JOURNAL OF FINANCIAL AND QUANTITATIVE ANALYSIS VOL. 36, NO. 2, JUNE 2001

The Market Demand Curve for Common Stocks: Evidence from Equity Mutual Fund Flows

Heung-Joo Cha and Bong-Soo Lee*

Abstract

We examine whether the market demand curve for equities is downward sloping. Unlike previous studies that examine individual stocks' demand curves, we look at the aggregate demand curve. As a proxy for aggregate demand, we employ equity mutual fund flows. Unlike previous studies that focus on events that are unlikely to convey new information to the market, we devise an empirical framework that disentangles the price-pressure effect and the information effect. We do not find evidence for the price-pressure effect that equity fund flows directly affect stock market prices in the presence of fundamentals of firms. Instead, we find that equity fund flows seem to be influenced by the performance of the stock market and that investors try to forecast fundamentals of firms and change their demand for stocks accordingly. Overall, these findings are consistent with a horizontal market demand curve for equities.

I. Introduction

Many important propositions in finance are implicitly based on the assumption of horizontal demand curves for a firm's equity: Investors can buy and sell any amount of a firm's equity without significantly affecting the price. Examples include the Modigliani-Miller theorem, CAPM or APT, optimal capital structures for firms, dividend policy, and capital budgeting (see, for example, Scholes (1972)).

Scholes (1972) tests empirically two competing hypotheses concerning the operation of the securities markets: the substitution hypothesis (SH) and the price-pressure hypothesis (PPH). The former maintains that since securities provide similar potential consumption streams, they are close substitutes and investors can alter their holdings in securities at approximately the prevailing market price because the demand curve is essentially *horizontal*. The latter assumes that investors consider a security to be a unique commodity with a low cross-elasticity

*Both authors, Department of Finance, College of Business Administration, University of Houston, Houston, TX 77204. We have benefited from discussions and comments from Gwangheon Hong, Praveen Kumar, Rich Pettit, Sudipto Sarkar, Ron Singer, Sorin Sorescu, and participants at the Finance Department seminar, University of Houston. We thank William Goetzmann (associate editor and referee) for helpful comments.

of demand with other securities. In particular, when the size of trades is large (e.g., large-block sales), the price of stock must fall to induce investors to purchase these additional shares because the demand curve for shares is *downward sloping*.

Scholes (1972) also provides the information hypothesis (IH) as a resolution of some of the differences between the two hypotheses. According to the information hypothesis that is based on market efficiency, share prices would fully adjust to the expected value of information in trades, and this adjustment would not imply an inducement in the form of subsequent abnormal profits for share purchasers. As such, the information hypothesis is more closely related to the substitution hypothesis than to the price-pressure hypothesis.

Given the importance of the assumption of horizontal demand curves for stocks, there have been many studies that examine empirical evidence on the issue. Using a sample of the largest block distributions of securities and secondary distributions, Scholes (1972) finds strong support for the substitution hypothesis. Kraus and Stoll (1972) and Dann, Mayers, and Raab (1977) using large block trades, Hess and Frost (1982) using new issues of seasoned securities, and Mikkelson and Partch (1985) using secondary distributions find an immediate significant price drop following large sales. However, these findings cannot be used to discriminate among the various price response hypotheses because secondary distributions, block sales, and new issues are all often associated with negative information about future security prospects. Without controlling for the information effects of these sales, these events cannot be used to make inferences about short- and long-run elasticities of demand.

Harris and Gurel (1986) point out that there may be two approaches to testing the various price response hypotheses. One is to measure the informational price effect of possible information-bearing transactions, and the other is to focus on events which, by their very nature, are unlikely to convey new information to the market. They recognize the former approach is quite difficult since it requires an empirical model of the informational price effect. The latter approach has been popular and has been taken by most previous studies (e.g., Scholes (1972), Hess and Frost (1982), Mikkelson and Partch (1985), Harris and Gurel (1986), and Shleifer (1986)). However, the potential problem with the latter approach is that it is, in fact, very difficult to find events that do not convey any new information to the market.[1] And the results from various studies based on the latter approach are, as we will review below, at best, mixed (see Section II).

Given mixed results with the latter approach, an alternative would be to take the former approach, which assumes that price responses may reflect both the information effect and the price-pressure effect. The question becomes, then, whether the change in prices would be more than expected from only an information effect, that is, how to identify and measure the relative importance of each effect. We provide a framework that fully takes into account both the information effect and the price-pressure effect and provides a measure of the relative importance of the two effects.

[1]For example, although Harris and Gurel (1986) and Shleifer (1986) argue that the S&P decisions to include or exclude stocks in its composition have no information content, Jain (1987) disputes their claim (see Section II).

In contrast to previous studies that focus on demand curves for individual stocks, in this paper, we are concerned with the aggregate demand curve for the stock market index portfolio. If we find a horizontal aggregate demand curve, it would provide a sufficient condition for horizontal individual demand curves. This is because if some individual demand curves are downward sloping, the horizontal aggregate demand curve implies that some other individual demand curves have to be upward sloping, which is very unlikely. This is particularly important since some studies show horizontal individual demand curves, while others show downward-sloping individual demand curves. We can avoid a possible small sample problem by using the aggregate demand curve. For example, the changes in (i.e., addition to or deletion from) the S&P 500 composition include only a very small number of stocks. In addition, when we use aggregate data, substitutions among individual securities matter little (see Warther (1998))[2] and, thus, we can test for a horizontal demand curve for aggregate securities without relying on the substitution effect. As such, the contrast between the information hypothesis and the price-pressure hypothesis becomes a focal point of the test.

As a measure of (proxy for) the aggregate demand for equities, we employ data on equity mutual fund flows by exploiting the recent surge in mutual fund flows. Financial analysts and the press have often pointed to equity mutual fund flows as a driving force behind the sustained rise of stock prices in recent years (see Section V). Their argument seems convincing: equity mutual fund growth reveals a greater demand by individuals to hold stocks, and this price pressure must surely lead to higher stock prices as more investors chase a relatively fixed supply of corporate equity. On the other hand, a lower demand for equities by investors could result in widespread mutual fund redemptions, sending stock prices plummeting. This view underlies the downward-sloping demand curve for the stock market.[3]

Under market efficiency, equity prices should be equal to the present value of expected future cash flows. Hence, equity prices should be affected only by fundamentals such as expected cash flows and discount rates (expected returns). As such, equity fund flows should affect equity prices (and returns) only to the extent that they affect the fundamentals, which is through the information effect.[4]

[2]Warther ((1998), p. 253) argues that although the substitution hypothesis is a reasonable assumption for an individual security, there is no reason to believe that the hypothesis applies to the aggregate stock market. However, some financial economists believe that the substitution hypothesis may not hold even for an individual security.

[3]Warther (1995) notes that mutual fund flows are a logical place to look for indicators of unsophisticated (or uninformed) investor sentiment because mutual fund investors are considered to be less informed investors in the market. If investor sentiment is an important force in the markets and if mutual fund flows are a good measure of that sentiment, then mutual fund flows should have a significant effect on security returns. In particular, they may have a stronger effect on small stocks. (Lee, Shleifer, and Thaler (1991) argue that investor sentiment affects small stocks more than large stocks.) If mutual fund flows indeed represent uninformed investors' demand, they would be a good proxy for the non-information-induced demand, and any effect they may have on equity market returns can be viewed as evidence of the price-pressure effect. However, fund investors tend to rely on well-informed brokers or advisors who guide them to the appropriate funds. As such, fund investors may not be so uninformed (see, for example, a comment by Rea in Warther (1998)).

[4]It is debatable whether equity fund flows are fundamentals (see, for example, Warther (1998)). Our view is that if equity fund flows directly affect stock market returns without affecting revisions in expectations of future cash flows and/or returns, they may be considered as fundamentals. Otherwise, they are not.

If equity fund flows directly affect (or contain additional information that helps predict) stock returns in the presence of other fundamentals, it would be indicative of the rejection of a horizontal demand curve. This implication will be tested, first, by a variation of the stock price valuation (present value relation) model that allows for both the information effect and the price-pressure effect and, second, by causality tests in the presence of other fundamentals.[5]

The paper is organized as follows. Section II briefly reviews related literature on the demand curve for equities. Section III presents two empirical frameworks that examine the effect of demand on stock market returns. Section IV describes the data and empirical results. Section V further discusses related issues. Section VI concludes.

II. Related Literature

Harris and Gurel (1986) and Shleifer (1986) report evidence in favor of the price-pressure hypothesis. They find that stocks newly included in the S&P 500 Index have earned a significant positive abnormal return at the announcement of the inclusion. Since the returns are positively related to measures of buying index funds and since criteria for the inclusion are public information and are not directly concerned with information about future prospects of the firm, they interpret the finding as evidence of the price-pressure hypothesis and downward-sloping demand curves for stocks. Pruitt and Wei (1989) provide further evidence for the existence of price-pressure effects by examining actual changes in institutional holdings following both additions to and deletions from the S&P 500. Using post-October 1989 data, Lynch and Mendenhall (1997) document significantly positive (negative) post-announcement abnormal returns that are only partially reversed following additions (deletions) and interpret the finding as the existence of temporary price pressure and downward-sloping long-run demand curves for stocks.

Several studies, however, find little support for the price-pressure hypothesis and downward-sloping demand curve. Hess and Frost (1982), using data on new issues of utility stocks traded on the NYSE, find that rates of return appear to be uncorrelated with the size of the new issue. Hence, they reject the price-pressure hypothesis in favor of the efficient market hypothesis that implies the absence of any price effects. They further argue that the announcement of new issues does not necessarily involve new issues yet and that there is no increase in supply of equities; thus, any change in prices should be information-related.

Jain (1987) provides evidence that excess returns following the S&P decisions to include or exclude stocks in its indexes is not explained by the price-pressure hypothesis. Kalay and Shimrat (1987) find that an announcement of new equity issues has not only a negative effect on stock prices but also a significant negative effect on bond prices. They interpret this as being consistent with the information hypothesis because new equity issues lead to a reduction

[5]It is interesting to note that Shiller, in his comment on Warther (1998), p. 270 points out that "Granger or Sims causality tests might be employed to try to discover whether a causal relation exists from stock market returns to mutual fund flows."

in firm value and, thus, a negative effect on bond price. They reject the price-pressure hypothesis because the quantity of corporate bonds is not increased, and the price-pressure hypothesis does not predict a decline in bond prices when a new equity issue is announced. Sanger and Peterson (1990) present evidence that firms' values are negatively impacted when their common stocks are delisted from a major exchange. The observed loss in firm value is likely due, in part, to the decrease in liquidity that accompanies delistings. But they find little support for the downward-sloping demand curve because the changes in the average percentage of outstanding shares held by institutions were insignificant. Dhillon and Johnson (1991) report evidence from stock, bond, put, and call prices around announcements of listings in the S&P 500 that is consistent with the information hypothesis but inconsistent with the price-pressure hypothesis.

Davidson, Chhachhi, and Glascock (1996) find a mixed result. A large increase in abnormal returns occurring just prior to and at the time of the tender offer announcement is consistent with an information effect. However, the large increase in volume at the time of the announcement that continues until expiration and the negative abnormal returns at expiration are consistent with the price-pressure effect.[6] Kandel, Sarig, and Wohl (1999), using a unique data set that includes the full demand schedule of 27 Israeli IPO auctions, find that the demand schedules are relatively flat around the auction clearing price. In sum, previous studies are concerned with demand curves for individual stocks focusing mostly on events that are unlikely to convey new information to the market, but their results are, at best, mixed.

Others have documented positive contemporaneous correlations between equity fund flows and returns and also have looked at the lagged relationship. Zheng (1998) looks at the investment sector flows over the past 50 years and finds that quarterly institutional demand shocks are contemporaneously correlated to stock market returns. Using daily fund flow data, Goetzmann and Massa (1998) and Edelen and Warner (1999) find that short-term fluctuations in aggregate investor demand for stocks are correlated with contemporaneous price changes and, thus, may move security prices. Goetzmann and Massa also show a strong contemporaneous correlation between fund inflows and S&P market returns and no evidence for positive feedback trading, supporting the hypothesis of causality from flows to returns. However, using daily index fund flows data from the Trimtabs for the sample period, January 1998–July 1999, Goetzmann, Massa, and Rouwenhorst (2000) find little evidence of a direct demand effect story using international funds: fund flows affect returns through the fund's shift in the aggregate demand schedule for certain securities. Karceski (2000) proposes an agency model where returns-chasing behavior by mutual fund investors causes beta not be priced to the degree predicted by the standard CAPM. To support the model's time-series flow performance assumption, he provides evidence that market returns have a large economic impact on subsequent aggregate mutual fund flows.

[6] Fortune (1998), p. 9 relates the finding of a downward-sloping demand curve for stocks (e.g., Shleifer (1986)) to momentum investing even when there is no new information about the firm.

III. Empirical Framework

A. A Framework for Estimating the Information Effect and the Price-Pressure Effect

This section provides an empirical model of measuring the informational price effect of possible information-bearing transactions (see Harris and Gurel (1986)). We employ a variation of the present value model of equity valuation that allows for time-varying expected returns. Noting that, in an efficient market, only cash flows and/or changes in expected returns can affect stock prices (and returns), we test whether equity fund flows directly affect stock prices (i.e., have price-pressure effects) in the presence of the present value of expected future cash flows and/or changes in expected returns. In doing so, we measure the extent of the equity fund flow shock affecting stock market returns without being justified by its effect on subsequent cash flows and/or changes in expected returns.

We begin with an equation in Campbell (1991), which is derived from the log-linear dividend-price ratio model of Campbell and Shiller (1989). It is obtained by taking a first-order Taylor approximation of the equation relating the log stock returns to log stock prices and dividends. The model allows both expected returns and expected future cash flows to affect stock prices.

The equation states that the stock return in period $t(h_t)$ is the sum of expected stock returns $(E_{t-1}(h_t))$ and unexpected stock returns. The unexpected stock returns include unexpected changes in rational expectations of current and future growth in cash flows and future stock returns,[7]

$$(1) \qquad h_t = E_{t-1}h_t + (E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j \Delta d_{t+j} - (E_t - E_{t-1})\sum_{j=1}^{\infty}\rho^j h_{t+j},$$

where h_t denotes the log real return on a stock held from the end of period $t-1$ to the end of period $t(=\log[(P_t + D_t)/P_{t-1}])$, d_t denotes the log real cash flow paid during period t, E_t denotes an expectation formed at the end of period t, Δ denotes a difference operator (e.g., $\Delta d_t = d_t - d_{t-1}$), and ρ is a discount parameter a little smaller than one. The equation can be rewritten as

$$(2) \qquad (E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j h_{t+j} = (E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j \Delta d_{t+j}.$$

The above equation equates unexpected changes in rational expectations of future real stock returns to the unexpected changes in rational expectations of changes in cash flows.

1. A Measure of the Price-Pressure Effect

One implication of the above model is that equity fund flows should affect stock market returns to the extent that they affect current and future changes in real

[7] It should be noted that equation (1) allows for time variation in expected returns instead of imposing a constant expected return. This is consistent with findings by, for example, Keim and Stambaugh (1986), Fama and French (1989), Fama (1990), and Schwert (1990).

cash flows and/or changes in expected returns because $E_t(x) = E(x|\Omega_t)$, and the information set Ω_t includes changes in equity fund flows (Δeff_t), i.e., $\Delta\text{eff}_t \in \Omega_t$.

This equation motivates an alternative test of the informational price effect. Suppose that a shock to equity fund flows may affect the stock market return directly without (or in addition to) affecting either current and future changes in real cash flows or changes in expected returns. We then may measure this effect by allowing another route to affect the stock market returns,

$$(3) \quad (E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j h_{t+j}$$
$$= (E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j[(1-\theta)\Delta d_{t+j} + \theta\Delta\text{eff}_{t+j}]$$
$$= (1-\theta)(E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j\Delta d_{t+j} + \theta(E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j\Delta\text{eff}_{t+j},$$

where eff_t denotes equity fund flows. This equation shows that equity fund flows affect stock returns, first, by way of current and future changes in real cash flows and/or changes in expected returns (*the information effect*) and, second, directly without affecting either current and future changes in real cash flows or changes in expected returns (*the price-pressure effect*). The parameter θ provides a measure of the extent of the price-pressure effect independent (or in excess) of the information effect. To better understand the role of the parameter θ, we rewrite equation (3) as

$$(4) \quad h_t = E_{t-1}h_t - (E_t - E_{t-1})\sum_{j=1}^{\infty}\rho^j h_{t+j} + (1-\theta)(E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j\Delta d_{t+j}$$
$$+ \theta(E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j\Delta\text{eff}_{t+j},$$

which states that the stock return in period t (h_t) is the sum of expected stock returns ($E_{t-1}(h_t)$), unexpected changes in rational expectations of future stock returns with weight one (called *the expected return effect*), unexpected changes in rational expectations of current and future growth in cash flows with their weight $(1-\theta)$ (called *the cash-flow effect*), and unexpected changes in rational expectations of current and future equity fund flows with their weight θ (called *the price-pressure effect*).

2. An Alternative Measure of the Price-Pressure Effect

By imposing the constraint that the cash-flow effect and the price-pressure effect sum to one, the approach in (3) (or (4)) enables us to identify and estimate the price-pressure effect by solving one equation in one unknown parameter θ. In addition, the estimate of the single parameter θ provides a measure of the relative size of the three effects—the expected return effect with its weight one, the cash-flow effect with its weight $1-\theta$, and the price-pressure effect with its weight θ—and helps explain the relationship between stock returns and equity fund flows.[8]

The information that equity fund flows may contain may be either about revisions in expected cash flows or about revisions in expected returns. Both these terms are fundamentals and may need to be treated symmetrically. Then we consider

$$(5) \qquad (E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j h_{t+j} = (E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j \Delta d_{t+j} + \gamma(E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j \Delta \text{eff}_{t+j}.$$

In this model, we do not restrict that the cash-flow effect and the price-pressure effect sum to one. Instead, we maintain the assumption that the expected return effect and the cash-flow effect are symmetric so that we do not allow for differential effects of equity fund flows on revisions in expected cash flows and on revisions in expected returns. The price-pressure effect in this model is measured by the parameter γ. The Appendix explains how to identify and estimate the price-pressure effect parameters θ and γ in the two models.

B. Do Equity Fund Flows Affect Stock Market Returns in the Presence of Market Fundamentals?

As mentioned in the Introduction, an alternative way to examine whether the aggregate demand for the market index portfolio is downward sloping is to test whether equity fund flows directly affect stock market returns. To allow for equity fund flows to affect market returns indirectly through market fundamentals (i.e., an information effect) as well as directly without affecting market fundamentals, we test for the effect of equity fund flows in the presence of such market fundamentals as earnings, dividends, and discount rates. This amounts to testing whether equity fund flows contain additional information about stock market returns and, thus, affect the returns in the presence of usual market fundamentals.

If equity fund flows contain additional information, they indeed drive stock market returns, and the demand curve for stocks should be downward sloping. On the other hand, if stock market returns contain additional information about equity fund flows while equity fund flows do not contain any additional information about market returns, then equity fund flows are simply responding to changes in market returns.

[8]An alternative, more general approach would be to allow for at least two parameters, one each for the information (cash-flow) effect and the price-pressure effect. This approach, however, does not allow us to identify the two parameters. In addition, the interpretation of either the relative size of the three types of effects or the relationship between stock returns and equity fund flows may not be very clear.

The information content of equity fund flows with respect to market returns can be examined by Granger-causality tests (see footnote 5). For the causality test in the presence of other fundamentals, we use the following regression equations,

$$(6) \qquad h_t = a_0 + \sum_{i=1}^{m} \alpha_i h_{t-i} + \sum_{i=1}^{m} \beta_i \Delta\text{eff}_{t-i} + \sum_{i=1}^{m} \gamma_i \text{Dividend}_{t-i} + \sum_{i=1}^{m} \eta_i \text{Earning}_{t-i} + \sum_{i=1}^{m} \xi_i \text{T-Bill}_{t-i},$$

and

$$(7) \qquad \Delta\text{eff}_t = b_0 + \sum_{i=1}^{m} \phi_i \Delta\text{eff}_{t-i} + \sum_{i=1}^{m} \varphi_i h_{t-i} + \sum_{i=1}^{m} \nu_i \text{Dividend}_{t-i} + \sum_{i=1}^{m} \mu_i \text{Earnings}_{t-i} + \sum_{i=1}^{m} \omega_i \text{T-Bill}_{t-i}.$$

The null hypothesis that equity fund flows do not Granger-cause stock market returns in the presence of market fundamentals is tested by $\text{H}_0 : \beta_i = 0$, for all i in (6), where we employ measures of dividends, earnings, and T-bill rates as fundamentals. Similarly, the null hypothesis that stock market returns do not Granger-cause equity fund flows in the presence of market fundamentals is tested by $\text{H}_0 : \varphi_i = 0$, for all i in (7).

IV. Data and Empirical Findings

A. Data

The Investment Company Institute (ICI) provides data on monthly mutual fund flows. The Institute is a trade association for the mutual fund industry, and virtually all U.S. mutual funds are Institute members. The data is divided into 21 categories by the investment objective of the funds. Within each group, fund cash flows are further broken down into total sales, redemptions, exchange sales, and exchange redemptions. Total sales and redemptions represent outside flows, while exchange sales and exchange redemptions represent flows between funds within a fund family. Thus, we compute net fund flows (net sales) as total sales minus redemptions, plus exchange sales minus exchange redemptions.

Our sample period is from January 1984 to December 1999.[9] Our attention focuses on the period beginning January 1984 because the pre-1984 data is not comparable to the post-1984 data (i.e., ICI changed the way it collected data in 1984), and mutual funds played a much smaller role in the pre-1984 markets. Monthly securities return data comes from the Stocks, Bonds, Bills and Inflation Series of Ibbotson and Associates. The rates of return (and return indexes) are the

[9]Prior to 1984, the data is available for only three stock fund categories instead of 21 categories available for the post-1984 data. In addition, the pre-1984 data is not easily made available to the public without approval from the Investment Company Institute.

returns on the S&P 500 (for large company stocks) and the returns on the Dimensional Fund Advisors 9/10 Small Company Fund (for small company stocks). The dividend series is obtained from S&P 500 dividend yields.[10] The earning series is from S&P 500 P/E ratios. They are obtained from S&P's Statistical Service. We deflate nominal series using the CPI index to obtain real series.

B. Empirical Results

1. Empirical Results on the Price-Pressure Effect

For the empirical estimation and test for the model in Section III, we use the returns on the S&P 500 Index. The empirical estimates of θ in equation (3) (or (4)) and γ in (5) are reported in Table 1, panels A and B. For the estimation of θ, we need an estimate of the discount parameter ρ, which is obtained by the inverse of total returns (i.e., the inverse of (1 + sample mean of h_t)). Using the sample average value of a monthly return of 1.32%, the average value of the discount parameter would be about 0.988. In addition, we also consider four other values of the discount parameter ρ: 0.995, 0.99, 0.98, and 0.95. For the estimation, we need to determine the lag length m in the VAR (see Appendix). Considering both Akaike (1974) and Schwarz (1978) information criteria, we include either one or four lags in the estimation.

The estimates of θ and γ being a nonzero may indicate either that there exists a significant price-pressure effect or that the equity fund flow shock impacts expected cash flows and/or stock returns in a way that is not captured by our proxy for expected cash flows and/or returns. The estimates of θ and γ being a zero implies, on the other hand, that the equity fund flow shock is relevant to stock returns only to the extent that it affects current and future cash flows and/or expected returns.

Table 1, panel A shows that the estimates of the price-pressure parameter θ are positive but very small and statistically indifferent from zero. The estimates are between 0.6964×10^{-4} and 0.7200×10^{-4} with one lag, and between 0.9631×10^{-5} and 0.2090×10^{-4} with four lags, respectively. Their significance levels are all above 0.41, which indicates that the null hypothesis $\theta = 0$ (i.e., the absence of the price-pressure effect) is not rejected. This implies that equity fund flow shocks affect the stock market through expected future cash flows and/or expected future returns. Estimates of θ are not very sensitive with respect to different values of the discount parameter ρ and different numbers of lags in the VAR estimation.

Similar estimates are obtained for γ (Panel B). The estimates are between 0.6969×10^{-4} and 0.7704×10^{-4} with one lag, and between 0.9877×10^{-5} and 0.2113×10^{-4} with four lags, respectively. The estimates are statistically

[10]The t-ratios from predictive regressions of stock returns on the lagged values of financial fundamentals (e.g., dividend yields or price-earnings ratios) or macroeconomic indicators are subject to a small sample bias that may indicate that returns are more predictable than they, in fact, are. See Stambaugh (1986), Hodrick (1992), and Goetzmann and Jorion (1993). In particular, Goetzmann and Jorion (1993) point out that time-series studies of returns conditional upon any ratio involving price levels (e.g., dividend yields) are subject to a substantial bias. Several studies have explored the small sample problems of the VAR methods that include lagged endogenous variables (see Hodrick (1992) and Goetzmann and Jorion (1993)). Notice that we do not use dividend yields directly in the VAR model. Instead, we use returns, dividend growth, and fund flow growth.

TABLE 1

Estimates of the Parameter of the Price-Pressure Effect θ (or γ) Due to Equity Fund Flows (Sample Period, 1984:1–1999:12)

Panel A.

$$(E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j h_{t+j} = (1-\theta)(E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j \Delta d_{t+j} + \theta(E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j \Delta \text{eff}_{t+j},$$

where h_t, Δd_t, Δeff_t denote stock market returns, dividend growth rate, and growth rate of equity fund flows, respectively.

ρ	θ	Std. Error	*t*-Statistic	*p*-Value
With one lag in a VAR				
0.995	0.7200×10^{-4}	0.8890×10^{-4}	0.8099	0.4180
0.99	0.7174×10^{-4}	0.8886×10^{-4}	0.8073	0.4195
0.98	0.7121×10^{-4}	0.8877×10^{-4}	0.8021	0.4225
0.988	0.7163×10^{-4}	0.8884×10^{-4}	0.8063	0.4201
0.95	0.6964×10^{-4}	0.8851×10^{-4}	0.7868	0.4314
With four lags in a VAR				
0.995	0.2090×10^{-4}	0.8523×10^{-4}	0.2452	0.8063
0.99	0.1945×10^{-4}	0.8399×10^{-4}	0.2316	0.8169
0.98	0.1669×10^{-4}	0.8161×10^{-4}	0.2046	0.8379
0.988	0.1888×10^{-4}	0.8350×10^{-4}	0.2261	0.8211
0.95	0.9631×10^{-5}	0.7526×10^{-4}	0.1279	0.8982

Panel B.

$$(E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j h_{t+j} = (E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j \Delta d_{t+j} + \gamma(E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j \Delta \text{eff}_{t+j},$$

where h_t, Δd_t, Δeff_t denote stock market returns, dividend growth rate, and growth rate of equity fund flows, respectively.

ρ	γ	Std. Error	*t*-Statistic	*p*-Value
With one lag in a VAR				
0.995	0.7704×10^{-4}	0.8892×10^{-4}	0.8101	0.4179
0.99	0.7177×10^{-4}	0.8888×10^{-4}	0.8076	0.4194
0.98	0.7125×10^{-4}	0.8879×10^{-4}	0.8024	0.4223
0.988	0.7167×10^{-4}	0.8886×10^{-4}	0.8065	0.4199
0.95	0.6969×10^{-4}	0.8855×10^{-4}	0.7871	0.4312
With four lags in a VAR				
0.995	0.2113×10^{-4}	0.8539×10^{-4}	0.2475	0.8046
0.99	0.1968×10^{-4}	0.8415×10^{-4}	0.2339	0.8151
0.98	0.1693×10^{-4}	0.8177×10^{-4}	0.2071	0.8360
0.988	0.1911×10^{-4}	0.8366×10^{-4}	0.2285	0.8193
0.95	0.9877×10^{-5}	0.7543×10^{-4}	0.1309	0.8958

indifferent from 0, with their significance levels all above 0.41. This indicates that the finding of the insignificant price-pressure effect is not sensitive to different formulations of models and that the effect of equity fund flows on stock returns are symmetric with respect to revisions in expected cash flows and revisions in expected returns.[11]

In sum, we may safely conclude that the price-pressure effect is very small and insignificant. Equity fund flows seem to affect market returns through both

[11] When we use the change in the normalized equity fund flows , ΔReff, in lieu of the growth in equity fund flows, Δeff, the results are almost identical (i.e., the coefficients θ and γ are insignificantly different from zero).

revisions in expected future cash flows and revisions in expected future returns and, thus, the stock market appears to respond in an indirect manner to equity fund flow shocks. As such, these findings are consistent with the absence of a substantial price-pressure effect and with a horizontal demand curve for stocks.

2. Empirical Results on the Information Content of Equity Fund Flows

Granger causality tests from equity fund flows to stock market returns are performed by incorporating fundamental variables such as dividends, earnings, and Treasury bill rates. The fundamental variables are appropriately modified to meet the stationarity condition. We employ both the first-differenced equity fund flows (Δeff_t) and normalized equity fund flows (Reff) computed by dividing equity fund flows by the fund's net asset value in the previous month. For dividends, we use the first-differenced S&P 500 dividends (ΔD), dividend growth rates (GD), and S&P 500 dividend yields (DY) (see footnote 10). For earnings, we use the first-differenced S&P 500 earnings (ΔY), earnings growth rates (GY), and S&P 500 price/earnings ratios. For interest rates, we use three-month Treasury bill rates (TB), the first-differenced three-month Treasury bill rates (ΔTB), and Treasury bill growth rates (GTB).

The results in Table 2, panel A show that the null hypothesis that equity fund flows do not Granger-cause equity market returns in the presence of fundamentals (i.e., $H_0 : \beta_i = 0$) is not rejected. This result holds whether we use the first-differenced equity fund flows or the normalized equity fund flows, regardless of whether we use the first difference of fundamental variables, growth rates in the variables, or ratios of the variables (e.g., dividend yields and P/E ratios). The findings are robust with respect to the different number of lags. This result is consistent with that of Table 1 in that equity fund flows do not affect stock market returns directly in the presence of market fundamentals.

The results in Table 2, panel B show that the null hypothesis that equity market returns do not Granger-cause equity fund flows in the presence of fundamentals ($H_0 : \varphi_i = 0$) is rejected in most cases except for a couple of cases with two lags in the regressions. The results seem somewhat sensitive to the number of lags. This may be because the exclusion restriction (i.e., $\varphi_i = 0$) is less likely to be rejected as the number of lags increases in the regression. As discussed in Section III.B, the observation that stock market returns contain additional information about equity fund flows while equity fund flows do not contain any additional information about market returns implies that equity fund flows may be responding to changes in market returns.

V. Further Discussions

A. The Contemporaneous Relation between Equity Fund Flows and Market Index Prices

Using a variation of the dynamic present value relation and multivariate causality tests, we have presented evidence that equity fund flows do not directly affect stock market returns in the presence of other market fundamentals. Occasionally, the financial press reports that equity fund flows move stock market

TABLE 2

Multivariate Causality Tests

(Sample Period, 1984:1–1999:12)

Panel A. Granger-Causality Tests from Equity Fund Flows to Stock Market Returns

$$h_t = a_0 + \sum_{i=1}^{m} \alpha_i h_{t-i} + \sum_{i=1}^{m} \beta_i \Delta\text{eff}_{t-i} + \sum_{i=1}^{m} \gamma_i \text{Dividend}_{t-i} + \sum_{i=1}^{m} \eta_i \text{Earnings}_{t-i} + \sum_{i=1}^{m} \xi_i \text{T-Bill}_{t-i}$$

$H_0: \beta_i = 0$, for $\forall i$ (Equity fund flows do not Granger-cause S&P 500 returns)

Δeff(x)	Dividend	Earnings	T-Bill	Lags (D.F.)	F-Statistic	p-Value	$x \overset{G.C.}{\rightarrow} h$
Δeff	ΔD	ΔY	ΔTB	1 (1,184)	0.889	0.347	No
				2 (2,178)	0.967	0.382	No
Reff	GD	GY	GTB	1 (1,184)	1.158	0.283	No
				2 (2,178)	0.977	0.379	No
Reff	DY	PE	TB	1 (1,184)	0.909	0.341	No
				2 (2,178)	1.409	0.247	No
Reff	D	Y	TB	1 (1,184)	0.424	0.516	No
				2 (2,178)	0.839	0.434	No

Panel B. Granger-Causality Tests from Market Returns to Equity Fund Flows

$$\Delta\text{eff}_t = b_0 + \sum_{i=1}^{m} \phi_i \Delta\text{eff}_{t-i} + \sum_{i=1}^{m} \varphi_i h_{t-i} + \sum_{i=1}^{m} \nu_i \text{Dividend}_{t-i} + \sum_{i=1}^{m} \mu_i \text{Earnings}_{t-i} + \sum_{i=1}^{m} \omega_i \text{T-Bill}_{t-i}$$

$H_0: \varphi_i = 0$, for $\forall i$ (S&P 500 returns do not Granger-cause equity fund flows)

Δeff(y)	Dividend	Earnings	T-Bill	Lags (D.F.)	F-Statistic	p-Value	$h \overset{G.C.}{\rightarrow} y$
Δeff	ΔD	ΔY	ΔTB	1 (1,184)	5.118	0.025*	Yes
				2 (2,178)	1.373	0.256	No
Reff	GD	GY	GTB	1 (1,184)	10.424	0.002*	Yes
				2 (2,178)	2.847	0.061*	Yes
Reff	DY	PE	TB	1 (1,184)	10.304	0.002*	Yes
				2 (2,178)	1.342	0.264	No
Reff	D	Y	TB	1 (1,184)	10.665	0.001*	Yes
				2 (2,178)	2.996	0.052*	Yes

Granger-causality tests of equity fund flows and stock market returns are performed by incorporating fundamental variables such as dividends, earnings, and Treasury bill rates.

h = S&P 500 returns; Reff = normalized equity fund flows computed by dividing equity fund flows by the fund's net asset value in the previous month; Δeff = first-differenced equity fund flows; ΔD = first-differenced S&P 500 dividends; GD = dividend growth rates; DY = S&P 500 dividend yields; ΔY = first-differenced S&P 500 earnings; GY = earnings growth rates; PE = S&P 500 price/earnings ratio; ΔTB = first-differenced three-month T-bill rates; GTB = T-bill growth rates.

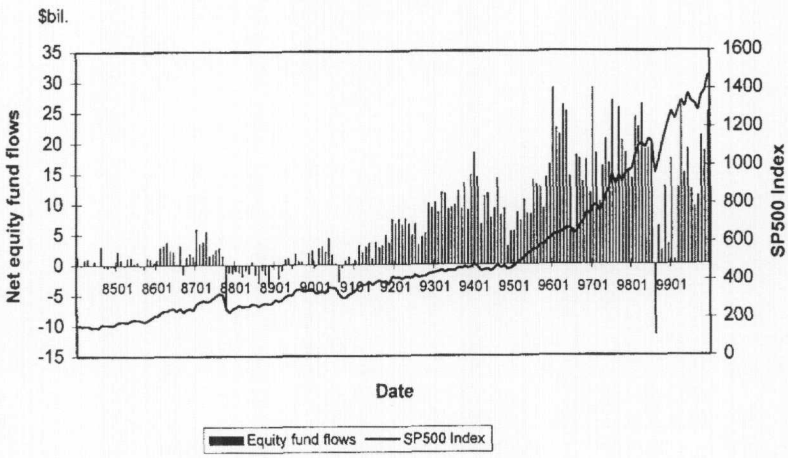
"Yes (No)" indicates presence (absence) of causality at a 10% significance level.
D.F. denotes the degrees of freedom.
*indicates significance at the 10% level.

prices. Some studies report evidence that the equity bull market of the 1990s is attributable to the huge flow of funds into equity mutual funds and that equity fund flows and stock market prices tend to move together over time (e.g., Goetzmann and Massa (1998)).

To gain more insight into the relationship between equity fund flows and stock market returns reported in the popular financial press, we employ various tests and further look at the relationship. For a possible comovement (or contemporaneous relationship) between equity fund flows and stock market index prices, we present Figures 1 and 2. They exhibit a contemporaneous relation and a comovement over time between the two variables. The contemporaneous correlation between S&P index returns (h_t) and the normalized equity fund flows (Reff_t) is 0.485 with a t-statistic of 7.72. To formalize the contemporaneous comovements, we test for a cointegration relation between equity fund flows and S&P index prices (Engle and Granger (1987)). As expected from the figures, Table 3, panel A shows that equity fund flows (eff) and S&P 500 Index prices (SP) are cointegrated. We also find that the equity fund flows and small company stock index prices (SPS) are cointegrated.

FIGURE 1

Net Equity Fund Flows and S&P 500 Index (1984:01–1999:12)



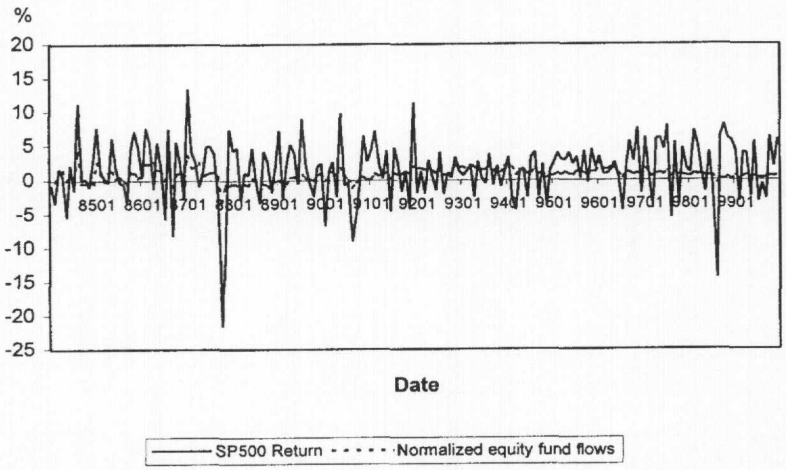
Data source: Value of net equity fund flows and S&P 500 index are from Investment Company Institute and Ibbotson Associates, respectively.

Table 3, panel B presents the results of causality tests between the first-differenced market indexes (ΔSP or ΔSPS) and equity fund flows (Δeff). Since their levels are cointegrated, we include a spread (or contemporaneous relation) term S_i between market indexes and equity fund flows to avoid misspecification and to fully take account of the comovements between the levels of the two variables (Granger (1988)). Panel B.1 provides evidence for the causation from the market indexes (of either large company stocks or small company stocks) to equity fund flows. Panel B.2 also shows that, in the presence of the cointegration term, equity fund flows Granger-cause stock indexes (ΔSP) (see footnote 3 for discussion of the relationship between small company stock returns and equity fund flows).

Panel C reports the results of bivariate causality tests between market returns and normalized equity fund flows (Reff), which are calculated by dividing equity fund flows by their total net asset in the previous month. The results are different from those in panel B in which the first-differenced level data are used. S&P returns are Granger-causally prior to equity fund flows, whereas equity fund flows

FIGURE 2

Normalized Net Equity Fund Flows and S&P 500 Returns (1984:01–1999:12)



Data source: Value of net equity fund flows and S&P 500 returns are from Investment Company Institute and Ibbotson Associates, respectively.

Net equity fund flows are normalized by dividing by the net asset of the equity funds in the previous month.

do not help predict future S&P returns, which is consistent with the results in Section IV.B.2 in the presence of market fundamentals (see Table 2).[12]

Overall, the findings indicate that the bivariate causal relation is from market returns to equity fund flows (whether they are first-differenced or normalized). This relation holds either in the presence of fundamentals or not. However, when we explicitly take into account the cointegration between the levels of the two variables and use the first-differenced series, there is some evidence of causality from equity fund flows to index prices mainly through the cointegration term so that there seems to be a feedback (i.e., bi-direction causal) relation between the levels of equity fund flows and market index prices.

B. More Evidence of Indirect Effect of Equity Fund Flows on Stock Returns

To gain further insight into the information relationship, we now introduce market fundamental variables into the regressions. Table 4, panel A presents the results of the bivariate causality test between fundamental variables and equity fund flows. Equity fund flows help predict both dividend growth and dividend yields, whereas no causal relation is found between equity fund flows and earnings growth (or price/earnings ratio). Causality tests for three variables—dividend growth (or dividend yield), earnings growth (P/E ratio), and equity fund flows—are reported in Table 4, panel B. As in the bivariate tests, equity fund flows

[12]Using bivariate Granger-causality tests, Edwards and Zhang (1998) report evidence that fund flows into stock funds have not affected stock returns, which is consistent with our results.

TABLE 3

Bivariate Causality Tests between Stock Market Performance and Equity Fund Flows

Panel A. Cointegration Test

Regressions

(1) $SP_t = \alpha_1 + \beta_1 eff_t + S_{1t}$

(2) $eff_t = \alpha_2 + \beta_2 SP_t + S_{2t}$

(3) $SPS_t = \alpha_3 + \beta_3 eff_t + S_{3t}$

(4) $eff_t = \alpha_4 + \beta_4 SPS_t + S_{4t}$

Variables (x_t)	Dickey-Fuller Test		Phillips-Perron Test	
	$m = 2$	$m = 4$	$k = 2$	$k = 4$
S_{1t}	−1.54	−0.85	−3.22*	−3.32*
S_{2t}	−3.50*	−2.79	−6.38*	−6.73*
S_{3t}	−2.92	−2.10	−6.04*	−6.42*
S_{4t}	−4.47*	−3.58*	−8.71*	−9.13*

For the cointegration tests of the spreads S_i for $i = 1, 2, 3$, and 4, critical values with 100 (200) observations are 10%, −3.03 (−3.02); 5%, −3.37 (−3.37); and 1%, −4.07 (−4.00), respectively (see Engle and Yoo (1987), Table 2, p. 157).

For Dickey-Fuller test, see Dickey and Fuller (1979). For Phillips-Perron test, see Phillips and Perron (1988).

The spreads S_i for $i = 1, 2, 3$, and 4 denote the residuals from the above regressions (1)–(4).

m = the number of lags in tests.

*indicates significance at the 10% level.

Panel B. Stock Market Indexes and Equity Fund Flows

B.1. $\Delta \text{Fundflow}_t = b_0 + \sum_{i=1}^{m} \delta_i \Delta \text{Index}_{t-i} + \sum_{i=1}^{m} \phi_i \Delta \text{Fundflow}_{t-i} + \eta S_{it-1}$

H_0: The stock market index does not Granger-cause equity fund flows.
[$H_0 : \delta_i = 0$, for $\forall\ i$ and $\eta = 0$]

Index (x)	Fund Flow (y)	S_i	Lags (D.F.)	*F*-Statistic	*p*-Value	$x \overset{G.C.}{\rightarrow} y$
SP	eff	S_1	2 (2,183)	3.001	0.032*	Yes
SP	eff	S_2	2 (2,183)	4.548	0.004*	Yes
SPS	eff	S_3	2 (2,183)	5.659	0.001*	Yes
SPS	eff	S_4	2 (2,183)	8.312	0.000*	Yes

B.2. $\Delta \text{Index}_t = a_0 + \sum_{i=1}^{m} \alpha_i \Delta \text{Index}_{t-i} + \sum_{i=1}^{m} \beta_i \Delta \text{Fundflow}_{t-i} + \gamma S_{it-1}$

H_0: Equity fund flows do not Granger-cause the stock market index.
[$H_0 : \beta_i = 0$, for $\forall\ i$ and $\gamma = 0$]

Fund Flow (x)	Index (y)	S_i	Lags (D.F.)	*F*-Statistic	*p*-Value	$x \overset{G.C.}{\rightarrow} y$
eff	SP	S_1	2 (2,183)	7.021	0.000*	Yes
eff	SP	S_2	2 (2,183)	3.759	0.012*	Yes
eff	SPS	S_3	2 (2,183)	4.930	0.003*	Yes
eff	SPS	S_4	2 (2,183)	4.781	0.003*	Yes

SP and eff, SPS and eff are cointegrated. Hence, bivariate spreads between them (S_i) are incorporated into the Granger-causality tests to take into account possible long-term equilibrium relationships.

(continued on next page)

Granger-cause dividend growth (or yields). The causation from equity fund flows to dividend growth (or dividend yields) in the bivariate and trivariate models implies that equity fund flows may affect stock returns by way of current and future changes in dividends.

Table 4, panel C shows that when stock returns are added to the three-variable model (dividends, earnings, and equity fund flows), equity fund flows lose their predictive power for dividend growth (and dividend yields). Instead, a strong causation from stock returns to dividend growth (and dividend yields) is observed. These findings suggest that equity fund flows affect stock returns in-

TABLE 3 (continued)

Bivariate Causality Tests between Stock Market Performance and Equity Fund Flows

Panel C. Stock Market Returns and Normalized Equity Fund Flows

C.1. $\text{Fundflow}_t = b_0 + \sum_{i=1}^{m} \delta_i \text{Return}_{t-i} + \sum_{i=1}^{m} \phi_i \text{Fundflow}_{t-i}$

$H_0 : \delta_i = 0$, for $\forall\, i$ (The stock market returns do not Granger-cause equity fund flows)

Return (x)	Fund Flow (y)	Lags (D.F.)	F-Statistic	p-Value	$x \overset{G.C.}{\rightarrow} y$
h	Reff	2 (2,184)	3.819	0.024*	Yes

C.2. $\text{Return}_t = a_0 + \sum_{i=1}^{m} \alpha_i \text{Return}_{t-i} + \sum_{i=1}^{m} \beta_i \text{Fundflow}_{t-i}$

$H_0 : \beta_i = 0$, for $\forall\, i$ (Equity fund flows do not Granger-cause the stock market returns)

Fund Flow (x)	Return (y)	Lags (D.F.)	F-Statistic	p-Value	$x \overset{G.C.}{\rightarrow} y$
Reff	h	2 (2,184)	1.509	0.224	No
Reff	hs	2 (2,184)	1.532	0.219	No

eff = equity fund flows; SP = S&P 500 index; SPS = small company stock index; Reff = normalized equity fund flows; h = S&P 500 returns; and hs = small company stock returns.

"Yes (No)" indicates presence (absence) of causality at a 10% significance level.

*indicates significance at the 10% level.

directly through their forecasts of dividends, but not directly. That is, since the effect of equity fund flows on stock returns is captured by current and future dividends (or cash flows), the stock market responds indirectly to changes in equity fund flows through the information effect. These findings are consistent with the test results in Section IV and suggest that the market demand for equities reflected in equity fund flows is horizontal.

C. On Breaking the Flow Effect into Changing Expectations about Dividends (Numerator Effect) and Discount Rates (Denominator Effect)

In Section IV.B.1, we find that equity fund flows affect market returns through revisions both in expected cash flows (dividends) and in expected future returns based on the Campbell-Shiller decomposition relation. To address how to break the flow effects into changing expectations about dividends (numerator effect) and discount rates (denominator effect), we decompose the forecast error variance of equity fund flows into the two orthogonalized components—expected returns (h_t) and dividend growth rates (Δd_t)—based on an orthogonalized trivariate VAR model of stock returns, h_t, dividend growth rates, Δd_t, and the equity fund flows, Reff_t.

The results are presented in Table 5. We order the stock return first in the VAR so that it can have potentially a stronger explanatory power for the equity fund flows. Stock returns and dividend growth explain about 10% of the forecast error variance of the normalized equity fund flows. Even with the stock return ordered first, dividend growth seems to have greater explanatory power for the normalized equity fund flows. A similar result is obtained when we use the growth in equity fund flows (Δeff) in lieu of the normalized equity fund flows (Reff).

As an alternative way of decomposing the flow effects into changing expectations about dividends (numerator effect) and discount rates (denominator ef-

TABLE 4

Causal Relationship between Equity Fund Flows and Fundamentals

Panel A. Bivariate Causality Test

$y_t = a_0 + \sum_{i=1}^{m} \alpha_i y_{t-i} + \sum_{i=1}^{m} \beta_i x_{t-i}$

$H_0 : \beta_i = 0$, for $\forall\, i$ (x does not Granger-cause y)

Causing Variable (x)	Caused Variable (y)	Lags (D.F.)	F-Statistic	p-Value	$x \overset{G.C.}{\rightarrow} y$
GD	Reff	2 (2,184)	0.993	0.373	No
		4 (4,178)	1.058	0.377	No
GY	Reff	2 (2,184)	0.187	0.830	No
		4 (4,178)	0.220	0.927	No
DY	Reff	2 (2,184)	4.068	0.019*	Yes
		4 (4,178)	1.188	0.318	No
PE	Reff	2 (2,184)	0.455	0.635	No
		4 (4,178)	0.221	0.926	No
Reff	GD	2 (2,184)	8.425	0.000*	Yes
		4 (4,178)	4.992	0.001*	Yes
Reff	GY	2 (2,184)	2.212	0.112	No
		4 (4,178)	0.985	0.417	No
Reff	DY	2 (2,184)	8.701	0.000*	Yes
		4 (4,178)	5.692	0.000*	Yes
Reff	PE	2 (2,184)	0.137	0.872	No
		4 (4,178)	0.490	0.743	No

Panel B. Trivariate Causality Tests

B.1. Three variables (x_t = [GD, GY, Reff]′)

	Caused Variables		
Causing Variable	GD	GY	Reff
GD	16.05 (0.00)*	1.03 (0.39)	1.13 (0.34)
GY	1.03 (0.39)	9.40 (0.00)*	0.31 (0.87)
Reff	4.05 (0.01)*	0.87 (0.48)	19.99 (0.00)*

B.2. Three variables (x_t = [DY, PE, Reff]′)

	Caused Variables		
Causing Variable	DY	PE	Reff
DY	1170.24 (0.00)*	1.28 (0.28)	1.10 (0.36)
PE	1.53 (0.19)	326.08 (0.00)*	0.16 (0.96)
Reff	3.97 (0.01)*	0.08 (0.99)	19.71 (0.00)*

(continued on next page)

fect), we orthogonalize the fund flows with respect to current and future dividend changes (i.e., innovations in the numerator), and see whether the correlation decreases significantly. We also orthogonalize the fund flows with respect to future returns (i.e., innovations in the denominator), and see whether the correlation decreases significantly. In Table 6, the contemporaneous correlation between stock returns h_t and the fund flows orthogonalized with respect to current and future (four-month) dividend changes ξ_{1t} decreases substantially to 0.188 from 0.485. However, the contemporaneous correlation between stock returns h_t and the fund flows orthogonalized with respect to future (four-month) returns ξ_{2t} decreases to 0.464 from 0.485.

TABLE 4 (continued)

Causal Relationship between Equity Fund Flows and Fundamentals

Panel C. Four-Variable Causality Tests

C.1. Four variables (x_t = [GD, GY, Reff, h]′)

Causing Variable	Caused Variables: GD	GY	Reff	h
GD	4.14 (0.01)*	1.80 (0.13)	0.96 (0.43)	0.38 (0.82)
GY	0.86 (0.49)	10.00 (0.00)*	0.31 (0.87)	0.80 (0.53)
Reff	0.94 (0.44)	0.28 (0.89)	16.75 (0.00)*	0.68 (0.61)
h	5.25 (0.00)*	3.94 (0.01)*	1.07 (0.37)	1.12 (0.35)

C.2. Four variables (x_t = [DY, PE, Reff, h]′)

Causing Variable	Caused Variables: DY	PE	Reff	h
DY	1443.64 (0.00)*	0.73 (0.58)	3.20 (0.02)*	1.11 (0.35)
PE	0.93 (0.45)	399.65 (0.00)*	0.20 (0.94)	1.33 (0.26)
Reff	1.63 (0.17)	0.45 (0.77)	24.74 (0.00)*	1.14 (0.34)
h	8.90 (0.00)*	1.37 (0.25)	2.16 (0.08)*	2.39 (0.05)*

h = S&P 500 returns; DY = S&P 500 dividend yields; GD = dividend growth rates, PE = S&P 500 price/earnings ratio; GY = earnings growth rates. Reff = normalized equity fund flows computed by dividing equity fund flows by the funds' net asset value in the previous month.

The numbers in each cell are F-statistics for the null hypothesis that the causal variable in each row does not Granger-cause the "caused" variable in each column.

The numbers in parentheses are significance levels for the F-statistic.

"Yes (No)" indicates presence (absence) of causality at a 10% significance level.

Test statistics for panel B (panel C) are derived from a three-equation (four-equation) VAR with a four-month lag structure.

*indicates significance at the 10% level.

TABLE 5

Forecast Error Variance Decomposition of Equity Fund Flows

Panel A. Decomposition of Variance for Series Reff

Forecast Horizon	h	Δd	Reff
1 month	0.0000	0.0000	100.0000
2	1.0886	0.2094	98.7020
3	1.1525	1.4752	97.3723
4	2.4180	5.7974	91.7846
8	3.2074	5.9131	90.8795
12	3.1256	5.9928	90.8816
24	3.1003	6.0361	90.8636

Panel B. Decomposition of Variance for Series Δeff

Forecast Horizon	h	Δd	Δeff
1 month	0.0000	0.0000	100.0000
2	0.5000	0.7716	99.1784
3	0.9993	1.5489	97.4518
4	1.3259	1.9000	96.7741
8	2.0561	2.4050	95.5389
12	2.1121	2.4090	95.4789
24	2.1128	2.4091	95.4781

Reff = normalized equity fund flows computed by dividing equity fund flows by the fund's net asset value in the previous month; Δeff = growth rate of equity fund flows; h = S&P 500 returns; Δd_t = dividend growth rate.

TABLE 6

Correlations between Orthogonalized Equity Fund Flows and Stock Returns

Panel A. Correlation between Stock Returns and Equity Fund Flows

Correlation (h_t, Reff$_t$)	0.485 (7.719)*

Panel B. Orthogonalizing Equity Fund Flows with Respect to Current and Future Dividend Changes

B.1. $\text{Reff}_t = \alpha_0 + \sum_{i=0}^{-m} \alpha_i \Delta d_{t-i} + \xi_{1t}$

	Two Leads	Four Leads
Correlation (h_t, ξ_{1t})	0.247 (3.490)*	0.188 (2.598)*

B.2. $h_t = \gamma_0 + \gamma_1 \xi_{1t} + \varepsilon_t$

	γ_1 Coefficient	Std. Error	*t*-Statistic	*p*-Value
Two leads	1.252	0.359	3.490	0.001*
Four leads	0.981	0.378	2.598	0.01*

B.3. Measure of contribution of Δd_{t+j} effect [Corr(h_t, Reff$_t$) − Corr(h_t, ξ_{1t})]

	Corr(h_t, Reff$_t$)	Corr(h_t, ξ_{1t})	Corr(h_t, Reff$_t$) −Corr(h_t, ξ_{1t})
Two leads	0.485	0.247	0.238
Four leads	0.485	0.188	0.297

Panel C. Orthogonalizing Equity Fund Flows with Respect to Future Stock Returns

C.1. $\text{Reff}_t = \alpha_0 + \sum_{i=-1}^{-m} \alpha_i h_{t-i} + \xi_{2t}$

	Two Leads	Four Leads
Correlation (h_t, ξ_{2t})	0.486 (7.598)*	0.464 (7.127)*

C.2. $h_t = \gamma_0 + \gamma_1 \xi_{2t} + \varepsilon_t$

	γ_1 Coefficient	Std. Error	*t*-Statistic	*p*-Value
Two leads	2.283	0.300	7.598	0.00*
Four leads	2.203	0.309	7.127	0.00*

C.3. Measure of contribution of h_{t+j} effect [Corr(h_t, Reff$_t$) − Corr(h_t, ξ_{2t})]

	Corr(h_t, Reff$_t$)	Corr(h_t, ξ_{2t})	Corr(h_t, Reff$_t$) −Corr(h_t, ξ_{2t})
Two leads	0.485	0.486	−0.001
Four leads	0.485	0.464	0.021

In sum, having shown that there is little evidence of price-pressure effect in Section IV.B.1, our findings in Tables 5 and 6 suggest that the remaining correlation appears to be marginally due more to variation in future dividend growth than to variation in expected returns.

D. On the Limitation of Granger-Causality and the Contemporaneous Relationship

A potential limitation of Granger-causality is that it does not help explain the contemporaneous relationship. An interesting and useful issue would be to see if accounting for various fundamental effects changes the contemporaneous correlation because, at the monthly horizon, one can presume that most of the actual causality is taking place. To address this issue, we examine whether the contemporaneous correlation between market returns and the normalized equity fund flows changes significantly when the stock market returns are orthogonalized with respect to contemporaneous fundamentals such as dividend growth (divr), P/E ratio (pe), dividend yield (dy), inflation (inf), and Treasury bill yields (tb).

Our findings in Table 7 show that accounting only for various *contemporaneous* fundamental effects does not reduce the contemporary correlation between fund flows and stock returns. However, when we account for *current* and *past* fundamental effects, the correlation reduces almost to zero, suggesting that a substantial amount of actual causality may take place over longer than a month. In short, the relation is more than a contemporaneous relation.

TABLE 7

The Effect of Fundamentals on Contemporaneous Relationship

Correlations of Series X_t and Y_t

X_t	Y_t	Correlation Coefficient
h	Reff	0.4847
Reff	ε_1 1)	0.4884
Reff	ε_2 2)	0.0173
h	ν_1 3)	0.3988
h	ν_2 4)	0.0048

The error terms (ε_i and ν_i) are obtained from the following regressions:

1) $h_t = a_0 + \alpha \text{divr}_t + \beta pe_t + \gamma \text{dy}_t + \eta \inf_t + \xi \text{tb}_t + \varepsilon_{1t}$

2) $h_t = a_{01} + \sum_{i=0}^{4} \alpha_i \text{divr}_{t-i} + \sum_{i=0}^{4} \beta_i \text{pe}_{t-i} + \sum_{i=0}^{4} \gamma_i \text{dy}_{t-i} + \sum_{i=0}^{4} \eta_i \inf_{t-i} + \sum_{i=0}^{4} \xi_i \text{tb}_{t-i} + \varepsilon_{2t}$

3) $\text{Reff}_t = b_0 + \phi \text{divr}_t + \varphi \text{pe}_t + \nu \text{dy}_t + \mu \inf_t + \omega \text{tb}_t + \nu_{1t}$

4) $\text{Reff}_t = b_{01} + \sum_{i=0}^{4} \phi_i \text{divr}_{t-i} + \sum_{i=0}^{4} \varphi_i \text{pe}_{t-i} + \sum_{i=0}^{4} v_i \text{dy}_{t-i} + \sum_{i=0}^{4} \mu_i \inf_{t-i} + \sum_{i=0}^{4} \omega_i \text{tb}_{t-i} + \nu_{2t}$

E. Empirical Results using Quarterly Data

Given the importance of the results using various frequencies of data, we re-estimate the decomposition and causal relations using quarterly data, which covers a longer sample period (i.e., 1952:I–1999:IV). Quarterly unadjusted equity mutual fund flows ($ millions) are from the "Flow of Funds" from the Federal Reserve Board. The results of quarterly data are very similar to those of monthly data.[13]

Major findings are as follows. First, the price-pressure effect based on the Campbell-Shiller decomposition relation is very small and insignificant, as in the case of the monthly data. That is, equity fund flows seem to affect market returns through both revisions in expected future cash flows and revisions in expected future returns, which is consistent with the absence of a substantial price-pressure effect and with a horizontal demand curve for stocks.

Second, equity fund flows do not Granger-cause equity market returns in the presence of fundamentals. However, equity market returns Granger-cause equity fund flows in the presence of fundamentals. Third, when we explicitly

[13]The results are not reported in the paper to save space. However, they are available from the authors upon request.

take into account the cointegration between the levels of the quarterly equity fund flows and market index prices and use their first-differenced series, there is some evidence of causality from equity fund flows to index prices mainly through the cointegration term so that there seems to be a feedback (i.e., bi-direction causal) relation between the levels of equity fund flows and market index prices.

VI. Concluding Remarks

We have examined whether the market demand curve for equities is downward sloping. Unlike previous studies that examine individual stocks' demand curves, we look at the aggregate demand curve. This is because those studies provide mixed results, and the finding of a horizontal aggregate (or market) demand curve would be sufficient for horizontal individual demand curves. In addition, we do not have to rely on the substitution hypothesis for the horizontal demand curves. As a proxy for aggregate demand, we employ equity mutual fund flows, which have experienced a substantial surge in recent years and provide a clear indication of an increased demand from investors.

Unlike previous studies that focus on events that are unlikely to convey new information to the market, we devise an empirical framework that disentangles the price-pressure effect and the information effect. This is because it is very difficult to find events that do not convey any information to the market, and the results from previous studies are mixed.

We do not find evidence for the price-pressure effect that equity fund flows directly affect stock market prices in the presence of market fundamentals. Instead, we find that equity fund flows seem to be influenced by the performance of the stock market and that investors try to forecast fundamentals of firms and change their demand for stocks accordingly. Overall, these findings are consistent with a horizontal market demand curve for equities. A significant implication of these findings is that many important propositions in finance that are implicitly based on the assumption of horizontal demand curves for equities seem to be well founded.

Appendix: Estimation of the Price-Pressure Effect Parameter θ

In this Appendix, we discuss how to identify and estimate the price-pressure effect parameter θ. Consider a three-by-one vector z_t consisting of stock returns, h_t, changes in cash flows, Δd_t, and changes in equity fund flows, Δeff_t (i.e., $y_t = [h_t, \Delta d_t, \Delta \text{eff}_t]'$. We estimate the following trivariate vector autoregressive model with m lags, VAR (m),

$$\text{(A-1)} \quad \begin{bmatrix} h_t \\ \Delta d_t \\ \Delta \text{eff}_t \end{bmatrix} = \begin{bmatrix} A_{11}(L) & A_{12}(L) & A_{13}(L) \\ A_{21}(L) & A_{22}(L) & A_{23}(L) \\ A_{31}(L) & A_{32}(L) & A_{33}(L) \end{bmatrix} \begin{bmatrix} h_{t-1} \\ \Delta d_{t-1} \\ \Delta \text{eff}_{t-1} \end{bmatrix} + \begin{bmatrix} u_{1t} \\ u_{2t} \\ u_{3t} \end{bmatrix},$$

where L is the lag operator (i.e., $L^n x_t = x_{t-n}$) and

$$A_{ij}(L) \quad = \quad \sum_{k=1}^{m} a_{ij}^{k} L^{k-1}.$$

By stacking variables, equation (A-1) can be written compactly as

$$\text{(A-2)} \qquad z_t \quad = \quad A z_{t-1} + u_t,$$

where

$$z_t \quad = \quad \begin{bmatrix} h_t \\ h_{t-1} \\ . \\ . \\ h_{t-m+1} \\ \Delta d_t \\ \Delta d_{t-1} \\ . \\ . \\ \Delta d_{t-m+1} \\ \Delta \mathrm{eff}_t \\ \Delta \mathrm{eff}_{t-1} \\ . \\ . \\ \Delta \mathrm{eff}_{t-m+1} \end{bmatrix}, \quad u_t \quad = \quad \begin{bmatrix} u_{1t} \\ 0 \\ . \\ . \\ 0 \\ u_{2t} \\ 0 \\ . \\ . \\ 0 \\ u_{3t} \\ 0 \\ . \\ . \\ 0 \end{bmatrix},$$

$$A \quad = \quad \begin{bmatrix}
a_{11}^1 & a_{11}^2 & . & . & a_{11}^m & a_{12}^1 & a_{12}^2 & . & . & a_{12}^m & a_{13}^1 & a_{13}^2 & . & . & a_{13}^m \\
1 & 0 & 0 & 0 & 0 & 0 & 0 & . & . & 0 & 0 & 0 & . & . & 0 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 & . & . & 0 & 0 & 0 & . & . & 0 \\
. & 0 & 0 & 0 & 0 & 0 & 0 & . & . & 0 & 0 & 0 & . & . & 0 \\
. & . & . & . & . & . & . & . & . & . & . & . & . & . & . \\
a_{21}^1 & a_{21}^2 & . & . & a_{21}^m & a_{22}^1 & a_{22}^2 & . & . & a_{22}^m & a_{23}^1 & a_{23}^2 & . & . & a_{23}^m \\
0 & 0 & . & . & 0 & 1 & 0 & . & . & 0 & 0 & 0 & . & . & 0 \\
. & . & . & . & 0 & 0 & 1 & 0 & . & 0 & 0 & 0 & . & . & 0 \\
. & . & . & . & . & . & 0 & 0 & . & . & . & . & . & . & 0 \\
. & . & . & . & . & . & . & . & . & . & . & . & . & . & 0 \\
a_{31}^1 & a_{31}^2 & . & . & a_{31}^m & a_{32}^1 & a_{32}^2 & . & . & a_{32}^m & a_{33}^1 & a_{33}^2 & . & . & a_{33}^m \\
0 & 0 & . & . & 0 & 0 & 0 & . & . & 0 & 1 & 0 & . & . & 0 \\
. & . & . & . & . & . & . & . & . & 0 & 0 & 1 & 0 & . & 0 \\
. & . & . & . & . & . & . & . & . & . & . & 0 & . & . & 0 \\
. & . & . & . & . & . & . & . & . & . & . & . & . & . & 0
\end{bmatrix}.$$

Letting e_j for $j = 1, 2,$ and 3 be the $(1 \times 3m)$ row vector with one in the $[(j-1)m+1]$st column and zeros elsewhere, we can express h_t, Δd_t and $\Delta \mathrm{eff}_t$ in terms of z_t,

$$\text{(A-3)} \qquad h_t \; = \; e_1 z_t, \qquad \Delta d_t \; = \; e_2 z_t, \qquad \text{and} \qquad \Delta \mathrm{eff}_t \; = \; e_3 z_t.$$

Using the expectations operator that $E_t[.] = E[.|y_{t-j}, j \geq 0]$, we notice that future $u_t s$ are orthogonal to current information,

$$E_t[u_{t+j}] \quad = \quad 0 \quad \text{for} \quad j > 1.$$

Therefore, using a prediction formula, we obtain

$$E_t[h_{t+j}] = E_t[e_1 z_{t+j}] = e_1 A^j z_t, \quad \text{and}$$
$$E_{t-1}[h_{t+j}] = E_{t-1}[e_1 z_{t+j}] = e_1 A^{j+1} z_{t-1}.$$

Then, we can represent unexpected changes in variables as

$$(E_t - E_{t-1}) h_{t+j} = e_1 A^j (z_t - A z_{t-1}) = e_1 A^j u_t.$$

Similarly, we obtain

$$(E_t - E_{t-1}) \Delta d_{t+j} = e_2 A^j (z_t - A z_{t-1}) = e_2 A^j u_t, \quad \text{and}$$
$$(E_t - E_{t-1}) \Delta \text{eff}_{t+j} = e_3 A^j (z_t - A z_{t-1}) = e_3 A^j u_t.$$

Hence, equation (3) can be rewritten as

$$\text{(A-4)} \qquad \Sigma_{j=0}^{\infty} \rho^j e_1 A^j u_t = (1-\theta) \Sigma_{j=0}^{\infty} \rho^j e_2 A^j u_t + \theta \Sigma_{j=0}^{\infty} \rho^j e_3 A^j u_t.$$

This can be simplified as

$$\text{(A-5)} \quad e_1 (1 - \rho A)^{-1} u_t = (1-\theta) e_2 (1 - \rho A)^{-1} u_t + \theta e_3 (1 - \rho A)^{-1} u_t,$$

or

$$[e_1 - e_2](1 - \rho A)^{-1} u_t = \theta [e_3 - e_2](1 - \rho A)^{-1} u_t.$$

By letting $(1 - \rho A)^{-1}$ be $F(=[f_{ij}]$ for $i, j = 1, 2,$ and $3)$, equation (A-5) becomes

$$[e_1 - e_2] F u_t = \theta [e_3 - e_2] F u_t.$$

Therefore, the parameter θ in (3) can be obtained by

$$\theta = \frac{[e_1 - e_2] F u_t}{[e_3 - e_2] F u_t}.$$

Similarly, the parameter γ in (5) can be obtained by

$$\gamma = \frac{[e_1 - e_2] F u_t}{e_3 F u_t}.$$

Note that the estimates of θ and γ are based on the rational expectations relationship between expected future returns and expected future cash flows, treating returns, cash flows, and equity fund flows as *endogenous* in a VAR framework. Therefore, we do not have to distinguish between the right- and left-hand-side variables in a regression and, thus, our approach does not suffer from the endogeneity problem. In addition, shocks to equity fund flows are computed conveniently by innovations (or one-step-ahead forecast errors) in these variables (i.e., $u_{3t} = (E_t - E_{t-1}) \Delta \text{eff}_t$) as a byproduct of the VAR modeling.

References

Akaike, H. "A New Look at the Statistical Identification Model." *IEEE Transactions on Automatic Control*, 19 (1974), 716–723.

Campbell, J. Y. "A Variance Decomposition for Stock Returns." *Economic Journal*, 101 (1991), 157–179.

Campbell, J. Y., and R. J. Shiller. "The Dividend-Price Ratio and Expectations of Future Dividends and Discount Factors." *Review of Financial Studies*, 1 (1989), 195–228.

Cohen, R. "Asset Allocation Decisions of Individuals and Institutions." Working Paper, Harvard Univ. (1999).

Dann, L.; D. Mayers; and R. Raab, Jr. "Trading Rules, Large Blocks and the Speed of Price Adjustment." *Journal of Financial Economics*, 4 (1977), 3–22.

Davidson, W., III; I. Chhachhi; and J. Glascock. "A Test for Price Pressure Effects in Tender Offer Stock Repurchases." *Financial Review*, 31 (1996), 25–49.

Dhillon, U., and H. Johnson. "Changes in the Standard and Poor's 500 List." *Journal of Business*, 64 (1991), 75–85.

Dickey, D., and W. Fuller. "Distribution of the Estimators for Autoregressive Time Series with a Unit Root." *Journal of the American Statistical Association*, 74 (1979), 427–431.

Edelen, R., and J. Warner. "Aggregate Price Effect of Institutional Trading: A Study of Mutual Fund Flow and Market Returns." Working Paper, Univ. of Pennsylvania (1999).

Edwards, F., and X. Zhang. "Mutual Funds and Stock and Bond Market Stability." *Journal of Financial Services Research*, 13 (1998), 257–282.

Engle, R., and W. Granger. "Cointegration and Error Correction: Representation, Estimation and Testing." *Econometrica*, 55 (1987), 251–276.

Engle, R., and B. Yoo. "Forecasting and Testing in Cointegrated Systems." *Journal of Econometrics*, 35 (1987), 143–159.

Fama, E. F. "Stock Returns, Expected Returns, and Real Activity." *Journal of Finance*, 45 (1990), 1089–1109.

Fama, E., and K. French. "Business Conditions and Expected Returns on Stocks and Bonds." *Journal of Financial Economics*, 25 (1989), 23–49.

Fortune, P. "Mutual Funds, Part II: Fund Flows and Security Returns." *New England Economic Review* (Jan.–Feb. 1998), 3-22.

Goetzmann, W., and P. Jorion. "Testing the Predictive Power of Dividend Yields." *Journal of Finance*, 47 (1993), 663–679.

Goetzmann, W., and M. Massa. "Index Funds Investors and Stock Market Growth." Working Paper, Yale Univ. (1998).

Goetzmann, W.; M. Massa; and K. Rouwenhorst. "Behavioral Factors in Mutual Fund Flows." Working Paper, Yale Univ. (2000).

Granger, C. W. "Some Recent Developments in a Concept of Causality." *Journal of Econometrics*, 39 (1988), 199–211.

Harris, L., and E. Gurel. "Price and Volume Effects Associated with Changes in the S&P 500 List: New Evidence for the Existence of Price Pressure." *Journal of Finance*, 41 (1986), 815–829.

Hess, A., and P. Frost. "Tests for Price Effects of New Issues of Seasoned Securities." *Journal of Finance*, 36 (1982), 11–25.

Hodrick, R. J. "Dividend Yields and Expected Stock Returns: Alternative Procedures for Inference and Measurement." *Review of Financial Studies*, 5 (1992), 357–386.

Jain, P. C. "The Effect on Stock Price of Inclusion in or Exclusion from the S&P 500." *Financial Analysts Journal*, 43 (1987), 58–65.

Kalay, A., and A. Shimrat. "Firm Value and Seasoned Equity Issues: Price Pressure, Wealth Redistribution, or Negative Information." *Journal of Financial Economics*, 19 (1987), 109–126.

Kandel, S.; O. Sarig; and A. Wohl. "The Demand for Stocks: An Analysis of IPO Auctions." *Review of Financial Studies*, 12 (1999), 227–247.

Karceski, J. "Returns-Chasing Behavior, Mutual Funds and Beta's Death." Working Paper, Univ. of Florida (2000).

Keim, D., and R. Stambaugh. "Predicting Returns in the Stock and Bond Markets." *Journal of Financial Economics*, 17 (1986), 357–390.

Kraus, A., and H. Stoll. "Price Impacts of Block Trading on the New York Stock Exchange." *Journal of Finance*, 27 (1972), 569–588.

Lee, C.; A. Shleifer; and R. Thaler. "Investor Sentiment and the Closed-End Fund Puzzle." *Journal of Finance*, 46 (1991), 75–109.

Lynch, A., and R. Mendenhall. "New Evidence on Stock Price Effects Associated with Changes in the S&P 500 Index." *Journal of Business*, 70 (1997), 351–383.

Mikkelson, W., and M. Partch. "Stock Price Effects and Costs of Secondary Distribution." *Journal of Financial Economics*, 14 (1985), 165–194.

Phillips, P., and P. Perron. "Testing for a Unit Root in Time Series Regression." *Biometrika* 75 (1988), 335–346.

Pruitt, S., and J. Wei. "Institutional Ownership and Changes in the S&P 500." *Journal of Finance*, 45 (1989), 509–513.

Sanger, G., and J. Peterson. "An Empirical Analysis of Common Stock Delistings." *Journal of Financial and Quantitative Analysis*, 25 (1990), 261–272.

Scholes, M. S. "The Market for Securities: Substitution versus Price Pressure and the Effects of Information on Share Prices." *Journal of Business*, 45 (1972), 179–211.

Schwarz, G. "Estimating the Dimension of a Model." *Annals of Statistics*, 6 (1978), 461–464.

Schwert, G. W. "Stock Returns and Real Activity: A Century of Evidence." *Journal of Finance*, 45 (1990), 1237–1257.

Shleifer, A. "Do Demand Curves for Stocks Slope Down?" *Journal of Finance*, 41 (1986), 579–590.

Stambaugh, R. F. "Bias in Regression with Lagged Stochastic Regressors." CRSP Working Paper No. 156, Univ. of Chicago (1986).

Warther, V. A. "Aggregate Mutual Fund Flows and Security Returns." *Journal of Financial Economics*, 39 (1995), 209–235.

________________. "Has the Rise of Mutual Funds Increased Market Instability?" In *Brookings-Wharton Papers on Financial Services*, R. Litan and A. Santomero, eds. Washington, D.C.: Brookings Institution (1998), 239–280.

Zheng, L. "Who Moves the Market? A Study of Stock Prices and Investment Cash Flows." Working Paper, Univ. of Michigan (1998).