

## CHASING THEIR TAILS: INFLOW MOMENTUM AND YIELD CHASING AMONG PROVIDENT FUND INVESTORS IN ISRAEL

NADAV STEINBERG\* AND YEHUDA PORATH\*\*

### Abstract

This paper examines the short-term relationship between provident fund yields and investment in provident funds. Using Panel VAR regressions, we find that there is short-term momentum in provident fund yields and flows and investors engage in short-term yield chasing. We also find positive effect of flows on short-term yields. We reinforce these conclusions by dividing our sample to pre-crisis, crisis and post-crisis estimation and confirming our main results in the sub-periods. Additional evidence seems to suggest that investor yield chasing is affected by fund risk and management fees.

### 1. INTRODUCTION

Provident fund is a general name for a group of medium- and long-term pension savings instruments. We would like to concentrate on provident funds that make pension payments ('kupot gemel'), and in particular on 'allowance and compensation funds'. The investor in such a fund can be either self-employed or an employee, in which case the employee and the employer put equal amounts of money into the fund. The major benefit provident funds offer savers is a tax exemption.

Recent reforms in Israel's pension system, the most prominent of which being the Bachar committee, enabled savers to move between provident funds without great difficulty. Notwithstanding the advantages of the newly fierce competition, it also led to the highlighting of yields and in particular short-term yields, frequently at the expense of equally important measures such as risk.

\* Research Department, Bank of Israel, nadav.steinberg@boi.org.il

\*\* Research Department, Bank of Israel, yehuda.porath@boi.org.il

This research was supported by THE ROTHSCHILD CAESAREA CENTER FOR CAPITAL MARKETS AND RISK MANAGEMENT. The authors are grateful to Eugene Kandel for suggesting the idea which led to this paper, to Shiry Zuk from the Ministry of Finance for her help and insightful comments, to Uri Barazani who saw us through the data, to Yigal Menashe, Meital Graham, Tanya Suhoy, Kobi Broida, Yoni Sidi and Zviya Erdman for their helpful advice, to Maya Haran for her help with the data and to Inessa Love and Lea Ziccino for the use of their Panel VAR program.

Any views expressed in this paper are those of the authors and do not necessarily reflect those of the Bank of Israel.

The 2008-2009 financial crisis served as a warning sign of the new pitfalls in the provident fund market. Provident funds, which had large holdings of risky assets, suffered significant losses and investors spooked by market turmoil moved money away from provident funds. The new ease of movement within funds and between pension saving vehicles led to investors first chasing returns and then flying to safety at all cost. Those trends have been reinforced by the funds' marketing which focused on the funds' short-term results, rather on their long-term attributes. The fact that most of the money in provident funds is pension savings has been sidelined by investors and fund managers alike.

Considering the importance of provident funds in the Israeli pension market and the recent reforms in this market, there is a need for current research focusing on provident funds in Israel. The effect of the financial crisis on the provident fund industry demonstrated the necessity of better understanding the connection between fund performance and investor behavior. We use Panel VAR, a methodology novel to the field of investment research, to explore whether Israeli savers engage in return chasing and whether they are aware of the cost of those returns as they are reflected in provident funds' management fees and risk. We conclude that investors tend to move between funds based on the funds' short-term yield and inflow, and they take the funds' fees and risk into account when doing so.

This paper is organized as follows. Section 2 examines literature on investor behavior. Section 3 describes the pension savings environment in Israel. Section 4 describes the data. Section 5 details the PVAR methodology. Section 6 presents the results, Section 7 analyzes those results and Section 8 concludes.

## 2. INVESTORS' BEHAVIOR AND YIELDS

### a. Investors in Mutual Funds and Pension Funds

Little research has been done on the behavior of investors in provident funds, due to the unique nature of this savings instrument. We believe, however, that the behavior of these investors is likely to resemble the behavior of households investing in the capital market in general and through mutual funds and pension funds in particular.<sup>1</sup>

Ippolito (1992) uses pooled regression and fixed-effects models on yearly data and finds that a fund's past performance affects its current inflow. Ippolito also shows that current performance is positively correlated to past performance, hence rewarding the investors' yield chasing behavior. He doesn't find conclusive evidence as to whether investors concentrate on funds' past yield or on its past risk-adjusted yield. Ippolito shows that

<sup>1</sup> Hereinafter, we focus on papers studying how flows of money into a specific fund affect its yield and vice-versa. Macro papers which investigate how the aggregate flows of money affect the market price level and vice-versa include Warther (1995), Fant (1999), Cha and Kim (2010) and Ben-Rephael, Kandel and Wohl (2009, 2010).

investors react in asymmetrical ways to funds' past yields: They invest in winning funds more rapidly than they leave losing funds<sup>2</sup>.

Edelen (1999) claims that flows into/out of open end mutual funds can cause liquidity trading by the fund, which in turn will cause losses, reducing its return. He uses both the monthly positive and negative flows as a proxy for the funds' liquidity motivated trading. Edelen runs a regression aimed at explaining abnormal returns by liquidity-motivated trading and information-motivated trading. He addresses the endogenous nature of flows with respect to returns by adding lagged abnormal returns to the equation and by using lagged flows as an instrument for current flows. Edelen finds that liquidity-motivated trading significantly reduces the fund's net abnormal return, and even its gross abnormal return (which, unlike the net return, is unaffected by additional trading costs caused by the liquidity-motivated trading). This finding is true for both inflows and outflows, as well as the combination of the two flows.

Wermers' (2003) findings are not in line with those of Edelen (1999). He finds that a fund's inflows enhance its returns and vice-versa. Wermers shows strong persistence in mutual fund returns over the years. He suggests the following string of events: last year's returns attract investors, the managers of the 'winning funds' use the large inflows to invest in momentum stocks and the latter outperform the market not only due to the momentum factor, but also because of the positive flows themselves. This process enables 'winning funds' to outperform other funds for at least two years following the ranking year.

Nanda, Wang and Zheng (2003) exploit a natural experiment of funds introducing multiple share classes in order to examine the effect of positive inflows on fund performance. Their results are in line with Edelen's: They show that the positive inflows result in a significant deterioration in fund performance which the authors ascribe to liquidity costs and decreasing returns to scale. The drop in performance in turn, leads to a drop in inflows. They claim that these results might explain the empirical evidence showing that performance persistence and smart money effect are short lived: As investors chase past returns, the increase in the volatility and level of fund cash flow would tend to equalize the expected abnormal returns across funds.

Benson, Faff & Smith (2007) show that the relation between a fund's return and its flows is both contemporaneous and endogenous. Using a simultaneous equation model, they find that current flows have a negative impact on returns, whereas lagged flows have a positive impact. The researchers also find that both current and lagged returns have a positive impact on flows. In addition they show that both the fund's age and its expenses have a negative impact on the fund's flows. Benson, Faff & Smith infer that fund managers

<sup>2</sup> While Ippolito (1992) explains this phenomenon as pure irrationality, Goetzmann and Peles (1997) suggest an interesting psychological explanation of cognitive dissonance: investors adjust their beliefs to support past decisions. They claim that investors display a positive bias in their recollection of past fund performance and this bias hinders them in taking their money out of losing funds. Sirri and Tufano (1998) suggest yet another explanation: they claim that search costs are the cause of the asymmetry. Sirri and Tufano show that funds that receive greater media attention and belong to larger management firms grow faster than other funds, and that the performance-flow relationship is stronger for funds with higher marketing effort (as measured by high fees). They claim that all of these factors act to reduce the consumers' search costs.

find it difficult to place large inflows quickly or to deal with large requests for outflows (though in the case of outflows the yield jumps temporarily due to the sale of low yield assets), while investors are quick to recognize high performing funds and move their money accordingly.

Rakowski and Wang (2009) study mutual funds' daily data using a Vector Auto Regression approach. They estimate a VAR model with 5 lags for each of the funds in their sample, and use the percentage of funds showing positive/negative significant results in order to reach conclusions regarding the entire population. The researchers show that investors tend to move money to funds that performed poorly in the previous days which they interpret as evidence of more mutual fund investors following a strategy consistent with short-term contrarian behavior than with momentum behavior. Rakowski and Wang also show that past flows have a positive impact on future returns and that this impact decreases in significance as the lags increase, which they interpret as consistent with a long-term information effect dominating the transient price pressure effect. The results also suggest that daily fund returns show a large degree of positive autocorrelation, while daily flows demonstrate negative autocorrelation. When using monthly data, most of the above-mentioned patterns disappear.

All of the above-mentioned papers deal with mutual funds. Provident funds however, are very different from mutual funds when it comes to the investment horizon. In order to enjoy the tax exemption (which is the main advantage of provident funds over alternative investments such as mutual funds), money invested in a provident fund must be saved either until the investor reaches retirement age or until at least 15 years have passed since the money was first invested in a provident fund (money invested before 2008, following the previous, more lenient regulations). This feature makes provident funds closer in many aspects to pension funds than to mutual funds. A typical provident fund customer invests his/her money for the long-term, and therefore has a greater resemblance to the typical pension fund customer.

Del Guercio and Tkac (2002) investigated the differences in flow-performance relations between mutual funds and pension funds. They find that savers in pension funds are more likely than mutual fund investors to use risk-adjusted performance measures in evaluating managers. The shape of the flow-performance relationship also greatly differs between the two types of funds: While the mutual fund flow-performance relationship was found to be highly convex (consistent with previous research), the flow-performance relationship was found to be approximately linear in the pension fund segment. This means that the 'winner takes all' phenomenon and the phenomenon of 'investors not punishing losers as much as they reward winners', which have been documented in the mutual funds market, do not characterize the pension fund market. The findings by Del Guercio and Tkac suggest weaker incentives for pension fund managers to take excessive risks compared with mutual fund managers<sup>3</sup>. In addition, the researchers find that in contrast to the high degree of autocorrelation in mutual fund flows, pension fund flows exhibit very low autocorrelation.

<sup>3</sup> Chevalier and Ellison (1997) estimate the shape of the flow-performance relationship for a sample of mutual funds and infer that this shape creates incentives for fund managers to increase or decrease the

## **b. Investors' behavior and provident fund yields in Israel**

Our paper is related to a small body of literature regarding provident funds in Israel. In a preliminary paper, Blass (1996) utilizes data from the Ministry of Finance and focuses on Allowance and Compensation provident funds. He shows that the provident funds' yields in the years 1987-1994 were lower than those attainable in the market and explains it by poor market timing in the selection of investment channels and by low performance compared with the relevant benchmark indices. The lower yields were not compensated for by lower risk. Blass offers a number of possible explanations for those disappointing yields<sup>4</sup>: too many transactions which led to high transaction fees, high management fees, tendency to buy securities based on past yields, tendency to buy securities based on other provident funds' purchases (herd behavior), conflicts of interest which led to sub-optimal investment decisions, inconsistent investment strategies and investment in mutual funds which led to the customer effectively paying multiple management fees.

Following various studies which showed a high degree of centralization in the bank-run Israeli capital market, which resulted in a stunted non-bank credit market, high management fees relative to the performance of mutual & provident funds and conflicts of interest, the Bachar committee was formed. The committee recommended that commercial banks in Israel should not be allowed to manage mutual & provident funds and should instead focus on distribution and customer counseling regarding these instruments. The mutual funds were sold quickly, as opposed to the provident funds whose sales were slower.

Blass (2007) examined the funds' performance in the years 2000-2005. He studied the performance of the bank-held and non-bank-held provident funds in the years 2000-2005 using data from the Capital Markets Department at the Ministry of Finance. Blass shows that the funds' annual yields were low relative to a benchmark of 20% stocks and 80% bonds. Blass finds that a 1% rise in the stock market leads to a rise of approximately 0.25% in the fund's excess returns. A central conclusion from the regression is that the yields of the private funds were higher, but this gap shrank after deducting management fees. The results strengthen the conclusion from Blass's previous paper regarding provident funds' negative excess returns on the market and they show that although the private funds had negative excess returns, they still performed better than the bank-held funds<sup>5</sup>. In addition, Blass finds that there is no persistence in provident funds' excess returns, which means that one cannot "pick winners".<sup>6</sup>

---

riskiness of the fund in a way which may not benefit the investors. They also show that mutual funds indeed alter the riskiness of their portfolios at the end of the year in a manner consistent with these incentives.

<sup>4</sup> It is worth mentioning that in a study on mutual funds in Israel, Lauterbach and Barak (2002) find significant negative abnormal yield which they attribute to high management fees.

<sup>5</sup> Blai (2003) compares the performance of bank-held flexible mutual funds to those of their privately-held counterparts. She is unable to find significant differences in the returns, though it seems that privately-held funds show better market timing, while bank-held funds demonstrate better selection abilities.

<sup>6</sup> Lauterbach and Barak (2002) do find persistence in mutual fund returns which justifies investors' yield chasing behavior. Gruber (1996) show similar results for mutual funds in the U.S.

The paper on provident funds most related to our work is Horesh and Rahman-More (1999). Horesh and Rahman-More study the effect of provident funds' yields on their flows, using monthly data on one provident fund which amounted to 15% of the provident fund market in the sample period (10/1993-01/1997). The dependent variable is the fund's net inflows (inflows-outflows) and the explanatory variables are the fund's (price-level adjusted) two-month lagged yield, its change relative to the three-month lagged yield, alternative yield variables (the '*Makam*' yield, bank deposit yield and medium-term government bond yield) and the six-month standard deviation of the fund's yield, which represents the fund's risk. Horesh and Rahman-More use a simple auto-regression model and find that higher two-month lagged fund yields and greater changes in two-month lagged fund yields lead to significantly higher inflows, while higher yields of alternative investments lead to higher contemporaneous outflows. The volatility of the fund's yield, as measured by its six-month standard deviation, was found to have no explanatory power on the fund's flows. In addition, the researchers find that the fund's average yield in the six previous months has no effect on its flows, reinforcing their inference that the fund's investors are overly influenced by short-term returns and do not pay enough attention to the fund's risk and long-term performance. Though interesting, Horesh and Rahman-More's paper suffers from a limited focus, concentrating on only one fund and solely on the effect of the fund's return on its flows, while neglecting the opposite channel. This shortcoming covers over a more serious problem—we believe that the fund's yield and flow might be determined simultaneously; hence using a simple least-squares regression to study the effect of yields on flows might lead to erroneous conclusions. We will try to address this problem in the coming sections.

### 3. THE CURRENT SITUATION IN ISRAEL AND ITS PROBLEMS

#### a. Pre-crisis developments

The pension system in Israel is composed of pension funds, insurance programs and provident funds. Provident funds are a savings instrument which is unique to Israel. They are a hybrid vehicle which combines features of a pension fund and of a mutual fund. In the past few years, however, the regulator has taken several steps aimed at lengthening the savings horizon of provident funds and equalizing their terms to those of the other savings vehicles, hence bringing the provident funds closer to pension funds.

In recent years there have been several reforms in pension savings in Israel:

- The Bachar committee of 2005 compelled the transfer of ownership (by selling over a period of several years) of mutual funds, pension funds and provident funds from the banks to private bodies, mostly insurance firms and financial investment firms.
- The Mandatory Pension Law, which went into effect at the beginning of 2008, expanded pension savings to the entire working population, resulting in inflows to the pension market, mostly to pension funds and life insurance programs.

- The equalization of terms between the three long-term savings paths: In 2008 the taxes on savings through pension funds, provident funds and life insurance programs were equalized, as were the channels by which savers could get their money upon retirement (means-tested regulation of lump-sum payments).

- The new 'financial services regulations' of 2008 enabled savers to move their money from one savings path to another as well as from one savings firm to another with relatively few difficulties.

These reforms created a far more competitive market in which savers are able to transfer their savings between different savings paths, including but not limited to provident funds, and between different management firms. Savers who choose to save through provident funds are able to choose their provident fund from a large variety of funds<sup>7</sup> and move relatively effortlessly between funds during the entire savings period.<sup>8</sup> However, the savers may lack the knowledge and information to make an informed decision. Every fund advertises, highlighting its short-term yields and the savers have a hard time making the right decision. The long-term savers may be tempted with short-term yields which might come on account of increased risk that will likely be realized later on.

The Bachar committee suggested one way of dealing with the new problems by enabling the banks to provide pension consulting. All the major Israeli banks, as well as some smaller non-bank firms, received pension consulting licenses during the years 2007-2009, giving savers new opportunities for objective pension consulting, but at a cost: The savers asking for a consultation have to either pay for it directly or pay for it indirectly through higher management fees, due to a fixed distribution fee paid to the consulting firm. (This is the model adopted by the banks.)

The fact that people of all ages and risk preferences use provident funds as a major investment vehicle is inherently problematic. In order to tackle this problem the Ministry of Finance has decided to adopt IRA- Individual Retirement Accounts – which are suited for relatively sophisticated investors, and a multi-fund pension system, which is aimed towards the general population. Shiffenbauer (2007) offers an international comparison of multi-fund pension systems, which were adopted by, among others, Sweden, Estonia, Peru, Latvia, Slovakia and Chile. The multi-fund pension is a new product aimed at offering the fund's customers a variety of savings options suitable for different age groups. The idea is that the customer will be able to choose the appropriate risk level according to his age and level of risk aversion. The increase in consumer choice should improve decision making optimization at the individual level and lead to a better equilibrium at the economy level.

As for Israel, Shiffenbauer mentions that the scope of publicly available data has increased rapidly in recent years due to several factors, including the development of the 'Gemel-Net' and 'Pensia-Net' systems, which give the public access to monthly data on provident and pension funds. Nevertheless, the proportion of assets invested in multi-fund provident funds remains static at approximately 2% of assets invested in provident funds on

<sup>7</sup> This large variety of funds might be too much for the simple saver who needs to choose where to put his/her life savings. The legislature responded to this problem in 2009 by changing the Financial Services Law, forbidding firms from running more than one provident fund of each type.

<sup>8</sup> E.g.: in the year 2008, after most of the above-mentioned reforms, money transfers between savings bodies went up 40%, most of which was transfers between provident funds.

average, though those funds account for one third of the total number of provident funds in Israel and offer a variety of savings paths. The author concludes that public involvement in choosing the savings path and public understanding of the subject need to increase simultaneously. Shiffenbauer emphasizes the importance of adjusting savings to the saver's personal status and age.

#### **b. Post-crisis reactions**

The liberalization and development of capital markets in Israel enabled provident funds to take high risks and, more importantly for them, obtain high yields. Funds used the high yields as a means of attracting new money, thus making larger profits through management fees. Many of the funds utilized their new-found freedom to buy high-yield corporate bonds, which carried high risk.

The global financial crisis caught most of the provident funds off-guard. The annual report of the Commissioner of Capital Markets, Insurance and Savings (2008) explains that the provident funds were hit especially hard for several reasons: a much larger percentage of their funds could be withdrawn without a fine/tax penalty; 37% of their assets were corporate bonds, which dropped precipitously when the crisis began due to concerns as to the stability of many firms; unlike pension funds they did not own a significant amount of 'designated bonds'<sup>9</sup>; and a large portion of their inflows come from the self-employed who deposit money at the end of the year and may have deposited less money during the crisis. The result was that provident funds suffered larger net outflows compared with pension funds and they responded by selling their riskier assets and buying safer assets.

The Ministry of Finance responded to the immediate threat of a 'run on the fund' by offering a safety net for savers close to retirement age who, at the peak of the crisis, seemed unlikely to be able to make up the lost money in the few years they had until retirement.

On March 24, 2009, Yadin Antebi, the Commissioner of Capital Markets, Insurance and Savings at the Ministry of Finance, announced the department's new plan for regulating provident funds, following the recent crisis (Antebi 2009). The plan included not only the implementation of a multi-fund pension system and IRA, but also cutting down the number of possible savings paths, a prohibition on the advertising of short-term (less than 12-month) yields by institutional investors, obligatory reporting of management fees in the quarterly report sent to the institutional investors' customers, the standardization of customer service guidelines among institutional investors, ex-ante publishing of the institutional investors' investment policy, alignment of the investment managers' compensation to the long-term performance of the fund/insurance company, limitations on the institutional investors' investments in corporate bonds, strengthening the risk management, control and supervisory mechanisms in institutional investment bodies, an increase in minimum capital requirements, and further limitations on institutional investors' investments.

<sup>9</sup> Bonds which the Israeli government issues for certain types of pension funds and which carry relatively high yields.



#### 4. THE DATA

##### a. Data sources and observations

We conduct an empirical study aimed at understanding both the connection between Israeli provident funds' yields and their inflows and the connection between the fund's past yields and their future yields. In addition we try to understand how the funds' management fees, risk and size affect that connection, and to see if investors take those fees and risks into account when they make investment decisions.

We utilize data from the Israeli Ministry of Finance's (hereafter MOF) 'Gemel-Net' provident funds' data system. The Gemel-Net system contains data on all Israeli provident funds. This data includes: yields, withdrawals, deposits, transfers, net inflows and total assets on a monthly basis, as well as asset composition and management fees on a yearly basis. We also collect monthly data on the funds' management fees, asset composition and deposits by employees/self-employed from the Bank of Israel's 'KLGEMEL' system.

Our sample period is 01/2003 to 06/2010, inclusive. In this 90 month period, after the data restrictions discussed in section 4.3, we have a sample of 21,594 monthly observations of 364 provident funds belonging to 85 management firms. This is an unbalanced panel - a fund can enter the sample after 01/2003 or leave the sample prior to 06/2010.

##### b. Variables

We use a fund's total assets at the beginning of each month as a method of normalizing all variables to the fund's size:

**Fund Assets**<sub>i,t</sub> = total assets of fund i at the beginning of month t.

Our two main dependent variables are the provident fund's net inflow and the provident fund's gross yield, both normalized by the fund's total assets at the beginning of the month. Other dependent variables are variations on these variables.

**Inflow**<sub>i,t</sub> = (deposits in fund i in month t minus withdrawals from fund i in month t plus net transfers to fund i in month t)/Fund Assets<sub>i,t</sub>.

**Transfers**<sub>i,t</sub> = net transfers to fund i in month t divided by Fund Assets<sub>i,t</sub>.<sup>10</sup>

**Fund Yield**<sub>i,t</sub> = percentage yield in fund i in month t as calculated by the MOF from the daily reported yields of fund i.

We use several measures of fund characteristics:

**Risky\_Assets**<sub>i,t</sub> = the share of the fund's assets which are risky.<sup>11</sup>

<sup>10</sup> Our data does not allow us to identify the source of a transfer to a fund or the target of a transfer from a fund. While potentially interesting, such data is not relevant to our empirical examinations.

<sup>11</sup> We define the following assets as risky: Stocks, Corporate Bonds, Foreign Bonds, Loan & Mortgage Portfolios, Convertible Assets, Real Estate, Structured Assets, Futures, Options, Mutual Funds, Stock ETFs, Bond ETFs, and unclassified assets. We define the following assets as not risky: Government bonds, Cash and Cash Equivalents, Treasury Bills, and Bank Deposits. We take the assets in absolute values, counting short positions as adding to the firms' risk as much as long positions. This variable is restricted to between 1% and 100%.

**Management Fee**  $i,t$  = The yearly management fees collected by fund  $i$  in the year in which month  $t$  appears as a percentage of fund assets divided by the number of months in which fund  $i$  was active in the year in which month  $t$  appears.

Management fees are collected on a monthly basis. The monthly data is not available to savers and according to provident fund market participants and officials at the MOF the variations in the monthly data are generally unrelated to changes in the management fee level. We therefore decided to use the accumulated yearly management fees data from the 'Klgemel' system which we converted into monthly terms. We searched for outliers and, when possible, corrected them using the monthly data from the 'Klgemel' system. Upon encountering zeros we double-checked the data vs. the 'Gemel-net' system and if the 'Gemel-net' data was different from zero we used the 'Gemel-net' data.<sup>12</sup> It is important to note that using monthly management fees which are based upon the annual management fees reduces the variance of this variable across the sample: we lose most of the between period variance, but maintain the cross-sectional variation within each period.

### c. Data Restrictions

We restrict our sample to the years 2003-2010 for reasons of data availability and coverage. We limit our sample to Allowance and Compensation funds as those are the funds in which the individual savers are the account holders and not their employers. We also drop sub-types of allowance and compensation funds that have significantly different characteristics: funds that promise specific yield levels ('Mavtivot Tsuah'), IRA funds ('Nehul Ishi') and mutual insurance funds which are mismarked in the data as allowance and compensation funds.

To avoid a dominant effect of extreme observations (outliers) on the results, we apply a 1% two-sided (0.5% of each side of the distribution) trim to inflow. We believe the dropped observations are primarily composed of fund mergers and acquisitions<sup>13</sup> (inflows of thousands of percent a month) and fund closures (inflows of negative 80-100 percent a month). A comparison of the main variables before and after the trim appears in Table 1 of the Appendix. The table highlights the resemblance between the variables before and after the trimming, with the exception of the Inflow and Transfers variables. We examine results from the untrimmed sample in our robustness checks.

We decided to concentrate on provident funds of significant size only and therefore dropped funds that did not have assets above NIS 10 million at least once in the sample, similar to the restriction used in Blass (2007). Specifically, a fund enters the sample when it reaches or passes NIS 10 million and only the subsequent observations are included in the sample.

<sup>12</sup> Zero management fees are a possible outcome, usually a feature of provident funds which serve only a single organization and are managed by that organization.

<sup>13</sup> This conclusion is a result of conversations with officials at the MOF and the examination of a limited number of outliers, as our data does not allow us to identify mergers and acquisitions specifically.

The first six months of each fund's existence are not included in the sample, as this period tends to be both extremely volatile in terms of inflows and not representative of fund behavior in general.

#### d. Summary statistics

Table 1 presents summary statistics for the raw variables: Deposits, Withdrawals, Fund Transfers, Fund Inflow and Fund Assets, and for the normalized variables: Inflow and Transfers.

**Table 1**  
**Monthly Inflow and Asset Summary Statistics**

	mean	median	sd	min	max	N
Deposits	2,144	430	7,303	-7,300	376,080	21,594
Withdrawals	2,715	460	9,671	-270	273,500	21,594
Fund Transfers	-216	-20	13,296	-360,350	499,740	21,594
Fund Inflows	-787	-40	17,556	-552,650	495,620	21,594
Fund Assets	556,526	132,005	1,683,187	-	21,700,000	21,594
Normalized Inflows	1.01%	-0.06%	6.83%	-27.25%	139.15%	21,594
Normalized Transfers	0.97%	-0.01%	6.36%	-30.96%	125.64%	21,594

\*The figures for all but Inflows and Transfers are in thousands of NIS.

Figure 1 presents the Deposits, Withdrawals, Fund Transfers and Fund Inflow variables (Fund Inflow is calculated as Deposits minus Withdrawals plus Fund Transfers). The peaks in the deposits chart show the annual surge in deposits in December, a technical phenomenon known as the 'December effect', which results in part from the self-employed making deposits at the end of the year. The chart highlights the decline in inflows, resulting mainly from the decline in net transfers following the markets' tumble after the collapse of Lehman Brothers. The decline in the average net transfers is the result of investors moving their money away from provident funds and into other investment vehicles.

**Figure 1**  
**Provident Funds' Average Deposits, Withdrawals, Fund Transfers and Fund Inflow**  
 (thousands of NIS)

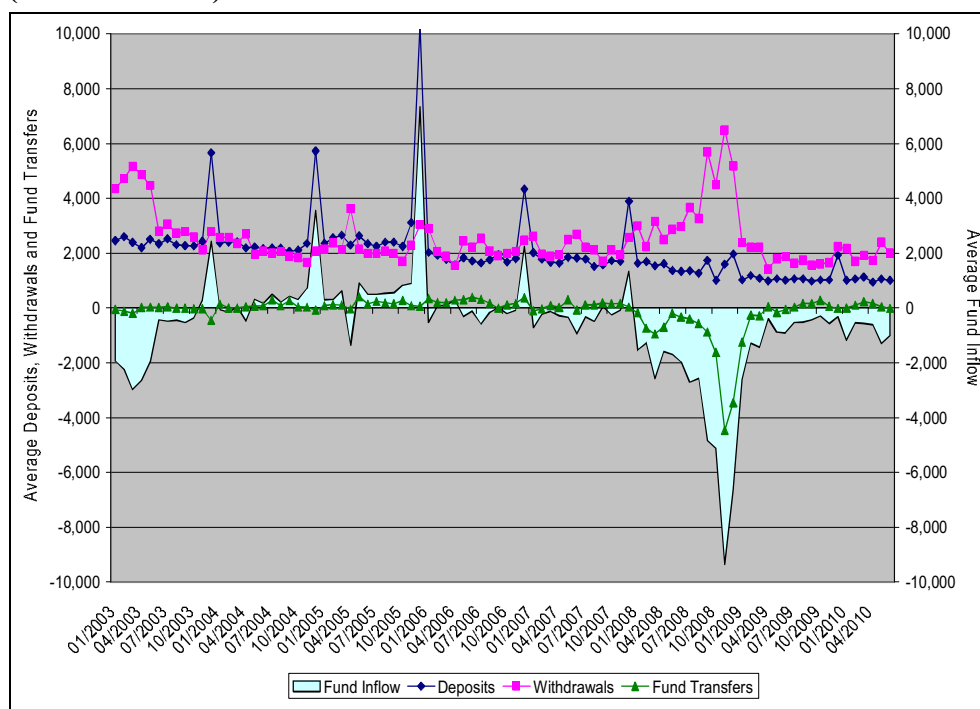


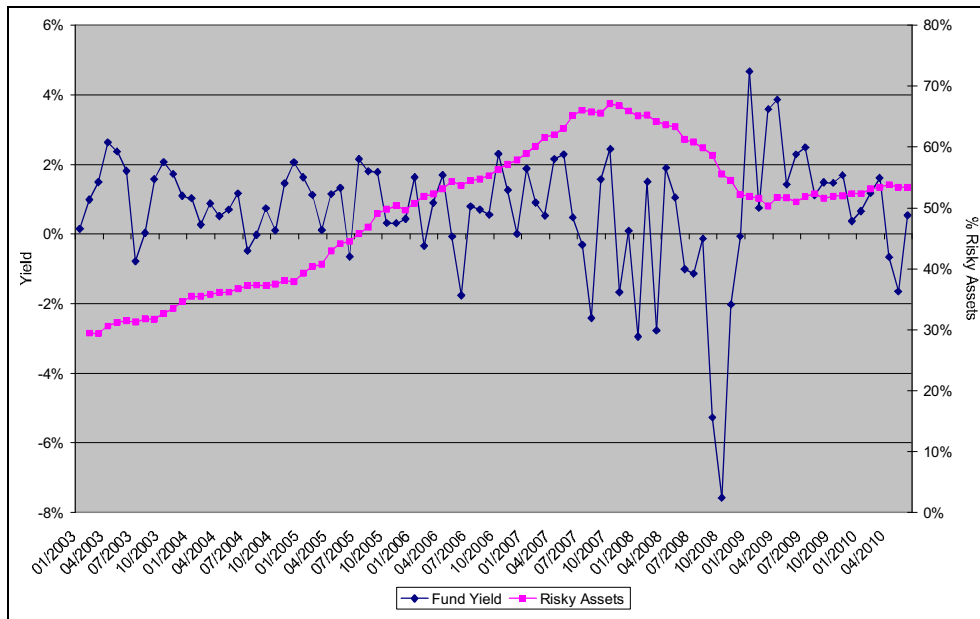
Table 2 presents summary statistics for the Yield, Risky Assets, and Management Fees variables.

**Table 2**  
**Summary statistics for Monthly Yield, Risky Assets and Management Fees**

	mean	median	sd	min	max	N
Fund Yield	0.60%	0.76%	2.30%	-22.22%	19.35%	21,594
Risky Assets	51%	53%	24%	1%	100%	21,570
Management Fees	0.08%	0.08%	0.04%	0.00%	0.34%	17,164

Figure 2 presents the Fund Yield and Risky Assets variables. The Chart highlights the decline in yields following the markets' tumble after the collapse of Lehman Brothers, which was followed later on by a weaker surge. The Risky Assets rose steadily until the end of 2007, when signs of a financial crisis began to appear, dropped until the beginning of 2009 and stabilized from then on.

**Figure 2**  
**Provident funds' Average Monthly Yield and Risky Assets**



The sample period is differentiated from other periods by the global financial crisis which had an exceptional influence on the financial markets as well as on the real economy. The main phase of the crisis began with the collapse of Lehman Brothers in September 2008. The markets' recovery, though not the recovery of the real economy, started in March 2009. The crisis' influence on the financial markets and the response of investors worldwide in general, and of savers in the provident funds in Israel in particular, may affect our results. In order to deal with this issue, we divide the sample into three periods: Before the crisis (01/2003-08/2008), the peak of the crisis (09/2008-02/2009) and the aftermath of the crisis (03/2009-06/2010). Table 3 and table 4 present the summary statistics separately for the three periods:

**Table 3**  
**Monthly Inflow and Asset Summary Statistics - 3 Periods**

	Pre-Crisis					
	mean	median	sd	min	max	N
Deposits	2,570	540	8,437	-7,300	376,080	14,862
Withdrawals	2,772	440	9,347	-210	182,010	14,862
Fund Transfers	-50	-10	10,830	-188,260	219,380	14,862
Fund Inflow	-252	-20	13,993	-231,020	261,440	14,862
Fund Assets	599,005	135,340	1,796,104	960	21,700,000	14,862
Inflow	1.16%	-0.02%	6.62%	-27.25%	118.53%	14,862
Transfers	1.00%	-0.01%	5.99%	-30.96%	121.27%	14,862

	Crisis					
	mean	median	sd	min	max	N
Deposits	1,474	300	5,064	-3,810	135,790	1,729
Withdrawals	4,603	800	17,137	-	273,500	1,729
Fund Transfers	-2,390	-370	30,772	-360,350	499,740	1,729
Fund Inflow	-5,519	-670	42,036	-552,650	495,620	1,729
Fund Assets	436,391	114,210	1,298,579	1,990	18,000,000	1,729
Inflow	1.12%	-0.92%	11.38%	-27.03%	139.15%	1,729
Transfers	1.68%	-0.37%	11.26%	-25.98%	125.64%	1,729
	Post-Crisis					
	mean	median	sd	min	max	N
Deposits	1,111	250	2,847	-5,070	67,270	5,003
Withdrawals	1,891	430	6,389	-270	102,570	5,003
Fund Transfers	41	-10	9,261	-105,120	65,490	5,003
Fund Inflow	-739	-40	11,388	-159,000	65,480	5,003
Fund Assets	471,852	126,130	1,430,274	-	20,300,000	5,003
Inflow	0.52%	-0.06%	5.15%	-25.15%	53.42%	5,003
Transfers	0.64%	-0.01%	4.90%	-23.30%	50.42%	5,003

\*The figures for all but Inflow and Transfers are in thousands of NIS.

It is noticeable that although negative throughout the sample period, the average fund's inflows were much lower during the financial crisis, with an average fund losing more than NIS 5.5 million in assets each month between 09/2008 and 02/2009. Those negative net inflows resulted mostly, as we saw in the above chart, from large transfers to other long-term investment vehicles.

**Table 4**  
**Monthly Yield, Risk and Management Fee Summary Statistics - 3 Periods**

	Pre-Crisis					
	mean	median	sd	min	max	N
Fund Yield	0.62%	0.71%	1.65%	-13.17%	9.93%	14,862
Risky Assets	50%	51%	23%	1%	100%	14,858
Management Fee	0.06%	0.06%	0.05%	0.00%	0.34%	12,816
	Crisis					
	mean	median	sd	min	max	N
Fund Yield	-1.54%	-0.52%	4.94%	-22.22%	19.35%	1,729
Risky Assets	54%	58%	24%	1%	100%	1,725
Management Fee	0.09%	0.09%	0.04%	0.00%	0.22%	1,715
	Post-Crisis					
	mean	median	sd	min	max	N
Fund Yield	1.30%	1.15%	2.07%	-9.66%	15.26%	5,003
Risky Assets	52%	58%	26%	1%	100%	4,987
Management Fee	0.09%	0.09%	0.04%	0.00%	0.17%	4,967

Table 4 shows that the funds' yields dropped significantly during the crisis, with the average provident fund yielding approximately -10% from 09/2008 to 02/2009. This may seem mild compared with the scope of the crisis, but for many savers, seeing their pension savings drop by 10% or more within half a year was too much and, as we saw above, many of them moved their money elsewhere. The yields improved significantly from March 2009, enabling more patient savers to make up for the money they lost.

## 5. PANEL-DATA VECTOR AUTO-REGRESSION (PVAR) METHODOLOGY

Our goal is to determine if fund inflows are a function of fund yields, if fund yields are a function of fund inflows, and how fund characteristics affect those variables. We examine both lagged and contemporaneous relationships. We use the Panel VAR method to take full advantage of both the time-series and the cross-sectional variation while solving the endogeneity problems.

Until October 2009 provident fund monthly yields were published on the 'Gemel-net' system by the Capital Markets, Insurance and Savings Department at the Ministry of Finance between the 17th and the 20th of following month, based on reports submitted by the funds on the 15th. Several of the financial newspapers published estimates of these yields at the beginning of each month, with a fair degree of accuracy. Regulations promulgated by the Department require that transfers between pension savings instruments be carried out within 20 business days of the transfer request.<sup>14</sup> As fund yields are available only with a lag, fund inflows cannot be contemporaneously caused by fund yields. Fund yields, however, can be affected contemporaneously by fund inflows as the money received can be invested immediately.<sup>15</sup> In September 2009 the Department promulgated new regulations forbidding provident funds from advertising yields shorter than a year and ceasing publication of the same on 'Gemel-net'. While monthly yields can be derived from the data on 'Gemel-net', they are no longer easily accessible.

We explain fund yields by, among other things, contemporaneous inflows, since those funds can be used for investment immediately. On the other hand, funds' yields can only affect their inflows with a lag, due to reasons explained above. Many papers in the field have ignored the bi-directional connection between yields and inflows (e.g. Ippolito (1992), Horesh and Rahman-More (1999)). In contrast with those papers, several recent papers have identified this issue and responded by using 2SLS (Benson, Faff and Smith, 2007) or VAR (Rakowski and Wang, 2009). While these methods represent an improvement over previous efforts, we believe that the Panel VAR method makes better use of the entire scope of the data. Rakowski and Wang's VAR aggregation method does not make full use

<sup>14</sup> 20 business days is the maximum permissible period for inactive savers. For active savers the 20 business days' count starts only at the first deposit to the fund receiving the money. Until 2008 transfers were allowed only between pension savings instruments of the same type. Transfers between provident funds were carried out within 7 business days.

<sup>15</sup> Granger causality tests enable us to reject the hypothesis that lag yields do not 'Granger cause' (Granger, 1969) current inflows. We are also able to reject the hypothesis that lag inflows do not 'Granger cause' current yields.

of the cross-sectional data and while 2SLS is similar to Panel VAR, the latter enables us to follow the effects of exogenous shocks to the endogenous variables on the dynamic structure of the model.

We use a Panel-VAR (PVAR) structure which combines the traditional VAR approach with the panel-data approach. Thus we both treat all the variables in the system as endogenous and allow for unobserved individual heterogeneity. The PVAR system enables us to capture the interactions between the leads and lags, and between the funds' yields and inflows. As far as we are able to determine, this is the first paper that uses the PVAR approach to model the relationships between inflow and yield. While breaking new ground in this respect, we are able to build on a small, though growing, body of literature utilizing PVAR for other purposes. Those papers include, among others, Love and Zicchino (2006), Coad (2007), Dramance (2009), Assenmacher-Wesche and Gerlach (2008) and Agnello and Sousa (2010). Specifically, we will examine the following model:

$$\begin{bmatrix} Inflow_{i,t} \\ Yield_{i,t} \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \end{bmatrix} + \sum_1^n \begin{bmatrix} \beta_{11,n} & \beta_{12,n} \\ \beta_{21,n} & \beta_{22,n} \end{bmatrix} * \begin{bmatrix} Inflow_{i,t-n} \\ Yield_{i,t-n} \end{bmatrix} + f_i + d_t + \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \end{bmatrix}$$

Where  $\alpha_j$  is a vector of constants,  $\varepsilon_{j,t}$  is a vector of error terms, and  $n$  denotes the number of lags.

Our model allows for firm-specific fixed-effects,  $f_i$ , and time dummies,  $d_t$ , in order to control for unobserved firm-specific properties and to deal with seasonality issues, period-specific shocks and market returns respectively.

In order to use a PVAR, we first need to check the order of integration of the variables and insure that they are all of the same order. Most of the commonly used panel unit-root tests require balanced panels (Im, Pesaran and Shin (2003), Levin, Lin and Chu (2002)). However, the Fisher test (Maddala-Wu (1999)) does not. We run the Fisher test for inflow, transfers and fund yield. The null hypothesis of unit-root is rejected at 1% for all variables.

As in Ben-Rephael, Kandel and Wohl (2009, 2011), we use information criteria for lag-order selection. Specifically, we use the Akaike, Schwartz and Hannan & Quinn information criteria and the final prediction error. We calculate these criteria for each of the funds in our sample and test up to 12 lags. The fund average of the 4 criteria was 3.3 lags, which led us to choose a 3 lag VAR.

One advantage of using the PVAR approach is that it increases the efficiency of the statistical inference. While the estimation of firm-level VARs, as in Rakowski and Wang (2009), suffers from a small number of degrees of freedom due to the lack of available data, the PVAR can incorporate cross-firm differences into the model using fixed effects.

We would like to use the common mean-differencing procedure for eliminating fixed effects. However, as we use lags of the dependent variables as explanatory variables, there is a correlation between the fixed effects and the regressors, and therefore, the correlation between the regressors and the error term does not go to zero, biasing the estimates. (Holtz-Eakin et al., 1988, Nickell, 1981).



We avoid the drawback of the fixed effects estimator by following a two-stage procedure in which: (i) we use a forward mean-differencing approach (the 'Helmert procedure') that removes only the mean of all future observations available for each fund-month (Arellano and Bover, 1995); and (ii) we estimate the system by GMM, using the lags of the regressors as instruments, thereby keeping the orthogonality between lagged regressors and transformed variables unchanged (Blundell and Bond, 1998). Given that the number of regressors is equal to the number of instruments, the model is "just identified" and the system GMM is equivalent to a two-stage least squares estimator applied equation by equation (Love and Zicchino, 2006). The time dummies are eliminated by subtracting the means of each variable calculated for each month.

In what concerns the impulse-response functions, we follow the Choleski decomposition of variance-covariance matrix of residuals<sup>16</sup>, and assume that yield adjusts immediately to shocks to inflow, while inflow only reacts to shocks to yield with a lag. This ordering of the variables in the system is based upon our knowledge of the timeline of provident funds' data: while the inflow is available to the funds' managers for investment by the end of the relevant day, the investors see the funds' yield with a lag of (at least) one month and are only able to react to that yield even later. This specification allows for contemporaneous effects of inflow shocks on yield, through the Choleski decomposition.

Our sample period lasts from 01/2003 to 06/2010, inclusive. As we explained in the descriptive statistics section above, this period was far from homogenous and contained three distinct sub-periods. Therefore we will estimate the model not only for the entire sample, but also for the three sub-periods.

## 6. RESULTS

### a. General Results

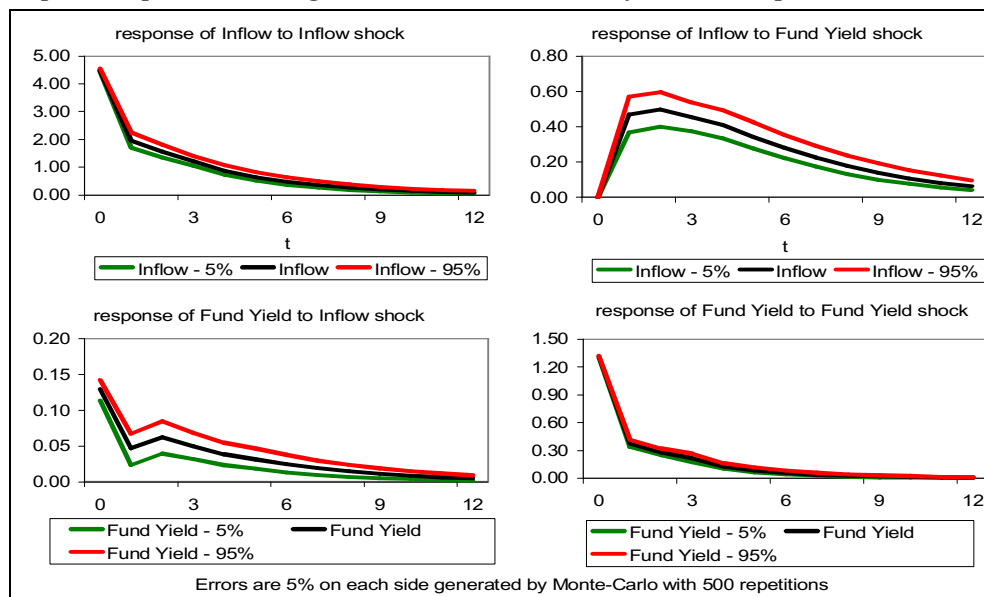
The model estimated is a Bi-variate PVAR with Inflow and Fund Yield as endogenous variables. In order to analyze the dynamic relationships between the variables, we construct the Impulse Response Functions presented in figure 3.<sup>17</sup> The Impulse Response Function shows the response of each variable in the PVAR to a 1-standard-deviation exogenous shock to each variable, holding all other shocks at zero.

We see that there is strong persistence in inflow. A shock to inflow increases future inflow for 12 months or more. Yield also exhibits high autocorrelation, with a shock to yield positively affecting yield for several months.

<sup>16</sup> Choleski decomposition enables the isolation of the shocks of one variable to the innovations in another variable in the system, while holding all other shocks equal to zero. It does so by allocating any correlation between the residuals of any two elements to the leading variable among the relevant variables. This is equivalent to transforming the system in a recursive manner (Hamilton, 1994)

<sup>17</sup> The Panel VAR coefficients and t-statistics are presented in Table 2 in the Appendix.

**Figure 3**  
**Impulse responses for 3-lag PVAR of inflow and fund yield - entire period**



A shock to yield causes significantly higher inflow the next month. The effect shows strong persistence, with inflow remaining significantly higher for over a year. The size of the effect is much smaller than that of an inflow shock.

An exogenous positive shock to inflow contemporaneously increases yield. The effect decays fast, but it remains significantly positive for about a year. The size of the effect is much smaller than that of a yield shock. Considering the results presented in Table 2 in the Appendix, we can infer that while a shock to inflow has a significant positive effect on yield contemporaneously, the persistence of the yield response is due more to yield momentum than to an ongoing effect of lagged inflow on yield.

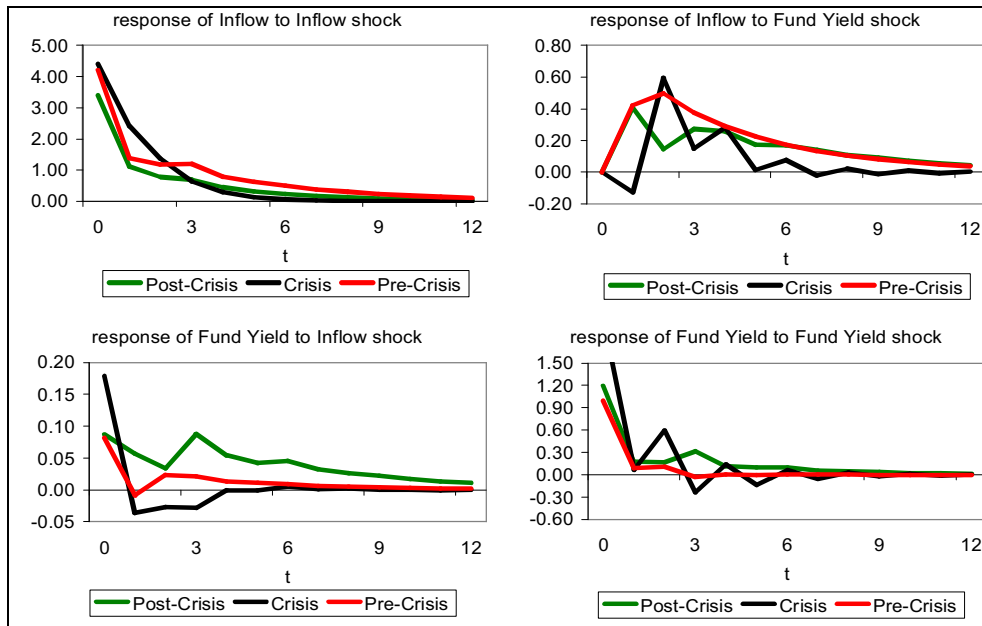
These results highlight the high persistent autocorrelation of both fund yield and inflow, as well as the positive persistent effect of fund yield on inflow and vice-versa.

#### **b. Results for the three sub-periods**

The above results treat our sample period as a homogeneous one within which investor behavior did not fundamentally change. The global financial crisis that happened in the middle of the sample does, however, raise doubts as to the validity of this assumption. In order to confirm the accuracy of the above results, we divide the sample into 3 periods and check to see if the connections between the variables remain the same. The three periods, as mentioned above, are: Before the crisis (01/2003-08/2008), the peak of the crisis (09/2008-02/2009) and the aftermath of the crisis (03/2009-06/2010).

We investigate by rerunning the model in the 3 periods. A comparison of the impulse response functions for the 3 periods is presented in Figure 4. The figure shows that the autocorrelation we identified in inflow comes from the pre- and post-crisis periods, while this autocorrelation is much weaker during the crisis. On the other hand, the autocorrelation we identified in fund yield comes primarily from the post-crisis period and decays relatively quickly in the other periods. Shocks to inflow have a positive contemporaneous effect on fund yield in all three sub-periods, but this effect is only persistent in the post-crisis period, similar to the entire sample. As in the general results, past fund yield has a positive and persistent effect on inflow in the pre- and post-crisis periods. During the crisis this effect is also positive but it is much less persistent.

**Figure 4**  
**Impulse-Responses for 3 lag PVAR of inflow and fund yield - three periods**



The response of inflow to yield shocks is less persistent and less significant during the crisis than in the entire period or before or after the crisis. This may be due to a flight to safety that caused investors to care less about short-term yield and more about long-term security.

The post-crisis period displays the greatest similarity with the entire period. The relationships between all the variables are positive, significant and persistent.

### c. Effects of Provident Fund Characteristics

So far we have seen the behavior of investors in provident funds in general and in 3 sub-periods. In order to make sure that these results are not artifacts driven by specific fund characteristics such as fund size, risk or management fees, we sub-divide our sample according to those factors and examine whether this affects our results. Furthermore, we use an additional econometric procedure<sup>18</sup> to directly examine the effect of these characteristics on the results and to determine the statistical significance of this effect. Finally, we try to understand whether the results are driven by savers' preferences or by other factors, such as employers channeling money to specific funds.

#### 1. Fund Size

Throughout this paper we normalize yields and inflows by fund assets in order to ensure that they are comparable between funds and give equal weight to all funds in the sample. We believe this is necessary to prevent our results being driven entirely by a few large funds. In this section we examine whether the relationships we found above hold for large<sup>19</sup> and small funds alike.

Running the estimation equation using the Xtabond2 procedure with a dummy exogenous variable for large funds and interactions of this dummy with the other explanatory variables yields results which are in line with the main results presented above. However, the lag effect of large funds' inflows on their yields and inflows is significantly smaller than the effect of lag inflows on the yields and inflows of the smaller funds.

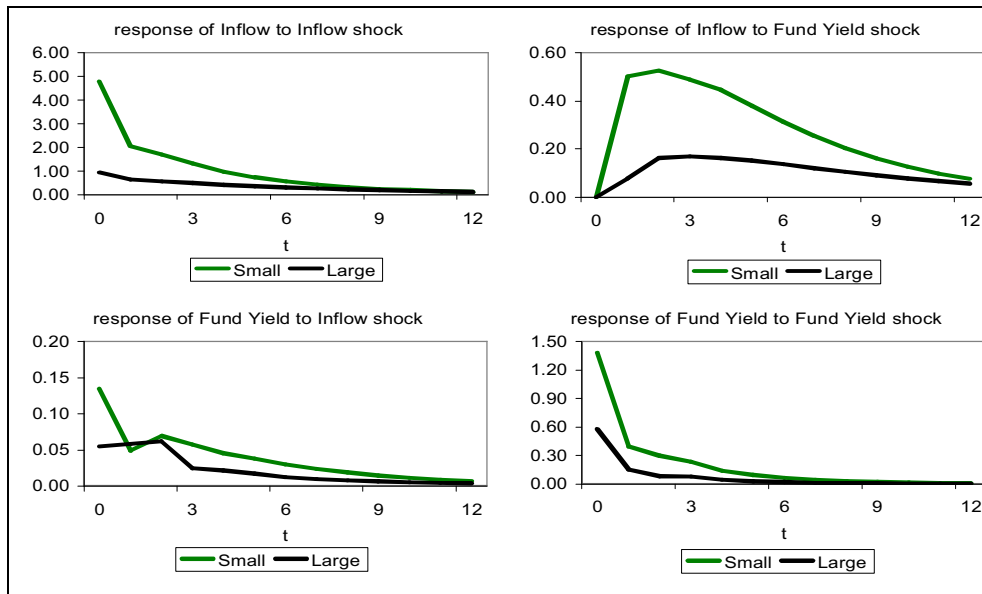
In figure 5 we compare the IRFs for large and small funds.<sup>20</sup> The results for both types of funds are qualitatively similar to the results in the entire sample, specifically – positive (negative) yields cause positive (negative) inflows, and the momentum in inflows remains. However, while the results for the small funds are practically identical to the results in the entire sample in sign, relative size and persistence, the responses of the large funds are significantly smaller. In addition, the momentum in the response of yields in large funds to shocks to both yields and inflows is less persistent than the general results. The sizes of the shocks to inflow and yield clarify that large funds have less variance in these variables relative to small funds, but as the average large fund is 17 times the size of the average small fund, the absolute size of those shocks in shekels is much greater in large funds than in small.

<sup>18</sup> The program that we use to estimate the PVAR (Love & Zicchino, 2006) suffers from technical limitations that prevent us from adding exogenous variables. We address the problem by using the Xtabond2 procedure (Roodman, 2009) which enables us, among other things, to estimate panel regressions with exogenous variables. We use the same sub-division in both cases for the sake of consistency.

<sup>19</sup> Observing the distribution of fund sizes, we define fund<sub>i,t</sub> as large if it has NIS 1 billion or more in assets.

<sup>20</sup> We ran the same regression for the large funds while excluding the 3 largest funds, in order to insure that they were not controlling our results. The results were quantitatively and qualitatively similar.

**Figure 5**  
**Impulse-Responses for 3 lag PVAR of inflow and fund yield - by fund size**



Altogether, we can conclude that our general results hold true for provident funds of different sizes, but the effect of lag inflows on future yields and inflows is lower for the large provident funds.

*2. Fund Risk*

Up to this point we have looked at fund yields, while ignoring the risks taken in achieving those yields. In this section we use the Risky\_Assets variable as a measure of fund risk, to determine if fund risk affects our results.

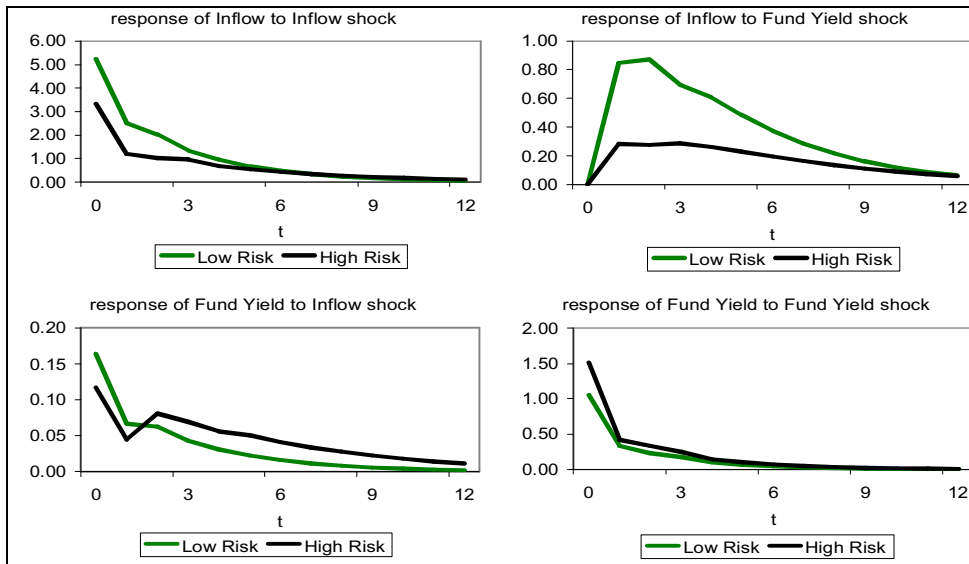
Running the estimation equation using the Xtabond2 procedure with a dummy exogenous variable for high risk funds<sup>21</sup> and interactions of this dummy with the other explanatory variables yields results which are in line with the main results presented above. However, this specification shows that the effect of lag yields on current yields is stronger for high-risk funds; meaning that high-risk funds demonstrate more persistence in their yields. On the other hand, the effect of lag yields on inflows is significantly lower for high-risk funds; meaning that investors show greater tendency to channel their money to a low-risk fund that increases its yield than to a high-risk fund that increases its yield.

In figure 6 we compare the IRFs for the high-risk and low-risk funds. The results are generally similar to the main results in sign but not in magnitude. The figure also supports

<sup>21</sup> We define a fund as high-risk if the share of its assets which are risky is 50% or above; in other words, if the Risky\_Assets variable is greater than or equal to 50%

the inference that inflows react more strongly to yields in the less risky funds: despite the fact that the shock to yields is smaller in the low-risk funds, the response of inflows to yields is approximately 3 times as large and equally persistent.

**Figure 6**  
**Impulse-Responses for 3 lag PVAR of inflow and fund yield - by fund risk**



We conclude that while the signs of our general results hold true for provident funds of different risk levels, investors respond with different intensities to yield in funds of different risk levels.

### 3. Management fees

Another parameter commonly discussed in relation to investor behavior is fund management fees. These fees may have opposite effects on investors – on one hand they cost the investors money and on the other hand they may be used to improve the fund's yield (e.g. by hiring skilled money managers).

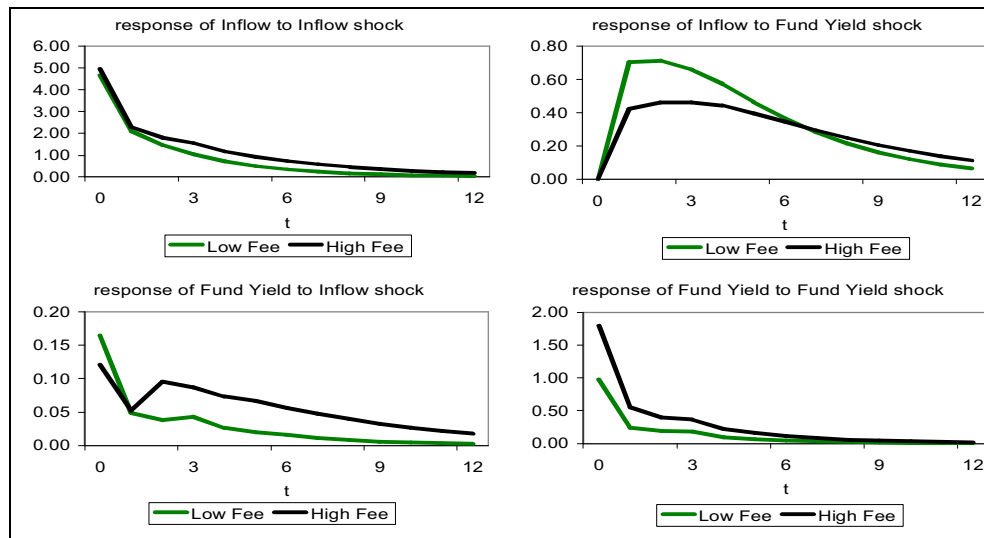
Running the estimation equation using the Xtabond2 procedure with a dummy exogenous variable for high management fees<sup>22</sup> and interactions of this dummy with the other explanatory variables yields results which are in line with the main results presented above. However, this specification shows that funds with high management fees demonstrate stronger persistence of yields and inflows and stronger effect of lag inflows on yields. On the other hand, the effect of lag yields on inflows is significantly lower for high

<sup>22</sup> We define a fund as high-fee if its monthly management fee is greater or equal to 0.08 percent (the sample median).

management fees funds: Investors show a greater tendency to channel their money to a low management fee provident fund that increases its yield than to a high management fee provident fund that increases its yield.

In figure 7 we compare the IRFs for the high-fee and low-fee funds. Both results are generally similar to the main results in sign but not in magnitude. The figure also supports the inference that inflows react more strongly to yields in low management fee funds: The shock to yields in the low management fee funds is half as large, but the response of inflows to yields in these funds is 1.5 times larger than in the high management fee funds and equally as persistent.

**Figure 7**  
**Impulse-Responses for 3 lag PVAR of inflow and fund yield - by fund fees**



We conclude that while the signs of our general results hold true for Provident Funds with different levels of management fees, investors respond with different intensities to yield in funds of different management fee levels.<sup>23</sup>

**d. Active Entrepreneurs and Passive Employees**

In Israel both self-employed workers and employees use provident funds. The self-employed choose which funds to deposit in, while the employees' choice of fund may be influenced by the employer, the union, etc.<sup>24</sup> Our dataset allows us to distinguish between

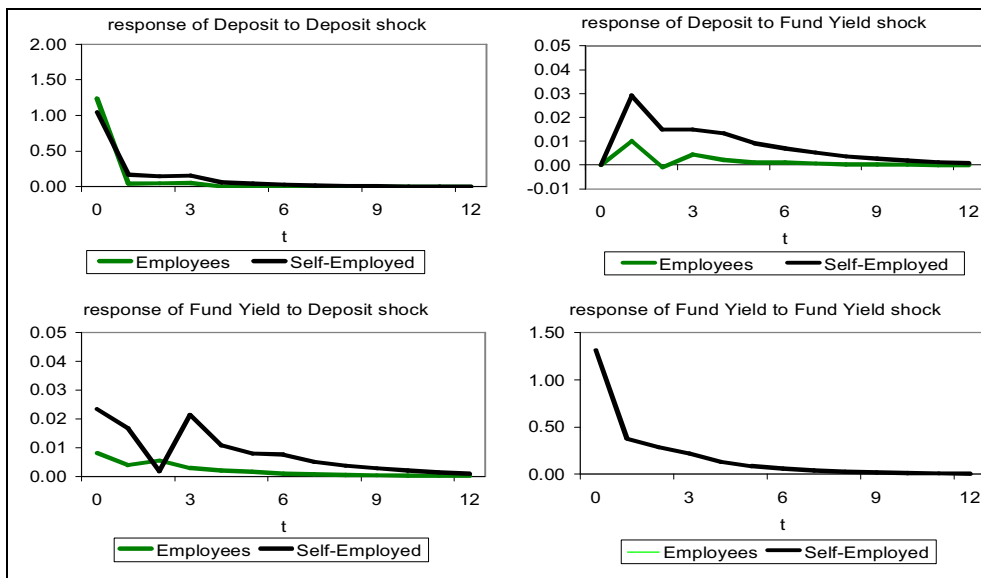
<sup>23</sup> Despite the unavailability of the monthly management fee data to savers, it is possible that this data is a proxy for observable management fee data. We therefore repeat the division of the sample using the monthly data rather than the yearly data, with very similar results.

<sup>24</sup> This does not necessarily imply which group is better off, as employees may benefit from lower management fees or better terms in corporate accounts.

deposits from the two groups<sup>25</sup>, which enables us to isolate the deposits of the self-employed, a group of savers whom we believe choose provident funds according to their own preferences. An examination of the deposits of the two groups shows that approximately half of the deposits come from each group and this proportion is stable across risk, size and management fee categories, indicating the similarity of the groups in most investment-relevant characteristics.

In Figure 8 we compare the IRFs for deposits and yield for the two employment groups. Looking at the self-employed, the results are qualitatively similar to our main results. In particular we see that their deposits are affected by past deposits and yields. The impact of yield on the deposits of the self-employed, although small relative to the yield's impact on inflow<sup>26</sup>, can serve as an indicator of the sign of investor response to yield, *ceteris paribus*. On the other hand, we see that employee deposits do not respond to past deposits or yields. The response of employee deposits to exogenous shocks to yields and deposits is not statistically significant. This lack of response may indicate that employees' choice of provident fund is affected by factors other than fund performance and market trends.

**Figure 8**  
**Impulse-Responses for 3 lag PVAR of deposits and fund yield - employees and self-employed**



<sup>25</sup> Unfortunately we were unable to obtain similar data for withdrawals and transfers.

<sup>26</sup> This impact is small relative to fund assets because one may transfer decades of accumulated savings in a single transfer, while a change in the target of monthly deposits will have only a gradual effect on the amount saved in the fund.



**Robustness of the results**<sup>27</sup>

1. One might suggest that our results are driven by noise in the inflow variable. In order to tackle this concern we replace the inflow with the transfers variable. Unlike inflow which might be affected by constant deposits and withdrawals which may show high sensitivity to factors unrelated to the funds' attributes, transfers are affected only by the active decisions of savers who decide to move their money into or out of a specific provident fund. When we re-estimate the model using transfers instead of inflow the results remain qualitatively and quantitatively similar.
2. When estimating the basic model, we used 3 lags, following the results of various information criteria we examined. As a robustness check we re-estimate the model using both 2 lags and 4 lags. The results are not sensitive in the 2-4 lag range and remain qualitatively and quantitatively similar.
3. When estimating the basic model, we used a Panel VAR program which does not enable us to address potential heterogeneity in the variances between different provident funds. It might be the case that different provident funds are characterized not solely by different intercepts, but also by different variances. In order to tackle this concern we use the 'Xtabond2' procedure in the 'Stata' program (Roodman, 2009), which enables the use of 'clustered standard errors'. We get results that are qualitatively similar to our main results. In particular, the use of cluster does not alter the significance of the main results.
4. Our sample consists of only Allowance and Compensation funds. Though relatively homogenous in their attributes, we do recognize an exception among those funds: there are some Allowance and Compensation provident funds which are open only to employees of a specific firm and not to the general public. One might be concerned that relationship between inflow and yield might be different in these funds and thus they might bias the entire sample. To eliminate such suspicion, we re-estimate the model after eliminating these funds, which are identifiable using the MOF 'Gemel-Net' data. The results remain qualitatively and quantitatively similar.
5. As mentioned in section 4.3, prior to the estimations we trimmed the sample in order to avoid extreme inflow outliers affecting the results. As a robustness check we re-estimate the model, once without the two-sided trimming and once with a 2% trim. The PVAR results (Figure 1 in the Appendix) with a 2% trim are qualitatively and quantitatively similar to the general results. However, the results for the untrimmed sample (Figure 2 in the Appendix) are quite different. In particular, the effect of a shock to inflow on inflow is very large but only contemporaneous, and its effect on fund yield is weaker, though still positive and statistically significant. These results suggest that the trimming of the sample according to the inflow variable had an effect on the results. We believe however, that the trimming is necessary because it prevents the results from being dominated by outliers resulting from fund M&A and fund closures. The comparison between the 1% trimmed, 2% trimmed and untrimmed variables (Table 1 in the

<sup>27</sup> Results of the robustness tests other than test #4 are not presented due to space considerations. All such results are available from the authors upon request.

Appendix) persuades us that the trimming used disposes of the outliers, is parsimonious in observations and does not significantly influence the other main variables.

6. Finally, as we have emphasized throughout this paper, we used a methodology novel in finance, PVAR, to achieve our results. We believe this methodology to be the most appropriate for our data and research question. We nonetheless also used more traditional methods (i.e. Rakowski and Wang's VAR aggregation method, pairs of standard OLS regressions) which are less suitable, in our opinion, but have been used in similar studies. The results were qualitatively similar.

The above-mentioned robustness checks support the inference that our results are not driven by data or estimation problems, but rather that they properly describe the relationships between provident funds' yields and inflows.

## 7. DISCUSSION

The results of the estimation suggest high autocorrelation in provident fund inflows. The inflow autocorrelation is positive and significant throughout the 3 sub-periods (pre-crisis, crisis, post-crisis). This result is consistent with the results of Del Guercio and Tkac (2002) for mutual funds, but the opposite of their results for pension funds. This indicates that even after controlling for the financial crisis and fund yields, investors demonstrate herd behavior – investing in provident funds that were popular in recent periods or running from those that were unpopular. Further research into provident fund marketing and distribution channels as well as investment biases may provide better understanding of this behavior.

Provident fund yields also show high autocorrelation in the general results. However, when we divide the sample into 3 sub-periods, this autocorrelation is persistent only in the post-crisis period, while persistence in the pre-crisis period is very short, and during the crisis we are unable to identify persistence in yields at all. This means that during the crisis, past yields had no predictive power for current and future yields. The results in the literature regarding persistence of mutual fund performance are mixed, with the persistence in yields that we find in the general results being in line with some papers regarding mutual funds in the US (e.g. Gruber, 1996) and with the results of Lauterbach and Barak (2002) for mutual funds in Israel. Results for provident funds show that Blass (2007), using annual data, found no persistence in Israeli provident fund yields, suggesting that the yield persistence that we find may be limited to the short term. This yield persistence may, however, indicate that investors are able to pick winners, at least in the short term.

The results show positive effect of short-term yields on future inflows. The positive effect of yield on inflow suggests that provident fund investors tend to chase past yields, and they weigh recent yields more heavily. These findings are consistent with those of Ippolito (1992), Wermers (2003) and Benson, Faff & Smith (2007) regarding mutual funds. This result holds true in all three sub-periods: Investors tend to chase past returns, even during the crisis, though the results are less significant during the crisis sub-period. The weaker response of inflow to yield shocks in the crisis sub-period might be explained by a flight to safety that caused investors to care less about short-term yield and more about long-term security.

Our general results show both contemporaneous and lag positive effects of the fund's inflow on its yield. The contemporaneous response holds in all 3 sub-periods, meaning that positive (negative) inflows increase (decrease) a fund's yield in the same period. The response of yield to inflow is persistently and significantly positive in all but the crisis sub-period. These results are in line with the permanent information effect hypothesis according to which the inflows reflect investors' information and the investors correctly predict future short-term yields (Rakowski and Wang, 2009). However, the results do not support the temporary liquidity costs theory (Benson, Faff & Smith, 2007) or theories highlighting the costs of liquidity-motivated trading (e.g. Edelen, 1999; Nanda, Wang and Zheng, 2003).

We see above that the results for the crisis sub-period differ from the other results. Some of these differences are due to the unique characteristics of this period, while others may be due to the fact that the crisis sub-period is only 6 months long and thus the average fund has only 3 observations in this period.

The results confirm that yield and inflow have positive, persistent and strongly significant effects on each other, in line with Wermers' (2003) results for mutual funds.

We run several robustness checks with results similar in general to the above-mentioned results. The trimming of 1% of the distribution of provident fund flows has a significant impact on the results. We believe, however, that this trimming is required in order to reduce the impact of extreme outliers, made up primarily of fund M&As and closures.

Having established the relationship between yields and inflows, we explore the differing effects of provident fund characteristics on this relationship by dividing our sample according to fund size, risk and management fees.

The results for the smaller funds resemble the general results. The response of large funds' yield and inflow are significant and positive but weaker than those of small funds, likely due to the fact that the shocks themselves are of much smaller magnitudes.

The divisions of the sample by risk and management fees yield results which are qualitatively similar to the general results, leading to the conclusion that the relationship presented above between yield and inflow is not due to risk or management fees. However, the stronger response of inflow to yield in low-risk funds and low-fee funds indicates that investors rationally put more weight on returns that are gained with lower costs (whether these costs are incurred directly as fees or indirectly in the form of higher risk).

The ability to distinguish between employee and self-employed deposits enables us to see that the behavior of the self-employed, whose deposits respond positively to fund yield and past deposits, matches our general results. As they are more likely than employees to make independent investment decisions, this serves as further evidence for investor yield chasing and herd behavior. On the other hand, neither yields nor past deposits have a significant effect on employees' deposits. While we cannot reject the possibility that the difference between the self-employed and employees is due to differences in unobserved characteristics between the groups, further research into factors that might be relevant to employees only, such as corporate management fee discounts or corporate relationships with provident fund management firms, may prove rewarding.

The results presented in this section support the claim that provident fund investors chase yields. We suspect that this behavior is driven by provident fund advertising and insurance agents, who market provident funds, highlighting short-term yield as opposed to

long-term yield.<sup>28</sup> Yield chasing per-se might not necessarily be negative, especially when funds' yields show high autocorrelation, as is the case in our data. This argument is acceptable for short-horizon investors (e.g. mutual fund investors) who can act as momentum investors and chase recent winners for short-term gains. Without research into the relationship between short-term and long-term yield, which is beyond the scope of this paper, it is difficult to reject the possibility of a long-term yield reversal, turning short-term gains into long-term losses. As such, it is harder to justify short-term yield chasing when dealing with pension savings.

## 8. CONCLUSION

This paper examines a specific segment of the pension savings market: Allowance and Compensation Provident Funds. Provident funds are a type of fund unique to Israel, similar to pension funds, but with shorter investment horizons, different tax advantages and greater involvement in capital markets.

Using data from the Ministry of Finance's 'Gemel-net' system and the Bank of Israel's 'Klgemel' system, we examine the relationships between provident funds' inflow and yield while controlling for fund size, risk and management fees. We use a novel econometric method, Panel VAR, in order to tackle endogeneity problems and to make full use of our panel data.

We are able to establish the relationships between inflow and yield and to show autocorrelation in both. We find that yield positively affects future inflow and interpret this as an indication of investors' yield chasing behavior. We show that investors' tendency to invest in higher yielding funds is greater in funds with lower risk and funds with lower management fees, indicating that investors rationally put more weight on returns that are gained with lower costs. We find that inflow tends to positively affect yield both contemporaneously and with a lag. We interpret this result as supportive of the permanent information hypothesis.

Due to the unique nature of the sample period, which included a major global financial crisis, we also look into three sub-periods: before, during and after the crisis. The results for the pre- and post-crisis periods are similar to the general results. The crisis sub-period shows a weaker effect of yield on inflow, which we interpret as flight to safety taking over from yield chasing.

Our dataset allows us to isolate the deposits of the self-employed, a group of savers whom we believe choose provident funds according to their own preferences, from the deposits of the employees, who may be affected by exogenous factors. The results support our main conclusions regarding investor behavior. However, further research regarding the factors affecting employees' choice of provident fund is called for.

<sup>28</sup> Mullainathan and Shleifer (2005) examine the emphasis placed on yields and risk in mutual fund advertisements in the U.S. They find that when the markets surge, financial institutions emphasize the yields of the funds they manage, which they do not do when the markets decline.

This paper establishes the bi-directional connection between provident fund yields and inflows and shows empirically that provident fund investors chase yields. It is unique methodologically for its use of the Panel VAR estimation method to investigate the relationships between inflows and yields in the field of investments. Further research on the connection between current short-term yields and future long-term yields might provide insights on the efficacy of the investor behavior outlined in this paper.

**Appendix****Table 1: Main Variables by Inflow Trim (Monthly Data)**

	Sample with 2% Trim					
	mean	median	sd	min	max	N
Inflows	0.84%	-0.06%	5.42%	-16.25%	64.08%	21,394
Transfers	0.82%	-0.02%	5.10%	-16.28%	65.59%	21,394
Fund Yield	0.60%	0.77%	2.31%	-22.22%	19.35%	21,394
Fund Assets	561,226	133,810	1,690,280	-	21,700,000	21,394
Risky Assets	51%	53%	24%	1%	100%	21,370
Management Fees	0.07%	0.07%	0.05%	0.00%	0.34%	19,304
	Selected Sample - Sample with 1% Trim					
	mean	median	sd	min	max	N
Inflows	1.01%	-0.06%	6.83%	-27.25%	139.15%	21,594
Transfers	0.97%	-0.01%	6.36%	-30.96%	125.64%	21,594
Fund Yield	0.60%	0.76%	2.30%	-22.22%	19.35%	21,594
Fund Assets	556,526	132,005	1,683,187	-	21,700,000	21,594
Risky Assets	51%	53%	24%	1%	100%	21,570
Management Fees	0.07%	0.07%	0.05%	0.00%	0.34%	19,498
	Untrimmed Sample					
	mean	median	sd	min	max	N
Inflows	1.45%	-0.05%	31.24%	-100.83%	4232.14%	21,808
Transfers	1.38%	-0.01%	31.00%	-100.00%	4228.57%	21,808
Fund Yield	0.61%	0.76%	2.33%	-22.22%	19.35%	21,808
Fund Assets	551,231	129,810	1,675,756	-	21,700,000	21,808
Risky Assets	51%	53%	24%	1%	100%	21,779
Management Fees	0.07%	0.07%	0.05%	0.00%	0.34%	19,707

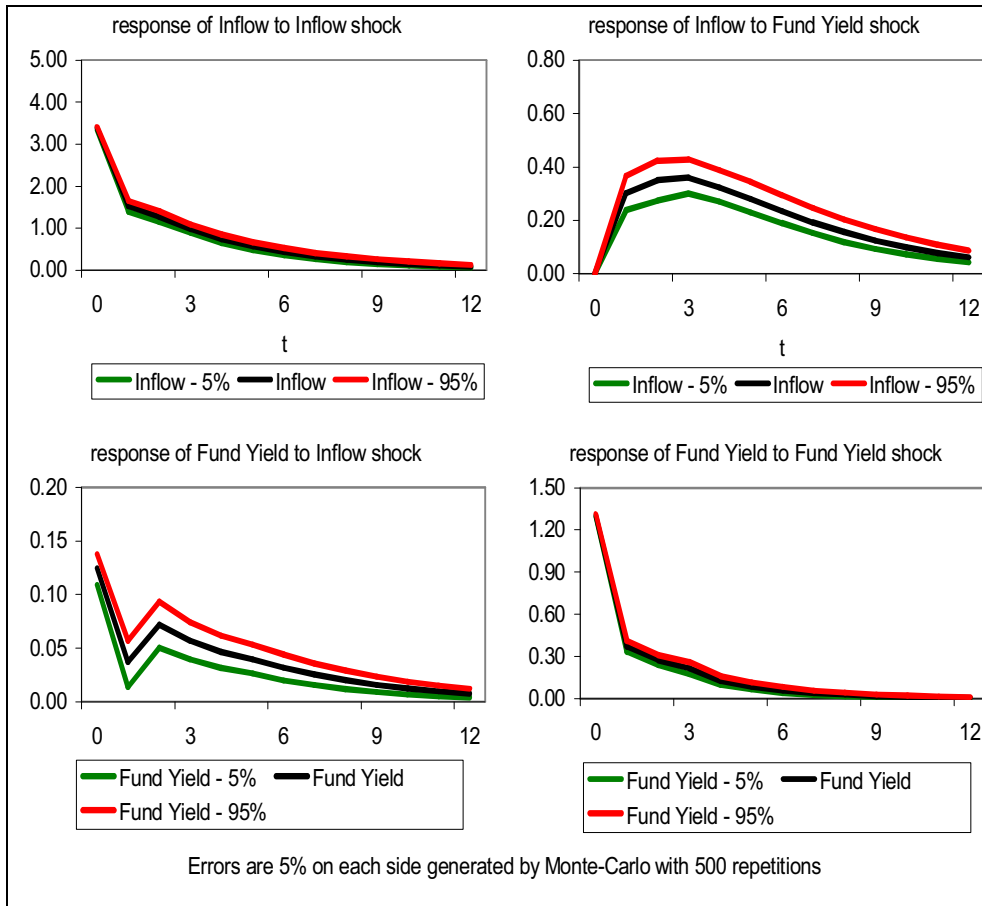
**Appendix****Table 2: General PVAR Results\***

Response to:	Entire Period	
	Response of:	
	Inflow	Fund Yield
<u>Inflow Variable</u>		
Inflow in t-1	0.424*** [12.503]	0.02 [0.733]
Inflow in t-2	0.155*** [5.631]	0.006** [2.102]
Inflow in t-3	0.045** [2.466]	0.000 [0.208]
<u>Yield Variables</u>		
Fund Yield in t-1	0.359*** [7.935]	0.286*** [16.248]
Fund Yield in t-2	0.124*** [3.276]	0.131*** [8.057]
Fund Yield in t-3	0.017 [0.530]	0.064*** [3.791]
Number of Observations		20,071
Number of Funds		364

t-statistics are in the parentheses. Time and fund fixed effects are removed prior to estimation.

\*, \*\* and \*\*\* indicate statistical significance at the 10, 5 and 1 percent levels, respectively.

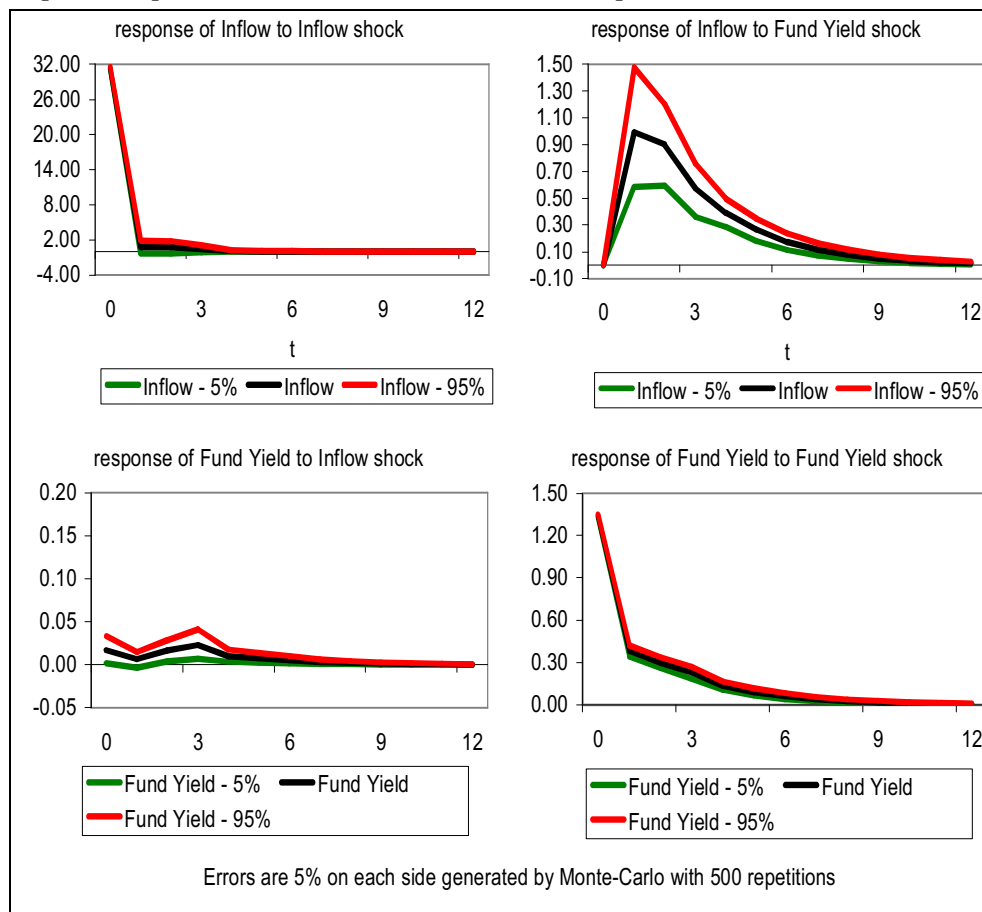
**Appendix – Figure 1**  
**Impulse-Responses - Entire Period - 2% Trimmed Sample**





**Appendix – Figure 2**

**Impulse-Responses - Entire Period - Untrimmed Sample**



## REFERENCES

- Angello, Luca and Sousa, Ricardo M., "Fiscal Policy and Asset Prices", NIPE Working Papers, 2010.
- Antebi, Yadin, "Proceedings in the pension savings market following the events of the global crisis", Capital Markets, Insurance and Savings Department, Israeli Ministry of Finance, March 2009, available at:  
[http://ozar.mof.gov.il/hon/2001/general/gen\\_reports.asp#g2009\\_Crisis](http://ozar.mof.gov.il/hon/2001/general/gen_reports.asp#g2009_Crisis) (Hebrew).
- Arellano, Manuel and Bover, Olympia, "Another look at the instrumental variable estimation of error component models", *Journal of Econometrics*, 68, 1995.
- Assenmacher-Wesche, Katrin and Gerlach, Stefan, "Monetary Policy, Asset Prices and Macroeconomic Conditions: A Panel-VAR Study", National Bank of Belgium Working paper No. 149, October 2008.
- Ben-Rephael, Azi, Kandel, Shmuel and Wohl, Avi, "Measuring Investor Sentiment with Mutual Fund Flows", Forthcoming in the *Journal of Financial Economics*, 2009.
- Ben-Rephael, Azi, Kandel, Shmuel and Wohl, Avi, "The Price Pressure of Aggregate Mutual Fund Flows", *Journal of Financial and Quantitative Analysis*, vol 46(2), 2011.
- Benson, Karen L., Faff, Robert W. and Smith, Tom, "Fund Flow and Return: Evidence from Individual Funds", Unpublished paper, 2007.
- Blai, Sharon, "Management by Banks vs. Private Management: Flexible Mutual Funds Market Timing Performance and Selectivity in Israel, 1992-1997", *Bank of Israel Survey* (Hebrew), June 2003.
- Blass, Asher, "Provident Funds' Performance and Market Structure: 1987-1994", *Economic Quarterly*, Israeli Economic Association (Hebrew), 2/96, August 1996.
- Blass, Asher, "Removing the Management of Provident Funds and Trust Funds from the Banks", *Economic Quarterly*, Israeli Economic Association (Hebrew), 54.03-54.04, September/December 2007.
- Blundell, Richard., and Bond, Stephen, "Initial conditions and moment restrictions in dynamic panel data models", *Journal of Econometrics*, 87, 115-143, 1998.
- Cha, Heung-Joo and Kim, Jaebeom, "Stock Returns and Aggregate Mutual Fund Flows: A System Approach", *Applied Financial Economics* Vol. 20 No. 19, 2010.
- Chevalier, Judith and Ellison, Glenn, "Risk Taking by Mutual Funds as a Response to Incentives", *The Journal of Political Economy* Vol. 105 No. 6, December 1997.
- Coad, Alexander, "Disentangling the Firm Growth Process: Evidence From a Recursive Panel VAR", *Papers on Economics & Evolution*, Max Planck Institute, December 2007.
- Del Guercio, Diane and Tkac, Paula A., "The Determinants of the Flow of Funds of Managed Portfolios: Mutual Funds vs. Pension Funds", *The Journal of Financial and Quantitative Analysis* Vol. 37 No. 4, December 2002.
- Dramance, Coulibaly, "Macroeconomic Determinants of Migrants' Remittances: New Evidence from a panel VAR", CES Working Papers, July 2009.
- Edelen, Roger M., "Investor Flows and the Assessed Performance of Open-End Mutual Funds", *Journal of Financial Economics*, 53, 1999.

- Fant, Franklin L., "Investment Behavior of Mutual Fund Shareholders: The Evidence from Aggregate Fund Flows", *Journal of Financial Markets* 2, 1999.
- Goetzmann, William N. and Peles, Nadav, "Cognitive Dissonance and Mutual Fund Investors", *Journal of Financial Research* Vol. XX No. 2, summer 1997.
- Granger, C. W. J. (1969). "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods," *Econometrica*, 37, 424-438.
- Grinblatt, Mark and Keloharju, Matti, "The investment behavior and performance of various investor types: a study of Finland's unique data set", *Journal of Financial Economics* 55, 2000.
- Gruber, Martin J., "Another Puzzle: The Growth in Actively Managed Mutual Funds", *Journal of Finance* Vol. 51 No. 3, 1996.
- Hamilton, James D., "Time Series Analysis", *Priceton University Press*, 1994.
- Holtz-Eakin, Douglas, Newey, Whitney, and Rosen, Harvey S., "Estimating vector autoregressions with panel data", *Econometrica*, Vol. 56, November 1988.
- Horesh, Reuven and Rahman-More, Dalia, "The Relation between Savers Withdrawal from Provident Funds and the Monthly Reported Returns", *Economic Quarterly*, Israeli Economic Association (Hebrew), May 1999.
- Im, Kyung So, Pesaran, M. Hashem and Shin, Yongcheol, 'Testing for Unit Roots in Heterogeneous Panels', *Journal of Econometrics*, 115 (2003), 53-74.
- Ippolito, Richard A., "Consumer Reaction to Measures of Poor Quality: Evidence from the Mutual Fund Industry", *Journal of Law and Economics* Vol. 35 No 1, April 1992.
- Israel Ministry of Finance, "The Annual Report of the Commissioner of Capital Markets, Insurance and Savings" (Hebrew), 2008.
- Lauterbach, Beni and Barak, Ronen, "Mutual Funds in Israel: Yields and Risk", *Economic Quarterly*, Israeli Economic Association (Hebrew) 3/02, September 2002.
- Levin, Andrew, Lin, Chien-Fu and Chu, Chia-Shang James, "Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties", *Journal of Econometrics* Vol. 108, 2002.
- Love, Inessa and Zicchino, Lea, "Financial Development and Dynamic Investment Behaviour: evidence from Panel VAR", *The Quarterly Review of Economics and Finance*, 46 (2006), 190-210.
- Maddala, G.S. and Wu, Shaowen, 'A Comparative Study of Unit Root Tests With Panel Data and A New Simple Test', *Oxford Bulletin of Economics and Statistics* 61, 631-652, 1999.
- Modigliani, Franco and Modigliani, Leah, "Risk-Adjusted Performance, How to Measure It and Why", *The Journal of Portfolio Management*, Winter 1997.
- Mullainathan, Sendhil and Shleifer, Andrei, "Persuasion In Finance", NBER Working Paper, 2005.
- Nanda, Vikram, Wang, Jay Z. and Zheng, Lu, "The ABCs of Mutual Funds: A Natural Experiment on Fund Flows and Performance", Working paper, December 2003.
- Nickell, Stephen, "Biases in Dynamic Models with Fixed Effects", *Econometrica* Vol. 49 No. 6, November 1981.
- OECD, "Current Trends and Policy Topics in Retirement-Income Provision in OECD Countries", *OECD Report- Pensions at a Glance*, 2009.

- Rakowski, David and Xiaoxin, Wang, "The Dynamics of Short-Term Mutual Fund Flows and Returns: A Time-Series and Cross-Sectional Investigation", *Journal of Banking & Finance* 33, 2009.
- Roodman, David, "How to do xtabond2: An introduction to "Difference" and "System" GMM in Stata", *Stata Journal* 9(1) (2009), 86-136.
- Shiffenbauer, Lavi, "Multi-Fund Pension System", Capital Market, Insurance and Savings Department, Israeli Ministry of Finance Working Paper, December 2007.
- Sirri, Erik R. and Tufano, Peter, "Costly Search and Mutual Fund Flows", *Journal of Finance* Vol. 53 No 5, October 1998.
- Warther, Vincent A., "Aggregate Mutual Fund Flows and Security Returns", *Journal of Financial Economics* 39, 1995.
- Wermers, Russ., "Is Money Really "Smart"? New Evidence on the Relation Between Mutual Fund Flows, Manager Behavior, and Performance Persistence", Working paper, University of Maryland, 2003.