The Dependence of the Inflows to Mutual Funds on Past Performance

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CONTENTS

1. Introduction

When on March 21, 1924 Edward G. Leffler launched his Massachusetts Investors Trust, the world's first open-end mutual fund there were not to many cheers or celebration but on this day history was made[1]. This day certainly did not mark the beginning of the mutual fund era of today but was a first important step on the way to the place where the mutual fund industry is now. Over last 75 years mutual funds has grown to the third largest financial industry in the U.S.—second only to banks and insurance companies. In this span of time the mutual fund industry have grown from fledgling novelty to an ordinary investment vehicle owned by more than 44 million U.S. households. U.S. mutual funds experienced especially dramatic rise in their importance over the last decade as their assets exploded from 810 billions in 1989 to more than 5.5 trillions at the end of last year. Over similar period number of mutual funds has grown from 2,900 to over 7,300 providing even wider choice of investment objectives, strategies and performance record.

Asked about the reason for this tremendous success proponents of the mutual funds point to their unique characteristics making them an ideal investment vehicle for unsophisticated investors seeking diversification, choice of variety investment objectives and strict antifraud regulation yet allowing them to exploit opportunities of the fast growing stock market.

The tremendous growth in size of the mutual fund industry had a profound effect on the U.S. stock market as the mutual funds allowed millions of households to switch away from direct ownership of shares to indirect mainly through mutual funds. This process reflects the growth in demand for tax-deferred investment accounts which have large component in equities. As the result of this growth mutual fund managers has amassed lot of power as their investment decisions affect both welfare of their shareholders and to the great extent valuation of the stock market (Fortune 1998).

The importance of the mutual fund industry has risen the questions among both regulators, practitioners and finance theorists as to what drives the growth of individual funds and what incentives result from this growth for mutual fund managers and industry as the whole. Those questions spurred variety of research on investors purchasing decisions and their consequences on their wealth and behavior of mutual fund managers.

One of the hypotheses about investors behavior assumes that investors who are unsure about funds future performance form a possibly rational expectations about it from its past performance. As the result, they may seem to try to chase performance by investing increasingly more in recent best performers - which seems to be reasonable prediction in view of many psychological models of consumer (investor) behavior. This hypothesis is interesting from the point of view of one of its theoretical predictions which says that the knowledge of this decision process may offer mutual fund managers some insights as to what to do in order to maximize their proceeds from management fees.

This study is concerned with the concept of flow-performance relationship in the mutual fund industry and attempts to test the hypothesis that flows into mutual funds depend to high degree on their past performance and that past performance can predict future flows. The predictions of the hypothesis are tested on the sample of 132 U.S. mutual funds for the period 1991-1994.

The full analysis of the investors purchasing decisions requires considering many aspects including: practical operations and investment issues in the mutual fund industry, methodological concepts of measuring both flows and performance and theoretical insights and empirical evidence available in the mutual fund literature.

Accordingly this study has been divided in four main chapters concerned with each of those problems.

Chapter 2 provides a review of several issues important for the understanding the investing environment of the mutual fund investors. Among others it introduces a basic taxonomy of funds, shares pricing methodology, their structure and regulation. Particular attention has been paid to tax considerations and the role of mutual funds in U.S. retirement investment market which offer important insights in motives of larger group of shareholders for investing in mutual funds.

Chapter 3 is concerned with the basic methodology of performance and flow measurement. It surveys several crude and composite performance measures found in both practitioners' and theoretical literature that form a base for further discussion of both empirical results reported in the literature and my own results of testing the hypotheses presented in the later chapters. This chapter concerns also methodology of flow measurement and pays special attention to the assumptions underlying flow models.

Chapter 4 presents both theoretical predictions of models of investors behavior and results of their tests reported in the mutual fund literature. It starts with theoretical models assuming both rational and irrational response of investors to the uncertainty he faces about future performance of the funds. The empirical part reports results of testing of those and other models of investors' behavior and attempts to draw common conclusions and predictions about this behavior that will be helpful in forming hypotheses that are tested in the later chapter.

The empirical part of the study - chapter 5 - presents the four hypotheses about flow-performance relationship that were set to be tested: H1:about basic flow-performance relationship; H2: relative strength of crude and composite performance measures; H3: relative importance of more recent

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[1] The minimum investment: just $250 (only $2.50 less than than the cost of a new, economical Ford Model T), plus a 5% sales charge.

performance information and; H4: about asymmetry in investors' reaction to under- and outperformance. Those hypotheses are tested using simple portfolio methodology for initial analysis and formal regression framework for main results. The results of tests of those hypotheses are presented and discussed in the later sections of this chapter.

The chapter 6 concluding this study summarizes the main findings and reiterates their practical consequences.

2. Mutual Fund Operations and Issues

Any attempt to study investors' behavior requires good understanding of the investment vehicle, the market in which he makes his investment decisions and its intricacies. This chapter attempts a short presentation of mutual funds and the context in which they operate. Sections 2.1 and 2.2 provides an introduction to mutual funds, mutual fund terminology and some technical issues concerning pricing of their shares. Section 2.3 enumerates rudimentary benefits of mutual funds and sections 2.4 and 2.5 describe structure, operations and regulation of U.S. mutual funds. Sections 2.6 and 2.7 concluding this chapter are concerned with tax considerations and use of mutual funds for retirement investments which have significant impact on mutual fund investors.

2.1 INTRODUCTION TO MUTUAL FUNDS

According to the basic definition[2] a mutual fund is „an investment company that pools money from shareholders and invests in a diversified portfolio of securities". The Investment Company Act of 1940 enumerates mutual funds as one of the three basic classes of investment companies next to unit investment trusts and closed-end funds. As a managed investment company mutual funds are organized as corporations or trusts (few are limited partnerships) and have a board of directors or trustees that is elected by its shareholders. In turn the board will commonly hire a firm—the management company—to manage the company's assets for an annual fee that is typically based on the total market value of the assets.

As an open-end investment company mutual funds have to stand ready at all times to purchase its own shares at or near their net asset value. Most of the mutual funds also continuously offer new shares to the public for a price at or near their net asset values. Hence their capitalization is "**open**", with the number of shares outstanding changing on a daily basis. There are two methods used by mutual funds to sell their shares to the public: direct marketing and the use of **sales force**. With **direct marketing** the mutual fund sells shares directly to investors without use of a sales organization. In such a situation mutual funds are known as **no-load funds** and sell their shares at a price equal to their net asset value. The other method involves the use of a sales force that is paid commission based on the number of shares sold. This sales force often involves brokers, financial planners, and employees of insurance companies and banks. The mutual funds that use this method are known as **load funds**, because the commission involves adding a percentage **load charge** to the net asset value. When mutual fund

[2] Cf. Mutual Funds Factbook 1999, Investment Company Institute, http://www.ici.org

shareholders want to sell their shares, they usually receive an amount equal to the fund's net asset value times the number of shares sold. However, a few funds charge a **redemption fee**, or conditional deferred sales charge which decreases with the time the investor owned the shares. Most of the mutual funds operate within mutual fund complexes (families) which usually share board of directors, investment advisors etc. Such complexes comprise number of funds with various investment objectives and most of them enable their investors to easily[3] (and relatively cheaply) transfer/exchange their money between portfolios with different investment objectives.

The investor in mutual fund may benefit from his share in two ways. One, is the capital appreciation of his shares proportional to the appreciation of the value of the mutual fund portfolio (**unrealized capital gains**). Second, are distributions coming from **dividends** on portfolio securities and **realized capital gains** on securities sold from the portfolio. U.S. mutual funds are often tax-exempt companies and must pass all those gains on their shareholders. The proportion of those three sources of wealth flow depends on the investment strategy/objective of the fund and their asset allocation.

The mutual fund companies can be broadly divided by the **asset classes** they invest in and more specifically by their **investment objectives**. The Investment Company Institute[4] classification distinguishes four basic classes. These classes are equity, bond, money market hybrid, and hybrid funds depending whether they invest in stocks, bonds, money market instruments, and mix of all. Each of those broad classes is further divided into 33 investment objective categories. Different mutual funds have different investment objectives (also termed investment styles). Some of them are designed as substitutes for their shareholders' entire portfolio; others expect their shareholders to own other securities. Some of the objective categories for equity funds are described in the Appendix A. The multitude of investment objectives poses a problem of evaluating the performance of those investment strategies. This performance can be judged only using an appropriate **benchmark** which represents and opportunity costs of a given investment strategy. The deviations of the ex-post returns of the given investment strategy from the benchmark hints about out- or underperformance of the management team. Although most of the funds aim at beating their respective benchmarks there is a special class of mutual funds which attempt to match rather than beat the benchmark-usually a market index. Those **index funds** which try to mimic returns on the given index attract huge flows of money from the investors disillusioned about the possibility of "beating the market"

2.2 MUTUAL FUND SHARE PRICING

Mutual funds are required by law to determine the price of their shares each business day. A fund's net asset value (NAV) per share is the current value of all the fund's assets, minus liabilities, divided by the total number of shares outstanding.

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[3] Some complexes allow for transferring the money by phone order. Ibidem.

$$NAV_t = \frac{\text{Total Assets}_t - \text{Total Liabilities}_t}{\text{Number Of Shares Outstanding}_t}$$

This is very important property as it makes impossible to sell short mutual fund shares what has certain implications for the hypothesized overall efficiency of the market for mutual funds[5]. A fund's share price, or offering price, is its NAV per share plus any applicable front-end sales charge (the offering price of a fund without a sales charge would be the same as its NAV per share). The NAV must reflect the current market value of the fund's securities, as long as market quotations for those securities are readily available. Other assets should be priced at „fair value, determined in good faith by a fund's board of directors"[6]. The vast majority of mutual funds release their daily share prices through NASDAQ. For a fund's share price to be published in the next day's morning newspapers, it must be delivered by 5:50 p.m. Eastern time to NASDAQ. As prices are received by NASDAQ, they are instantaneously transmitted to wire services and other subscribers. Wire services transmit the prices to their client newspapers. In addition to newspapers, daily fund prices are available from other sources. Many funds offer toll-free telephone service, which provides the fund's share price and other current information.

2.3 *BENEFITS OF MUTUAL FUNDS*

Similarly to holding the shares directly through investment account, the ownership of the mutual fund inherently incurs risk as the fund's securities rise and fall in value, and unlike bank deposits, mutual funds are not insured or guaranteed. The mutual fund literature quotes however many advantages of holding the mutual fund shares as opposed to directly holding the shares. The recent developments in the U.S. capital market—steady decrease in direct ownership of securities by the U.S. households and accompanying increase in the indirect ownership of securities through mutual funds—point clearly that millions of investors really see those advantages worth the costs of active management. Among the reasons most widely cited in the literature are: (Gruber 1996, Chordia 1996) are: diversification, low transaction costs, professional management and customer services. Less elaborated upon (Chordia

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[4] The Investment Company Institute (ICI) is widely regarded as a trade organization of mutual fund industry and encompasses almost all U.S. mutual funds.

[5] In contrast to equity investors mutual fund investors can use only information about outperformance of mutual funds - they cannot sell short underperforming funds.

[6] The Investment Company Act of 1940 requires "forward pricing": shareholders purchasing or redeeming shares receive the next computed share price following the fund's receipt of the transaction order. Any income and expenses (including any fees) must be accrued through the date the share price is calculated. Changes in holdings and in the number of shares must be reflected no later than the first calculation of the share price on the next business day. Funds typically value exchange-traded securities using the most recent closing prices from the exchange on which the securities are principally traded, even if the exchange closes before the fund's daily pricing time (which occurs with many foreign securities). If a material event that will likely affect the value of a security occurs after the exchange closed and before the fund's share price is deter-mined, it may be necessary to determine the fair value of the security in light of that event.

1996) are benefits of choosing funds with different investment objectives and benefits of sharing the liquidity risk. I will now elaborate on these simple advantages of holding mutual funds.

Diversification. Fund managers typically invest in a variety of securities, seeking portfolio diversification. The average investor would find it expensive and difficult to construct a portfolio as diversified as that of a mutual fund. Mutual funds are supposed to provide an economical way for the average investor to obtain the same kind of professional money management and diversification of investments that is available to large institutions and wealthy investors. During 1980-89 the average investment in equity funds was less than $12,000[7] which is regarded by many as not enough for diversification[8]. Some of the funds allow for the initial investment of as low as $50[9].

Accessibility. Mutual fund shares are easy to buy and the transaction costs incurred by them are decreasing steadily. Investors may purchase fund shares either with the help of an investment professional (e.g., a broker, financial planner, bank representative or insurance agent) or directly, based on the investor's own research and knowledge. In the first case the investment professionals analyzing the client's financial needs and objectives and recommending appropriate funds are compensated for their services through a sales commission, or through 12b-1 and/or service fees deducted from the fund's assets. Direct-marketed funds are sold through the mail, by telephone, on the web or at office locations. They typically offer fund shares to the public with a low sales charge or none at all. Mutual funds may also be offered as investment selections in 401(k) plans and other employee benefit plans.

Professional management and economies of scale. The money accumulated in a mutual fund is managed by professionals who decide on behalf of shareholders on an investment strategy. In theory, these professionals choose investments that best match the fund's objectives as described in the prospectus and their investment decisions are based on extensive knowledge and research of market conditions and the financial performance of individual companies and specific securities. As economic conditions change, the fund may adjust the mix of its investments to adopt a more aggressive or a more defensive posture to meet its investment objective. Apart from professional management the investors benefit also indirectly from the fact that mutual funds have lower transaction costs because of savings gained through brokerage and other security service discounts on fund's large trades. Bennan and Hughes (1991) document that brokerage commissions decline with the size of the transaction.

Investor Protection. Mutual funds are highly regulated by the federal government through the U.S. Securities and Exchange Commission (SEC). As part of this government regulation, all funds must meet certain operating standards, observe strict antifraud rules and disclose complete information to current and potential investors (See section 2.5).

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7 Cf. Mutual Funds Factbook 1999, Investment Company Institute, http://www.ici.org

8 Most of the practitioners emphasize at this point role of transaction costs involved in creation of well-diversified portfolio.

9 Source: http://www.pathfinder.com and http://www.money.com

Shareholder Services. Mutual funds offer a wide variety of services to meet shareholders' needs. These services include toll-free telephone service, 24-hour telephone access to account information and transaction processing, consolidated account statements, shareholder cost basis (tax) information, exchanges between funds, automatic investments, checkwriting privileges on many money market and some bond funds, automatic reinvestment of fund dividends, and automatic withdrawals. Mutual funds also provide extensive investor education and shareholder communications, including newsletters, brochures, retirement and other planning guides, and websites. Many funds also allow for transfer of the money within the family of funds.

A Variety of Fund Investments. In the US market there are more than 7,300 mutual funds[10] representing a wide variety of investment objectives, from conservative to aggressive, and investing in a wide range of securities. There are also specialty or sector funds that invest primarily in a specialized segment of the securities markets - from golf funds to religious funds[11]. Specialty funds include biotechnology funds, small-company growth funds, index funds, funds that invest in other mutual funds, and social criteria funds. The broad selection of funds arose over the years to meet consumer demand for fund products that help meet a variety of financial objectives.

Liquidity risk. Mutual funds enable investors to share liquidity risk - the risk of the liquidation of the investor's portfolio due to meet his/her exogenous liquidity risk, and thus the risk of having to liquidate their portfolios at a cost[12].

2.4 MUTUAL FUND STRUCTURE

Virtually all mutual funds are externally managed. They do not have employees of their own. Instead, their operations are conducted by affiliated organizations and independent contractors. The parties that are involved in the typical mutual fund include: shareholders, board of directors, investment advisors, administration, custodian and transfer agent. Those parties are presented in Figure 2.1.

10 Surprisingly there are more mutual funds than stocks listed on major American exchanges.
11 Http://www.abcnews.com
12 A simple model is presented in Chordia (1996).

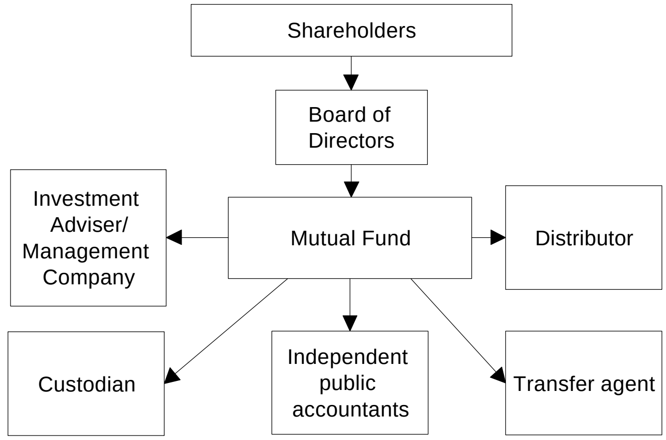

FIGURE 2.1 STRUCTURE OF THE TYPICAL MUTUAL FUND

Shareholders. Like shareholders of other companies, mutual fund shareholders have specific voting rights which include the right to elect directors at a meeting called for that purpose (subject to a limited exception for filling vacancies). Material changes in the terms of a fund's investment advisory contract also must be approved by a shareholder vote, and funds seeking to change investment objectives or policies deemed fundamental must also seek shareholder approval.

Directors. A mutual fund is governed by a board of directors who have oversight responsibility for the management of the fund's business affairs. They have fiduciary duty and are expected to exercise sound business judgment, establish procedures and undertake oversight and review of the performance of the investment adviser, principal underwriter and others that perform services for the fund. A provision of the 1940 Act states that at least 40 percent of a fund's board of directors must be independent of the fund's investment adviser or principal underwriter. Independent fund directors are supposed to serve as watchdogs for the shareholders' interests and oversee a fund's investment adviser and others closely affiliated with the fund. Small funds usually have an „umbrella board" for the whole fund family.

Investment Adviser/Management Company. The investment adviser is responsible for selecting portfolio investments consistent with the objectives and policies stated in the mutual fund's prospectus. The investment adviser places portfolio orders with broker-dealers and is responsible for obtaining the best overall execution of those orders. A written contract between a mutual fund and its investment adviser specifies the services the adviser performs. The investment advisers may be independent firms, investment advisers, firms associated with brokers, or insurance companies. Often the adviser is the business entity (for example, a subsidiary of a brokerage firm) that started or promoted the investment company. An adviser may have contracts to manage a number of investment companies, each of which is a separate organization with its own board of directors. Most advisory contracts provide that the adviser receive an annual fee based on a percentage of the fund's average net assets. The adviser is subject to numerous legal restrictions, especially regarding transactions between itself and the fund it advises.

Administrators. Administrative services may be provided to a fund by an affiliate of the fund, such as the investment adviser, or by an unaffiliated third party. Administrative services include overseeing the performance of other companies that provide services to the fund and ensuring that the fund's operations comply with legal requirements. Typically, a fund administrator pays for office costs and personnel, provides general accounting services and may also prepare and file SEC, tax, shareholder and other reports.

Principal Underwriters. Most mutual funds continuously offer new shares to the public at a price based on the current value of fund assets plus any sales charges. Mutual funds usually distribute their shares through principal underwriters. Principal underwriters are regulated as broker-dealers and are subject to National Association of Securities Dealers, Inc. (NASD) rules governing mutual fund sales practices.

Custodians. Mutual funds are required by law to protect their portfolio securities by placing them with a custodian. Nearly all mutual funds use qualified bank custodians which in turn are required by the SEC to segregate mutual fund portfolio securities from other bank assets.

Transfer Agents. A transfer agent is employed by a mutual fund to conduct recordkeeping and related functions. Transfer agents maintain records of shareholder accounts, calculate and disburse dividends, and prepare and mail shareholder account statements, federal income tax information and other shareholder notices. Some transfer agents prepare and mail statements confirming shareholder transactions and account balances and maintain customer service departments to respond to shareholder inquiries.

2.5 REGULATION OF MUTUAL FUNDS

All U.S. funds are subject to regulation and oversight by the U.S. Securities and Exchange Commission (SEC). As part of this regulation, all funds must provide investors with full and complete disclosure about the fund in a written prospectus. US mutual funds must comply with federal laws and regulations. Among those the there are:

The Investment Company Act of 1940 regulates the structure and operations of mutual funds. Among other things, the 1940 Act requires mutual funds to maintain detailed books and records, safeguard their portfolio securities, and file semiannual reports with the SEC.

The Securities Act of 1933 requires the federal registration of all public offerings of securities, including mutual fund shares and also that all prospective investors receive a current prospectus describing the fund.

The Securities Exchange Act of 1934 regulates broker-dealers, including mutual fund principal underwriters and others who sell mutual fund shares, and requires them to register with the SEC.

Among other things, the 1934 Act requires registered broker-dealers to maintain extensive books and records, segregate customer securities in adequate custodial accounts, and file detailed, annual financial reports with the SEC.

The Investment Advisers Act of 1940 requires federal registration of all investment advisers to mutual funds. The Advisers Act contains various antifraud provisions and requires fund advisers to meet recordkeeping, reporting and other requirements.

2.6 MUTUAL FUND FEES

The average cost of investing in the mutual funds has decreased considerably over the last 20 years. For equity funds those costs had fallen from 2.25% in 1980 to 1.49%[13] in 1995. Those decreases are usually attributed to the economies of scale which has been observed both at the level of individual funds and fund families. Mutual fund fees generally fall into two categories: **shareholder fees** and **annual operating expenses**. Their structure is quite transparent as the mutual funds fees are subject to more exact regulatory standards and disclosure requirements than any comparable financial product offered to investors. The fund's prospectus is required by law to contain a standardized fee table which allows the investors to easily discern all the fees a fund charges and ultimately to compare the costs of one fund versus another.

Shareholder Fees are charged directly to an investor for specific transaction, such as purchase, redemption or exchange. The most important within the class of shareholders fees are fees (or loads) which are usually charged when investor enters/exits the fund. However, investors may or may not pay shareholder fees. Whether the fund charges those fees to the shareholder determines its category as load or no-load funds. No-load funds are considered those funds which charge fees of no more than 0.25 percent. This distinction between the load and no-load funds is important as it determines true costs of various investing strategies and will be elaborated upon further on. We briefly describe the shareholder fees in the order they appear in the funds prospectus table:

- **Sales Charge (**Load) Imposed on Purchases is the "front-end load" that may be attached to the purchase of mutual fund shares. This fee compensates a financial professional for his or her services. By law, this charge may not exceed 8.5 percent of the investment, although most fund families charged average of 3.5%14 - considerably less than the maximum.
- Deferred Sales Charge (Load) is the sales charge that a fund may impose when shares are redeemed or sold, and is an alternative way to compensate financial professionals for their services. This fee is however typically conditional on the time the money is invested in the fund and applies for the first few years of owner-ship and then disappears. It is typically calculated as a percentage of the net asset value or offering price at the time of purchase and applies only for the first few years that an

[13] Sales weighted average for cost ratios of individual funds. Cf. Mutual Funds Factbook 1999, Investment Company Institute, http://www.ici.org

investor owns a fund. The fee decreases incrementally, usually 1 percent per year, until it disappears if an investor does not sell the shares over a specified period.

- Sales Charge (Load) on Reinvested Dividends is the fee charged by a fund when dividends are reinvested in the purchase of additional shares. Most funds do not charge a fee for this service.
- Redemption Fees, like contingent deferred sales charges, are a other type of back-end charge for redeeming shares. Unlike contingent deferred sales charges, these fees are paid to the fund. They are usually expressed as a dollar amount or as a percentage of the redemption price.
- Exchange Fees may be charged when transferring money from one fund to an other within the same fund family.
- Account Maintenance Fees may be charged by some funds, for example, to maintain low-balanced[15] accounts.

Annual Fund Operating Expenses reflect the normal on-going costs of operating fund. These expenses, along with most other charges, are shown in a fund's prospectus, expressed as a percentage of the fund's average net assets and referred to as "total operating expenses." Unlike transaction fees, these expenses are not charged directly to an investor, but are deducted from fund assets before earnings are distributed to shareholders. Annual Operating Expenses are charged by all funds including no-load funds.

- ***The management fee***. The largest component of a fund's total operating expenses usually is its management fee, an ongoing charge paid to an investment adviser who manages the fund's assets and selects its portfolio of securities.
- ***The 12b-1 fee***. Some funds pay a 12b-1 fee, which is named for a rule under the Investment Company Act of 1940 that authorizes mutual funds to „pay for marketing and distribution expenses, such as compensating sales professionals", directly from a fund's assets. By law, 12b-1 fees used to pay marketing and distribution expenses cannot exceed 0.75 percent of a fund's average net assets per year. There is also a lifetime cap based on a fund's overall sales. In addition, a fund may also pay a service fee of up to 0.25 percent of aver-age net assets each year to compensate sales professionals for providing ongoing services to investors or their accounts. A "no-load" fund may pay a 12b-1 fee of up to 0.25 percent of average net assets each year.
- ***Other Expenses*** include, for example, fees charged by a fund's transfer agent to pay for fund shareholder services such as toll-free phone communication, computerized account services, website services, recordkeeping, printing, mailing or advertising.

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[14] Source: http://www.pathfinder.com

[15] As low-balanced accounts are considered those containing less than $1000. Cf. Mutual Funds Factbook 1999, Investment Company Institute, http://www.ici.org

In order to make the fees easier for comparison the **The Total Annual Fund Operating Expenses (Expense Ratio)** is usually quoted in the prospectus. This ratio is computed as the sum of all of all fund's annual operating costs, expressed as a percentage of average net assets.

2.7 FEES GOVERNANCE AND CLASSES OF SHARES

The Investment Company Act of 1940 determines that the fees that a mutual fund charges shareholders are subject to ongoing oversight and review by the fund's board of directors, including its independent under the law to protect the interests of shareholders. A mutual fund's directors annually review the fees paid to manage the fund. Any increase in these fees must be approved by fund shareholders and a majority of the fund's independent directors. The SEC requires that a fund's board and a majority of its independent directors annually approve the 12b-1 fee. Any increase in a 12b-1 fee must also be approved by shareholders.

The list of fees that the funds are allowed to charge give them a considerable room for tailoring the payment structure to the investment needs and preferences of their investors. This is done by the means of different "classes" of shares which represent ownership in the same mutual fund, but offer different ways of paying the associated costs. The way an investor pays for fund shares depends on the share class owned. Class A shares, for example, generally have a front-end sales charge (or "load"). Class B shares often have a 12b-1 fee and a deferred sales charge. Class C shares may charge a higher 12b-1 fee, but no front-end or deferred sales charges. Some funds offer still other share classes, such as a class sold without a sales charge for tax-deferred retirement plans.

2.8 MUTUAL FUNDS AND TAX CONSIDERATIONS

Both distributions that the mutual funds make to their shareholders every year (ordinary dividends and capital gains) are in principle taxable and have to be reported respectively as dividends and long-term capital gains (regardless of how long the taxpayer has owned the fund shares). This is an unfortunate situation for the mutual fund investors as they have hardly any influence on the timing of those burdens. The same applies to the shares sales and exchanges which result usually in capital gain which is also taxed (capital losses from such transactions may be used to offset other gains). In this case tax considerations can cause investors to be 'locked in' involuntarily in the funds in which they held interest for a long time and which accrued large capital gains. The investors can be reluctant to sell shares of the funds even if it does not seem to be good investment in the future because of the danger of incurring large capital gain taxes. The only exception from general rule are tax-exempt mutual funds (sometimes referred to as tax-free) and tax-deferred Retirement Accounts.

Tax-exempt funds invest in municipal bonds. Those bonds pay interest which is exempt from federal income tax and, in some cases, state and local taxes as well. This can be favorable depending on investors income-bracket but even though income from these funds is generally tax-exempt, investors must still report it on their income tax returns. For some taxpayers, portions of income earned by tax-exempt funds may also be subject to the federal alternative minimum tax, which can raise the need for an investor to consult a tax adviser.

Even though municipal bond dividends and interest may be tax-free, an investor who redeems tax-exempt fund shares may realize a taxable capital gain. An investor may also realize a taxable gain from a tax-exempt fund if the fund manager sells securities during the year for a net gain.

Tax-deferred Retirement Accounts. According to current regulations mutual fund investments in certain retirement accounts are tax-deductible and, generally, dividend and capital gain distributions remaining in the accounts accrue tax-deferred until distributed from the account. This is favorable to investors as they pay taxes on dividends and capital gains only after they want to withdraw money from their accounts after retirement. This applies also to mutual fund sales and exchanges as long as the money remain in the tax-deferred account. The regulations concerning Tax-deferred Retirement Accounts span employer-sponsored 401(k)[16] plans, IRA[17] contributions and other similar tax-deferred accounts, such as 403(b)[18] accounts. For most investors, distributions from tax-deferred accounts typically begin at or near retirement age, at which time the individual may be in a lower income tax bracket. It should be noted however that investors who receive proceeds from tax-deferred accounts prior to age 59½ may incur a tax penalty in addition to federal, state and local income taxes.

2.9 MUTUAL FUNDS AND RETIREMENT MARKET

Mutual funds as a long-term investing vehicle are regarded by many as an necessary part of investing for retirement. It is not strange that in 1998 mutual funds accounted $1.9 trillion, or 17 percent, of the $11 trillion U.S. retirement market at year-end 199819 and in turn retirement plans comprised 35 percent of all mutual fund assets at year-end 1998. Consistent with overall asset growth in the mutual fund industry, mutual fund retirement plan assets grew by $338 billion, or 22 percent, during that year. Mutual fund retirement assets come from two sources: employer-sponsored plans and Individual Retirement Accounts (IRAs) in roughly equal proportions. Most of the funds in employer-sponsored plans come from defined-contribution plans 401(k) and 403(b) which have been already mentioned in the previous section. The other sources included defined-benefit plans offered by federal, state and local government employers, as well as some corporate employers and insurance companies.

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[16] 401(k) Plan is an employer-sponsored retirement plan that enables employees to make tax-deferred contributions from their salaries to the plan.

[17] Individual Retirement Account (IRA) is an investor-established, tax-deferred account set up to hold and invest funds until retirement.

[18] 403(b) Plan is an employer-sponsored retirement plan that enables employees of universities, public schools and non-profit organizations to make tax-deferred contributions from their salaries to the plan.

[19] The remaining $9.1 trillion, or 83 percent, of assets in the retirement market is managed by pension funds, insurance companies, banks and brokerage firms. Cf. Mutual Funds Factbook 1999, Investment Company Institute, http://www.ici.org

The retirement plans play an especially important role in U.S. domestic and foreign equity funds which are subject of this study. U.S. domestic equity funds alone comprise $1.2 trillion, or 64 percent, of mutual fund retirement assets. By comparison, only 54 percent of overall fund industry assets — including retirement and non-retirement accounts—were invested in equity funds in 1998. Although the impact of the plans was roughly the same over the recent years the two types differ significantly in that employer-sponsored plans generally did not offer the beneficiaries opportunity to chose the fund on their own. This has serious implications for investors' behavior studies. Although because of their size those plans invest generally in funds which are not available to individual investors they may also invest in funds available to individual investors. In this case however their investing behavior may significantly differ from that of individual investors both in their preferences and decision process. This may potentially lead to biases in the studies which would not discriminate between those two types of investors.

3. Performance and Flow Measures

The task of analyzing performance-flow relationship asks for a detailed specification of the measured phenomena - both performance of mutual funds and inflows into mutual funds. In this chapter a survey of those measures based on the literature in this field is attempted. This is however not an easy as one would like since other notions in economics like performance and even flows do not lend themselves to an easy definition.

This chapter is divided in two major sections. Section 3.1 surveys different performance measures ranging from simple (and presumably most widely used) raw returns to risk-adjusted composite measures and to measures based on multi-factor models. Special attention is paid to both methodological and pragmatic trade-offs between those measures. Section 3.2 is devoted to measures of flows. It considers different models of flows and presents several measures that can be built upon their assumptions. Because flow measurement is a relatively new field a small survey of flow measures found in the mutual fund literature is also presented.

3.1 PERFORMANCE MEASURES

The performance measures are central to the flow-performance relationship in the mutual fund industry as they form a base for individual investor' decisions. Those decisions are then translated in the changes in the overall demand for fund's shares and result in changes of its TNAs due to purchases which can be then observed by interested parties. It should be pointed to however that the performance measures are essential in this decision process but not sufficient to explain it as the investors have bounded rationality and the final purchases are affected by many important noises like: transaction costs; ability to comprehend and act on performance data; and availability of performance data itself.

This section is devoted to a survey of performance measures which are offered by both mutual fund industry and finance theory and can be used in explaining flows into mutual funds. Subsection 3.1.1 starts with crude measures of raw returns and then is followed by more sophisticated market-adjusted measures in subsection 3.1.2. Subsection 3.1.3 presents several risk-adjusted measures which are more or less commonly found in the mutual fund literature: Treynor measure, Sharpe ratio, Jensen alpha and M^2 measure (less so). Some attention is also paid to the generalized Jensen alpha which is based on different assumptions. Subsection 3.1.4 concluding this section is concerned with both relative strengths of the measures and considerations about availability of performance information for investors to act upon.

3.1.1 CRUDE PERFORMANCE MEASURES - RAW RETURNS

Raw returns (R_{it}) and raw return rankings are the oldest and still the most popular measures of portfolio performance. The reasons for that are both their appealing simplicity and the fact that it was only in the early 1960s when the developments in portfolio theory showed investors how to quantify and measure risk in terms of the variability of returns. Although more sophisticated measures have been developed from this time the raw returns seem to exert the largest influence on the average, unsophisticated investor[20]. They seem to be the natural way of expressing changes in investors wealth as they relate almost directly to changes in Net Asset Value per share owned and therefore they are widely advertised. Commonly reported in consumer periodicals are fund's raw return rankings relative to other funds within the same investment objective. The typical data source[21] about fund performance includes raw returns over period of 3, 6 and 12 months together with annualized average raw returns for 3, 5 and 10 years. As the result raw returns take up most of both the advertising space and performance evaluation in industry periodicals and other sources.

The most serious fallacy of this measure is their inability to take into account the riskiness of the investment—both systematic and total risk. Apart from the simple error of omission of risk, use of this measure can result in relatively high volatility of performance rankings based on them—surely not proportional to the changes in manager's ability as the relative returns. This is because raw return rankings are highly dependent on market performance and relative beta[22]. Some authors (Haugen (1995)) go as far as to claim that in fact, they are so dependent on these factors, they are nearly useless for judging the relative skill of the managers.

3.1.2 MARKET-ADJUSTED RETURNS

In order to take into account market-wide changes of returns from period to period most of the performance information sources provide also market-adjusted returns defined as:

$$EMR_{it} = R_{it} - R_{mt}$$

where:

R_{it} = return on fund i in period t

R_{mt} = return on the proxy for the market in period t

The market adjusted excess returns are simple extension of raw returns and will always give the same assessment of a portfolio performance relative to market portfolio. Their advantage over raw

[20] Sirri and Tufano (1997) found that simple mesure of raw returns is good proxy for more shophisticated risk-adjusted measures.

[21] Cf. Morningstar mutual funds, Morningstar, Inc., 1998.

[22] If *ceteris paribus* two funds have the characteristic lines crossing at the expected return on the market but different betas then in the bear market the fund with lower beta will produce greater rate of return and will rank first. In turn, during a bull market the higher beta fund will rank first.

returns is however that they can provide for a way to compare performance over several (not necessarily overlapping) periods as they adjust for market-wide changes in returns.

Similarly to raw returns they are typically reported in consumer periodicals. The typical data sources[23] contain market excess returns over period of 3, 6 and 12 months together with annualized average market excess returns for 3, 5 and 10 years. The commonly used market proxies are widely quoted market indexes: S&P 500, Willshire 5000 or Russel 2000 (for small caps).

3.1.3 RISK-ADJUSTED MEASURES

The clear deficiency of crude performance measures at including the risk component of the performance prompted the development of **composite risk-adjusted measures** that take into account both return and riskiness of the investment. It was postulated that those measures should adjust the investment return by the amount attributable to the relative risk of the portfolio, given the strength of the market in the period that performance is evaluated. In constructing a risk-adjusted performance measure, however one must make assumptions about the nature of risk and the relationship between return and risk i.e. assume the validity of a given pricing model. The last assumption however poses a danger that if the pricing model is wrong, rankings based on the measure are likely to be biased.

The five risk-adjusted performance measures presented in this subsection are based on the standard form of the capital asset pricing model (CAPM). The first and fourth (Treynor mreasure and M^2 measure) measures are presented for the sake of completeness as only two other measures measures (Jensen measure and Sharpe measure) found their way to the standard data sources widely available to mutual fund investors. The last measure mentioned—generalized Jensen measure is based on the multi-factor models and the Arbitrage Pricing Theory has found so far application only in the financial literature.

3.1.3.1 Treynor measure

Treynor (1965) developed the first composite measure of portfolio performance that included risk. He postulated two components of risk: 1) risk produced by general market fluctuations and 2) risk resulting from unique fluctuations in the portfolio securities. Treynor was interested in a measure of performance that would apply to all investors—regardless of their risk preferences. To identify risk due to market fluctuations, he introduced the *characteristic line*, which defines the relationship between the rate of return from a portfolio over time and the rates of return for an appropriate market portfolio. He noted that the characteristic line’s slope measures the relative volatility of the portfolio’s returns in relation to returns for the aggregate market. A higher slope(beta) characterizes a portfolio that is more sensitive to market returns and that has greater market risk. Building on developments in capital market theory, he introduced a risk-free asset that could be combined with different portfolios to form a straight line portfolio possibility line. He showed that rational, risk-averse investors would always prefer portfolio

[23] Cf. Morningstar mutual funds, Morningstar, Inc., 1998.

possibility lines with larger slopes because such high-slope lines would place investors on higher indifference curves. The *ex ante* Treynor measure is the slope of this portfolios possibility line and is equal to:

$$Tr = \frac{E(r_i) - r_f}{b_i}$$

where

$E(r_i)$ = expected rate of return for fund i during a specified time period of time

r_f = risk free rate of return during a specified time period of time

b_i = the slope of fund's characteristic line during that time period

As noted above, a larger *Tr* value indicates a larger slope and a better portfolio for all investors (regardless of their risk preferences). Because the numerator of this ratio ($E(r_i)$-r_f) is the *risk premium* and the denominator is a measure of risk (portfolio's beta), the total expression indicates the portfolio's *risk premium per unit of risk*. All risk-averse investors would prefer to maximize this value. Note, that the risk variable beta measures systematic risk and tells us nothing about the diversification of the portfolio. It *implicitly assumes* a completely diversified portfolio, which means that systematic risk is the relevant risk measure. This can be the case of many large mutual fund portfolios but certainly not of all. This strong assumption caused that both practitioners and researchers favor the Sharpe measure instead of Treynor measure and it has been hardly used in the recent studies of mutual fund performance.

3.1.3.2 Sharpe measure

Sharpe (1966) likewise conceived of a composite measure to evaluate the performance of mutual funds. The measure followed closely his earlier work on the capital asset pricing model (CAPM) and he used capital market line (CML) as a benchmark. The formula for the *ex ante* Sharpe measure is given by

$$Sh_i = \frac{E(r_i) - r_f}{s_i}$$

where

s_i = standard deviation of returns of fund i

This composite measure of portfolio performance clearly is similar to the Treynor measure; however, it seeks to measure the *total risk* of the portfolio by including the standard deviation of returns rather than considering only the systematic risk summarized by beta[24]. Because the numerator is the portfolio's risk

[24] The Sharpe measure, therefore, evaluates the portfolio manager on the basis of both rate of return performance and diversivication. For a completely diversified portfolio, one without any unsystematic risk, the two measures give identical rankings because the total variance of the completely diversified portfolio is its systematic risk. Alternatively, a poorly diversified portfolio could have a high ranking on the basis of the Treynor performance measure but a much lower ranking on the basis of the Sharpe performance measure. Any difference in rank would come directly from a difference in diversivication.

premium, this measure indicates the *risk premium return earned per unit of total risk*. In terms of capital market theory, this portfolio performance measure uses total risk to compare portfolios to the CML, whereas the Treynor measure examines portfolio performance in relation to the SML. Those properties decided about Sharpe measure's popularity—it is routinely included in the information sources about the performance available to most of the investors[25]. In order to judge about out- or underperformance relative to the market proxy, the Sharpe measure of given fund has to be compared with the slope of *ex post* CML which is given by $(\overline{R}_m - \overline{R}_f) / \hat{s}_m$. If Sh_i is greater than this value, the portfolio lies above the *ex post* CML, indicating that it has outperformed the market. Alternatively, if Sh_i is less than this value, the portfolio lies below *ex post* CML, indicating that it has not performed as well as the market.

3.1.3.3 M^2 measure

The M-squared measure proposed by Modigliani and Modigliani (1997) similarly to Sharpe measure uses standard deviation as the relevant measure of risk and thus also uses CML as a benchmark. The main rationale behind this measure is that it is expressed in the same units as raw returns (namely percentage change) and adjusts for fund-specific risk and market risk at the same time. This measure also implicitly assumes validity of CAPM. *Ex ante* M^2 measure is given by formula:

$$M_i^2 = r_f + \frac{E(r_i) - r_f}{s_i} s_m$$

where:

s_m = standard deviation of market portfolio

s_i = standard deviation of rate of return on portfolio i

The risk-adjusted return M^2_i is the average return that would have been earned if the amount of riskfree investing or lending had resulted in the standard deviation of the (fund's) portfolio being equal to that of the market portfolio. Depending on the relation of the standard deviations of rate of return on portfolio and market proxy to M^2 effectively 'levers'/'de-levers' portfolio's return to bring its risk level to that of the market portfolio and then proportionately increases/decreases portfolio return by the degree of 'leveraging'/'de-leveraging'.

In order to judge about out- or underperformance relative to the market proxy M^2 can be compared directly with the average return on the market proxy. The M^2 measure can be regarded as an extension of Sharpe measure as both of them are based on *ex post* CML and will always give the same assessments of a fund performance relative to market portfolio. Furthermore, the two measures will rank a set of fund's portfolios exactly the same and there is strict relation between the two measures which can be expressed as:

[25] Cf. Morningstar mutual funds, Morningstar, Inc., 1998.

$$M_i^2 = r_f + Sh_i s_m$$

Thus, the value of M^2 for any (fund) portfolio is simply equal to a positive constant plus the portfolio's Sharpe measure multiplied by a positive constant. Because those two constants are the same for all portfolios, the ranking for M^2 will be exactly the same as the ranking for Sh_i..M^2 has been introduced only recently and for this reason has not found yet wider application both in theoretical research and practical applications.

3.1.3.4 Jensen measure

The Jensen measure (Jensen alpha, introduced in Jensen (1970) is similar to the other measures in that it is based on the CAPM. It uses the SML as a benchmark and is computed as the difference between the expected rate of return on the portfolio[26] and what its expected return would be if the portfolio were positioned on the SML. The equation for the Jensen measure is as follows:

$$Jn_i = E(r_i) - \left\{ r_f + [E(r_m) - r_f] b_i \right\}$$

where

$E(r_m)$ = expected return on market proxy in period of time

b_i = beta of the portfolio i relatively to market proxy

The significant positive alpha indicates the consistent positive residuals from the expectations based on the CAPM, significantly negative alpha on the other hand indicate consistent market underperformance.

The Jensens measure is usually estimated within the regression framework using the following model:

$$R_{it} - R_{ft} = a_i^1 + b_i^1 (R_{mt} - R_{ft}) + u_{it}$$

where

R_{it} = return on portfolio *i* in period *t*

R_{ft} = risk-free rate for period *t*

a_i = risk adjusted excess return = Jensen alpha = Jensen measure

b_i = the sensitivity of the excess return on fund *i* to market portfolio

R_{mt} = return on market portfolio in period *t*

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[26] All versions of the CAPM calculate the expected one-period return on any security or portfolio by the following expression:

$$E(R_{it}) = R_{ft} + b_i (E(R_{mt}) - R_{ft})$$

where

$E(R_{it})$ = the expected return on security or portfolio *i* in period *t*

R_{ft} = the one-period risk-free interest rate in period *t*

b_i = the systematic risk (beta) for security of portfolio j

$E(R_{mt})$ = the expected return on market portfolio of risky assets

Jensen's alpha is a performance measure of choice for most of the mutual fund researchers (Gruber (1996), Zheng (1998), Ippolito (1992)). Similarly to Sharpe measure the Jensen's alpha is routinely reported in the sources with performance evaluation financial. In those sources S&P500 or S&PMid400 are usually used as a proxy for the return on market portfolio.

3.1.3.5 Generalized Jensen measure

It should be reiterated at this point the validity of each of the measures described above is depends on the validity of a particular pricing model it is based on (in the latter cases it is the CAPM). In particular, if the assumptions backing the model are wrong, rankings based on the measures are likely to be biased. Over the last 20 years, however, there has been much suspicion about the validity of this model in the academic community (Fama and French (1996)) and as the evidence of its irregularities amassed some of the researchers (Gruber (1996)) proposed new measures based on factor models and the Arbitrage Pricing Theory (APT). Those multi-factor models exploit the fact that in the APT there is linear relationship between the factor betas and the expected rates of return on securities and portfolios[27], similarly to the security market line used as a benchmark in the classical Jensen measure. The multi-factor models that follow from this model tend to much better explain the expected returns and cope with the problems of e.g. with 'size effect' (Gruber (1996)).The equation for the multi-factor alpha is as follows:

$$GJ_i = E(r_i) - \left\{ r_f + b_{2,i}\, l_1 + b_{2,i}\, l_2 + ... + b_{n,i}\, l_n \right\}$$

Generalized Jensen measure can be estimated *ex post* using sample of returns of mutual fund and factor portfolios using following regression:

$$R_{it} - R_{ft} = a_i^n + b_{1i}^n\, l_{1t} + b_{2i}^n\, l_{2t} + ... + b_{ni}^n\, l_{nt} + u_{it}$$

where

R_{it} = the rate of return for portfolio *i* during a time period *t*

R_{ft} = the rate of return on a risk-free investment during time period *t*

l_{nt}=the average price of factor *n* in period *t*

b_{ni} = factor loading on n-th factor

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[27] The APT calculates the expected one-period return on any security or portfolio by the following expression:

$$R_{it} = R_{ft} + b_{1i}^n\, l_{1t} + b_{2i}^n\, l_{2t} + ... + b_{ni}^n\, l_{nt}$$

where

$E(R_{it})$ = the expected return on security or portfolio *i* in period *t*

R_{ft} = the one-period risk-free interest rate in period *t*

b_{ni} =the factor beta - security's (portfolio's) *i* sensitivity to factor *n*

l_{nt}=the average price of factor *n* in period *t*

There is no agreement as to which factor portfolios should be used as the APT does not make any predictions about what the factors are. However, some of the researchers[28] report that models based on small set of commonly used factors like size-portfolio and book-to-market portfolio excel as a benchmarks for mutual funds. The most commonly used factor portfolios aim at correcting observed irregularities of CAPM:

irregularity	factor
size effect	the difference in return between small cap portfolio and large cap portfolio
value effect	the difference in return between a high growth portfolio and a value portfolio
interaction between stock and bond market	excess return on a bond index that represents an estimate of aggregate corporate and government bonds

3.1.4 Discussion and comparison of the performance measures

There is certainly no performance measure which is widely accepted and considered superior to the others. Different performance information users favor different measures for their own reasons - e.g. performance information availability, ease of comprehension, psychological effects etc. Therefore, every performance-flow study aimed at analyzing investor's behavior has to take into account the clear trade-off between their relative conceptual prowess and degree of acceptability within investors' community. For instance, measures based on CML or multi-factor models can be conceptually superior to the raw returns rankings but certainly the latter influence average investors the most.

Some methodological tradeoffs should be pointed to at this point. First of all there is a problem of raw returns and market excess returns which fail to include risk component of the investment in the mutual fund and therefore are arguably inferior to the composite risk-adjusted measures. Secondly the four other CAPM-based measures also are subject to subtle tradeoffs: measures based on SML (Treynor and Jensen measure) fail to evaluate the portfolio manager's ability to diversify because they calculate risk premiums in terms of systematic risk. As noted earlier, to evaluate the performance of a group of well-diversified portfolios such as mutual funds, this is likely to be a reasonable assumption. However this does need to be always the case and whenever mutual funds portfolios have large unique risk this may lead to different classifications of out- and underperformance. In such cases, CML-based measures (Sharpe and M2 measure) will rank mutual fund portfolio lower than the first two measures. Those conflicting classifications may ask for the additional assumptions as to which measure should be considered as primary to investor's decisions.

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[28] Gruber (1996) reports that his four-factor model does an excellent job of expaining mutual fund return behavior. They both have high R-square and conform with the predictable sensitivity for given categories of funds. For example, funds that are categorized as seeking maximum capital gains have higher loadings on small stocks and growth stocks than do either growth funds or growth and income funds. Similarily growth and income funds have negative loadings on growth (positive on value), while more growth oriented funds have positive loadings on growth.

On the pragmatic side however there are another trade-offs. Most of the researchers and practitioners admit to the clear informational tradeoff between widely available and advertised simple and easy-to-comprehend measures of raw and market-adjusted returns and more sophisticated measures which proliferated much slowly in the performance sources and suffer from inherent conceptual complexity. Although the raw returns as a performance measure fail to be sensitive to both the relative risk and the strength of the market, they remain very popular performance measure among not too sophisticated investors. Realizing this tradeoff requires answer to two questions: a) whether investors really have an access to this performance data; and b) if they do, whether they can comprehend them and act on them correctly. Those questions have large implications for the bounded rationality of the mutual fund investors exposed e.g. in Patel, Hendricks, Zeckhauser (1994). It could be hypothesized that investors are bounded not only in whether they can have an opportunity to act on performance but also whether they can have timely access and can really comprehend the performance information. In respect to the first question Sirri and Tufano (1997) postulate that studies of flow-performance dependence should concentrate on the type of annual information available to consumers in the given period through leading purveyors of mutual fund data. They claim that throughout the period 1970 to 1990 consumers were exposed only to most rudimentary measures of performance (and rankings based on them) like raw returns or market adjusted returns. They provide some evidence that those measures are as good as risk-adjusted measures at predicting flows into mutual funds and that they continue to have material relationship with flows, even after including more sophisticated measures. Such evidence can prompt hypothesis that raw performance rankings may have a separate impact on fund flows beyond that of more precise performance measures.

In respect to the second question about the comprehension of the performance information both Sirri and Tufano (1997) and Patel, Hendricks, Zeckhauser (1994) suggest that even if investors have an access to the data on more sophisticated measures they will not comprehend them correctly. They point that (as it also has been reported in Chapter 2) millions of US households invest in mutual funds and one would hardly expect from them proficiency in market analysis and knowledge of complicated measures and finance theory. This effect can be strengthened by the fact that large number of new, unsophisticated investors who entered the market in the last decade of mutual fund explosion did not have enough time to comprehend all intricacies of sophisticated measures and could still limit their decisions to those basic measures. This view is however challenged by Gruber (1996) who reports in his study that investors act as if they were really considering the most complicated measures like four-factor generalized alphas. It could be therefore hypothesized that although investors cannot comprehend complicated risk-adjusted performance numbers they could however at the same time approximate it from other sources of information. This is especially plausible if we assume that investors have some time to learn and stay in the market longer - like it used to be the case over most of the history of the mutual fund industry[29].

3.2 MEASURES OF FLOWS TO MUTUAL FUNDS

At first sight the realm of mutual fund flow measures may seem to be much easier and simple than that of performance measures but the research practice proves to the contrary. In contrast to the performance analysis, the area of flow study is relatively young and no clear guidelines have been developed so far as to which measures are optimal in a given case—including the simplest choice between the use of measures of absolute (dollar value) flow or flow relative to the size of the fund (growth rate). The scarcity of detailed data about actual purchases of the mutual fund shares adds to this problem and forces researchers to use models. Those models require assumptions about the investors behavior and therefore are inherently biased in favor of different effects. In the following section I attempt to describe various aspects of flow measures and present how the assumptions behind the stated models could influence the results.

3.2.1 MONEY (DOLLAR) FLOWS VS. NORMALIZED FLOWS

First of all there is a question of considering normalized (relative) flows or dollar value (absolute) flows as the measure of new money. Normalized flows (after Gruber (1996)) are expressed as the ratio of the flow in the period to the size of the fund at the beginning of the period and are sometimes referred to as growth rates. Most of the studies do not give explicit reason for using either of the measures although there is an obvious trade off between the two. Gruber (1996) points that the dollar value flows tend to be large for the large funds regardless of their performance whereas normalized flows tend to magnify the reported cash flows for funds with very small overall TNAs. Zheng (1998), argues that those huge changes in percentage flows observed for small funds are not necessarily meaningful from the perspective of the aggregate mutual fund industry.

The survey of the literature reported in this section suggests however that normalized flows (growth rates) are by far the most popular measure as they enable use of large samples of funds of different sizes. Moreover, Zheng (1998) and Gruber (1996) who use both normalized and dollar value flows report that both measures give similar results.

3.2.2 FLOWS WITHIN THE MUTUAL FUND

Before we define measure of flows we should consider the multitude of different flows which while interacting with the intrinsic growth in assets determine the size of mutual fund. All the basic flows have been depicted in Figure 3.1.

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[29] Boegle 1998 reports that the average time of the investment in 1990s is 3 years - much less than 12 years which used to be in 1960s.

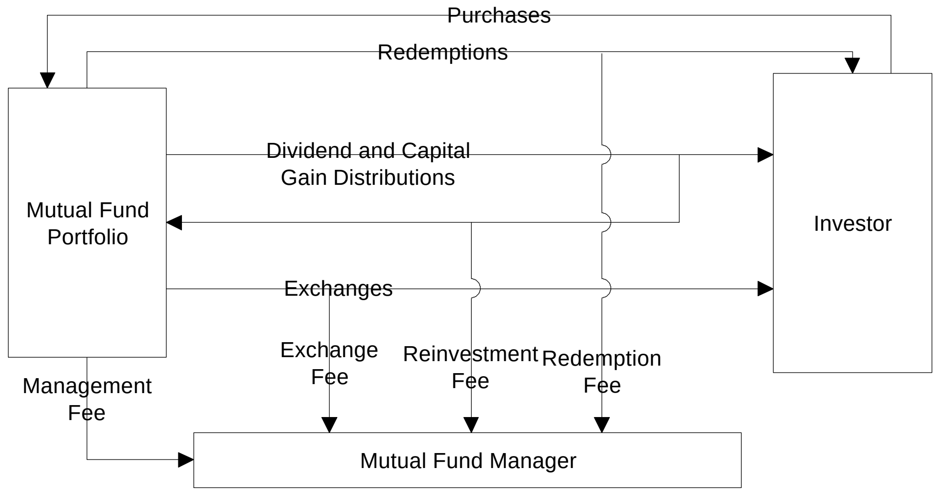

FIGURE 3.1 MUTUAL FUND FLOWS

We can distinguish the following flows:

Purchases - represent the inflows of new money as the purchase of new mutual fund shares. This flows should be used as a base for calculating flows as they are solely result of conscious investors' purchasing decisions.

It should be noted that the purchases of load-funds - i.e. funds marketed by the sales force of financial institutions like brokerages, insurance companies and banks - are subject to additional charges not shown in Figure 3.1. Those charges, however, accrue to those who sell the mutual fund shares—not to the mutual fund itself and therefore are not relevant in this overall picture.

Redemptions - are outflows due to the shareholders' decisions to sell the shares in the mutual fund and therefore decrease the fund's TNAs. Similarly to purchases, those flows are subject to additional charges in form of redemption fees and CDSC fees described in Chapter 2. Again, however, those charges do not accrue to the mutual fund itself and therefore do not affect further the size of the fund.

Dividend and Capital Gain Distributions - represent outflows accruing directly to the mutual fund shareholders. Dividend distributions come primarily from the interest and dividends earned by the securities in the fund's portfolio after expenses. Capital gain distributions represent the fund's net gains from the sale of securities held in its portfolio for more than one year. When gains from these sales exceed losses, they are distributed to shareholders. Dividend and capital gain distributions must be made at least once a year. The investors have however tax incentives to reinvest the distributions in the fund[30]. In fact most of the funds provide an option to their shareholders to automatically reinvest those distributions in new shares purchased and most of the investors use this option[31]. The redistributions may be however subject to charges and those charges accrue to the management and therefore

[30] Those are exempt from the tax until they are realized. Cf. Mutual Funds Factbook 1999, Investment Company Institute, http://www.ici.org
[31] About 76 percent for year 1997. Ibidem.

effectively decrease the flows. Subsection 3.2.4 is concerned with the methodological repercussions of considering those automatic purchases as conscious investment decisions.

Exchanges - are outflows due to transferring the money to another fund within the fund subgroup/family. In the aggregate, mutual fund exchanges net to zero, but subgroups/families can have positive or negative net exchanges. When considering single mutual fund the exchanges have an effect similar to redemptions—they are also results of conscious shareholders' decisions to decrease their investment in the mutual fund. Similarities go even further—most of the funds charge additional fee for exchanges - (see Chapter 2) which usually accrue to the advisors of mutual fund and therefore decrease the value of money transferred.

3.2.3 TNA-BASED MEASURES

The researchers attempting to study new flows into mutual funds face two problems: lack of primary data on mutual fund purchases and validity of assumptions of model of investor behavior. Most of the funds do not provide separate data on purchases minus the redemptions, exchanges which could be used to estimate them more precisely. Moreover even if the data on purchases were available there could be still methodological questions whether automatic reinvestment of distributions should be regarded as conscious decision based on performance and other criteria or rather a mechanical decision of the investor—an expression of his unsophistication and inertia.

Because of those problems virtually all studies resort to estimating new inflows using TNAs and measures of assets appreciation due to internal growth. In this case an inflow is defined as a dollar change in TNA minus the appreciation in the fund assets[32]. Assuming that flows take place a the beginning of the period t the flow would be defined as:

$$F_t = TNA_t - TNA_{t-1}(1 + G_t)$$

where

F_t = flow in period t

TNA_t = total net assets of fund at the end of period t

G_t = appreciation in total net assets due to capital appreciation in period t

It should be noted here that the inflow defined in this way is in fact share purchases net of redemptions and exchanges. In order to specify the final version of the flow measure two assumptions must be made: about reinvestments and timing of the inflow.

[32] In some studies where information is available on mergers of the funds the correct definition of an inflow is then: a dollar change in TNAV minus the appreciation in the fund assets and the increase in the total asset due to merger.

3.2.4 MODEL OF CONSUMER VIGILANCE—AUTOMATIC VS. CONSCIOUS REINVESTMENT

As stated above, the assumption about automatic reinvestment of distributions in the mutual fund is crucial as it will tend to underestimate or overestimate the 'true' flow attributed to 'conscious' investors' decisions.

Petel, Hendricks, Zeckhauser (1994) and Ippolito (1992) provide two hypotheses about investors behavior: The first hypothesis is that investors' basic strategy is to buy and maintain. In this case, the existing shareholders reinvest all distributions in the fund automatically and because those investments are not 'conscious' those should be excluded from the flow measure. Constructing the measure based on such assumptions requires increasing the appreciation of the mutual fund assets by the value of distributions. This can be done using widely available total returns[33]. In this case for a given fund during period t, the size fluctuations identifiable as net flows would be:

$$F_t = TNA_t - TNA_{t-1}(1 + R_t)$$

where

R_t = total return in period t

It should be noted, however that this measure underestimates inflows by the amount of reinvestment fees charged by the fund what was already mentioned in the previous sections.

The second hypothesis is that any strategy changes on the part of investors apply directly to all incremental investments, including distributions received from existing investments. The rationale behind this is that investors can withdraw automatic reinvestments at will, and individuals who opt to receive dividend checks can redeposit their money at will. In this case proportional change in the NAVs should be used as the measure of return (appreciation) and inflow is defined as:

$$F_t = FNAV_t = TNA_t - TNA_{t-1} \cdot NAV_t / NAV_{t-1}$$

where

NAV_t = net asset values at the end of period t

Ippolito (1992) claims that the problem with this approach is that it makes it difficult to distinguish a model of consumer vigilance from one that treats investors as persons who are ignorant of quality measures but who blindly reinvest or withdraw distributions in the fund regardless of observed returns. In the latter model, a positive correlation is expected between distributions in the fund last year and growth in shares this year owing to unconscious reinvestment of distributions. Because of this problems and low proliferation of data sets including NAVs most of the researchers use the first model while defining measure of inflows.

[33] Total return is a measure of a fund's performance that encompasses all elements of return: dividends, capital gain distributions and changes in net asset value. Total return is the change in value of an investment over a given period, assuming reinvestment of any dividends and capital gain distributions, expressed as a percentage of the initial investment.

3.2.5 TIMING OF THE INFLOWS

Virtually all studies make explicit assumptions about the timing of the inflows. The three basic possibilities are that inflows take place at the beginning of the period, in the middle of the period or at the end of the period.

The different measures defined accordingly to the assumption about the timing are listed in the table :

Flows assumed at:	Flow measure	Study
Begining of the period	$F1_t = TNA_t - TNA_{t-1}(1+R_t)$	Zheng (1998), Gruber (1996), Patel, Zeckhauser, Hendricks (1994), Chevalier and Ellison (1996), Sirri, Tufano (1997)
mid-point of the period	$F_t = TNA_t - TNA_{t-1} \cdot (1+R_t) / (1+R_t / 2)$	Ippolito (1992)
end of the period	$F_t = TNA_t / (1+R_t) - TNA_{t-1}$	Zheng (1998),

The assumptions about timing of the flows however seem to be not as methodologically crucial as assumptions about reinvestments. The only study to use multiple assumptions is Zheng (1998) who reports that his findings are robust for both extreme variants (flows timing assumed at the beginning and at the end of the period).

3.3 CONCLUSIONS

Both performance and flow measures are central to the problem of performance-flow relationship in the mutual fund industry and as such deserve a special attention. In this Section I attempted to introduce and present survey of those measures to point to the multiple of methodological and pragmatic tradeoffs faced by the researchers studying behavior of the mutual funds' investors. The survey of the performance measures attempted to show that although those measures can be ranked according to their sophistication and methodological prowess no superior measure can be selected if we take into consideration both data availability and measure-comprehension concerns. This suggests for the further study that both simple (e.g. raw returns) and composite measures (e.g. Jensen measure and Sharpe ratio) should be considered as an explanatory variables. Furthermore it could be also interesting to attempt to analyze relative strengths of those measures to validate claims found in the literature. The survey of flow measures attempted to point to the problems of estimating the true extent of investing decisions of mutual fund investors i.e. their purchases of mutual fund shares. It has been emphasized that although most of the researchers are not concerned with construction of flow measures they indeed make some implicit assumptions leading to biased measures as they have to consider three dimensions flow measures: a) money value vs. normalized; b) conscious vs. automatic reinvestment and; c) timing. The overall impression about flow measures is that both their methodological and pragmatic (data availability) problems are less severe than those for performance measures and the further study should attempt to make use of methodology reported in the literature to facilitate easy comparison of results.

4. Theory and Empirical Evidence on Performance-flow Relationship

4.1 INTRODUCTION

This chapter is devoted to both theoretical considerations and empirical evidence about the performance-flow relationship. I start in Section 4.2 from the null hypothesis of Efficient Markets Theory and study its implications on the flows in the mutual fund industry. Section 4.3 is devoted to the theoretical expectations about the flow relationship and studies both rational expectations equilibrium model of Ippolito (1992) and behavioral hypotheses drawing on developments in experimental psychology. The evidence about testing of those hypotheses is provided in Section 4.4. Some final remarks and conclusions are contained in Section 4.5.

4.2 EMH AS A BENCHMARK

The Efficient Market Theory and accompanying Efficient Market Hypothesis (EMH) is regarded by academic community as a valuable hypothesis and serves as a benchmark of many theories explaining the investors behavior. In an efficient market, successive period returns are serially independent and investors outperform the market as often as they will underperform it. A large body of empirical evidence has evolved to support serial independence of successive period returns over short periods and, hence, support the efficient market hypothesis. Fama (1970) and LeRoy (1982) provided an extensive survey of these early tests of the efficient market hypothesis.

The Efficient Market Theory has parallel implications for mutual fund management. The first issue to have gained considerable attention is the ability of mutual fund managers to consistently earn returns which exceed alternative passive investment strategies on a risk-adjusted basis. If security prices quickly reflect all available information, then it can be argued that mutual fund managers should not be able to consistently earn sufficient excess returns to offset the additional costs associated with active portfolio management. Empirical evidence consistent with this position generally has found average mutual fund performance lagging overall market performance on risk-adjusted basis, Elton et al. (1993), Grinblatt and Titman (1989), Jensen (1968); Malkiel (1995), Sharpe (1966), Treynor (1965). However, research by Chang and Lewellen (1984), Grinblatt and Titman (1992), and Ippolito (1989) indicates that some mutual fund managers have been able to earn sufficient excess returns to meet or exceed the additional costs of active portfolio management. Recently attention has shifted towards examining the relationship between prior and subsequent period mutual fund performance. If markets are efficient, then successive period returns are serially independent and, therefore, past mutual fund performance should not provide any meaningful insight into subsequent period performance on a risk-adjusted basis. However, if a mutual fund's superior performance is the result of superior security selection, efficiencies in information acquisition and dissemination, or appropriate market timing, then it can be argued that relative prior period performance might be a useful factor in the mutual fund selection process. A growing body of empirical evidence supports the opinion that mutual funds exhibit persistence in performance: Grinblatt and Titman (1992), Hendricks, Patel and Zeckhasuer (1993) and Elton, Gruber and Blake (1996).

Although the EMH predict that all information about assets future price is contained in the current price this does not apply directly to mutual fund investors as they buy shares of mutual funds at their net asset value. This means that if any mutual fund could consistently earn abnormal returns then this mutual fund investors would also earn abnormal returns because the managers ability is not included in share price (Gruber(1996)). This limits the application of the EMH only to behavior of mutual fund managers but not to behavior of investors who can hope that they are able to identify funds consistently earning abnormal returns net of expenses.

4.3 THEORETICAL MODELS OF FLOW PERFORMANCE RELATIONSHIP

In this section is concerned with two types of hypotheses about mutual fund investors' purchasing/selling behavior which provide the rationale for the existence of flow performance relationship and possible asymmetry in response to underperformance. The basic difference between those two types is in their assumptions about investors' rationality. The first subsection is concerned with the model created by Ippolito (1992) who conjectures that rational investor facing uncertainty about the quality of the fund should try to chase better recent performers as this increases their chance to end up with higher quality fund. His model assumes that investors behave fully rationally and the outcome results in equilibrium which disciplines the mutual fund industry to provide high-quality products. The second subsection is devoted to behavioral hypotheses about investors' behavior and its basic assumption is that investors do not act fully rationally and are subject to number of psychological biases. A number of psychological effects are presented together with how they can influence the final outcome in the industry. Both of the groups of strains are important and valuable in their own respect and as evidence in Section 4.4.2 shows can used as a good predictions about how investors would behave in the mutual fund market.

4.3.1 PERFORMANCE-FLOW AND RELATIONSHIP AS A RESULT OF RATIONAL ACTIONS OF INVESTORS ACTING IN THE CONDITIONS OF UNCERTAINTY ABOUT QUALITY.

The theoretical consideration of flow-performance relationship in Ippolito (1992) suggest that the dependence of flows on recent performance results from the simple information asymmetry about 'product quality' the investors face while deciding about their mutual fund investments. He claims that the mutual fund market is ripe for a degenerate equilibrium as there is both much noise in performance across mutual funds and over time (hence it is difficult to judge the fund manager's ability) and managers can either overstate their own ability to act on information or suffer deterioration of their ability over time. It is easy to infer that in such conditions, low quality could proliferate bringing about decline of the industry. Ippolito however tries to explain the rapid expansion and undeniable success of the mutual funds with the hypothesis that investors' vigilance plays an important role in generating efficient equilibrium He provides a simple model of rational response of investor facing population of high-quality and low-quality funds. The first type is able to act on information and provide added-value a (equal to residual alpha from CAPM) to offset expenses and the second expends resources without generating any superior returns $-x$. If the high quality funds manage some portion s of the total assets of the industry then expected value of investing in the industry is:

$$sa-(1-s)x$$

If however, as he assumes investors have the option of using index funds then this should be equal zero as the index fund investors pocket zero abnormal returns after adjusting for risk and expenses. Ippolito reasons further that unless the expenses of collecting and acting on information are zero ($x=0$) or all managers are both honest and competent ($s=1$), the alpha for high quality must be positive to offset the negative alphas of low quality funds: $a>0$. In a more realistic setting however investors' observations of alphas are distorted by errors and take the form of performance residuals:

$$V_{Ht}=a+et$$

for high-quality funds and

$$V_{Lt}=-x+et$$

for the low-quality funds. Given those observations investors can increase their expected payoffs if they choose the recent best performers as:

$$qa-(1-q)x>sa-(1-s)x$$

where q is the probability that an observed higher residual is drawn from a distribution with mean a compared with one with mean $-x$. Hence in the absence of transaction costs the net gain of selecting the latest best performer comparing to a random choice of fund is then

$$G=(q-s)(a+x)$$

and since $q>s$, G is positive. The lower the market share of high-quality funds, the less likely it is that a random choice will identify a high-quality fund and, thus, the higher incremental benefit of using an allocation strategy based on recent performance. Similarly, the greater the difference in the means of the two residual distributions, the more often the higher observed residual will come from the distribution with the highest mean and, thus, the more likely the algorithm will identify a high quality fund. Thus the algorithm should both ensure non-degenerate equilibrium and performance-flow relationship as the investors switch from poorly investing funds to better performing funds whenever possible and this is the main prediction of this model. Inclusion of the transaction costs however does lead to non-linear performance flow relationship as the switching can incur costs beyond the immediate benefit of the investor. This costs are responsible for apparent lack of large swings in mutual fund shares each time performance is announced. Ippolito claims that rationality with inclusion of transaction costs and scale effects precludes frequent switches or overly diversification. He predicts that investors will use recent performance to allocate **new money** to the funds rather than transfer money from the funds they are already locked in due to transaction costs. Concerning the whole industry there should be more reaction in shares purchased (and seeking better performance) than shares sold (leaving the underperforming funds). At the aggregate level of the funds the privately profitable investment decisions of investors should result in asymmetry–i.e. greater sensitivity of shares purchased to average or high-performance and lower sensitivity to underperformance.

4.3.2 Behavioral Hypotheses of Origins of Performance-flow relationship

Apart from rational equilibrium model of Ippolito (1992) some other researchers attempted to draw on psychological phenomena to predict the behavior of investors facing the uncertainty about true quality of mutual funds. Those behavioral hypotheses and models base on the assumption that investors are not fully rational and are subject to various psychological phenomena that therefore their investment decisions can result in the outcomes far away from rational equilibria. Predictions of those hypotheses although less formal and therefore discussible are at times also quite plausible and may offer some intriguing insights in the collective effects of individual irrationality.[34]. The hypotheses stated in this section consider both general performance-flow relationship as well as asymmetry in reaction to underperformance.

Patel, Hendricks and Zekhauser (1991, 1994) present predictions about investors' behavior if the latter is driven by irrational motives. They view financial markets as an ecosystem, populated by rational and nonrational investors where depending on their relative numbers, and the ability of the first group to capitalize on the errors of the second, equilibria with varying qualitative figures arise. Although modern finance refined well-specified theories of the way rational investors should behave, the nonrational investors are still an underdeveloped area in finance and there seems to be no hope for unified theory as the nonrational investors come in different species. The authors consider four behavioral hypotheses, variants of those are found within the mainstream psychological literature, for explaining the behavior of investors in mutual fund industry: 1) barn door closing, 2) expert and reliance effect 3) status quo bias 4) illusions, framing and data packaging. Those hypotheses predict both dependence of flows on performance and asymmetry in reacting to underperformance, and size effect.

[34] Irrational is used here as an equivalent of behavioral i.e. whithout any pejorative meaning.

Barn door closing refers to undertaking behavior that would have been profitable yesterday. Investors seek to reproduce actual or imagined past investment successes by investing in the same way. A special version of this hypothesis when the current strategy is to continue an actual past strategy is often called 'riding the winners'. According to both versions investors should chase recent good performance in hope it will identify future performance.

Status quo bias refers to investors' tendency to stick with strategies because of a reluctance to depart from the status quo, a widely observed human tendency (Samuelson and Zeckhauser (1988)) reinforced by a number of psychological phenomena. This bias may be promoted by reliance on rules of thumb (which itself is an outgrowth of bounded rationality) and reinforced by 'expert effects' deterring individuals from investing beyond their expertise. This would cause investors to stick to underperforming funds they have chosen according to their old rules until they are able to devise new rules and new expertise. Status bias is also apparently stimulated by concerns about regret, which tend to make errors of omission (failing to sell a fund that later goes down) much less serious than errors of commission (selling a fund only to see it perform spectacularly). This would also result in the asymmetry in response to poor performance whereas investors predict that they would be severely dissatisfied if they sold poorly performing fund (and thus incurred losses) only to see it outperform (and thus incur further dissatisfaction). The strength of status quo bias can be tested by examining flow persistence over time and the relationship of flows to fund size.

Illusions, framing and data packaging is consistent with psychological evidence that people follow simple rules based on direct evidence available to them. This effect is promoted by mutual fund performance rankings compiled on a regular and timely basis which seems to be widely followed. This is further strengthened by advertising as mutual funds that do relatively well tout their performance prominently in their advertising whereas those that don't, search for the measure that puts them in the best possible light. This all could result in observable greater reliance of the investors on rankings and greater visibility of bigger funds due to their big advertising budgets. Zekhauser, PH conjure that the data packaging effect can be studied by comparing the effects on flows of (a) a widely reported ranks, and (b) cardinal measures of absolute or risk adjusted performance, which are preferable from the standpoint of financial theory but may not be easily understood.

Goetzman and Peles (1997) add to this hypotheses two more effects in an attempt to explain why investors would tend to remain with funds that consistently perform poorly. They suspect that investors inertia is not only due to high economic switching costs but also because investors adjust their beliefs to support past decisions, a phenomenon termed by Festinger (1957) as a cognitive dissonance. This means that distressed by conflicting cognitive elements, such as discrepancy between empirical evidence and past choice, the investors alter their beliefs to conform to their past actions. This cognitive dissonance can be regarded as psychological costs the investors wish to minimize along with economic switching costs. In the mutual fund industry setting it would mean that investors would be slow to react to underperformance of their investments as they will try to subconsciously disregard the empirical evidence about the true size of the underperformance. At the industry level it will result in reluctance to punish the underperformers and therefore in asymmetry in treatment of performance. Similar to this effect is 'endowment effect'–i.e. people are more likely to believe something they own is better than something they do not own. This would result also in similar reaction to underperformance. The empirical results of investors surveys prove that indeed both informed and uninformed investors understate underperformance where this effect is stronger for the situations that those investing decisions are constrained (e.g. investors-participants in defined contribution plan who can't choose mutual fund manager).

4.3.3 CONCLUSIONS

Both rational equilibrium model of Ippolito (1992) and behavioral hypotheses offer interesting insights in the possible results of purchasing/selling decisions of rational or nonrational investors. In general they predict that performance chasing and asymmetry in reaction to underperformance can be viable predictions about investors' behavior and therefore should be tested as hypotheses. In particular, both rational equilibrium model and barn door closing hypothesis predict that investors will attempt to chase the performance in hope of identifying the future winners. Status quo bias suggests that the previous level of flows will be of substantial relevance in explaining current flows. It can be also expected that due to framing effect the size of the fund can be expected to be an important variable as investors may also perceive it as a signal of reliability. Data packaging effect suggests that investors will rely more on cardinal (e.g. ranks) than absolute measures of performance. Cognitive dissonance effect and endowment effect will have results similar to those of status quo effect. The evidence of testing of some of the hypotheses specified above will be provided in the next two sections.

4.4 EVIDENCE ON FLOW PERFORMANCE RELATIONSHIP

The theoretical relationship between performance measures and flows has been subject to extensive studies aiming at identifying it strength together with measures which seem exert the greatest influence on the investors' purchasing/selling decisions. Those studies were conducted at both industry and fund level and are presented in the Section 4.4.1 and Section 4.4.2, respectively.

4.4.1 FLOW-PERFORMANCE RELATIONSHIP AT THE INDUSTRY LEVEL.

At the industry level the flow-performance relationship has been studied only recently by a number of researchers. Most of those studies are targeted at analyzing the possible destabilizing influence[35] the mutual funds can have on stock and bond markets and usually analyze the causation from flows to

[35] Those studies concentrate mainly at analyzing the postive-feedback process. In this market returns cause them mutual fund flows at the same time that those flows cause the returns. Some observers fear

performance of various indices. Because no threatening effects have been found for the time being most of those studies analyze also reverse relation in causation between aggregate returns and inflows to the mutual fund industry.

As the result they may provide some insight into mutual funds investors behavior and specifically answer the question to which extent their investment depends on performance of the industry as the whole as proxied by stock market returns. The early study by Warther (1995) failed to find a seemingly evident positive relationship between performance of the capital markets and flows into the mutual funds. His approach and results, has been however since criticized by recent studies of Fortune (1998), and Edwards and Zhang (1998) who presented evidence that a positive relation between flows and performance is present in the U.S. market. Most of those studies use the notion of „Granger causation"[36] to analyze the causation between the two phenomena.

Warther (1995) presents one of the first studies mutual fund flows at the aggregate level of mutual fund industry and attempts to validate feedback trading theory of investor's behavior. In the process he investigates the relationship between mutual fund flows and past returns as well as contemporaneous returns. He uses ICI's monthly data for January 1984 to June 1993 and decomposes[37] net new money flows inflows into expected and unexpected components[38]. He aggregates 19 objective categories distinguished by ICI into several super-categories[39] and uses flows normalized by the aggregate TNAs of those wide super-categories in the previous month. Warther finds that unexpected money inflows to equity funds are positively correlated with current-month returns on common stocks. This result is consistent with the momentum investing hypothesis where investors are buying more of a mutual fund in a month when the prices of securities it holds rise. No evidence is however found for statistically significant effect of past stock returns on equity mutual fund inflows which is expected by the feedback trader theory of investor's behavior. To further investigate this puzzling result the author used weekly stock market returns from previous, current and following month. He finds that weekly returns from

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that such a process could turn a decline in the stock or bond market into a downward spiral in asset prices.

[36] Granger causation is a concept introduced by Granger (1969) whereby the direction of causation is synonymous with the existance of a lead or lag relationship. Variable A is said to „Granger cause" variable B if past values of A contain information useful in forecasting B. 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 philospohical sense.

[37] The rationale behind this decomposition is that some part of investment in mutual funds depend more on life-cycle motives in mutual funds—such as saving for retirement—what can make certain flows isensitive to short-term returns. In result, much of those flows would be predictable on the basis of past flows. Hence the analysis of mutual fund flows at the aggregate level should distinguish between long-term trends and short term fluctuations in mutual fund flows.

[38] Expected fund flows are defined as a function of past flows into the same group, and unexpected fund flows are defined as the residual from the expected flow regression.

[39] Those are: 'all stock funds', 'all bond funds', 'all funds', 'money market funds'. 'All stock funds' category includes aggresive growth, growth, growth and income, precious metals, international, global equity, income equity, and option income funds.

concurrent month are positive and significant but weekly returns from previous month are negative and insignificant (surprisingly coefficient for the first week of the previous month is significant). Those negative coefficients are puzzling, given the popular belief in feedback theory and the author states that more studies are required to check whether those results are robust.

In order to study the effect of short-term returns on mutual fund flows **Ramolona, Kleinman and Gruenstein (1997)** used an approach similar to Warther i.e. one that involves decomposition of mutual fund flows into expected and unexpected components. However in contrast to Warther they do not aggregate all funds to all-encompassing super-categories like 'all stock funds' but instead run separate regressions for a selection of ICI's objective-categories[40]. Moreover in order to estimate unexpected returns they use Instrumental Variables methods (with four macro-economic variables included as instruments). Their study is based on the ICI dataset comprising monthly returns and normalized net flows[41] for the period of 1986 to 1996. Similarly to Warther the authors report strong correlation between market returns and unexpected flows into three classes of equity funds. However they find that unexpected[42] equity fund flows are not affected by either contemporaneous or lagged (two months) stock returns. Nevertheless when the authors use the same set of variables as that of Warther the results are different in both frameworks (OLS and IV). For the growth stock funds lagged (one month) returns have statistically significant explanatory power for unexpected returns. At the same time however two-month lagged returns do not have any explanatory power.

Fortune (1998) attempts to test hypotheses of momentum trading and price pressure in the mutual fund industry. He uses a small Vector Autoregression (VAR) model with seven variables explaining flows: new money inflows for each of the four types and three market variables—realized returns on the S&P 500, on long-term U.S. Treasury bonds, and on one-year U.S. Treasury bills. This unrestricted VAR model is allegedly superior to the estimation methods used in Ramolona et al. (1997) and Warther (1995) which are equivalent to a restricted VAR and arbitrarily exclude some observations. The data series for four[43] broad-categories of funds are provided by ICI and comprises returns and normalized net new flows of for the period January 1984 through December 1996. The results of Granger tests using VAR model for new money and realized returns indicate that the history of each return, and other returns as well, is relevant in explaining mutual fund flows. In particular, the tests of the hypothesis of that changes in Rsp500 (return on the S&P. index) do not „Granger-cause" fund flows is sharply rejected for equity funds. The results provide strong support for the basic portfolio choice assumption that realized security returns affect subsequent security purchases. The difference between those results

[40] Those are: (stock funds:) growth, global equity, income, (bond funds:) government, corporate, GNMA, high yield, municipal.
[41] Net flows are computed as total sales minus redemptions, plus exchange sales minus exchange redemptions. Net flows are normalized by dividing them by the funds' net asset value in the previous month to control for the flows' strong rising trend during the period.
[42] Unexcpected flows are defined as residuals from IV regression.
[43] Those are: money market funds, bond funds, hybrid (bond and equity) funds and equity funds. Flows are normalized by aggregate TNAs of each type.

are explained by two effects. First, the three studies use dataset from the same provider but with different sample periods and with different aggregations of mutual funds. Secondly (and more importantly) the study by Fortune estimates an unrestricted VAR, without arbitrary restrictions placed on some parameters of the model. Thirdly, the study includes returns on several different securities as predictors of mutual fund flows whereas Warther uses only own-returns and Remolona et al. use own-security returns and only one other-return, as predictors of flows.

Edwards and Zhang (1998) study aggregate flow-relationship in the mutual fund industry over the 35-year period between 1961 to 1996 - much longer period than any other study to date. The dataset contains monthly net sales[44] of equity mutual funds and monthly annualized excess stock market returns defined as returns on the value weighted New York Stock Exchange Composite Index minus the annualized one-month T-bill return.

The Granger causality between stock market returns and mutual fund flows is tested using Instrumental Variables analysis exploiting a number of additional market-specific and macro-economic variables apart from aggregate flows and stock market returns. The model is estimated using OLS and equations are estimated using different lag structures of up to 13 monthly lags to capture possible delayed responses in the relationship between mutual fund flows and equity returns however the results do not change when more than four lags are used. The F-test shows that for the entire period January 1961 through February 1996, the null hypothesis that stock returns do not cause equity mutual fund net sales is rejected at the 5% level of significance. The difference is found between estimates for the period January 1984 thorough February 1996 and for the entire sample period as for 1984-1996 stock returns do not appear to cause either equity mutual fund sales[45].

Although the earlier studies did not find significant influence of performance on flows in mutual fund industry at an aggregate level the more recent evidence supports the hypothesis that investors indeed are concerned about overall profitability of industry while deciding about investing in funds. This can offer two hints about for further research of investors' behavior at the fund level. First, is that investors may generalize from larger population and in the same way they seek periods of good performance they can seek good performers upon deciding in what fund to invest. Second, is that methodologies that are used to analyze investors' behavior at fund level should take into consideration time effects. As it will be shown in Section 4.4.2 those are important considerations.

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[44] Net sales are defined as sales minus redemptions, where sales are new sales plus sales through exchanges from other funds within the same family of mutual flows, and where redemptions include those made through exchanges into other funds within the same fund family. Therefore whenever redemptions exceed sales, net sales are negative.

[45] Those differencies are explained by the fact that 1984-1990 was the period of only growth, other effects (growth in household savings, new technology, demographic trends) swamping the effect of higher stock returns on fund flows.

4.4.2 PERFORMANCE-FLOW RELATIONSHIP AT THE FUND LEVEL

The studies of the performance-flow relationship are considered the most important as they offer practical insight into flows of representative fund and therefore are important for both regulators and fund managers. Although the variety of methodologies used and datasets investigated preclude direct comparison of many of the studies described below, it is nevertheless possible to draw general conclusions as to the significance and direction of performance-flow relationship (detailed information about methodologies and datasets is contained in Table 4.1).

The first study in the group is **Ippolito (1992).** He empirically tests the dependence of flows on the past performance which is a prediction of his hypothesis about investor's rational behavior in conditions of the uncertainty about the mutual funds' quality (See Section 4.3.1). As a performance measure he uses residuals from returns and CAPM risk premia which are supposed to capture the inherent ability of the fund manager to deliver superior risk adjusted return. Although results of his pooled and fixed-effect regressions are unable to judge whether investors in fact adjust for the risk using CAPM he can confidently reject the hypothesis that fund growth is independent of recent investment performance. The coefficients for performance residuals with lags -1, -2, -3 show statistically significant correlation between past performance and current fund growth with the effect of the most recent period being about 150 percent of each of the other two periods.

Patel, Hendricks and Zekhauser 1994 test their hypotheses of investors irrationality (See 4.3.2). In particular they test whether investors' consideration of past performance is likely to focus on widely reported ranks rather than on a cardinal measure indicating absolute or risk-adjusted performance. The results of they regressions of dollar value flows on lagged flows and total returns controlling for size show that each of the variables is positive and significant. This supports the hypothesis of investors acting on past performance and chasing the winners - other things equal, a return 1% above the cross-sectional mean return in the previous period implies a $200,000 increased flow in this period. The strong persistence of flows offers also support to the hypothesis of *status quo* bias with investors showing inertia in their investment decisions. Similar to the latter, the *reliance effect* is also supported by the strongly significant and positive coefficients on size variable suggesting that investors eagerly invest in large mutual funds. The evidence about higher importance of ranks of returns over returns (data packaging) is somehow cloudy because quite naturally, ranks of returns and returns have a high correlation of 0.86. However in the presence of ranks the two composite measures Jensen alpha and Sharpe ratio do not add any explanatory power and are themselves statistically insignificant. Comparing to other studies their regressions have extraordinarily high explanatory power with R^2 up to 0.75.

Gruber (1996) takes Ippolito's reasoning about mutual fund quality uncertainty one step further. Similarly to the latter he analyses the situation of investors' who are uncertain about future performance of the fund. By comparing the investors in open-end and close-end mutual funds he concludes that quality problems in the open-end industry arise from the fact that mutual fund performance is not included in price because: 1) funds sell at net asset value and 2) good managers actually have lower expense ratios than bad managers, and they do not raise them as performance improves. He reasons that if at least some investors are aware of this, then the same performance measures that he found[46] to predict performance should also predict cash flows. His empirical findings are consistent with this hypothesis as he reports for both flow measures employed strong rankings in deciles of average annual flows based on past performance as measured by one year four index alphas (with differences between deciles statistically significant). He concludes that indeed investors seem to chase past performance. Because four index alpha seems unlikely to be the measure of choice of the average investor Gruber runs also cross-sectional regressions to investigate relative strength of different performance measures. He finds that still four index alphas are marginally the best predictor of cash flows with other performance measures like total returns and one-index alphas only marginally improve the explanatory power of the regression. He concludes that investors do act on past performance in allocating the money to mutual funds and in doing so they seem to pay attention to four index alphas. Moreover at least some of the investors seem to be paying attention to simpler measures like one-index alphas and total returns.

Sirri and Tufano (1997) use cross-sectional regressions to analyze shape of performance-flow relationship using rankings of total returns, market excess returns and Jensen alphas (therefore their findings will be presented in Section 4.4.3. They explicitly report only highly significant coefficients on Jensen alphas estimated over the preceding five years. The size included into regression has statistically significantly negative sign what suggests that smaller funds enjoy larger percentage flows. This however should not be in direct contradiction to the results of PHZ as the latter use dollar value instead of normalized flows what favors big funds[47]. Standard deviation has expected negative coefficient but is largely insignificant.

Rockinger (1995) uses sophisticated dynamic model accounting for time and fund specific effects to study determinants of flows into mutual funds. His methodology allows for verifying the models of Ippolito (1992) and Patel, Hendricks and Zekhauser (1992) which are nested in his model. Similarly to the latter authors he finds lagged flows as significant in explaining current flows into funds. He finds also time and group effects significant enough to warrant their inclusion in further tests. Taken individually all performance measures i.e. returns, rankings of return and Jensen alphas show high significance. If a fund realizes a 1 percent higher return, then this will lead in the short run to a 0.52 percent higher growth rate. A 1 percent higher alpha means a growth rate of 6.57 percent higher in the following year. In those regressions volatility is either not playing an economic or statistically significant role. Only in regression with Jensen alpha, volatility enters with the right sign. In joint

[46] In the previous sections of his paper, Gruber finds that one year four index alpha makes a good predictor of performance of mutual funds in his sample.

regression involving all performance measures only rankings of returns remain significant. This finding, contradicting results of PHZ, is explained by econometric inadequacy of the latter model which fails to take into account autocorrelation of residuals and therefore yields inconsistent estimates of parameters. This result is also interpreted as evidence supporting the hypothesis that investors are not able to dissociate numbers and have to resort to simple rules of the thumb like rankings (data packaging). Rockinger suggests that insignificance of Jensen alpha in the preferred model means that investors do not fully use the information to which they have access. In the further regression he reports that rank of alphas (although similarly to alpha significant on its own in explaining the flows) loses its significance if entered into regression in conjunction with alpha. This suggests that investors may fail to use all available information.

The results of studies of performance-flow relationship presented above provide strong evidence for dependence of flows on a variety of performance measures: performance residuals (Ippolito (1992)), raw returns (Pate et al. (1994)) and Gruber (1996), market excess returns (Rockinger (1995)), composite measures (Patel et al. (1994), Rockinger (1995)); There is however no agreement about relative prediction power of those measures although most of them suggest that investors prefer simpler, rudimentary measures to more complex ones. So. raw returns or market excess returns are preferred to composite measures like Jensen's alpha or Sharpe ratio as they don't fully comprehend the numbers. Moreover there is also recurring evidence (Patel et al. (1994), Rockinger (1995)) that cardinal measures like rankings are preferred to absolute measures as investors tend to be subject to data packaging and follow simple rules of the thumb. There is also strong evidence of persistence in flows hinting at *status quo* bias.

[47] See discussion of flow measures in Section 3.2

TABLE 4.1 SURVEY OF THE LITERATURE ABOUT FLOW-PERFORMANCE RELATIONSHIP.

Study	Objective	Dataset	Performance, flow measures and control variables	Methodology	Results
Ippolito (1992)	Dependence of funds' flows on recent performance.	143 open-ended (both load and no-load) funds in existence at the beginning of 1965 holding 80 percent of the assets held by all mutual funds in 1965. Annual returns and TNAs over 1965-1984 from Wiesenberger's Mutual Fund Panorama.	Flow: Annual normalized flows with investment assumed at beginning of the period. Perf.: Performance residual - risk premium/discount from CAPM equal to realized alpha.	Pooled and fixed effects regressions of flows on performance residual. Dummies include year, fund type and fund dummies.	Performance residuals with both lags of 1 to 3 years and averaged over 5 years are positive and highly significant. Results for pooled and fixed-effects regressions are similar.
	Asymmetries in reaction to positive and negative performance		(as above)	Fixed-effect regression of flows on separated positive and negative values of performance residual lagged 1 to 3 periods. Dummies include year, fund type and fund dummies.	Coefficients for positive performance variables significantly higher than coefficients on negative variables. For lags 2 to 3 all coefficients on negative variables insignificant in contrast to significant coefficients on positive variables.
Gruber (1996)	Do the same measure that predict performance also predict cash flows into mutual funds?	270 common stock funds accounting for 77.2 percent of the assets held by all common stocks in 1984. Yearly data for 1985-1994 from Wiesenberger's Mutual Fund Panorama. „Follow money" approach used to avoid survivorship bias.	Flow: Both dollar value and normalized flows with investment assumed at beginning of the period. Perf.: One year four index alphas. Also one year one index alpha; annual total returns.	Average realized annual cash flows for deciles formed on the basis of four index alphas in the year following formation.	Strong ranking for both flow measures with differences between groups of deciles all statistically significant at the 1 percent level. Similarly strong results for 3-year alphas.

TABLE 4.1 SURVEY OF THE LITERATURE ABOUT FLOW-PERFORMANCE RELATIONSHIP (CONTINUED).

Study	Objective	Dataset	Performance, flow measures and control variables	Methodology	Results
			(as above)	Cross-sectional regression for each year of flows against lagged (one or two periods) values of performance measures and past flows. Mean regression coefficients are reported together with their significance levels. Five combinations of variables.	Two year lagged four index alpha is always highly significant. So are the past flows, total returns and lagged one-index alpha. One year four index alpha always significant at least 5 percent level. Persistence of flows - 1% flow in the past year implies 0.3% flow in the next period.
Patel, Zeckhauser and Hendricks (1994)	Tests of behavioral hypotheses concerning investments in mutual funds.	96 no-load capital growth funds. Yearly share prices, sizes and net returns for 1975 to 1987. Compiled from Weisenberger Investment Survey and data from CDA Investment Technologies and Lipper Analytical Services.	Flow: 1) dollar value flows with reinvestment of all distributions; 2) dollar value flows without automatic reinvestment of all distributions. Investment assumed at beginning of the period. Perf.: One year total returns, rank of on year total returns, one year one index alphas and one year Sharpe ratios. Control: dollar size of fund.	Pooled GLS regression of flows on performance measures lagged flows and control variable (size).	Size and total returns highly significant and positive. Persistence of flows - $1 flow in the past year implies $0.75 in the next period.

TABLE 4.1 SURVEY OF THE LITERATURE ABOUT FLOW-PERFORMANCE RELATIONSHIP (CONTINUED).

Study	Objective	Dataset	Performance, flow measures and control variables	Methodology	Results
Sirri and Tufano (1997)		690 fund in three objective categories: aggressive growth; growth and income; long-term growth. Monthly to quarterly data for period 1971-1990 from Investment Company Data Institute supplemented with other sources. 'Survivorship-free' sample for period 1987-1990.	Flow: normalized flows with investment assumed at beginning of the period. Perf.: Total returns, returns rankings, market excess returns, Jensen alphas. Control: log of fund size, standard deviation of monthly returns, flows into fund category.	Distribution of flows over 20 performance ranges:-for each year and objective category, funds are ranked into one of twenty bins on the basis of their realized returns net of expenses.	Positive but shallow performance-flow relationship for bottom 80-percentiles, with no apparent penalty for extremely poor relative performance. Strong relationship for the top 20-percentile of best performers..
			(as above)	Cross-sectional regression for each year of flows against lagged performance measures. Mean regression coefficients are reported together with their significance levels. Control variables include size, flows into fund category, standard deviation of monthly returns and total fees.	
Rockinger (1995)	Assessment of importance of performance measures.	2483 open-ended funds of all categories. Annual returns and TNAs over 1987-1993 obtained from Morningstar CD.-ROM.	Flow: normalized flows with investment assumed at beginning of the period. Perf: total returns, ranks of total returns, Jensen alphas. Control: standard deviation.	Dynamic model nesting models of Ippolito (1992) and PHZ (1994).	Lagged flows have high prediction power for current flows. All three performance measures highly significant. When entered jointly only returns ranks play a role. Volatility is either statistically or economically insignificant.

TABLE 4.1 SURVEY OF THE LITERATURE ABOUT FLOW-PERFORMANCE RELATIONSHIP (CONTINUED).

Study	Objective	Dataset	Performance, flow measures and control variables	Methodology	Results
				Dynamic model accounting for time, group and fund individual effects.	Coefficients on negative performance are higher than on positive performance. The test of equality between coefficients has not been rejected.
Goetzman and Peles (1997)	Assessment of differential response to past performance.	All common stock funds from Mutual Funds Panorama over 1976-1988. Yearly data with control for survivorship bias.	Flow: dollar value flows with investment assumed at beginning of the period. Perf: ranks of total returns.	Fixed effect regression with inclusion of time effect on lagged flows, returns and returns divided in performance quartiles.	Rank measure for the top quartile is positive and significantly different from other ranks.
Chevalier Elisson (1997)	Identification of the shape of performance-flow relationship	449 growth and growth and income mutual funds. Annual data for the period 1983 to 1993 from Morningstar's Mutual Funds OnDisc.	Flow: normalized flows with investment assumed at beginning of the period. Perf.: market excess return Control: industry growth, size, age.	Semiparametric model to estimate coefficients of control variables and parameters of function f(excess returns). Separate estimation for sample of 'young' (less than 2 years age) and 'old' funds (remaining).	Asymmetric, option-like shape of function f(.) for both samples of young and old funds although their shapes differ. The non-linearity is tested to be statistically significant.

4.4.3 EVIDENCE ABOUT ASYMMETRY IN FLOW PERFORMANCE RELATIONSHIP

Together with the studies of the performance-flow relationship researchers investigated also shape of this dependence. The null hypothesis in those studies is usually non-linear relationship stemming from theories of asymmetric reaction to good and bad performance described in Section 4.

Ippolito (1992) finds the postulated asymmetry in reaction by splitting the positive and negative values of performance residuals in his regressions. For funds with a positive performance residual equal to 100 basis points over the past five years the current growth rate increases by 0.90 percent. For funds experiencing a negative residual last period in the same absolute amount, the growth rate increases by 0.35 percent and the difference from the positive coefficient is statistically significant . The results for simultaneous inclusion of separate positive and negative return variables for last three years show that coefficients on positive returns are positive and significant whereas same coefficients for negative returns are insignificant. This results suggest that indeed investors act as they wanted to reward better performers and believed that past performance can predict the future performance.

Ippolito predicts also that this is the new money which drives this asymmetry. This hypothesis however cannot be directly tested as it is impossible to identify the source of the money i.e. whether this comes from withdrawals from other funds or other sources. Instead he tests the hypothesis of transaction costs influencing the reaction of the investors. Indeed his regressions for separate samples of load and no-load funds finds that investors reaction to no-load funds is statistically higher than reaction to load funds (by almost 70 percent). This points to that indeed investors locked in load funds are reluctant to withdraw their money and face back-end loads.

Rockinger (1995) attempts to verify the findings of Ippolito using his dynamic model and similarly investigates the coefficients on positive and negative past returns. He uses several variants of his mode initially obtaining the results similar to those reported in the literature i.e. positive returns lead to inflows to funds whereas negative returns are met with indifference. He concludes however that those results are essentially due to group and time effects and after inclusion of those effects this asymmetry apparently reverses. The specification of the model Rockinger considers the most econometrically correct yields a greater coefficient for the negative segment of performance than for positive. Both coefficients are significant but the formal test does not reject the hypothesis that they are equal. The regression for ranks of returns shows similar pattern although not significant. Overall results of those regressions seem puzzling and the author does not elaborate on this result which suggests that contrary to widely held belief the investors in fact are able to punish the underperforming funds and react to negative performance more than to positive.

Sirri and Tufano (1997) aim to study the asymmetric response to performance measures in context of costly search. They find that consumers base their fund purchase decisions on prior performance information, but do so asymmetrically, investing disproportionately more in funds that performed well in the prior period. The fund flows, however, seem to be determined to great extent by the search costs as the high performance appears to be most salient for funds exerting higher marketing efforts, as measured by higher fees and size of fund's complex as well as media attention which considerably lower consumer's search costs. In order to analyze asymmetric response to performance they run piecewise linear regression, which allows them to separately calculate the sensitivity of flows to performance in each of five performance quintiles based on last year's total returns. The results confirm that equity mutual fund inflows are sensitive to historical performance, and this relation is not linear. However only for top performers, i.e. those in the top quintile of funds in their objective category the coefficient on rank of return is statistically significant and positive—for other quintiles relationship between performance and flows is not statistically significant. The control variables have significant coefficients; individual fund flows are strongly related to sectoral flows and smaller funds enjoy larger percentage flows than larger funds. The coefficient of riskiness is only marginally significant and the evidence of consumers risk aversion is weak. The authors are unable to bolster the hypothesis that the performance sensitivity of the top quintile differs significantly from those of each of the four remaining quintiles and they cannot reject the hypothesis that the other four quintiles are equal to one another.

Robustness of the base specification is checked using alternative performance specifications and the results seem to support the former. For both three and five year raw returns used in rankings the asymmetric reaction to performance is observed, although this is weaker what is consistent with consumers responding most strongly to the most recent fund history. This is also observed if one- and two- and three-year period is included in the performance rankings.

The coefficients for rankings based on more sophisticated measures—market excess returns and Jensen's alphas—are generally statistically significant and again more significant for the top performers than for the rest. Those measures do not rob the crude performance rankings of their material relationship with flows which suggests that performance rankings have a separate impact on fund flows beyond that of more precise performance measures. Particularly striking is however the influence of Jensen's alpha on the flows whose coefficient is over dozen times higher than that of the performance ranking—the puzzle which seems to pass unnoticed. The results found for 'survivorship free' sample for period 1987-1990 are similar to those of the whole sample. The overall results seems to suggest that reaction to performance is indeed asymmetric and as such can offer fund managers incentives to take on additional risk and gamble to climb the rankings and enjoy higher inflows.

Goetzman and Peles (1997) use a survivorship-free sample to study flows and performance in order to find differential response suggesting economic and psychological switching costs. They regress this year's new money on previous year's fund returns and flows and find that coefficients for returns in three lower quartiles have expected sign but are insignificant. The response of new money is significant only for the best quartile. Moreover tests for joint equality of these coefficients is rejected with probability 0.99. Therefore the top quartile of funds exhibits a response pattern different form the other quartiles. There is nothing special however about the coefficient on poor performance. The authors conclude that their results support their hypothesis of biases in investors' behavior resulting in inertia failing to adequately punish underperformers.

Ellison and Chevalier (1997) - specifically aim at estimating the shape of performance-flow relationship reported in previous studies in order to explore risk-taking behavior of mutual fund managers. Using a semiparametric model they estimate the shape of function *f(.)* - embodying the dependence of flows on past excess returns for two subsamples of 'young' and 'old funds'. The estimation of the function *f(.)* for the sample of young funds reveals a highly asymmetric response of the investors to the past performance of the fund. The curve is relatively flat for underperformance for up to 15 points below the market and a bit steeper for the outperformance for the same range. The curve is much steeper outside this range in both directions. For the sample of older funds flows are clearly less sensitive to year t excess returns than those for 'young' funds, never falling below -15 percent or rising above 75 percent for a fund whose return is within 25 points of the market. The shape of this relationship is generally convex, suggesting that incentives to carry unsystematic risk may be fairly universal for older funds. This is in contrast to young funds where outflows increase dramatically at the worst performance levels. The findings suggest asymmetric response in both samples although a bit different for younger funds. The departure from the linearity of the flow-performance relationship is found to be significant. The authors conclude that the option-like shape of performance-flow relationship offers mutual fund managers incentives to carry unsystematic risk into their portfolios in hope that this gamble will result in greater payoff.

The evidence presented in this subsection seems to suggest that there is indeed an asymmetry in how investors react to good and bad performance. Most of the studies attest to the hypothesis that good performance is exceptionally well rewarded by investors through increased purchase of new shares. After the initial investigation by Ippolito (1992) it has been also reported by Goetzman and Peles (1997) and Sirri and Tufano (1997) and investigated closely by Chevalier and Ellison (1997). The evidence from Rockinger (1995) which is out of line of both theoretical predictions of Section 4.3 and other mentioned papers deserves attention and should be further investigated. The reported asymmetry gives fund managers a payout that resembles a call option. If returns are high, funds gain assets and total fee revenue rises, but if relative returns are very low, losses of assets and fees are more modest. This suggests that funds can exploit the option-like nature of their payoff by increasing variance of returns and thereby value of this option. This suggest that managers have incentives that may result in behavior not particularly benefiting investors.

4.5 CONCLUSIONS

This chapter was concerned with both theoretical hypotheses and empirical evidence about investors' behavior. I started with the Efficient Market Hypothesis to conjure that although it can offer some predictions for mutual funds managers ability to consistently earn abnormal returns it cannot rule out both performance chasing and asymmetry in response to underperformance. Then I considered in Section 4.3 two groups of hypotheses which base on both rational equilibrium and behavioral concepts from psychology. Both of the groups predict performance chasing and asymmetry in response. The empirical evidence on testing those hypotheses has been reported in Section 4.4 and Section 4.4.3. This evidence offers some interesting insights about behavior of both investors and fund managers.

If performance is indeed persistent at least in the short term the investors should try to chase it by leaving poorly performing funds and purchasing better performing funds. However in order to do it efficiently they should try to decrease economic switching funds by choosing load funds that did not require high back end loads upon leaving the fund. However investors should watch variance of returns mutual funds as the managers have strong incentives to take up additional unsystematic risk.

If new investors focus on past performance rankings, the optimal mutual fund company strategy is to increase the number of funds, increase volatility of individual funds, and decrease the cross-fund correlation. To the extent that the principal benefit of equity funds is to provide low-cost diversification, this strategy does little to benefit mutual fund investors. The inertia caused by psychological or economic factors tempts mutual fund companies to slowly raise fees on poor performers. The cognitive dissonance theory together with data packaging effect provide some positive information for mutual fund managers on strategic use of information. Given a high level of cognitive dissonance surrounding the choice of mutual fund, the principal value of advertising by the fund is in confirming that its current investors made a wise choice. Although advertisements may not be able to influence new investor decisions, they may be able to help funds retain their current customers. Moreover the data packaging hypotheses suggest that mutual fund managers should tout their relative performance measures like rankings in order as those seem to induce purchases most efficiently.

5. Empirical Evidence on Flow-performance Relationship in the U.S. Mutual Funds

5.1 INTRODUCTION

This chapter is devoted to empirical study of the hypotheses about flow-performance relationship on the sample of 132 U.S. growth funds for the period January 1991-November 1994. By selecting a narrowly specified class for analysis of flows, I avoid confounding variables (such as changing investor preferences for safety and cash flows). This study is different from those in the literature not only due to the model applied but also due to higher frequency of data than has been used the studies published to date. This provides an opportunity to identify and analyze the postulated relationship in the shorter term.

The chapter is structured as follows: the set of four hypotheses to be tested is presented in Section 5.2 which is followed by description of the data and variables together with their descriptive statistics in Section 5.3. Section 5.3.2 is concerned with the initial analysis performed using simple performance portfolios and reports some tentative results about existence of a flow-performance relationship. In Section 5.4 a generic model for testing the hypotheses is introduced which will form a base for testing of the hypotheses. Section 5.5 provides the description of different model specifications for testing the set of hypotheses. Section 5.6 presents and discusses the results of testing the hypotheses. The study is concluded in Section 5.7.

5.2 HYPOTHESES

Chapter 3 discussing the literature about performance-flow relationship in the mutual fund industry reports scores of studies that provide much evidence about positive dependence between flows and performance measures. According to those studies the investors seem to reward good performing funds with increased flows as measured by the growth in the TNAs due to purchases of new shares. This relationship is found to be fairly common and unchallenged to date. This is consistent with the hypothesis about investors chasing the best performance presented in Section 4.3.1 (Ipoolito (1992)). In this study I want to check whether this relationship can be also observed at the higher (monthly) frequencies. Therefore, the first hypothesis to be tested will be:

H1: Flows are significantly and positively related to the performance measures.

This hypothesis should be tested for all three performance measures: raw returns, Jensen alpha and Sharpe ratio. It is expected that all of them will show positive and significant correlation with flows.

It has been also claimed in some studies that investors are more sensitive to more recent information and tend to follow the recent winners and dismiss evidence about long-term underperformance (Ippolito (1992), Gruber (1996) and Sirri and Tufano (1997)). This goes well with the hypothesis of bounded rationality presented in Section 4.3.2. However surprisingly Ippolito (1992) reports that sensitivity to performance measures spanning the longer period of time is higher than that for the most recent subperiod. This will be tested in the following hypothesis:

H2: Investors are more sensitive to the more recent performance information.

It seems reasonable to assume that this hypothesis should be tested for subperiods of length of 3 to 6 months for total returns and 6 to 12 months for composite measures. It is expected that the correlation between flows and performance measures will be the highest for the most recent performance measurement subperiod.

Although lots of studies identified a positive relationship between flows and performance not much research has been done on the relative importance of different performance measures as predictors of flows. This is probably caused by econometric problems that appear when using number of highly correlated performance measures as independent variables. It has been claimed that raw returns and rankings based upon them tend to explain the flows the best but there is disagreement whether the other performance measures remain significant along them. Patel, Hendricks and Zeckhauzer (1994) report that the Sharpe measure and Jensen alpha remain significant along with raw returns but Rockinger (1995) reports to the contrary that alpha loses its importance along side of total returns. In order to analyze this problem the following hypothesis should be tested:

H3: Composite performance measures remain significant when total returns are included as explanatory variable.

This hypothesis should be tested on pairs of total returns and both composite performance measures i.e. Jensen alpha and Sharp measure. It is expected that both will remain significant and positive along the total returns.

Almost all studies concerned with identifying a positive flow-performance relationship attempt to identify its shape. As it has been reported in section 4 most of their findings tend to support the hypothesis of non-linear relationship with investors reacting differently to the same amount of under- and outperformance. Moreover it has been also reported that investors reaction to the underperformance is relatively weaker than their reaction to outperformance and while they seem to chase the winners they are relatively reluctant to punish the losers. This findings tends to support the hypotheses of bounded rationality of investors' failing to behave optimally and subject to outperformance illusions described in Section 4.3.2. However, the findings about the shape of the flow-performance relationship has been challenged by Rockinger (1995) who reports asymmetric reaction to performance but such that tends to punish the losers more than it rewards the winners. I will attempt to identify the shape of this relationship for the funds from the sample and test the hypothesis:

H4: The relationship between flows and performance is asymmetric and investors tend to react more significantly to outperformance than to underperformance.

5.3 DATA AND PRIMARY VARIABLES

The data set comprises 132 U.S. growth funds which were operating between 1987-1994. It has been compiled from two large data sets of funds of different objectives[48]. For each fund the data set contains two primary variables:

- 48 monthly values of TNAs for period December 1990 to November 1994 (TNA_{it});
- 84 monthly total returns for period of January 1988 to November 1994 (R_{it}).

This allows for up to 47[49] months of testing period and up to 37 months for the estimation period. The primary variables data set is supplemented with data on S&P500 Total Return Index together with 1 month Treasury Bill rate spanning the whole period between January 1988 to November 1994 and obtained from Datastream. The primary variables are used as a base for flows and other derived variables described below:

Flows ($F_{i,t-l}$) are defined as normalized flow during the current period *t* lagged by *l* with the investment assumed to take place at the beginning of the period i.e.:

$$F_{i,t-l} = \frac{TNA_{i,t-l} - TNA_{i,t-l-1} \cdot R_{i,t-l}}{TNA_{i,t-l-1}}$$

This is by no means the only possible growth measure what has been also discussed in Section 4.2. This is however the most widely used measure and therefore enables comparison with the results from the mutual fund literature.

Size ($SIZE_{it-l}$) of the mutual fund is used as a control variable and is defined as the natural logarithm of the Total Net Assets of the fund in the period *t* lagged by *l* periods i.e. for a given fund:

$$Size_{i,t-l} = \log(TNA_{i,t-l})$$

Volatility ($Vol(p)_{i,t-l}$) of the mutual fund is used as a control variable and is computed as the variance of total raw returns of the fund estimated over *p* periods and lagged *l* periods i.e.:

$$Vol(p)_{i,t-l} = STDEV(R, t-l-p, p)$$

Where *STDEV(R,t-l-p,p)* is standard deviation of variable R over *p* periods starting in period *t-l-p*.

48 The datasets have been provided by Micropal.

49 Flows are computed on the base of differences of TNAs therefore efficiently shortening the testing period by 1 month. Further assumption in the model of existance of lagged flows from the last period shortens this period further by 1 month.

Raw returns ($R(p)_{i,t-l}$) are used as a performance measure and equal to total returns compounded over *p* periods and lagged *l* periods.

Jensen alpha ($Alpha(p)_{i,t-l}$), Sharpe ratio ($Sharpe(p)_{i,t-l}$) and Treynor measure ($Treynor(p)_{i,t-l}$) are estimated over *p* periods up to period *t-l* (i.e. lagged *l* periods). They are computed according to their definitions in Section 3.1.3.

Note, that the basic *estimation period* for most of the mentioned variables can be up to 36 months. However availability of TNAs which are required for the computation of flows efficiently shortens the *testing period* to 47 months or even to 46 whenever lagged flows are used as a dependent variable.

The descriptive statistics of primary variables and some of the derived variables are presented in Table 5.1

TABLE 5.1 DESCRIPTIVE STATISTICS OF SELECTED VARIABLES

Variable	Mean	Median	Stdev	Min	Max	1st quintile	3rd quintile
F	1,09	1,02	7,73	-44,76	71,78	-3,47	5,23
$Size_{-1}$	12,30	12,48	1,71	7,39	17,44	11,12	13,59
$Vol(12)_{-1}$	383,56	363,97	142,89	72,09	972,12	271,88	475,99
$Vol(18)_{-1}$	398,58	391,08	135,85	73,16	897,07	289,57	493,21
$Vol(24)_{-1}$	410,90	409,55	125,96	86,17	876,75	313,44	496,79
Total Returns							
$R(1)_{-1}$	1,04	1,10	3,66	-13,90	20,00	-1,50	3,30
$R(3)_{-1}$	3,66	3,21	6,37	-18,04	39,40	-0,46	6,93
$R(6)_{-1}$	7,90	6,85	9,72	-18,50	66,80	1,52	12,75
$R(9)_{-1}$	11,00	9,78	10,90	-26,43	85,64	3,89	16,59
$R(12)_{-1}$	15,04	13,08	12,23	-18,68	111,16	6,95	20,78
$R(24)_{-1}$	30,17	28,51	16,44	-17,65	136,00	19,05	39,69
Composite measures							
$Alpha(6)_{-1}$	116,60	114,63	149,25	-370,13	852,83	17,10	204,65
$Alpha(12)_{-1}$	100,65	93,92	93,61	-197,57	608,87	34,29	157,15
$Alpha(24)_{-1}$	81,42	80,66	61,18	-147,22	380,77	39,66	124,02
$Sharpe(6)_{-1}$	28,51	24,78	46,28	-151,52	245,37	-0,11	51,16
$Sharpe(12)_{-1}$	23,97	20,28	24,09	-84,49	145,99	7,92	38,07
$Sharpe(24)_{-1}$	19,68	18,71	14,57	-32,06	94,30	9,76	28,83

5.3.1 POTENITIAL BIASES

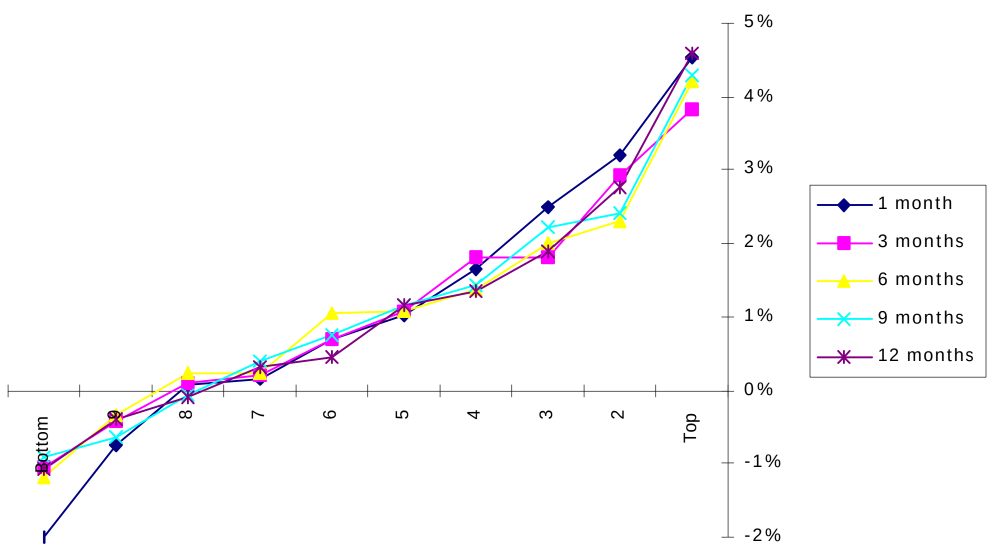
The data set used in this analysis is by no means complete or free from survivorship bias. The methodology applied here assumes that primary variables should be available for all dates within the 47/46-month testing periods. Moreover further 36 months of data are required for the estimation period. Those methodological requirements inevitably resulted in a potential survivorship bias. It should be noted however that most of the arguments about survivorship bias apply to studies concerned with profitability of the mutual funds and not the flow-performance relationship. Nevertheless this bias could be a serious limitation of this study.

5.3.2 Initial analysis of flows and performance measures

In order to perform the initial analysis of the relationship between performance measures and flows I use the methodology applied in Gruber (1996) and Sirri and Tufano (1997) in their initial studies. For each month 10 equally weighted flow portfolios are formed based on the ranking of realized performance measures. The average flows into those portfolios are averaged over 48 periods and presented on the graph. It should be noted that this methodology is quite crude and limited to only analysis of basic flow-performance relationship. Specifically it does not account for time- and fund-specific effects and therefore leaves much room for possible biases. Moreover it should not be used to reliably identify possible non-linearities in the relationship as portfolios are based on performance ranks and thus flows reaction is based on relative not absolute measures.

The figures 5.1 to 5.4 show the average monthly flows of portfolios formed on the base of 4 performance measures: raw returns, Jensen alpha, Sharpe ratio and average realized risk-adjusted excess market returns[50]. Although the differences between the portfolios are not statistically significant[51] the results are nevertheless striking. All major performance measures - raw returns, Jensen alpha and Sharpe ratio show clearly a discernible positive relationship between past performance and subsequent cash inflows. This relationship seems to be robust for wide range of periods over which the measures are estimated. Although the results are not statistically significant the obtained graphs can hardly be attribute to a chance.

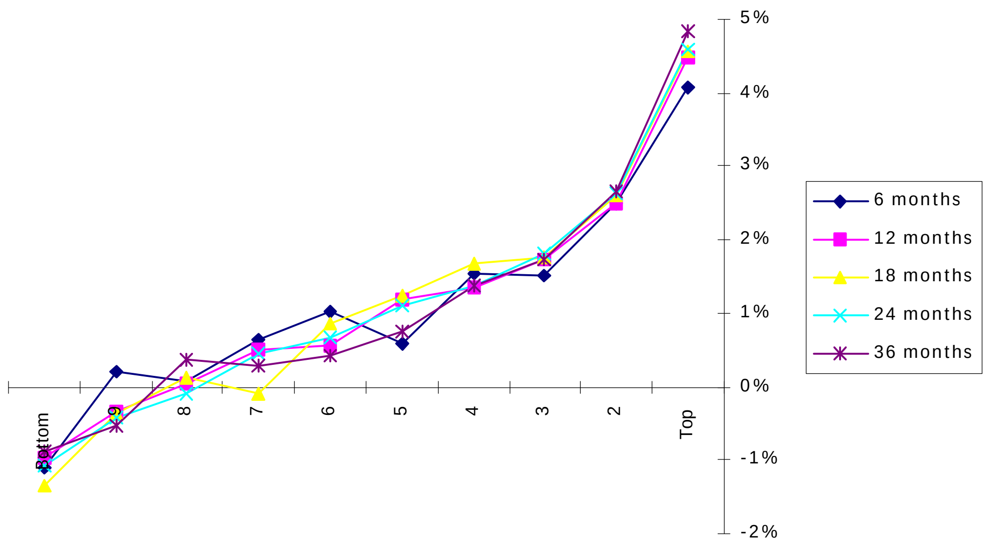
FIGURE 5.1 FLOWS AND TOTAL RETURNS. Graph depicts average normalized flows in equally weighted portfolios based on total returns compounded over period of time indicated in the legend.



[50] We chose the average market excess returns in favor of one-period market excess returns to allow to compare the strength of the relationship as the estimation period of given performance measure is increased.

In case of 6 month raw returns the top performers can on average attract an astounding 4.22% increase in their TNAs within a month whereas the worst funds will incur contraction of about 1.17%. For a fund staying in the top performance ranking for a full 12 months this figures would mean an astounding 64.21% increase in TNAs. At the same time the worst performer would lose only 13.17%. The closer inspection of other values between those extremes does not suggest any strong non-linearity of the relationship which has been reported e.g. by Sirri and Tufano (1997) in a similar study. This difference could be attributed to different frequency of data used.

FIGURE 5.2 FLOWS AND JENSEN ALPHA. Average normalized flows in equally weighted portfolios based on Jensen alphas estimated over period of time indicated in the legend.



For 6-month Jensen alpha the similar award for best performers is 4.08% and penalty for the worst performers is 1.11%. This result strongly resembles that for total returns suggesting that the rankings based on total returns and Jensen alphas are highly correlated - what has been documented in the literature. Again, no striking non-linearity seems to be observed in this figure and indeed the averages resemble those reported in Gruber (1996) for normalized cash inflows (after proper compounding).

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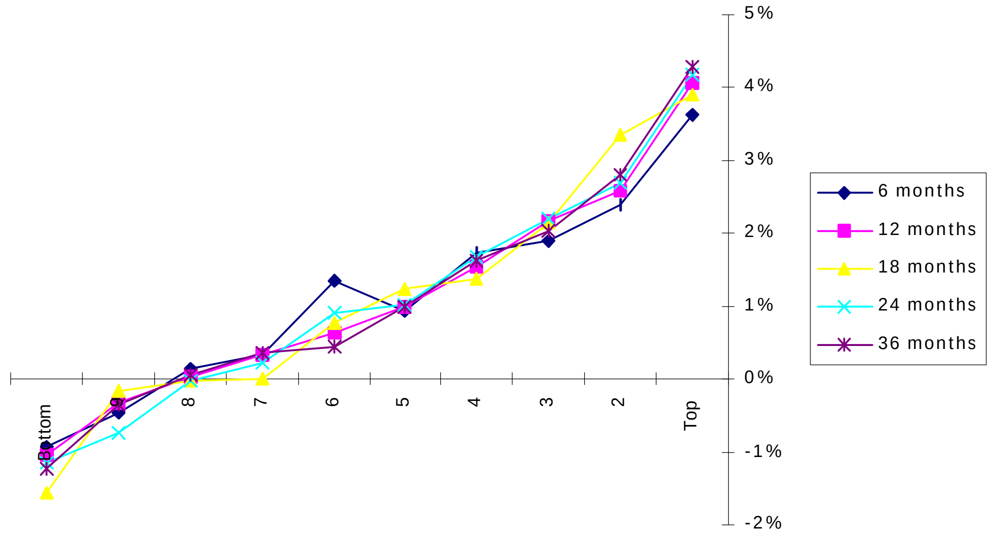
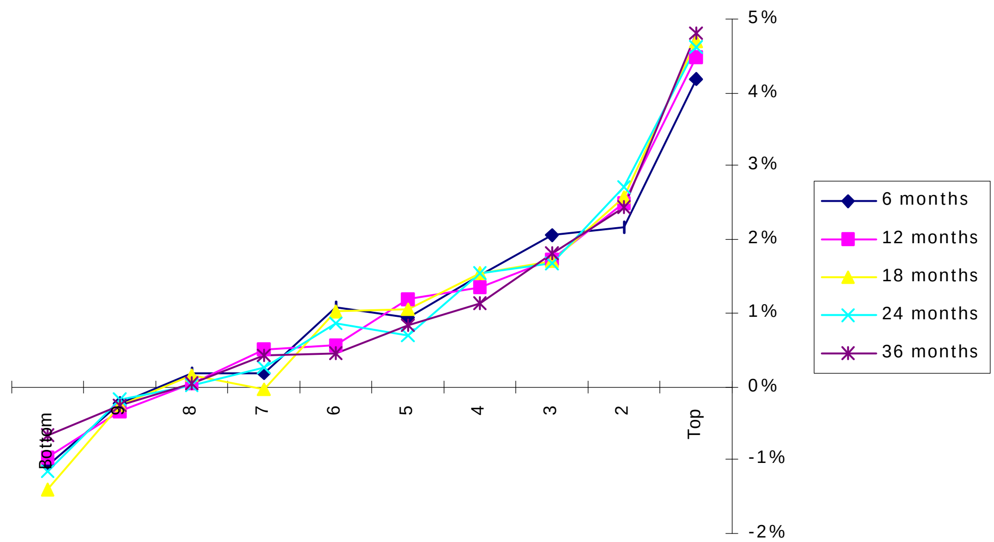
[51] This may be surprising but t-tests show that the means are not statistically different from zero. This is due to very high variance of flows between the years. However separate computations of the means for shorter periods show that pattern is consistent for all series of more than 7 months.

FIGURE 5.3 FLOWS AND SHARPE MEASURE. Average normalized flows in equally weighted portfolios based on Sharp measure estimated over period of time indicated in the legend.



Sharpe measure gives similar results and the corresponding figures for the measure estimated over 6-month period are 3.63% and 0.94%. This finding also suggests that Sharpe measure total returns and Jensen alphas are highly correlated and tend to rank funds in similar way.

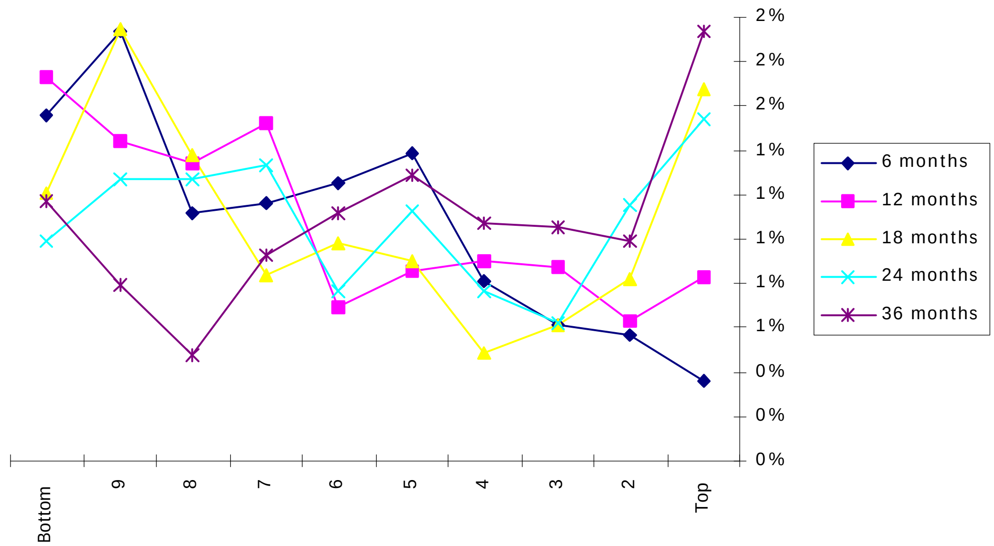
FIGURE 5.4 FLOWS AND EXCESS MARKET RETURNS. Average normalized flows in equally weighted portfolios based on average realized excess risk adjusted market returns over period of time indicated in the legend.



Average risk-adjusted market returns show the results very similar to Jensen alphas. This comes as no surprise as the both measures use the same fund's beta estimates and average excess returns are essentially alpha residuals.

In contrast to four measures presented above the positive flow-performance relationship does not seem to be supported by an evidence from flow portfolios based on Treynor measure which are presented in Figure 5.5.

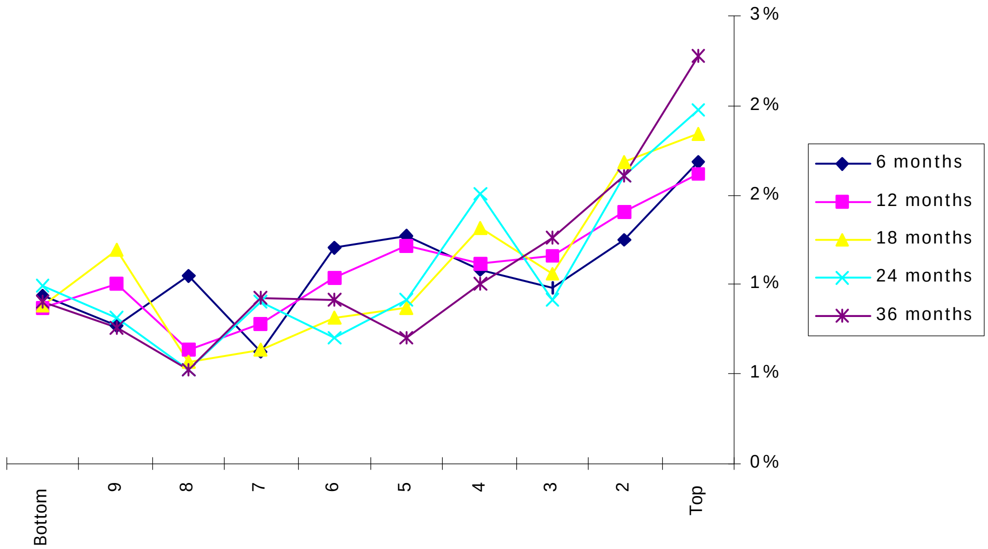
FIGURE 5.5 FLOWS AND TREYNOR MEASURE. Average normalized flows in equally weighted portfolios based on Treynor measure estimated over period of time indicated in the legend.



The relationship between realized performance as measured by Treynor measure seems to be at best coincidental making this measure a poor predictor for the future cash inflows. One could hypothesize that this effect may be caused by the inherent inability of this measure to account for the total volatility of the fund[52]. If the total volatility of the fund really influences the investor's purchasing decisions this should give a reason to consider Treynor measure as a less useful predictor than other measures. This hypothesis can be checked on Figure 5.6 that uses volatility as a performance measure.

[52] This and other characteristics of the Treynor measure have been summarized in Section 3.1.3.1.

FIGURE 5.6 FLOWS AND VOLATILITY. Average normalized flows in equally weighted portfolios based on volatility estimated over period of time indicated in the legend.



The graph seems to suggest that there is a slight relation between volatility and flows but also a relation of surprising direction. The cash inflows seem to be attracted by higher volatility! This is in contradiction with the basic portfolio theory which says that if historical volatility can be viewed as an indicator for future volatility, one should expect the funds where volatility is highest to be also the ones with smaller cash inflows. However, the findings presented in Figures 5.5 and 5.6 can be criticized on the ground that both Treynor measure and volatility fail to indicate any negative flow portfolios and therefore their power is much lower than that of other measures. It should be noted that a similar relation between volatility and flows has been identified by Sirri and Tufano (1997). They concluded that it could be possible that *funds that take on the greatest risk might populate the tails of the returns distribution*. If one considers relation in Figure 5.6 to be U-shaped than this would be the case and then the effect of volatility should be disentangled only in conjunction with other performance measures using the multivariate analysis. The Treynor measure will not be used in the further analysis but volatility will be introduced as a control variable.

This basic analytical framework provides some first helpful insights into the existence and shape of flow-performance relationship although it fails to take into account both fund- and time-specific effects. Nevertheless the findings for the first four performance measures can be hardly attributed to a chance and therefore it can be concluded that some support has been found for the hypothesis H1 of positive performance-flow relationship.

5.4 MODEL

The hypotheses of Section 1 are formally tested using the regression on a pool of data. The basic model to be estimated could be therefore the following:

$$F_{it} = a + x'_{i,t-1}b + e_{it} \qquad (5.1)$$

where F_{it} are flows to fund *i* in period *t*, *x* is a vector of independent variables explaining flows to fund *i* in period *t* and with error term e_{it} independently and identically distributed. Estimating the pooled regression has the advantage of using all the variation in the data. But in case the performance measures are positively correlated within funds over time or across funds within months, the standard errors on the coefficients are understated, and the coefficients may be biased. To accommodate for those potential problems a fixed-effect model is proposed which uses dummies to account for time- and fund-specific effects:

$$F_{it} = a + x'_{i,t-1}b + f'_i m + m'_t l + e_{it} \qquad (5.2)$$

where *f* and *m* are respectively vectors of fund- and time-(month) dummies. Although some time-specific dummies has been found significant almost all fund-specific dummies have been found insignificant and small. Therefore I decided to drop the latter from the further regressions. At the same time I included two control variables i.e. size (log of TNAs) and volatility to account for fund specific effects reported in the literature (Sirri and Tufano (1997)).

The initial regressions showed that lagged flows are significantly correlated and therefore should be included as a predictors of future flows. This findings are consistent with those reported in Patel, Hendricks and Zekhauser (1994) and Rockinger (1995). The final model which resulted from those considerations is:

$$F_{it} = a + x'_{i,t-1}b + gF_{i,t-1} + c'_{it}d + m'_t l + e_{it} \qquad (5.3)$$

where $F_{i,t-1}$ are flows to fund *i* in period *t-1* and $c_{i,t-1}$ is a vector of control variables.

5.5 TESTS OF THE HYPOTHESES

The proposed tests for the hypotheses based on my model are summarized in Table 5.2. which contains vectors of regressors that should be included into model 5.3.

TABLE 5.2 PROPOSED METHODOLOGY FOR TESTING THE HYPOTHESES.

Hypothesis		Proposed vectors of regressors:
H1: positive and significant flow-performance relationship		$x_{i,t-1}$'b = [$b_1 \cdot R(p)_{i,t-1}$] for p = 1,3,6,9,12,18,24,36 $x_{i,t-1}$'b = [$b_1 \cdot Alpha(p.)_{i,t-1}$] for p=6,12,18,24,36 $x_{i,t-1}$'b =[$b_1 \cdot Sharpe(p)_{i,t-1}$] for p=6,12,18,24,36.
H2: joint significance of total returns and composite measures		$x_{i,t-1}$'b =[$b_1 \cdot R(p)_{i,t-1}$ $b_2 \cdot Alpha(p.)_{i,t-1}$] for p=6,12,18,24,36 $x_{i,t-1}$'b =[$b_1 \cdot R(p)_{i,t-1}$ $b_2 \cdot Sharpe(p)_{i,t-1}$] for p=6,12,18,24,36
H3: higher sensitivity to more recent information	a:	$x1_{I,t-1}$'b =[$b_1 \cdot R(3p_1)_{i,t-1}$] $x2_{i,t-1}$'b =[$b_{01} \cdot R(p_1)_{i,t-1}$ $b_{02} \cdot R(p_1)_{i,t-p-1}$ $b_{03} \cdot R(p_1)_{i,t-2p-1}$]
	b:	$x1_{I,t-1}$'b =[$b_1 \cdot R(2p_2)_{i,t-1}$] $x2_{i,t-1}$'b =[$b_{01} \cdot R(p_2)_{i,t-1}$ $b_{02} \cdot R(p_2)_{i,t-p2}$] for p1=3, p2=12
	c:	$x1_{I,t-1}$'b =[$b_1 \cdot Alpha(2p)_{i,t-1}$] $x2_{i,t-1}$'b =[$b_{01} \cdot Alpha(p)_{i,t-1}$ $b_{02} \cdot Alpha(p.)_{i,t-p.-1}$]
	d:	$x1_{I,t-1}$'b =[$b_1 \cdot Sharpe(2p)_{i,t-1}$] $x2_{i,t-1}$'b =[$b_{01} \cdot Sharpe(p)_{i,t-1}$ $b_{02} \cdot Sharpe(p.)_{i,t-p.-1}$] for p=6.
H4: assymetry in response to under and outperformance	a:	$x_{I,t-1}$'b =[$b_1 \cdot Positive(R(p)_{i,t-1})$ $b_2 \cdot Negative(R(p)_{i,t-1})$] for p=1,3,6,9 $x_{I,t-1}$'b =[$b_1 \cdot Positive(Alpha(p)_{i,t-1})$ $b_2 \cdot Negative(Alpha(p)_{i,t-1}$] for p=6,12,18,24,36 b: $x_{I,t-1}$'b =[$b_1 \cdot Positive(Sharpe(p)_{i,t-1})$ $b_2 \cdot Negative(Sharpe(p)_{i,t-1}$] for p=6,12,18,24,36.
	b:	$x_{i,t-1}$'b =[$b_1 \cdot VeryHigh(R(p)_{i,t-1})$ $b_2 \cdot High(R(p)_{i,t-1})$ $b_3 \cdot$ $Low(R(p)_{i,t-1})$ $b_4 \cdot VeryLow(R(p)_{i,t-1})$] for p=12,24,36 $x_{i,t-1}$'b =[$b_1 \cdot VeryHigh(Alpha(p)_{i,t-1})$ $b_2 \cdot High(Alpha(p)_{i,t-1})$ $b_3 \cdot$ $Low(Alpha(p)_{i,t-1})$ $b_4 \cdot$Very $Low(Alpha(p.)_{i,t-1})$] for p=12,24,36 $x_{i,t-1}$'b =[$b_1 \cdot VeryHigh(Sharpe(p)_{i,t-1})$ $b_2 \cdot High(Sharpe(p)_{i,t-1})$ $b_3 \cdot$ $Low(Sharpe(p)_{i,t-1})$ $b_4 \cdot$Very $Low(Sharpe(p)_{i,t-1})$] for p=12,24,36

Note:

Positive(X)=X if X>=0; otherwise 0
Negative(X)=X if X<0; otherwise 0
VeryLow(X) =X if X<=Mean(X)-StdDev(X); otherwise 0
Low(X)=X if Mean(X)-StdDev(X)<X<=Mean(X); otherwise 0
High(X)= X if Mean(X) <X<=Mean(X)+ StdDev(X); otherwise 0
VeryHigh(X)= X if Mean(X) <X; otherwise 0

The hypothesis *H1* about the sign and significance of flow-performance relationship can be tested by including performance measures in the vector $x_{i,t-1}$ and testing sign and significance of their estimated coefficients:

H1: $b_1 > 0$ *and statistically significant*

The expected sign for all three performance measures is positive. In order to prove the robustness of the test it should be conducted using the performance measures estimated over a range of estimation periods. For raw returns it seems reasonable to use period of 1 month up to 18 months. For Jensen alpha and Sharpe measure the reasonable period should be from 6 to 36 months.

The hypothesis *H2* about the joint significance of total returns and composite measures can be tested by including both performance measures spanning given performance period in the vector $x_{i,t-1}$.

H2: $b_1, b_2 > 0$ *and statistically significant*

This test however is subject to problem of the possible colinearity of the regressors. In case the hypothesis is true the coefficients of both measures should remain significant and positive.

The hypothesis *H3* about sensitivity of investors to more recent information can be tested by comparing the coefficients of performance measure for given testing period and coefficients of the separate regression of the performance measures for subperiods. If the investors are indeed more sensitive to the recent performance than the coefficients (on variables in vector $x2_{i,t-1}$) for first subperiod should be greater than for any other subperiod and also greater than the coefficient from the second regression (on variable in vector $x1_{i,t-1}$) of the performance measure computed over whole performance period.

H3(a): $b_1, b_{01}, b_{02}, b_{03} > 0$ *and statistically significant;* $b01 > Max(b_1, b_{02}, b_{03})$

H3(b,c,d): $b_1, b_{01}, b_{02} > 0$ *and statistically significant;* $b_{01} > Max(b_1, b_{02})$

I conduct this test for all three performance measures. In case of differing significance, coefficients on variables for the more recent period are expected to be more significant than on variables for more distant subperiods.

The hypothesis *H4* about the asymmetry in reaction to under- and outperformance can be tested in two ways. First, using methodology (a:)described in Ippolito (1992) i.e. by separating positive and negative values of performance measures in two variables and checking signs of their regression coefficients.

H4(a): $b_1, b_2 > 0$ *and statistically significant;* $b_1 > b_2$

According to most of the evidence from the literature both coefficients should be positive and significant with coefficient of negative performance smaller of the two. I conduct this test for all three major performance measures.

This test however implicitly assumes that mean performance is around zero what need not be true for samples spanning the periods where mutual fund shares grow steadily (what is the case in this study). Because of the deficiencies of this methodology I propose methodology (b) that would relate directly to under- and outperformance. In test (b) performance is split first around it long-term mean in order to analyze separately reaction to under and outperformance. The values of performance measure are further split in two in order to test how severe this reaction is to extreme under- and outperformance. The split points are arbitrarily choosen at one standard deviation performance measure from its long-term mean. In this case hypothesis (b) is of form:

H4(b): $b_1, b_2, b_3, b_4 > 0$ *and statistically significant;* $b_1 > b_4$

According to the most of evidence from the literature all coefficients should be positive and significant with coefficient of very high performance larger than for very low performance. I conduct this test for all three major performance measures.

5.6 RESULTS AND DISCUSSION

5.6.1 FLOW PERFORMANCE RELATIONSHIP

The results for regressions testing the hypothesis H1 about positive and relationship between flows and performance for total returns, Jensen alpha and Sharp measure are contained in Table 5.3, 5.4, 5.5 respectively. The overall impression is that there is a significant and positive relationship between flows and those measures. This result seems to be robust for a whole range of lengths of testing period.

For total returns coefficients are positive and highly significant. The coefficients are the highest for more recent periods. However striking is that they are higher for 12-month period than for 6-month period. This could be explained by the hypothesis of investors taking judging funds on the base of their 1-year performance rankings published on the regular basis by the industry's press. The negative sign of coefficient on lagged flows results from high autocorrelation between flows which is about 0.26 for the whole sample.

The regressions for Jensen alphas computed over different periods show that this measure also can be regarded as a predictor of returns. All coefficients in Table 5.4 are positive and highly significant and their absolute value increase with the increase of estimation period. Similar results are found for Sharpe measure in Table 5.5 where all coefficients are positive and significant for a range of estimation periods. Again their absolute increases with the length of estimation period.

In general strong support is found for the hypothesis of positive and significant relationship between flows and performance measures at the monthly frequencies.

5.6.2 JOINT SIGNIFICANCE OF TOTAL RETURNS AND COMPOSITE PERFORMANCE MEASURES.

The results of the regressions for testing the joint significance of total returns and composite performance measures are presented in Table 5.6. The hypothesis is tested for estimation/compounding periods of 6- and 12-month length. For both periods Jensen alpha remains highly significant along with the total returns compounded over equal period of time. This is not however the case for Sharpe measure estimated over period of 6 months which is not found statistically significant. Coefficients for both composite measures and total returns have predicted sign. The interpretation of this results for Jensen alpha should be that this measure contains some additional information over raw total returns. This is probably due to the ability of this measure to take adjust for relative riskiness of the fund to market portfolio.

5.6.3 INVESTORS' SESITIVITY TO MORE RECENT INFORMATION

The results of the regression of flows over performance measures for different subperiods are shown in Tables 5.7 and 5.8. Regression coefficients for total returns in case of subperiods of length both of 3 and 12 months show that investors are more sensitive to more recent performance and that the latest period has the loading higher than that compounded over the whole period. In short the flows are explained better by recent performance than not-so-recent performance. At the same time they are however consistent with the hypothesis of investors chasing the latest winners.

Results for both composite measures are presented in Table 5.8. Coefficients on all measures are of the expected sign and highly significant. In both cases more recent performance tends to better explain the flows than more distant performance. It seems to be however that measures spanning all subperiods have a loadings similar to the sum of the coefficients for all subperiods. This results are in line with the evidence presented by Ippolito (1992) who found in his sample that the coefficient for the whole period was greater than any of the coefficients in the subperiods including the most recent one. It can be concluded that risk-adjusted composite measures behave differently than total returns in that they tend to work better on longer periods of time.

5.6.4 ASYMMETRY IN RESPONSE TO POSITIVE AND NEGATIVER PERFORMANCE.

The regression of flows on positive and negative total returns using first methodology (a) in Table 5.9 reveals positive and significant relationship as advocated by e.g. Ippolito (1992), Rockinger (1995). However investors reaction to negative performance is found to be bigger than to positive performance. This finding contradicts those found in the much of the literature and is in line with the results reported for a similar dynamic model by Rockinger (1995). One of the explanation could be that increasing frequency of observations to monthly as is the case in this study changes the nature of the relation.

The findings for Jensen alpha in Table 5.10 resemble closely those for total returns - coefficients positive and negative flows are significantly positive but yet again reaction to negative performance seems to be stronger than reaction to positive performance. This results again are not in line with evidence from literature.

The results for Sharpe measure presented in Table 5.11 are inconclusive. The coefficients for first two regressions show that reaction to negative performance is more severe than for positive but the last regression contradicts those findings.

These results are not in line with the evidence found in the literature but can be also explained by the fact that most of the performance in the given period were positive and negative performance occurred only rarely. In this case comparing coefficients may lead to wrong conclusions. The robustness of those findings is checked using the second methodology which concentrates on under- and outperformance comparing to the long-run mean rather than on negative and positive performance. The results are presented in Tables 5.12, 5.13 and 5.14.

For total returns the results are not conclusive - when considering performance over last 12 months the investors seem to react strongly to extreme underperformance than extreme outperformance. For both regressions for 24 and 36 months this relation however changes and results resemble more of those reported for similar periods in the literature. For both composite measures regressions (shown in Tables 5.13 and 5.14) on performance computed over last 12 months show stronger reaction to extreme underperformance. However for measures computed over longer time horizon this relation is again in favor of outperformance with investors reacting stronger on extreme outperformance than underperformance. This results will be further discussed in section 5.7 concluding this chapter.

TABLE 5.3 RELATIONSHIP BETWEEN FLOWS AND TOTAL RETURNS. This table reports the regression coefficients for models testing the hypothesis of positive relationship between flows and total returns compounded over different periods. The coefficients on 46 time dummies are omitted. Significance levels are reported in parentheses.

Coefficient					
Intercept	-1.512E-02	-2.356E-02	-2.252E-02	-2.607E-02	-2.361E-02
	(0.056)	(0.008)	(0.010)	(0.005)	(0.012)
F_{-1}	5.646E-02	-.305	-.311	-.322	-.320
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Size_{-1}$		1.691E-03	1.874E-03	1.159E-03	7.360E-04
		(0.005)	(0.002)	(0.071)	(0.247)
$Vol(12)_{-1}$	-3.123E-03	-3.317E-03	-5.363E-03	-1.224E-03	-2.256E-03
	(0.000)	(0.000)	(0.000)	(0.079)	(0.003)
$R(1)_{-1}$	1.388				
	(0.000)				
$R(3)_{-1}$		.473			
		(0.000)			
$R(6)_{-1}$			.113		
			(0.000)		
$R(9)_{-1}$				.165	
				(0.000)	
$R(12)_{-1}$					.170
					(0.000)
R^2	.410	.265	.274	.173	.186
N	6072	6072	6072	6072	6072

TABLE 5.4 RELATIONSHIP BETWEEN FLOWS AND JENSEN ALPHA. This table reports the regression coefficients for models testing the hypothesis of positive relationship between flows and Jensen alphaestimated over different periods. The coefficients on 46 time dummies are omitted. Significance levels are reported in parentheses.

Coefficient				
Intercept	-2.078E-02	-2.069E-02	1.767E-02	1.688E-02
	(0.022)	(0.027)	(0.093)	(0.111)
F_{-1}	-.340	-.321	-.325	-.343
	(0.000)	(0.000)	(0.000)	(0.000)
$Size_{-1}$	9.331E-04	-2.155E-04	-1.572E-03	-2.252E-03
	(0.133)	(0.736)	(0.014)	(0.001)
$Vol(12)_{-1}$	-2.773E-03	8.993E-04		
	(0.000)	(0.212)		
$Vol(24)_{-1}$			3.845E-03	5.838E-03
			(0.000)	(0.000)
$Alpha(6)_{-1}$	1.712E-02			
	(0.000)			
$Alpha(12)_{-1}$		1.999E-02		
		(0.000)		
$Alpha(18)_{-1}$			2.857E-02	
			(0.000)	
$Alpha(24)_{-1}$				3.232E-02
				(0.000)
R^2	.223	.181	.195	.183
N	6072	6072	6072	6072

TABLE 5.5 RELATIONSHIP BETWEEN FLOWS AND SHARPE MEASURE. This table reports the regression coefficients for models testing the hypothesis of positive relationship between flows and Sharpe measure estimated over different periods. The coefficients on 46 time dummies are omitted. Significance levels are reported in parentheses.

Coefficient				
Intercept	-3.254E-02	-3.873E-02	-3.164E-02	-2.014E-02
	(0.000)	(0.000)	(0.001)	(0.060)
F_{-1}	-.326	-.325	-.333	-.351
	(0.000)	(0.000)	(0.000)	(0.000)
$Size_{-1}$	1.477E-03	5.432E-04	-9.525E-04	-1.710E-03
	(0.018)	(0.392)	(0.132)	(0.008)
$Vol(12)_{-1}$	9.293E-04	5.735E-03	7.268E-03	1.052E-02
	(0.154)	(0.000)	(0.000)	(0.000)
$Sharpe(6)_{-1}$	5.019E-02			
	(0.000)			
$Sharpe(12)_{-1}$		8.529E-02		
		(0.000)		
$Sharpe(18)_{-1}$			.123	
			(0.000)	
$Sharpe(24)_{-1}$				.161
				(0.000)
R2	.213	.189	.201	.198
N	6072	6072	6072	6072

TABLE 5.6 RELATIONSHIP BETWEEN FLOWS AND TWO COMPOSITE MEASURES AT THE SAME TIME. This table reports the regression coefficients for models testing the hypothesis of joint significance of total returns and different composite measures. The coefficients on 46 time dummies are omitted. Significance levels are reported in parentheses.

Coefficient				
Intercept	-2.800E-02	-2.348E-02	-2.186E-02	-3.467E-02
	(0.005)	*(0.017)*	*(0.017)*	*(0.000)*
F_{-1}	-.333	-.321	-.326	-.324
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*
$Size_{-1}$	1.410E-03	4.481E-04	1.728E-03	6.321E-04
	(0.024)	*(0.488)*	*(0.005)*	*(0.319)*
$Vol(12)_{-1}$	-4.748E-03	2.988E-04	-4.907E-03	3.575E-03
	(0.000)	*(0.676)*	*(0.000)*	*(0.000)*
$R(6)_{-1}$	.162		.245	
	(0.000)		*(0.000)*	
$R(12)_{-1}$		.107		6.058E-02
		(0.000)		*(0.001)*
$Alpha(6)_{-1}$	8.136E-03			
	(0.000)			
$Alpha(12)_{-1}$		7.583E-03		
		(0.002)		
$Sharpe(6)_{-1}$			7.414E-03	
			(0.116)	
$Sharpe(12)_{-1}$				5.752E-02
				(0.000)
R2	.230	.186	.226	.190
N	6072	6072	6072	6072

TABLE 5.7 RELATIONSHIP BETWEEN FLOWS AND TOTAL RETURNS FOR DIFFERENT SUBPERIODS. This table reports the regression coefficients for models testing the hypothesis of different responses to total returns compounded over more recent periods. The coefficients on 46 time dummies are omitted. Significance levels are reported in parentheses.

Coefficient				
Intercept	-2.607E-02	-1.986E-02	-1.574E-02	-8.377E-03
	(0.005)	(0.031)	(0.111)	(0.410)
F_{-1}	-.322	-.311	-.354	-.344
	(0.000)	(0.000)	(0.000)	(0.000)
$Size_{-1}$	1.159E-03	1.911E-03	-1.290E-03	-8.309E-04
	(0.071)	(0.001)	(0.042)	(0.184)
$Vol(12)_{-1}$	-1.224E-03	-6.021E-03		
	(0.079)	(0.000)		
$Vol(24)_{-1}$			1.717E-04	-4.321E-03
			(0.825)	(0.000)
$R(9)_{-1}$	.165			
	(0.000)			
$R(3)_{-1}$		.540		
		(0.000)		
$R(3)_{-4}$		.142		
		(0.000)		
$R(3)_{-7}$		.102		
		(0.000)		
$R(24)_{-1}$			.144	
			(0.000)	
$R(12)_{-1}$				.247
				(0.000)
$R(12)_{-13}$				.131
				(0.000)
R2	.173	.284	.204	.228

TABLE 5.8 RELATIONSHIP BETWEEN FLOWS AND COMPOSITE MEASURES FOR DIFFERENT SUBPERIODS. This table reports the regression coefficients for models testing the hypothesis of different responses to composite measures estimated for more recent periods. The coefficients on 46 time dummies are omitted. Significance levels are reported in parentheses.

Coefficient				
Intercept	-3.426E-02	1.767E-02	-3.924E-02	-3.967E-02
	(0.001)	(0.093)	(0.000)	(0.000)
F_{-1}	-.341	-.325	-.335	-.333
	(0.000)	(0.000)	(0.000)	(0.000)
$Size_{-1}$	-7.192E-04	-1.572E-03	-8.353E-04	5.388E-04
	(0.246)	(0.014)	(0.185)	(0.383)
$Vol(12)_{-1}$	-1.640E-03	3.845E-03		
	(0.023)	(0.000)		
$Vol(24)_{-1}$			8.967E-03	4.468E-03
			(0.000)	(0.000)
$Alpha(18)_{-1}$		2.857E-02		
		(0.000)		
$Alpha(6)_{-1}$	2.055E-02			
	(0.000)			
$Alpha(6)_{-7}$	6.906E-03			
	(0.000)			
$Alpha(6)_{-13}$	5.309E-03			
	(0.000)			
$Sharpe(18)_{-1}$			.134	
			(0.000)	
$Sharpe(6)_{-1}$				6.047E-02
				(0.000)
$Sharpe(6)_{-7}$				2.175E-02
				(0.000)
$Sharpe(6)_{-13}$				2.553E-02
				(0.000)
R2	.251	.195	.210	.241
N	6072	6072	6072	6072

TABLE 5.9 RELATIONSHIP BETWEEN FLOWS AND NEGATIVE AND POSITIVE TOTAL RETURNS. This table reports the regression coefficients for models testing the hypothesis of asymmetry in response to positive and negative performance. The coefficients on 46 time dummies are omitted. Significance levels are reported in parentheses.

Coefficient				
Intercept	2.397E-02	-1.910E-02	-2.377E-02	-2.409E-02
	(0.019)	(0.060)	(0.011)	(0.021)
F_{-1}	-.305	-.325	-.323	-.320
	(0.000)	(0.000)	(0.000)	(0.000)
$Size_{-1}$	1.803E-03	1.684E-03	1.083E-03	7.389E-04
	(0.003)	(0.007)	(0.091)	(0.246)
$Vol(12)_{-1}$	-1.598E-03	-5.036E-03	-7.510E-04	-3.536E-04
	(0.038)	(0.000)	(0.288)	(0.602)
Negative($R(3)_{-1}$)	.482			
	(0.000)			
Positive($R(3)_{-1}$)	.456			
	(0.000)			
Negative($R(6)_{-1}$)		.391		
		(0.000)		
Positive($R(6)_{-1}$)		.260		
		(0.000)		
Negative($R(9)_{-1}$)			.364	
			(0.000)	
Positive($R(9)_{-1}$)			.145	
			(0.000)	
Negative($R(12)_{-1}$)				.337
				(0.000)
Positive($R(12)_{-1}$)				.156
				(0.000)
R2	.262	.226	.175	.185
N	6072	6072	6072	6072

TABLE 5.10 RELATIONSHIP BETWEEN FLOWS AND NEGATIVE AND POSITIVE JENSEN ALPHA. This table reports the regression coefficients for models testing the hypothesis of asymmetry in response to positive and negative performance. The coefficients on 46 time dummies are omitted. Significance levels are reported in parentheses.

Coefficient			
Intercept	-1.568E-02	-1.606E-02	-4.169E-02
	(0.123)	(0.125)	(0.000)
F_{-1}	-.339	-.321	-.324
	(0.000)	(0.000)	(0.000)
$Size_{-1}$	9.290E-04	-1.676E-04	-1.588E-03
	(0.135)	(0.794)	(0.014)
$Vol(12)_{-1}$	-2.297E-03	1.871E-03	
	0.001	.005	
$Vol(18)_{-1}$			3.877E-03
			(0.000)
Negative($Alpha(6)_{-1}$)	2.211E-02		
	(0.000)		
Positive($Alpha(6)_{-1}$)	1.576E-02		
	(0.000)		
Negative($Alpha(12)_{-1}$)		2.163E-02	
		(0.000)	
Positive($Alpha(12)_{-1}$)		1.995E-02	
		(0.000)	
Negative($Alpha(18)_{-1}$)			3.109E-02
			(0.000)
Positive($Alpha(18)_{-1}$)			2.831E-02
			(0.000)
R2	.224	.182	.195
N	6072	6072	6072

TABLE 5.11 RELATIONSHIP BETWEEN FLOWS AND NEGATIVE AND POSITIVE SHARPE MEASURE. This table reports the regression coefficients for models testing the hypothesis of asymmetry in response to positive and negative performance. The coefficients on 46 time dummies are omitted. Significance levels are reported in parentheses.

Coefficient			
Intercept	1.477E-02	-7.812E-03	-4.932E-02
	(0.157)	(0.475)	(0.000)
F_{-1}	-.324	-.325	-.336
	(0.000)	(0.000)	(0.000)
$Size_{-1}$	1.276E-03	5.091E-04	-5.507E-04
	(0.041)	(0.425)	(0.386)
$Vol(12)_{-1}$	1.063E-03	5.651E-03	9.431E-03
	(0.103)	(0.000)	(0.000)
Negative(Sharpe(6)$_{-1}$)	8.072E-02		
	(0.000)		
Positive(Sharpe(6)$_{-1}$)	4.183E-02		
	(0.000)		
Negative(Sharpe(12)$_{-1}$)		9.667E-02	
		(0.000)	
Positive(Sharpe(12)$_{-1}$)		8.406E-02	
		(0.000)	
Negative(Sharpe(18)$_{-1}$)			3.485E-02
			(0.233)
Positive(Sharpe(18)$_{-1}$)			.144
			(0.000)
R2	.216	.189	.212
N	6072	6072	6072

TABLE 5.12 RELATIONSHIP BETWEEN FLOWS AND TOTAL RETURNS IN FOUR UNDER- AND OUTPERFORMANCE BANDS. This table reports the regression coefficients for models testing the hypothesis of asymmetry in response to under- and outperformance. The coefficients on 46 time dummies are omitted. Significance levels are reported in parentheses.

Coefficient			
Intercept	0,03966	0,04358	-0,04801
	(0,000)	(0,000)	(0,000)
F_{-1}	-0,02489	-0,04735	-0,04797
	(0,046)	(0,000)	(0,000)
$Size_{-1}$	0,00085	-0,00001	-0,00073
	(0,039)	(0,977)	(0,084)
$Vol(12)_{-1}$	-0,00256		
	(0,001)		
$Vol(24)_{-1}$		-0,00316	
		(0,000)	
$Vol(36)_{-1}$			-0,00407
			(0,000)
$VeryLow(R(12)_{-1})$	0,25076		
	(0,000)		
$Low(R(12)_{-1})$	0,19803		
	(0,000)		
$High(R(12)_{-1})$	0,20761		
	(0,000)		
$VeryHigh(R(12)_{-1})$	0,21236		
	(0,000)		
$VeryLow(R(24)_{-1})$		0,07849	
		(0,008)	
$Low(R(24)_{-1})$		0,10014	
		(0,000)	
$High(R(24)_{-1})$		0,12407	
		(0,000)	
$VeryHigh(R(24)_{-1})$		0,12919	
		(0,000)	
$VeryLow(R(36)_{-1})$			0,05545
			(0,005)
$Low(R(36)_{-1})$			0,06254
			(0,000)
$High(R(36)_{-1})$			0,07375
			(0,000)
$VeryHigh(R(36)_{-1})$			0,08772
			(0,000)
R2	0,530	0,535	0,535
N	6072	6072	6072

TABLE 5.13 RELATIONSHIP BETWEEN FLOWS AND JENSEN ALPHA IN FOUR UNDER- AND OUTPERFORMANCE BANDS. This table reports the regression coefficients for models testing the hypothesis of asymmetry in response to under- and outperformance. The coefficients on 46 time dummies are omitted. Significance levels are reported in parentheses.

Coefficient			
Intercept	0,08583	-0,06816	-0,00604
	(0,000)	(0,000)	(0,408)
F_{-1}	-0,01401	-0,03785	-0,03544
	(0,27)	(0,003)	(0,005)
$Size_{-1}$	0,00055	-0,00081	-0,00144
	(0,19)	(0,055)	(0,001)
$Vol(12)_{-1}$	-0,00281		
	(0,000)		
$Vol(24)_{-1}$		-0,00322	
		(0,000)	
$Vol(36)_{-1}$			-0,00358
			(0,000)
VeryLow(Alpha(12) $_{-1}$)	0,04179		
	(0,000)		
Low(Alpha(12) $_{-1}$)	-0,04443		
	(0,05)		
High(Alpha(12) $_{-1}$)	0,01599		
	(0,000)		
VeryHigh(Alpha(12) $_{-1}$)	0,02048		
	(0,000)		
VeryLow(Alpha(24) $_{-1}$)		0,01786	
		(0,006)	
Low(Alpha(24) $_{-1}$)		0,03624	
		(0,000)	
High(Alpha(24) $_{-1}$)		0,04049	
		(0,000)	
VeryHigh(Alpha(24) $_{-1}$)		0,04159	
		(0,000)	
VeryLow(Alpha(36) $_{-1}$)			0,02850
			(0,002)
Low(Alpha(36) $_{-1}$)			0,02809
			(0,000)
High(Alpha(36) $_{-1}$)			0,03870
			(0,000)
VeryHigh(Alpha(36) $_{-1}$)			0,04742
			(0,000)
R2	0,519	0,530	0,528
N	6072	6072	6072

TABLE 5.14 RELATIONSHIP BETWEEN FLOWS AND SHARPE MEASURE IN FOUR UNDER- AND OUTPERFORMANCE BANDS. This table reports the regression coefficients for models testing the hypothesis of asymmetry in response to under- and outperformance. The coefficients on 46 time dummies are omitted. Significance levels are reported in parentheses.

Coefficient			
Intercept	-0,03772	0,02043	-0,04198
	(0,000)	(0,006)	(0,000)
F_{-1}	-0,02540	-0,01958	-0,04021
	(0,044)	(0,123)	(0,001)
$Size_{-1}$	0,00080	0,00058	-0,00042
	(0,053)	(0,167)	(0,329)
$Vol(12)_{-1}$	0,00416		
	(0,000)		
$Vol(24)_{-1}$		0,00467	
		(0,000)	
$Vol(36)_{-1}$			0,00358
			(0,000)
VeryLow(Sharpe(12) $_{-1}$)	0,08151		
	(0,000)		
Low(Sharpe(12) $_{-1}$)	0,08857		
	(0,000)		
High(Sharpe(12) $_{-1}$)	0,09541		
	(0,000)		
VeryHigh(Sharpe(12) $_{-1}$)	0,09422		
	(0,000)		
VeryLow(Sharpe(24) $_{-1}$)		0,07260	
		(0,019)	
Low(Sharpe(24) $_{-1}$)		0,04556	
		(0,001)	
High(Sharpe(24) $_{-1}$)		0,05567	
		(0,000)	
VeryHigh(Sharpe(24) $_{-1}$)		0,09136	
		(0,000)	
VeryLow(Sharpe(36) $_{-1}$)			0,03565
			(0,392)
Low(Sharpe(36) $_{-1}$)			0,10131
			(0,000)
High(Sharpe(36) $_{-1}$)			0,16620
			(0,000)
VeryHigh(Sharpe(36) $_{-1}$)			0,18530
			(0,000)
R2	0,524	0,517	0,529
N	6072	6072	6072

5.7 *DISCUSSION OF THE RESULTS AND CONCLUSIONS.*

The results presented in the previous section offer support to three out of four tested hypotheses. The results of the tests of the fourth hypothesis result however in new hypothesis which has not been considered in the literature.

Basing on the data from Tables 5.3. 5.4 and 5.5 the hypothesis H1 about positive and significant dependence of flows on the past performance cannot be rejected for all three performance measures. This result is found to be robust to the whole range of periods over which the performance measures are estimated. The relationship is particularly strong for total returns computed over last 1 to 3 months. The last result suggests that new money may really be attracted by recent spectacular performance and that investors indeed believe that recent spectacular performance can be result of special skills or pure luck but can predict better performance at least in the short run. No studies concerning such a short performance horizon are available for comparison.

The Hypothesis H2 about joint significance of total returns and composite performance measures cannot be rejected at least for Jensen alpha which retains its significance and expected sign in the presence of total returns. The Sharpe measure seems to lose some of its explanatory power after inclusion of total returns and is significant only at 11 percent level. The results suggest that at least Jensen alpha contains some additional information over total returns that could be used as a predictor of flows. Those results are generally in line with empirical evidence provided by Gruber (1996), Sirri and Tufano (1997) and others.

The Hypothesis H3 about relatively higher importance of recent performance is retained for all three performance measures. The coefficients on performance for the most recent subperiod is found to be higher than both any other of the subperiods and the full period. This suggests that indeed investors rely on more recent spectacular performance what is in line with the hypotheses of bounded rationality of Patel,Hendricks and Zeckhauser (1994). This effect can also be explained by vigilance of investors investing new money which has been pointed by Ippolito (1992). Those investors will try to find recent outperformers in hope that their will retain their skill in the future.

The overall results of testing the hypothesis H4 about the asymmetry in reaction to under and outperformance using two methodologies (a and b) are inconclusive . The pattern for reaction for negative performance and positive performance on monthly basis-an approach widely used in the literature shows that investors react stronger to negative performance than positive and thus seem to punish negative performers more severely than they reward outperformers. These results can be however criticized on the grounds that negative performance is relatively rare in my sample and thus comparing coefficients on the positive and negative part of the performance can lead to spurious inferences. The results of the second methodology which concentrates on the under and outperformance in relation to long-term mean (rather than zero) show that similar patter can be found for performance measure computed over period up to 12 months. For the longer periods however this pattern is replaced with stronger reaction to outperformance as reported in most of the studies.

Those contradicting results can be reconciled however if we assume that in fact there exist two patterns of investors reaction in short- and long-term which can be only uncovered using monthly data (in contrast to yearly data widely used in the literature). In short run investors would react strongly to negative performance and underperformance in general. This would be possible not because they redeem their shares from the fund but because new money would not flow to funds that experienced recently period of poor performance. In the long run however severe underperformance will not meet such extreme reaction due to investors reluctance to cut losses and biases in the perception of real losses. This hypothesis assumes that first pattern will be due to vigilance of investors investing new money and second will result from reluctance of investors already locked in the funds to cut their losses and withdraw.

The results of tests presented above have important practical consequences for mutual fund investors, managers and regulators.

The identification of basic performance-flow relationship has the most meaning for mutual fund managers. The immediate conclusion is that they can expect that good performance will be rewarded with higher inflows increasing fund's TNAs and thus for basis on which management fee is computed. Apparently the investors' dollars flow into funds that have superior track records (e.g. Ippolito, Sirri and Tufano, PHZ) what suggests investors act on the possibly rational expectation that past performance predicts future performance. This has a more serious consequence for both mutual fund companies and their regulators. If new investors focus on past performance rankings, the optimal strategy of mutual fund company is to increase the number of funds under management, increase the volatility of individual funds, and decrease the cross-fund correlation. To the extent that the principal benefit of equity funds is to provide low-cost diversification, this strategy does little to benefit mutual fund investors and should be a concern for regulators.

The results of tests of hypothesis about relative importance of crude and composite performance measures can offer managers information that although crude performance measures are by far the most important the Jensen alpha also contains some information in predicting flows to their portfolios. This is not as certain for the Sharpe measure. Taking into consideration however the value of the coefficients of those measures it could suggested that mutual funds should use crude measures for advertising purposes.

The tests of the relative importance of more recent performance information suggests that investors are more responsive to more recent information. This is important to mutual fund managers as they can hope that even if they frequently face cycles of good and poor performance they can hope that at least some investors will react to more recent information, discard longer-term evidence on performance and flock to funds with recent superior performance. This can result in situation where a long-term underperformer can cyclically appear as outperformer and attract new investment to sustain its size. This should be a concern to both investors and regulators. Investors should try to analyze performance over longer horizons to avoid such mistakes.

The tests of hypothesis about asymmetric response to under and outperformance gives rise to most far-reaching conclusions. The pattern identified in this study - a pattern of different responses of investors to short- and long-term underperformance. In the short run fund managers face penalty for a underperformance from the side of investors who avoid investing new money recent poor performers . However in the long run they face more call option-like relationship offering them incentives to increase the volatility of their portfolio in an attempt to make the top of rankings and attract disproportionately more new money. In the long run if returns are high, funds gain asset and total fee revenues rise, but if relative returns are very low, loses of assets and fees are more modest. Both investors and regulators should be aware of those incentives as they can lead to unnecessary gambling which contradicts the basic benefit of mutual fund—that of low-cost diversification mentioned above. Investors should then consider composite measures in their investment decision process as those allow for isolating effects which are due to increased riskiness of given mutual fund's investment policy. On the other side, regulators should devise ways to curb unnecessary risk taking by mutual fund managers.

6. Summary and Conclusions

Over last 75 years the U.S. mutual funds has grown to the third largest financial industry in the U.S. second only to banks and insurance companies. In less than half a century the mutual fund industry have grown from fledgling novelty to an ordinary investment vehicle owned by more than 44 million U.S. households. In less than 10 years the total assets of U.S. mutual funds has quintupled to 5.5 trillions making mutual fund managers the most important investors in the U.S. stock market.

The extraordinary rise in power and influence of the industry has risen questions about what really drives its growth and what results from this for the incentives of mutual fund managers and industry as the whole. The mutual fund literature has attempted to answer this question by proposing the hypothesis that flows into mutual funds depend to high degree on their past performance and thus past performance can predict future flows. This hypothesis of investors behavior assumes that investors who are unsure about funds future performance form a possibly rational expectation about it from its past performance. As the result, they may try to chase performance by investing increasingly more in recent best performers. The knowledge of this decision process however gives also some insights about what incentives mutual fund managers might have if they are aware of this decision process.

This study has been devoted to testing of this hypothesis on a sample of 132 U.S. growth mutual funds for the period 1991-1994. In order to provide better understanding of the problem before presenting results of the empirical tests a through introduction has been provided in the form of three chapters concerned with practical operations and investment issues in the mutual fund industry, methodological concepts of measuring both flows and performance and theoretical insights and empirical evidence available in the mutual fund literature.

Chapter 2 introduces practical issues of operations of mutual funds and in particular basic taxonomy of funds, shares pricing methodology, their structure and regulation which form a basic framework for investing in mutual funds. Particular attention has been paid to tax considerations and role of mutual funds in U.S. retirement investment market which offer important insights in motives of larger group of shareholders for investing in mutual funds.

Chapter 3 has been concerned with the basic methodology of performance and flow measurement. In particular it introduced several crude and composite performance measures that form a base for further discussion of both empirical results reported in the literature and my own results of testing the hypotheses presented in later chapters. The main conclusion of this part has been that because of methodological tradeoffs between crude and composite performance measures both of them should be considered in the further study in order to asses their relative strength and ability to predict the investors behavior. Special attention has been paid to assumptions of models measuring flow measures as they are not particularly widely elaborated upon in the literature. It has been pointed that although normalized measures seem to be most versatile there are no clear guidelines as to which flows measures should be used in the further study.

Chapter 4 presented both theoretical predictions of models of investors behavior and results of their testing reported in the mutual fund literature. It starts with model of rational response in conditions of uncertainty to go on to several hypotheses of investors irrationality draw from some psychological models. The empirical part reports results of testing of those and other models of investors behavior and attempted to draw common conclusions and predictions about this behavior. It has been concluded that the major prediction of the empirical studies is a significant and positive performance-flow relationship although its precise shape of its asymmetry is still debated by some researchers.

The empirical part of the study - chapter 5 - presented four hypotheses about flow-performance relationship that were set to be tested: H1:about basic flow-performance relationship; H2: relative strength of crude and composite performance measures; H3: relative importance of more recent performance information and; H4: about asymmetry in investors' reaction to under- and outperformance.

The initial analysis based on the portfolio methodology showed apparent dependence of flows on 3 major performance measures: raw returns, Jensen alpha and Sharpe ratio. This result formed the base for further testing of the hypotheses in a regression framework. The results of regressions showed clear and significant dependence of flows on all three performance measures for wide range of performance horizons. This relationship-especially strong for raw returns—has confirmed once again findings found in the literature but this time for monthly data. It has been also found that both composite measures retain most of their importance and predicting power when included in the regression along with raw returns (Sharpe ratio less so). This result says that at least Jensen alpha contains some additional information over total returns—which could be explained by its ability to incorporate funds riskiness relative to market. Tests of hypothesis H3 about relative importance of more recent performance information show that indeed investors care about more recent successes and losses and tend to discard longer-term performance information. This result offers support to various psychological models of investors behavior which predict this kind of biases toward recent, more spectacular information. This insight can provide mutual fund managers some positive information on strategic use of information.

The results of testing the hypotheses of asymmetry in response to under- and outperformance using two methodologies are not conclusive at first sight but can be reconciled if we assume two patterns: short- and long-term. In the short-term investors react more strongly to underperformance than outperformance and thus are punishing underperforming funds by turning away their new money from funds that recently underperformed. In the long-term investor tend to get locked in undeperforming funds both due to psychological costs of revising their long-celebrated investment policies and transaction costs in form of redemption fees. This model of asymmetric response to under- and outperformance assumes that those two patterns are caused by two kind of flows: new money avoiding underperformers and thus redirecting inflows somewhere else; and old money ‘locked in’ underperformers and thus reluctant to leave them as redemption outflows. This model has important implications for both mutual fund managers and investors. The performance-flow relationship assumed by this model, in conjunction with the prevailing compensation structure of the mutual fund industry in which management fees are a function of fund size, gives fund managers in the long-run a payout that resembles a call option. This suggests that funds can exploit the option-like nature of their payoffs by increasing variance of returns, and hoping for a extraordinary return. This will certainly result in unnecessary risk taking which is in contradiction with the basic benefit of mutual funds namely diversification of risk. This should be great concern for both mutual fund investors and regulators.

7. References

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