caused) Variables		
	Rsp500	Rus	Rbills
Returns on the S&P 500 (Rsp500)	8.33 (.14)	4.64 (.46)	6.34 (.27)
Returns on Long-Term U.S. Treasury Bonds (Rus)	6.52 (.26)	4.34 (.50)	**13.70** (.02)
Returns on One-Year U.S. Treasury Bills (Rbills)	6.94 (.22)	2.49 (.78)	**256.64** (.00)

Test statistics are derived from a 7-equation VAR for net new money and security returns, with a 5-month lag structure. Monthly dummy variables and a dummy variable for September–November 1987 were included. The sample period was July 1985 to December 1996. The numbers in each cell are Chi-square statistics for the null hypothesis that the causal variable(s) in each row do not Granger-cause the "caused" variables in each column. A high Chi-square statistic leads to rejection of that hypothesis in favor of the alternative hypothesis, that there is a causal effect. The numbers in parentheses are significance levels for the Chi-square statistic; a level less than 0.05 indicates statistical significance. Bold-faced numbers indicate statistical significance.

Persistence in Security Returns

As noted above, there is considerable evidence that purchases of mutual fund shares are positively correlated with returns on the securities held (see Part I). This is consistent with, but not proof of, a short-lived (within a month) role for momentum in shareholder investment in mutual funds. However, momentum investing is more likely to pose a serious problem for market stability when security returns are persistent; that is, when it is rational for investors to extrapolate current performance into future periods.

We have used our VAR model to examine persistence in security returns. All three security return equations were estimated with five lagged months of each of the three security returns included as independent variables. Then the three equations were re-estimated with the five lagged months of one security return excluded. Finally, a likelihood ratio test was used to determine whether the security return that had been excluded Granger-causes the three returns. This was done for each of the security returns being excluded.

The results are reported in Table 1, whose columns designate the dependent, or "caused," variables and whose rows define the independent, or "causing" variables. Each cell reports the value of the Chi-square statistic for the likelihood ratio test that the "causing" variable Granger-causes the "caused" variable. This is, of course, the test of the joint hypothesis that all coefficients on the causing variables (rows) in regressions with the caused variables (columns) as dependent variables are zero. The significance level associated with each Chi-square statistic is shown in parentheses; this is the probability that a value of Chi-square equal to or greater than the observed sample value would occur by chance. A significance level of 0.05 or less indicates that Granger-causation exists; if the significance level exceeds 0.05, any effect of the causing variable observed in the data is attributed to chance. Cell entries in bold text are statistically significant by that standard. For example, the Chi-square statistic for the Rsp500 row and Rus column in Table 1 is 4.64, a result that is not statistically significant because the significance level in parentheses is a very weak 0.46. We conclude that the five lagged values of the return on stocks do not have a statistically significant effect on the return on bonds.

The results in Table 1 soundly reject the notion of persistence in the realized returns on stocks or bonds. In no case is the history of either stock or bond returns statistically significant in explaining current returns on long-term securities. For example, the Chi-square value for the hypothesis that the history of stock returns is relevant to the current stock return (Rsp500) is 8.33, which, at a significance level of 0.14, is not statistically significant. This suggests that it is not rational for investors to project current performance of stock returns into the future, a fundamental requirement of destabilizing momentum investing. The same conclusion applies to bond returns.[8]

However, significant persistence is evident in the return on one-year Treasury bills. Indeed, the results suggest that the history of both bill and bond returns is relevant in explaining bill returns. Persistence in this market is interesting, as it indicates that the long-term securities market provides information to short-term investors, but not the reverse. However, persistence in the bill market is not a foundation for momentum investing in stocks and bonds.

[8] Note that this result applies to the broad indices of security returns used in this study, not to returns on individual equities or on specific mutual funds. As noted above, there is evidence supporting persistence at the micro level of individual firms and funds.

Table 2
Granger Causality Tests for Net New Money and Rates of Return
July 1985 to December 1996

	Dependent (Caused) Variables						
	Net New Money at Mutual Funds				Rates of Return		
Independent (Causing) Variables	MMF	Bonds	Bond & Equity	Equity	Rsp500	Rus	Rbills
Net New Money at Mutual Funds							
MMF					9.00	2.19	**1272.05**
					(.11)	(.82)	(.00)
Bond					**10.75**	**11.57**	**13.46**
					(.05)	(.04)	(.02)
Bond & Equity					**12.31**	5.03	**10.74**
					(.03)	(.41)	(.05)
Equity					7.87	1.76	**30.99**
					(.16)	(.88)	(.00)
Rates of Return							
Rsp500	**30.71**	**19.64**	**17.21**	**12.72**			
	(.00)	(.00)	(.00)	(.03)			
Rus	**37.03**	**16.94**	**13.46**	7.28			
	(.00)	(.00)	(.02)	(.20)			
Rbills	**22.49**	8.12	**18.86**	7.06			
	(.00)	(.15)	(.00)	(.22)			

Note: See note to Table 1. A 5-month lag length was used for the net new money-security returns relationship. This was selected by the Schwartz criterion for lag-length selection.

Are Mutual Fund Flows Affected by Returns on Stocks and Bonds?

Table 2 reports the results of our Granger tests for net new money and realized returns on the S&P 500, long-term U.S. government bonds, and one-year Treasury bills. The cells at the bottom left of Table 2 indicate that the history of each return, and of other returns as well, is relevant in explaining mutual fund flows. For example, the test of the hypothesis that changes in Rsp500 do *not* Granger-cause fund flows is sharply rejected for each of the four types of funds. The Treasury bond return, Rus, Granger-causes flows into money market, bond, and bond & equity funds, but not into equity funds. Bill returns Granger-cause flows into money market and bond & equity funds. The results provide strong support for the basic portfolio choice assumption that realized security returns affect subsequent security purchases, and are in strong contrast with the conclusions of Warther, Remolona et al., and Potter, that flows do not appear to be affected by past security returns.

Table 3 reports the results of Granger tests for redemptions instead of net new money. The results are consistent with those for net new money, providing strong evidence that rates of return affect redemptions, even after lags of several months. There is also evidence that bond and bond & equity fund redemptions "cause" returns on bonds and on stocks, although no support is shown for the view that equity fund redemptions affect subsequent stock or bond returns.

Do Fund Flows Influence Security Returns?

As noted above, previous studies have found no evidence that mutual fund flows play a role in determining security returns. However, the cells in the upper right-hand section of Table 2 suggest some support for the "reverse causation" view: Money market fund flows are significant predictors of Treasury bill returns, bond fund flows play a statistically significant role in predicting returns on all three securities, and bond & equity fund flows Granger-cause returns on equities and on Treasury bills (but not Treasury bonds).

While net new money flows into debt-type funds

Table 3
Granger Causality Tests for Redemptions and Rates of Return
July 1985 to December 1996

	Dependent (Caused) Variables						
	Redemptions at Mutual Funds				Rates of Return		
Independent (Causing) Variables	MMF	Bonds	Bond & Equity	Equity	Rsp500	Rus	Rbills
Redemptions at Mutual Funds							
MMF					12.53 (.08)	11.63 (.11)	**1255.32** (.00)
Bond					**27.30** (.00)	**14.79** (.04)	**16.10** (.02)
Bond & Equity					**14.79** (.04)	**14.72** (.04)	9.65 (.21)
Equity					6.68 (.46)	5.05 (.65)	8.73 (.27)
Rates of Return							
Rsp500	**18.10** (.01)	**25.16** (.00)	9.55 (.22)	**23.80** (.01)			
Rus	13.51 (.06)	**14.36** (.05)	6.47 (.49)	12.14 (.10)			
Rbills	7.87 (.34)	**25.88** (.00)	6.54 (.49)	**21.95** (.00)			

Note: See note to Table 1. A 7-month lag length was used for the redemptions-security returns relationship. This was selected by the Schwartz criterion for lag-length selection.

appear to Granger-cause returns on debt securities, equity fund flows do not Granger-cause returns on either equities or bonds. The reverse-causation story fails only in the case of equity funds, a result consistent with the work both of Potter and of Remolona, Kleiman, and Gruenstein. It is worth noting (see Table 3) that redemptions show a stronger case for reverse causation from redemptions to stock and bond returns, but there is still no evidence of reverse causation for equity fund redemptions.

Why Are This Study's Results Different?

We find very strong evidence for forward causation, from security returns to fund flows, as well as strong evidence, especially at debt-type funds, for reverse causation, from fund flows to security returns. These results are very different from those reported by Warther and by Remolona et al. All three studies use the Investment Company Institute's monthly data, but with different sample periods and with different aggregations of mutual funds. If these are the reasons for disagreement, we must conclude that relatively small changes in data definitions might have a large impact on the conclusions.

Other differences are, perhaps, more important. First, as noted above, we estimate an unrestricted VAR, while the other two studies use a restricted VAR in which arbitrary restrictions are placed on some parameters of the model, restrictions that might significantly alter the conclusions. Second, we include returns on several different securities as predictors of mutual fund flows, so our hypothesis tests are tests of the effect of *relative* rates of return on flows. Economic theory suggests that relative rates of return determine the allocation of financial flows, but Warther uses only own-returns, and Remolona et al. use own-security returns and only one other-return, as predictors of flows.

Finally, we use realized returns rather than a measure of expected returns (yield to maturity). This means that we are not attempting to decompose observed returns into their expected or unexpected components. While investors do make an effort to estimate expected returns, the available data do not tell us how that is done, and attempts to model the forecasting process will necessarily introduce errors in our estimates.

Box 4: Impulse Response Functions

The response of each endogenous variable to a one-time shock in any variable can be evaluated by rewriting the Vector Autoregression model (equation 3.2 in Box 3) in its Moving Average Representation. When Y is covariance stationary, the VAR model (equation 3.2 in Box 3), after repeated substitution to solve for Y_t as a linear function of past values of the surprise, e_t, gives the following convergent series of infinite length:

$$(4.1) \quad Y_t = e_t + C_1 e_{t-1} + C_2 e_{t-2} + \cdots + C_p e_{t-p} + \cdots,$$

$$\text{with } E(e) = 0 \text{ and } E(ee') = \Sigma$$

in which the matrices C_j ($j = 1, \ldots, \infty$) are formed from the matrices B_i ($i = 1, \ldots, p$). The impulse response function traces out the values of $\partial Y_{t+s}/\partial e_t$ ($s = 1, \ldots, \infty$); that is, of the effect of a one-time shock to Y at time t on the future values of Y. Thus, a one-time shock of Δe to the elements of Y will change Y by $\Delta Y_t = \Delta e$ in the same period, by $\Delta Y_{t+1} = C_1 \Delta e$ in the next period, by $\Delta Y_{t+2} = C_2 \Delta e$ in the second period, and so on. Estimates of the parameters in the B matrices can be obtained by Ordinary Least Squares estimation of the VAR in equation 3.2 of Box 3, and the matrices C_j can be formed from those estimates.

It is often convenient to express the shocks and responses in units of standard deviations rather than in raw values. If each element in ΔY_{t+k} is divided by the respective standard deviation of that endogenous variable, and the shock vector Δe is also divided by the standard error of the respective surprises, a *standardized* impulse response function can be traced out. This shows the number of standard deviations by which each endogenous variable changes when there is a one-standard-deviation shock in an element of e.

Some researchers are concerned that the shocks to the endogenous variables, measured as the error vector e_t, are correlated. For example, if Gross Domestic Product and an interest rate are two of the endogenous variables, one should expect that a shock affecting one will also affect the other. This shows up as Σ being a nondiagonal matrix, meaning that a shock to one equation affects other equations. To correct for this, these researchers will transform the original VAR model so that all equation errors are orthogonal, then compute the *orthogonalized* impulse response function. To do this, they estimate the VAR, and compute its error covariance matrix Σ. Using sophisticated methods, they transform the system so that the new error vector, call it u_t, has a diagonal covariance matrix, that is, each transformed equation's error is independent of every other transformed equations error. They then calculate the values of $\partial Y_{t+s}/\partial u_t$ ($s = 1, \ldots, \infty$); these form the orthogonalized impulse response function.

IV. How Important Is the Security Return–Fund Flow Interaction?

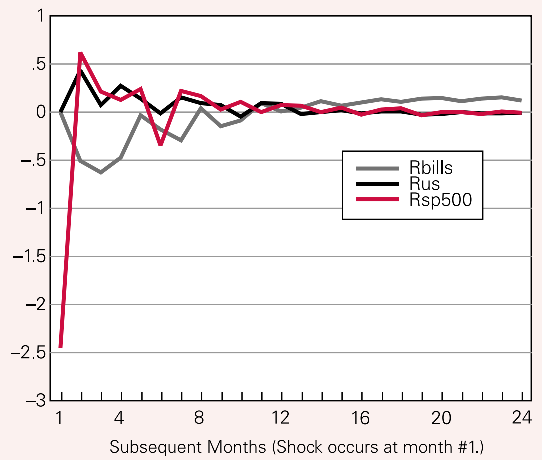
We have found evidence that security returns have statistically significant subsequent effects on net new money and redemptions at each type of mutual fund, and that some fund flows, particularly at bond and bond & equity funds, have statistically significant subsequent effects on some security returns. This two-way causation with lags defines a feedback mechanism. But is the feedback of economic as well as of statistical significance? Does it magnify a temporary departure of variables from a long-run equilibrium into a prolonged period of financial market volatility?

In order to assess that question we have estimated the dynamic multipliers associated with our seven-equation model. These multipliers are embedded in the VAR's "impulse response functions" (see Box 4), each showing the effect of a temporary shock to one of the seven variables on the values of each of the seven variables. In order to adjust for differences in measurement units, each shock is measured as a temporary increase in the variable by one standard deviation, maintained for only one month. The impulse response function shows the subsequent effects on each of the seven variables, each measured relative to the standard deviation of that variable.[9] Thus, the impulse response function shows the number of standard deviations by which a variable changes following a temporary one-standard-deviation shock to a driving variable.

[9] The VAR system has been transformed so that shocks are orthogonal. The standard deviations of the orthogonalized shocks are used to standardize the values of responses in each variable. The standard deviations of these shocks are as follows: one-year Treasury bill rate, 0.38 percent; long-term Treasury bond rate, 25.97 percent; S&P 500 return, 38.04 percent; MMF flows, 10.23 percent; BOND flows, 5.38 percent; EQUITY flows, 4.14 percent. All returns and flows are measured at annual rates.

Figure 5a

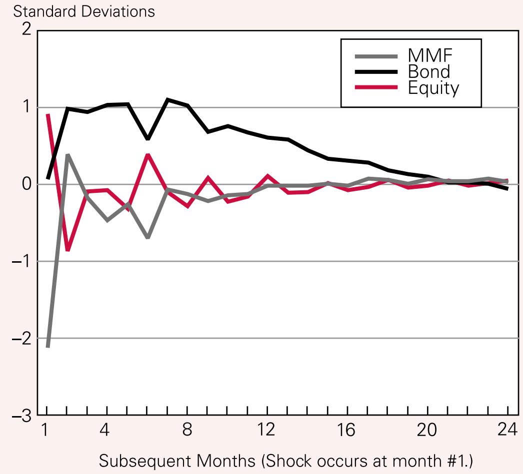
Effect of October 1987-Size Shock to S&P 500 on Standardized Values of Security Returns



Source: Author's calculations.

Figure 5b

Effect of October 1987-Size Shock to S&P 500 on Standardized Values of Mutual Fund Flows



Source: Author's calculations.

There are 49 different impulse response functions for our seven-equation VAR, seven for each variable. Rather than stupefy the reader with a tedious report on each of those 49 dynamic responses, we focus on those central to the concerns about stock market volatility and fund flows. We assume a shock in the form of an absolute decrease of Rsp500 by 2.70 standard deviations, about the size of the October 1987 stock market break. Because the standard deviation of Rsp500 is 38.04 percent, this translates to a value of about −103 percent.[10]

Figures 5a and 5b show the responses of security returns and mutual fund flows to this shock over the subsequent 24 months. In the months following the stock break, returns on long-term securities (bonds and stocks) are slightly above normal. This reflects an above-normal increase in security prices following a stock market break. The return on Treasury bills is reduced during the six months after the break. Note that our persistence tests (see Table 1) indicate that the subsequent deviations of bill, bond, and stock returns from their normal values are not statistically different from zero. Thus, after a sharp stock market break, bill, bond, and stock returns rapidly go back to normal levels.

Figure 5b shows that a stock market break has a long-lived effect on mutual fund flows, particularly on net new money flowing into bond funds. The immediate effect of the decline in stock prices is to induce net outflows at equity funds and net inflows at both money market funds and bond funds—a sign of a flight to quality. While bond fund inflows remain above normal throughout most of the 24 months, slowly returning to normal, equity fund flows remain slightly below normal for almost a year, and money market funds rapidly return to normal flows.

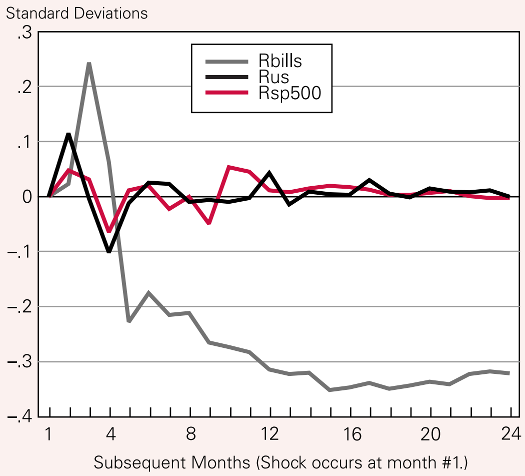
While our VAR model does indicate that an initial disturbance to stock prices sets off a cycle in fund flows and, perhaps, in security returns, there is no indication of a destabilizing feedback. Both returns and flows eventually return to normal levels, returns more quickly than flows. We find no evidence that even an October 1987-size shock initiates a protracted period of strong cyclical responses.

The effect of shocks to equity and bond fund flows on security returns are shown in Figures 6 and 7. Each of these shocks is a one-standard-deviation increase in the net new money flowing into the mutual

[10] The return data are monthly values expressed at annual rates, so a 10 percent decline in one month is a −120 percent return at an annual rate.

Figure 6

Effect of a One-Standard-Deviation Shock to Equity Fund Flows on Standardized Values of Returns



Source: Author's calculations.

fund. In both cases, a temporary increase in fund inflows has no long-term effects on bond or stock returns, but it does reduce Treasury bill returns in the long run. A shock to equity fund flows raises the bill rate in the short run, presumably because the funds are being transferred from money market mutual funds, but a shock to bond funds reduces bill rates in the short run as well as in the long run.

The impulse response functions charted in Figure 6 suggest that the subsequent responses of stock returns to a shock in equity fund flows is that a one-standard-deviation increase in equity flows changes stock returns by the largest amount (about 0.1 standard deviation) in the first and fourth subsequent months. If we compute the responses using actual rather than standardized values, a rise in equity fund inflows by an annual rate of about 4 percent of net assets will have the maximum effect of changing stock returns by an annual rate of about 3.8 percent, roughly a 1-to-1 effect. This is a short-term effect of some economic significance (although, as we have seen, of dubious statistical significance). It is interesting to note that a shock to bond fund flows has as large an effect on stock returns as does a shock to equity fund flows: The largest change in stock returns after a 5.4 percent bond fund flow shock is about 5.7 percent. Once again, the maximum response is about 1-to-1.

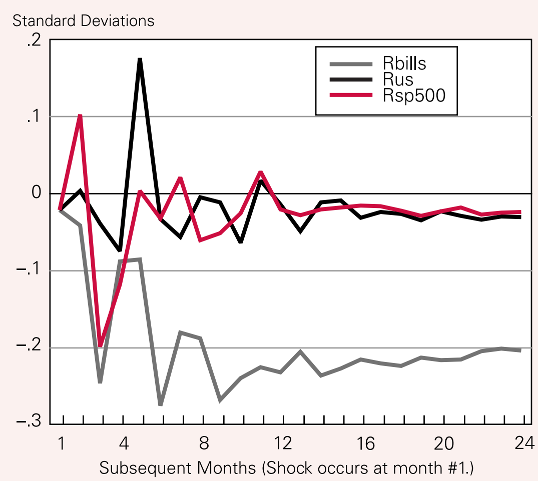
V. Summary and Conclusions

Prior to this study, the evidence on the interaction of mutual fund flows and rates of return suggested little connection. While strong evidence had been found for a positive *contemporaneous* correlation between fund flows and own-security returns, there was no evidence of a persistence in the relationship over time; that is, flows into mutual funds did not appear to be influenced by *past* values of the return on own-securities. Neither did returns on securities appear to be related to past values of flows into the mutual funds holding that type of security. In short, any disturbance to financial market equilibrium that affected security returns and mutual fund flows appeared to create a new equilibrium quickly, leaving no dynamic effects for subsequent periods.

The contemporaneous correlation between security returns and mutual fund flows is consistent with several hypotheses. The first is that a fundamental assumption of financial theory is valid: The demand

Figure 7

Effect of a One-Standard-Deviation Shock to Bond Fund Flows on Standardized Values of Returns



Source: Author's calculations.

for a security is a decreasing function of the return required by investors. According to this postulate, a decline in *required* returns on, say, common stock will stimulate demand, driving stock prices and equity fund flows up, and raising the *realized* return on the security.

A second hypothesis consistent with a contemporaneous correlation between fund flows and own-returns is that investors include momentum among their criteria for selecting asset allocations. Good performance is expected to be followed quickly by good performance, bad performance by bad, so that when security prices (and realized returns) rise, investors buy in anticipation of further increases, driving prices up further. The momentum hypothesis implies a destabilizing behavior by investors.

A third hypothesis is that increases in flows into a mutual fund will drive up prices of its securities. This might be explained as the result of price pressure—if equity funds have more money to invest, they must invest it and doing so will push stock prices up. It might also be explained by information transmission—if equity fund investors are particularly savvy, increased purchases of equity funds reveal to other investors that common stocks are a good buy, inducing that result.

Previous studies have also investigated the possibility of a feedback mechanism in the dynamics of the interaction between mutual fund flows and security returns. Recently, concerns have been raised about the role mutual funds might play in transmitting, and perhaps aggravating, financial shocks. The snowball scenario is that a shock to stock prices, say a break in the market on the order of the October 1987 experience, might induce redemption of shares at equity mutual funds. This, in turn, might lead equity fund managers to sell shares, driving prices down further and inducing more redemptions, ad infinitum. This feedback mechanism might lead to an exaggeration in the fluctuations of prices and flows following a shock, with eventual return to an equilibrium, or it might induce an instability in which prices decline for a prolonged period.

Previous studies have found scant support for this scenario. First, several studies have failed to find evidence that mutual fund flows are affected by lagged security prices, so the first step of the feedback is lost—a decline in stock prices affects this month's fund inflows (the contemporaneous effect cited above), but it does not affect fund inflows in future months. Furthermore, no evidence has been found that security prices in one period are affected by mutual fund flows in previous periods, so the second step of the feedback is lost. In short, the current orthodoxy is that when financial market shocks occur, they quickly get resolved through changes in prices and flows, with no persistent subsequent effects on prices and flows.

Clearly, security returns have a contemporaneous and direct effect on fund flows, so momentum trading might be a short-run phenomenon, but we find no persistence in security returns, so the rationale for momentum trading over a longer period finds no support.

This study reaches a less comforting conclusion, but it does not refute the ultimate conclusions of the previous studies. We find that a feedback exists—security returns do affect future fund flows, and some fund flows do affect future security returns. In particular, we find that returns on long-term Treasury bonds and on the S&P 500 are statistically significant predictors of flows of net new money into bond funds, bond & equity funds, and equity funds. In each case the own-security return is statistically significant, and in most cases the other-security return is also statistically significant. In short, disturbances to security returns do have repercussions on future fund flows as well as on current flows.

We also find evidence supporting a reverse causation, though it is less strong. Past flows into bond funds are statistically significant predictors of the returns on long-term bonds and on stocks, and flows into bond & equity funds are significant predictors of equity returns. However, like previous studies, we find no evidence that past flows into equity funds shape current returns on either stocks or bonds. Thus, we find no direct effect of equity fund flows on future common stock returns. This does not mean that there are no effects of equity flows on stock returns; these effects might be indirect, operating through a disturbance in equity flows on (say) Treasury bill returns, thence on to other returns and flows and, finally, on to common stock returns.

Our conclusions with regard to momentum investing are agnostic. Clearly, security returns have a contemporaneous and direct effect on fund flows, so momentum trading might be a short-run phenomenon. But we find no persistence in security returns—shocks to, say, stock returns do not imply further changes in stock returns, so the rationale for momentum trading over a longer period finds no support. Thus, if momentum trading does exist, it appears to be ephemeral and not the source of snowball effects.

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