

Institutional Traders' Behavior in an Emerging Stock Market: Empirical Evidence on Polish Pension Fund Investors

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Abstract: In this paper, we contribute to the literature on institutional herding and feedback trading by analysing the investment behavior of pension funds on the Polish stock market. Pension funds entered into the stock market due to the national pension system reform in 1999, providing a unique opportunity to receive deeper insight into the behavior of institutional investors in an emerging capital market. Our results show that Polish pension fund investors are to a greater extent involved in herd-like behavior and pursue feedback trading strategies more often than their counterparts in mature markets. This finding is primarily attributed to a stringent investment regulation and high market concentration. We do not detect, however, that trading by the pension funds exerts significant influence on the future stock prices.

Keywords: pension funds, herding, feedback trading, Polish stock market

1. INTRODUCTION

The increasing dominance of institutional investors on stock markets world-wide has stimulated public and academic

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discourse on the influence their trading exerts on asset prices. This interest is due to the common belief that institutional investors, being to a greater extent engaged in herding and feedback trading behavior than individual traders, may contribute to the destabilization of stock prices. A number of theoretical models were suggested to explain herding and feedback trading by institutions (Scharfstein and Stein, 1990; Roll, 1992; Froot, Scharfstein and Stein, 1992; Hirshleifer, Subrahmanyam and Titman, 1994; and Sentana and Wadhwani, 1992). Nevertheless, empirical studies of institutional behavior show that the actual extent of herding and positive feedback trading by institutions turned to be surprisingly modest (Grinblatt, Titman and Wermers, 1995; Wermers, 1999; and Borensztein and Gelos, 2000). These investigations scrutinize trading behavior conditional on the type of the institution, with particular emphasis on trading by mutual funds.

Whereas recent literature on institutional investors report the growing importance of pension funds for the domestic stock markets (Davis, 1997; and Davis and Steil, 2000), few studies focus on the investment behavior of pension fund managers. Lakonishok, Shleifer and Vishny (1992) investigate the holdings of more than 700 US pension funds and conclude that pension fund herding and positive feedback trading in large stocks is very modest. Somewhat more pronounced evidence of positive feedback trading was revealed for smaller stocks, however, even in this case it is not seen as having any destabilizing influence on individual stock prices.

Badrinath and Wahal (2002) examine pension funds along with a broad range of institutions of the US market including mutual funds, investment advisors, insurance companies, commercial banks, and trusts. They claim that pension fund managers are engaged in feedback trading even to a lesser extent than others, with the link between past returns and taking a position in stocks being more pronounced in small firms. Jones, Lee and Weis (1999), using a sample similar to Badrinath and Wahal, report that pension fund managers act as feedback traders especially on the buy side and mostly in small stocks with a high past performance. Blake, Lehmann and Timmermann (2002) find clustering in UK pension fund performance and conclude that in the presence of relative performance benchmarks pension fund

managers are likely to follow the investment behavior of the fund with median outcome.

The empirical studies mentioned above concentrate on pension funds of the so-called 'Anglo-Saxon' type, while omitting the 'Continental' and 'Latin American' types of pension funds adopted in the developed European countries, and the emerging economies of Latin America and Central Europe.¹ This omission is important because of the pronounced differences in investment regulations shaping these three types of pension funds. The 'Anglo-Saxon' type is characterized by a dominance of loose 'prudent-man' investment rules. Pension funds of the second type face quantitative limits on their investments, which are not, however, binding and rather reflect the conservative investment preferences of their participants. The 'Latin American' type is the strictest among the three types mentioned. It assumes substantial restrictions on the investment freedom of pension funds, e.g., quantitative limits on investments in particular types of assets, and an obligation to guarantee their participants pre-defined levels of returns.

Blake, Lehmann and Timmermann (2002) state that different investment rules may affect institutional trading resulting in different patterns of investment behavior amongst pension funds. This consideration warrants further inquiry into investment behavior of pension funds operating under different sets of regulations. For this reason, we extend the empirical literature on institutional trading behavior by analyzing pension funds of the Latin American type that are subject to more stringent investment rules than funds examined in the earlier studies. While several studies discuss operating of pension funds in Latin America (Simonetti, 2000; and Yermo, 2000), pension fund markets of the Central European countries, which adopted similar regulation, have drawn much less attention so far. As far as we know, this study is the first attempt to formally analyze investment behavior by pension funds in the region.

In this paper we analyze trading behaviour of pension funds on the Polish stock market. The Polish market is considered to be an example of successful stock market reforms and is viewed as one of the leading markets in Central Europe (Schroder and

1 For a description of the different types of pension systems see Davis (1997).

Koke, 2001). Due to peculiarities of its pension fund legal framework, designed after the Latin American type of regulation, we aim to gain additional insight into herding and feedback trading by pension funds. Our findings should be of interest to regulators of markets with similar investment rules and to pension fund participants, whose future pensions are directly influenced by investment decisions of pension fund managers. Therefore, we believe that our results have applicability for a wider range of emerging markets. In addition, there is an ongoing discussion between the Polish stock market observers and regulators about the presence of herding in the market. The present paper, being a first attempt to estimate herding among the Polish pension funds, will substantiate this debate.

Namely, in the present study we address the following questions. First, to what extent are Polish pension funds engaged in herding and feedback trading and is it comparable to the degree of herding and feedback trading found by the previous studies for 'Anglo-Saxon' pension funds? Second, are there any differences in the extent of herding and feedback trading with regard to particular groups of stocks categorized in terms of size, past performance and industry? Third, is there any relationship between the excess demand of pension funds and contemporaneous stock returns?

The rest of the paper is structured as follows. The next section describes the Polish pension reform and the pension fund market. The statistical methodology used to estimate the extent of herding and feedback trading is outlined in Section 3. Section 4 describes the data set used in the study. Empirical findings are represented in Section 5. Finally, Section 6 offers our conclusions.

2. PENSION FUNDS IN POLAND

By the end of the 1990s the growing demographic pressure in Poland brought about a heavy fiscal burden and highlighted the flaws of the old pay-as-you-go pension system. This stimulated its reform and the launch of a new three-pillar pension system in 1999.² The pension systems of the Latin American countries

2 By the mid 1990s, the level of deductions from personal incomes soared to 45% and the amount of pensions to be paid reached 15% of Polish GDP.

served as the model for the new Polish one. The latter consists of the reformed pay-as-you-go system represented by the government-run Social Insurance Institution (SII), the system of open pension funds run by private managing companies and privately funded pension security schemes. The first two pillars are compulsory. The third is voluntary and aims to provide an above-the-minimal standard of living by promoting long-term private savings through different types of investments.³

Polish pension funds are defined-contribution funds, i.e., the amount of future pensions accumulated in the second pillar depends solely on returns on invested assets.⁴ Employees transfer 7.3% of their gross salary through the SII to the pension funds, which invest it mostly in domestic financial instruments.⁵ In 2002 about 11 million individuals were insured within the second pillar.

By the end of 2002, 17 pension funds were operating in the Polish stock market with assets under management totalling 7.8 billion \$-US (KNUiFE, 2003a). The pension fund industry in Poland is highly concentrated, which is typical for developing countries that followed the same track of pension reform (Hadyniak and Monkiewicz, 1999). The four largest funds (Commercial Union, ING Nationale-Nederlanden Polska, PZU Złota Jesien and AIG) dominate the market. By the end of 2002 they accounted for 74% of total pension funds' assets and 63% of the participants. In terms of capital under discretionary management, pension funds represent the most influential group of institutional investors on the Polish stock market. Their assets outweigh those of mutual funds and insurance companies, totalling only 0.7 and 3.1 billion \$-US, respectively.

Polish pension funds are defined-contribution pension funds and, therefore, are subject to capital market risk. In order to ensure adequate retirement income, regulators introduced a number of investor protection measures like investment limits

3 For a detailed description of the three pillars see Hadyniak and Monkiewicz (1999) and Mech (2001). Our discussion refers primarily to the second one.

4 For an analysis of distinctions between defined-contribution and defined-benefit pension funds, see Davis (1997).

5 Only at the end of 2001 two of the pension funds realized the possibility provided by law to invest in foreign assets (Karpinski, 2002a).

and explicit guarantees of fund performance. These measures, considerably limiting investment activity of the funds, may be costly as they interfere with the asset selection process and may cause temporal inefficiency of portfolios. The Law on Organisation and Operation of Pension Funds (1997) imposes limits on asset allocation in each financial instrument. In particular, the proportion of funds invested in shares is limited to 40% of the total fund portfolio. An additional 20% may be invested in shares indirectly via holdings in mutual funds. In addition, funds are required to guarantee a minimum rate of return on their investments. Failure to achieve it is punished by penalties. Polish law defines the mandatory minimum rate of return as a return 50% lower than the weighted average rate of all funds established for a given period, or a rate of return four percentage points lower than the aforesaid average, whichever is lower. Therefore, the minimum rate of return represents a so-called 'peer-based' or relative performance evaluation benchmark. During the period investigated in this paper (1999–2002), the minimum required return was calculated and announced on a quarterly basis for the previous two-year period.⁶

A return that is lower than the required minimum rate of return should be made up out of the pension fund's own assets. If the pension fund is insolvent, the shortfall must be offset by the assets of its managing company. In case these assets do not suffice, the managing company is declared bankrupt. Funds to be paid into the accounts of the trustees are then withdrawn from a special government guarantee fund. Such regulation of the shortfall compensation mechanism effectively prevents the rise of moral hazard problem (Pennachi, 1998).

Due to regular and significant cash flows, Polish pension funds were expected to trigger an upturn in the domestic stock market. By the end of 2002 open pension funds' investments into stocks listed on the Warsaw Stock Exchange (WSE) amounted to about 30% of the assets under management or 2.2 billion \$-US. Funds' participation in the daily turnover of the

6 In August 2003 a new law was enacted that changed rules of calculation of the minimum rate of return (KNUiFE, 2003c). Accordingly, the minimum rate of return is estimated semi-annually for the period of the last three years.

WSE accounts for 17% and surpasses 5% of the capitalization of the Exchange (KNUiFE, 2003a, www.igte.com.pl). However, funds' holdings are highly concentrated and limited to the large capitalization stocks that are listed in the blue-chip index, WIG20 (Karpinski, 2002b). Pension funds' investments in shares have still not reached the 40% limit. Since the Polish stock market remains thin relative to the funds' ever increasing assets, and since investment in foreign capital markets is limited for Polish pension funds, there are growing fears of impending liquidity attenuation on the WSE (Brycki and Karpinski, 2002).

The heavy concentration of the pension fund market and stringent investment regulation are claimed to cause similar portfolio compositions and identical performance of Polish pension funds.⁷ Fund managers eschew active investment strategies and tend to copy each other's investment decisions. The central surveillance body of pension funds, the Insurance and Pension Funds Supervisory Commission (IPFSC), in its annual report admitted that regulatory provisions, such as the minimum rate of return, favor reduced competition and intensified herding behavior among Polish pension funds (KNUiFE, 2003b). In the following sections we formally investigate the extent of herding by the pension funds.

3. HERDING AND FEEDBACK TRADING MEASURES

To evaluate herding we utilize the measure suggested by Lakonishok, Shleifer and Vishny (1992) which is one of the most widely used herding measures in the empirical finance literature. It estimates herding as a degree of correlated trading among investors. Since it is more likely to reveal herding inside a homogenous group of investors that are directly competing for customers and are identically evaluated, than in a random sample of institutions, it is usually calculated for a group of identical institutions. The Lakonishok-Shleifer-Vishny measure gauges the average tendency of investors to end up on the same

⁷ Stanko (2003b) reports that performance outcomes of Polish pension funds tend to display low dispersion and to cluster around those of the funds with the median performance. A similar finding is documented by Blake and Timmermann (2002) for the UK pension fund industry.

side of the market in a particular stock and in a particular time period. The measure for stock i in period t is defined as:

$$H_{i,t} = |p_{i,t} - p_t| - AF_{i,t}, \quad (1)$$

where $p_{i,t} = B_{i,t}/(B_{i,t} + S_{i,t})$. $B_{i,t}$ ($S_{i,t}$) denotes the number of investors in the group that buy (sell) stock i in period t . p_t is the average of the $p_{i,t}$ s over all stocks that were traded in period t and measures the number of investors buying in a given period relative to the number of investors active in period t .

The adjustment factor in equation (1), $AF_{i,t}$, is defined as the expected absolute difference between $p_{i,t}$ and p_t :

$$AF_{i,t} = E(|p_{i,t} - p_t|), \quad (2)$$

where E denotes the expectation operator. $AF_{i,t}$ is calculated under the null hypothesis that $B_{i,t}$ follows a binomial distribution with the parameter p_t . The adjustment factor prevents the bias in $|p_{i,t} - p_t|$ for stocks that are traded by a low number of investors. In our empirical application the herding measures computed for each stock are averaged first across different subgroups of stocks and then across periods. Under the assumption of normality, positive values of these averaged herding measures that differ from zero will constitute evidence in favor of herd behavior.

Despite its popularity, the Lakonishok-Shleifer-Vishny herding measure has several shortcomings (Bikhchandani and Sharma, 2000). First, the measure limits the ability to differentiate between herding and a rational response of investors to publicly available information, thus failing to account for changes in fundamentals. Second, since it is not possible to trace inter-temporal trading behavior with the Lakonishok-Shleifer-Vishny measure, it is also not possible to determine whether a particular investor persists to herd. Third, taking only the number of active investors and disregarding the value of the stocks the trade threatens to overlook herding which can in fact be present. Finally, as shown in Jones, Lee and Weis (1999), the expected value of $H_{i,t}$ may be negative, since for low activity stocks the adjustment factor, $AF_{i,t}$, may take large values.

Feedback trading, which is a particular case of herding, presumes a relationship between past stock returns and current investor demand. It refers to acquiring stocks that were past winners and selling those that were past losers. Positive feedback trading strategies have been given much attention in the academic literature since they were believed to aggravate price destabilization (Lakonishok, Shleifer and Vishny, 1992). To estimate the extent of positive feedback trading we use the measures applied by Jones, Lee and Weis (1999), which are slight modifications to those initially proposed in Lakonishok, Shleifer and Vishny.

The so-called numbers ratio measure, $nratio_{i,t}$, is defined as:

$$nratio_{i,t} = B_{i,t} / (B_{i,t} + S_{i,t}) - p_t, \quad (3)$$

where, as in (1), $B_{i,t}$ is the number of institutions that purchased stock i in period t and $S_{i,t}$ denotes the number of investors which sold the stock. p_t is the average proportion of the investors that increased their holdings in a given stock during a given period. The modification by Jones, Lee and Weis consists in subtracting p_t from the ratio of the number of buyers to the total number of institutions active in a stock in a given period. Thus, this measure estimates the relative demand as a fraction of investors moving in the same direction that is in excess of the average.

The dollars ratio measure, $dratio_{i,t}$, is calculated as:

$$dratio_{i,t} = \$B_{i,t} / \$ (B_{i,t} + S_{i,t}) - \$p_t, \quad (4)$$

where $\$B_{i,t}$ ($\$S_{i,t}$) is the zloty amount of stock i bought (sold) by the investors in period t and $\$p_t$ denotes the average proportion of the institutional holdings increase in a given period, also denominated in zlotys.⁸ The $nratio$ and the $dratio$ measures can be viewed as complementary. While the $nratio$ measure provides an indication of the number of investors that increased their holdings in a particular asset during a given period, regardless of the extent of the ownership changes, the $dratio$ measure

8 We follow the original name of the dollars ratio feedback trading measure, as introduced in Lakonishok, Shleifer and Vishny (1992). However, since the reported values of pension fund holdings are expressed in the national currency, the Polish zloty, the values of $\$B_{i,t}$ ($\$S_{i,t}$) are also expressed in zlotys.

focuses instead on the zloty amounts of the shares being traded. Higher absolute values of *nratio* and *dratio* measures reflect stronger investor demand or supply for a given stock. We calculate values of these two measures and average them across different groups of stocks categorized by size and past returns, trying to shape trading patterns in terms of stock characteristics.

Additionally, Lakonishok, Shleifer and Vishny (1992) used a measure of excess institutional demand, $exdemand_{i,t}$, computed as:

$$exdemand_{i,t} = (\$B_{i,t} - \$S_{i,t})MVE_{i,t}, \quad (5)$$

where $\$B_{i,t}$ and $\$S_{i,t}$ are as defined above and $MVE_{i,t}$ denotes the market value of stock i in period t . $MVE_{i,t}$ serves as a scaling factor which enables us to distinguish the effect of the excess demand on moving stock prices. Positive values of $exdemand_{i,t}$ for a group of stocks indicate that the group is in excess demand, and negative values indicate excess supply. Computed values are again averaged across groups clustered by the extent of excess demand and past period returns. The available data enables us to perform the grouping by past returns only for the stocks in excess demand (in which investors are net buyers), since the low number of stocks in excess supply (in which investors are net sellers) precludes such segmentation.

4. DATA DESCRIPTION

In this study we use data on pension funds' ownership which relies on reports on the structure of their portfolios. According to the Decree of the Polish Council of Ministers of July 3, 2001, on the financial reports on joint security portfolios, investment funds are obliged to provide annual and semi-annual reports on their portfolio structures, including the names of the stocks and their proportion of total fund holdings. Pension funds are required to disclose these data to the public to keep current and potential investors informed about the level of risk exposure of the funds' investments. The data set used in the study was obtained from *Analyze Online*, a company that specializes in

the collection, analysis and distribution of data on Polish financial markets.

Our data set relies on the semi-annual and annual reports for 17 pension funds for the four year period from 1999 to 2002.⁹ In 2003 new legislation was introduced that changed the way the minimum rate of return is calculated. Since it may have an impact on the extent of herding displayed by pension funds, the year 2002 constitutes a natural end for our sample. Pension fund ownership reports contain the name, the value (expressed in Polish zlotys), and the proportion of each asset in the portfolio at the end of the year.¹⁰ We end up with the sample which contains 484 stock-periods.

Though in terms of the number of years this data set is short, it is not only the length of sample that is important, but also the number of securities, since the values of the herding and feedback trading measures are first averaged across the stocks. We analyze 121 stocks and the final sample comprises reasonable 484 stock-periods. This argument is especially relevant taking into account the fact that the dynamics of herding and feedback trading measures are not investigated. The focus is rather on the extent of herding and feedback trading activities by pension funds.¹¹

Our data set includes ownership reports for 17 funds that existed in the 1999–2002 period. Four smaller funds, that also operated during this period, had failed to attract significant number of participants and assets, were absorbed by larger ones. They are excluded from our study as the data on their investment portfolios are not available. A number of studies have pointed out the importance of survivorship bias in the context of performance persistence analysis (Brown et al., 1992; Grinblatt and Titman, 1992; and Carpenter and Lynch,

9 It should be noted that compared to the majority of mature stock markets, for which the year 2000 was dominated by the crash, this year was not an unusual year for the Polish market. In 2000 the WIG lost minor 1.3% and blue-chip index WIG20 even demonstrated some 1.5% rise. Therefore, we do not expect that our results are affected by including this year into our sample.

10 The pension fund portfolios besides corporate stocks also include stocks of the National Investment Funds, treasury bills and bonds.

11 In an earlier version of this paper we relied on a data set consisting of the three year period 1999–2001 and 363 stock-periods. The findings of the extended sample do not change our conclusions. Thus far our empirical results are robust.

1999). However, in the case of our sample the core of the findings should not be affected by the composition of data for the following two reasons.

First, the assets of the four liquidated funds accounted for only 2.6% of the total assets in the pension fund market, with three of the funds accounting for less than 1% and one fund accounting for about 1.6% of all pension fund assets (www.knuife.gov.pl). These funds were absorbed because of their failure to gain significant market share rather than because of inferior investment skills or poor performance (Stanko, 2003a). Moreover, excluding non-survivor funds we face a trade-off ensuring a minimal reasonable length of the sample. Second, it is well known that smaller institutions tend to be more often engaged in herding than the larger ones. As funds excluded from the study were small relative to the rest of the pension funds, we expected that having included them in the sample, we would get even stronger support in favour of herding.

Relying on the yearly pension fund ownership data, it is possible to estimate the value of purchases (sales), $B_{i,t}$ ($S_{i,t}$), of stock i in period t by subtracting the holdings in the current period from the holdings in the previous period.¹² The data on institutional ownership are supplemented by data on daily stock prices and stock capitalization, obtained from the WSE. To describe pension fund portfolios by the past performance of the stocks owned, we consider holdings of all pension funds as if they were one universal fund and we classify the stocks into five quintiles based on their past performance. The procedure is repeated for every period. When quintile compositions are known, we are able to calculate how much from each performance group is being purchased, sold or held by all pension funds.

It follows from the results reported in Table 1 that pension fund holdings in the extreme quintiles are skewed towards past winners. 54% of funds' assets are allocated to stocks from the top two performance quintiles and 32% of the assets are

12 However, since we do not possess information about the trading of the pension funds during a year, we are not able to account for possible changes in ownership that take place throughout the period.

Table 1
Holdings of Pension Funds by Past Performance

	<i>Past Performance Quintile</i>				
	<i>1 (Best)</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5 (Worst)</i>
Quintile Holdings as % of Total Holdings	23	31	13	22	10
Purchases in Quintile as % of Total Purchases	33	42	8	8	10
Sales in Quintile as % of Total Sales	14	31	11	13	31

Notes:

Total holdings are aggregated holdings of all pension funds as of one universal fund and then are assigned into quintiles according to the past performance of the assets. 1 indicates the quintile including stocks that performed the best in the past period and 5 indicates the quintile including stocks that performed the worst.

allocated to the two quintiles including stocks with the poorest performance (columns 1, 2, 4 and 5). Moreover, it also appears that funds are much more disposed towards purchasing stocks with excellent past performance which amounts to about 75% of total buys (columns 1 and 2). At the same time funds try to dampen the proportion of extreme losers (column 5). Sells in the worst performance quintile account for 31% of total sells whereas buys equal only 10%. Thus, funds are intensively selling extreme losers and buying extreme winners. This apparent discrepancy between the past performance of the assets that are being purchased and sold may serve as preliminary evidence on positive feedback trading.

5. EMPIRICAL RESULTS AND COMPARISON WITH PREVIOUS LITERATURE

(i) Empirical Results on Herding

The main findings on herding in our sample of Polish pension funds are represented in Table 2. The first column in Panel A provides the values of the Lakonishok-Shleifer-Vishny herding measure computed across all stocks owned by pension funds. The number 0.226 implies that if it is assumed that 50% of the ownership changes were increases, then 77.4% of all investors were changing their position in a stock in one direction and 22.6% in the opposite direction. Panel A also provides values of

the herding measure for stocks partitioned by the total number of investors trading these stocks. As expected, the Lakonishok-Shleifer-Vishny statistic attains its highest value (0.216) for the stocks traded by a substantial number of institutions (more than 15). The measures in Panel B suggest that among the actively traded stocks, i.e., stocks traded by more than ten investors, institutions herd more into stocks from the largest size quintiles, where size is defined in terms of capitalization.¹³

The values of the herding measures reported in Table 2 are rather high in comparison with the statistics reported for pension funds in mature markets. The magnitude of herding revealed by Wermers (1999) is 0.034 while Lakonishok, Shleifer and Vishny (1992) and Jones, Lee and Weis (1999) obtained even smaller values of 0.027 and 0.016, respectively. An explanation for such substantial herding found in our sample of Polish pension funds could stem from the above-mentioned regulatory framework of the funds' performance evaluation. Since the minimum required rate of return is

Table 2
Herding Measures by Trading Activity

Panel A: Herding Measures			
	<i>Number of Active Institutions</i>		
<i>All Stocks</i>	<i><10</i>	<i>10–15</i>	<i>>15</i>
0.226	0.187	0.133	0.216
Panel B: Herding Measures for Actively Traded Stocks			
	<i>Size</i>		
<i>1 (Largest)</i>	<i>2</i>	<i>3 (Smallest)</i>	
0.239	0.136	0.116	

Notes:

The mean of the Lakonishok-Shleifer-Vishny statistics across periods for a given group of stocks are presented. In Panel B, 1 indicates the quintile including stocks with the largest capitalization and 5 indicates the quintile including stocks with the smallest capitalization.

13 Since the 'small' nature of our data base implies high standard errors of the measures, we rely solely on the point estimates without reporting their standard errors.

computed as a weighted average of the rates of return achieved by all pension funds, the high concentration of the pension fund market results in a heavy influence of the returns attained by the largest institutions.

Moreover, the quarterly frequency at which the minimum required rate of return is calculated and announced provides pension fund managers with the additional incentive to undertake short-term investment strategies to avoid falling behind their peers. Smaller pension funds aiming not to under-perform their larger counterparts and to avoid penalties in case of their failure to achieve the minimum required return, simply track the investment behavior of large pension funds.

Our results are in line with the findings of Blake and Timmermann (2002) who state that when the evaluation benchmark is set to a weighted average, the safest investment strategy is the one followed by the market leaders. Our findings also support the widespread belief that smaller pension funds in the Polish stock market are imitators of the actions of the larger ones. Among the consequences of herd-like behavior are identical financial outcomes, reduced competition among the pension funds, and higher opportunity costs arising from giving up long-term investment strategies that might provide funds with larger capital accumulation.¹⁴

Since it is likely that investors are involved in herding in particular groups of stocks, we proceed with the analysis of herding for stocks classified by size, past performance, and industry. These results are shown in Table 3. Panel A demonstrates that when divided by size, the two highest values of the Lakonishok-Shleifer-Vishny herding measure (0.201 and 0.214) correspond to the two smallest size quintiles. However, the relationship is not monotonic. Herding in the larger stocks, although smaller, amounts to a value of 0.201 for the largest size quintile.

The literature provides two types of explanation that justify a higher degree of herding in small stocks compared to larger stocks. Depending on the motivation behind investment

14 For the discussion of pension fund evaluation measures and their influence on fund performance, see Blake and Timmermann (2002) and Blake, Lehmann and Timmermann (2002). For an analysis of the performance of Polish pension funds see Stanko (2003a).

Table 3

Herding Statistics by Firm Size, Past Performance, and Industry

Panel A: Firm Size Quintile				
<i>1 (Largest)</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5 (Smallest)</i>
0.201	0.137	0.178	0.201	0.214
Panel B: Past Performance Quintile				
<i>1 (Best)</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5 (Worst)</i>
0.186	0.210	0.187	0.148	0.201
Panel C: Industry				
<i>Banking</i>	<i>Computer Services</i>	<i>Construction</i>	<i>Metal Production</i>	<i>Pharmaceuticals</i>
0.188	0.137	0.128	0.203	0.128

Notes:

The mean of the Lakonishok-Shleifer-Vishny statistics across periods for a given group of stocks are presented. In Panel A, 1 indicates the quintile including stocks with the largest capitalization and 5 indicates the quintile including stocks with the smallest capitalization. In Panel B, 1 indicates the quintile including stocks that performed the best and 5 indicate the quintile including stocks that performed the worst in the previous period.

decisions, it distinguishes between intentional and unintentional herding. Intentional herding arises due to the lack of analyst coverage and publicly available information about small firms, which prompts investment managers to pay more attention to the actions of other investors (Bikhchandani and Sharma, 2000; and Lakonishok, Shleifer and Vishny, 1992). Unintentional herding arises when investors, not deliberately emulating other's behavior, undertake identical investments when facing similar decision problems.¹⁵ For example, investors may seek to dispose of small poorly performing stocks due to evaluation concerns. This so-called 'window dressing' phenomenon was brought forth by Lakonishok et al. (1991). Such behavior is more distinct in smaller rather than in larger stocks, since the latter are held by many investors.¹⁶

15 For theoretical models assuming unintentional herding, see Banerjee (1992), Scharfstein and Stein (1990) and Froot, Scharfstein and Stein (1992).

16 Selling extreme losers is probably the most widely used, though by no means the only form of window dressing. Other forms of window dressing are slowing down the pace of selling winners and buying losers (Lakonishok et al., 1991).

Additionally, we analyse herding intensity conditional on past return performance. The findings reported in Panel B show that herding is the highest for the second winner quintile (column 2) with a herding measure of 0.210. Fund investors also seem to follow herd-like behavior in extreme losers. This performance quintile also demonstrates a very high magnitude of herding (0.201). It is difficult, however, to discern a monotonic relationship conditional on the past performance history.

In Panel C we provide results for stocks classified by industry, since one may expect a higher degree of herding for stocks that belong to certain branches. This hypothesis is attributed to the sentiments that investors may share regarding particular industries, associated with uncertainty about the profits and cash flows of those industries. From the data set on pension fund holdings we determined the five industries in which institutions allocate their funds most often. These industries are the banking, computer services, metal production, pharmaceuticals and construction. They reflect the industrial composition of the blue-chip index WIG20, in which a considerable fraction of the pension fund stock holding is concentrated. In fact, metal production, banking and computer services show a higher magnitude of herding (0.203, 0.188 and 0.137) relative to stocks that belong to construction and pharmaceuticals industries (both 0.128).

Finally, Table 4 presents herding statistics aggregated across both past return performance and the size of stocks. All stocks held in the pension fund portfolios were first divided into five

Table 4
Herding Measures by Size of Stocks and Past Performance

<i>Past Performance Quartiles</i>	<i>Size Quintiles</i>				
	<i>1 (Largest)</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5 (Smallest)</i>
1 (<i>Best</i>)	0.176	0.118	0.204	0.237	0.167
2	0.206	0.159	0.245	0.167	0.153
3	0.162	0.203	0.116	0.232	0.261
4 (<i>Worst</i>)	0.213	0.145	0.143	0.100	0.229

Note:

The mean of the Lakonishok-Shleifer-Vishny statistics across periods for a given group of stocks are presented.

size quintiles, which then were assigned into four performance quartiles. This stock partitioning is motivated by the consideration that there can be an overlap between the small actively traded and poorly performing firms. It emerges from Table 4 that pension fund managers display a very high extent of herding into the two worst performance quartiles of the smallest stocks (column 5), with the values of the herding statistics attaining 0.261 and 0.229. Herding in the second largest size group (column 1) attains a considerable value of 0.206. However, the highest value in the largest quintile is achieved in the group of the extreme losers, for which the herding measure equals 0.213.

Remarkably, medium and smaller stocks with the best past performance also demonstrate a considerable degree of herding reaching 0.204 and 0.237. High values of the Lakonishok-Shleifer-Vishny herding measure, exceeding 0.200, are concentrated in columns 3 to 5, i.e., those containing results for the smaller stocks. It should be noted that patterns in trading behavior are more apparent in terms of the size of the assets rather than in terms of their performance, making it difficult to discern any monotonically changing pattern in the dual size-performance classification.

(ii) Empirical Results on Feedback Trading

Finding a relationship between investor demand and past stock performance will provide evidence in favor of the presence of feedback trading. To assess the extent of institutional feedback trading we use the dollars ratio and the numbers ratio discussed in Section 3. The findings are shown in Table 5 where we use the same dual partitioning of stocks in terms of their size and past history as in Table 4. The dollars ratio measures in Panel A indicate that pension funds aspire to sell stocks of the smallest companies (column 5) and especially those with medium performance. The overall minimum value (-0.182) corresponds to the smaller stocks with a poor past performance. Remarkably, the negative values of the dollars ratio measure are clustered in columns 3 to 5, i.e., in the medium and small stocks. This finding is consistent with the general view that the higher level of uncertainty attributed to smaller firms disposes fund

Table 5

Demand of Pension Funds by Size and Past Returns

<i>Past Period Performance</i>	<i>Size</i>				
	<i>1 (Largest)</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5 (Smallest)</i>
Panel A: Dollars Ratio Measures					
1 (<i>Best</i>)	0.307	0.299	0.052	0.106	0.042
2	0.232	0.162	0.015	0.162	-0.130
3	0.214	0.105	-0.074	-0.182	-0.086
4 (<i>Worst</i>)	0.251	0.025	-0.018	0.071	0.102
Panel B: Numbers Ratio Measures					
1 (<i>Best</i>)	0.278	0.197	0.062	0.197	0.037
2	0.171	0.083	0.028	0.019	-0.306
3	0.190	0.105	-0.076	-0.181	0.050
4 (<i>Worst</i>)	0.065	0.041	0.000	0.001	-0.034

Note:

The mean of the dollars ratio and the numbers ratio statistics across periods for given stock groups are presented.

managers to imitate the actions of other investors for evaluation reasons.

The insufficient liquidity of the Polish stock market may be an additional reason for the unwillingness of pension funds to hold small losers. Since small stocks are characterized by especially low liquidity and pension fund holdings are usually large relative to the market, it may require a considerable amount of time for a fund to exit a position in stock.¹⁷ Thus, fears of inability to quickly correct unprofitable investment decisions may provide the pension funds with an additional incentive to sell small poorly performing stocks. Remarkably, for the largest winners (column 1) the dollars ratio measure takes the overall maximum amounting to 0.307. Independently of the past period return, dollars ratio measures for the largest stocks always take values of more than 0.200, suggesting that the largest stocks are being excessively demanded by pension funds.

The herding discovered in the two extreme size-performance groups in Section 5(i) manifests itself through positive feedback

17 Selling a stock completely may require a pension fund to participate in up to twenty trading sessions. Sometimes several dozen trading sessions may be needed (Karpinski, 2003).

trading in large winners and smaller losers. At the same time, a contrarian type of behavior is more prevalent in large losers and the smallest winners. These findings are consistent with the results in Table 1 described in Section 4 and show pronounced differences between the past performances of purchased and sold stocks. Our results are also in line with the evidence on feedback trading documented by Jones, Lee and Weis (1999) for the US market.

The results on the numbers ratio measures are presented in Panel B. A numbers ratio value of 0.278 shows that institutions are apt to buy stocks from the largest size quintile with best past period performance but are reluctant to buy small stocks (column 5), with the smallest value of the numbers ratio measure (-0.306). The fraction of the institutions buying is low in the fifth size group. Again, the higher values of the feedback trading measure in Panel B are concentrated in columns 1 and 2, i.e., in the two larger size quintiles, whereas the smaller and the negative values are clustered in the columns 3 to 5, displaying results for the smaller stocks.

(iii) Current Returns and Excess Institutional Demand

The excess demand measure described in Section 3 helps to uncover the effects of herding and feedback trading that are unrelated to past stock returns. For this purpose contemporaneous size-adjusted stock returns are grouped according to their past period returns and values of the excess demand measure. The available data permits us to perform the grouping by past performance only for the stocks in excess demand (in which investors are net buyers). The low number of stocks in excess supply (in which investors are net sellers) does not allow us to perform such segmentation.

If negative (positive) contemporaneous returns coincide with poor (good) past performance regardless of the value of the excess supply (demand) measures, then changes in the returns can be attributed exclusively to momentum. If stocks with extreme negative (positive) returns correspond to the large excess supply (demand) measure no matter how well they performed in the past, this will indicate that contemporaneous returns are driven solely by institutional demand.

It emerges from Table 6 that stocks which performed best in the past and are now experiencing large excess demand demonstrate a negative size-adjusted return of -1.07% . The worst past performers continue to display a negative return (-1.69%). This indicates that momentum appears to surpass the influence of institutional trading. Small excess demand stocks display considerable positive returns in the best and average past performance groups, while worst performers display a relatively small return of 0.25% . The absence of the apparent link between the extent of institutional demand and past stock performance casts doubts on the conjecture that returns of the stocks experiencing excess demand are driven by institutional traders in the next period.

Returns of the stocks in excess supply show negative current returns independently of the extent of excess supply. The stocks in which pension funds are net sellers exhibit very high negative returns of -10.05% and -31.10% . Stocks in large excess supply do not demonstrate larger negative returns than those being sold for less. This result shows that positive feedback trading does not reinforce a momentum effect in the returns of the damped stocks. The negative contemporaneous returns documented for groups of stocks in excess demand show that institutional trading is not crucial in explaining posterior returns movements of the acquired stocks.

Table 6

Contemporaneous Size-Adjusted Returns by Past Returns and Levels of Excess Demand and Supply

<i>Firms in Excess Demand</i>	<i>Past Period Returns</i>			<i>Firms in Excess Supply</i>
	<i>1 (Best)</i>	<i>2</i>	<i>3 (Worst)</i>	
Large Excess	-1.07	3.30	-1.69	-10.05
Small Excess	5.49	3.04	0.25	-31.10

Notes:

The stocks are first divided into two groups conditional on whether they are in excess demand or excess supply based on the values of measure (5). Stocks in excess demand are grouped by their past period performance. The procedure is repeated every period. The figures displayed show the value of the current returns averaged across the assets in the group and the periods.

6. CONCLUSION

In this paper, we investigate the degree to which pension fund investors follow herd-like and feedback trading behavior as well as their effects on price formation in the developing stock market of Poland. Since Polish pension fund managers, contrary to their peers in mature markets, face substantial limitations in their investment activity, we examine the extent of herding and feedback trading displayed by pension funds in this regulatory framework.

The application of the widely used measure suggested by Lakonishok, Shleifer and Vishny (1992) enables us to compare the degree of herding and feedback trading between the Polish and developed stock markets. The estimated values of herding and positive feedback trading measures for Polish pension funds are considerably higher than the corresponding values reported for mature markets. We attribute these findings to the specific regulatory framework that includes relative performance evaluation and penalty structure and the high concentration in the Polish pension fund industry.

Our results provide evidence of substantial herding by Polish pension fund managers, especially in small size stocks and stocks of particular industries, like computer services, banking and metal production. Conditional on the past return performance, substantial herding is detected in both past winners and past extreme losers. We also find that pension fund managers in Poland are apt to track positive feedback trading strategies, being actively engaged in selling stocks of smaller firms that performed poorly in the past period and acquiring well-performing stocks with large capitalization. We do not find, however, that herding and positive feedback trading by the institutions have a significant effect on the next period prices of Polish stocks.

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