The impact of institutional investors on equity markets and their liquidity

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Chapter 6

The impact of domestic institutional investors on the Hungarian equity market

6.1 Introduction

Hungary was one of the first transition countries to adopt and systematically start implementation of the reform of its social security system. One of the positive externalities of the reform was probably the enhanced growth of other, non-pension, financial institutions. Pension funds and mutual funds have exhibited respectable growth rates in the last few years. The level of household savings collected through pension and mutual funds is expected to increase further. These savings will have to be channeled to the financial markets and an important part of them will most likely be directed to the domestic equity market. For this reason, the presence and operations of pension and mutual funds are expected to have an impact on the Hungarian equity market and its liquidity.

The impact of Hungarian pension funds and mutual funds on the domestic equity market is the focus of this chapter. We analyze in more detail the impact of domestic mutual funds on the equity market of the Budapest Stock Exchange (BSE) in the first decade of the funds' operations. The scope of our empirical analysis is limited by the availability of relevant data. Because the transaction data for individual funds or individual shares was not available, we look at the aggregate impact of funds on the equity market. We exclude foreign institutional investors from the analysis because we have no data on them. We first inspect the data to see whether mutual funds are an important group of non-bank institutional investors in Hungary, and whether voluntary and mandatory pension funds have any impact on the equity market and its liquidity. Then, we test two hypotheses: 1)
Mutual funds have a significant impact on the Hungarian equity market's prices; 2) The impact of mutual funds on the equity market's liquidity is becoming stronger over time.

The degree of the impact of mutual funds and pension funds depends largely on their investment strategies and trading patterns. It is important whether funds act purely as portfolio managers or whether they also have aspirations to exert control in the firms whose shares they own. The stronger their control-orientation, the lower the trading intensity may be. Funds that characterize themselves as active portfolio managers can be expected to have higher portfolio turnovers and thereby add to equity market liquidity through their frequent trading.

Our results show that the rapid growth of assets of pension funds and mutual funds in the period 1992-1999 is not reflected in their impact on the official equity market and its liquidity. First, pension funds invest most of their assets in safe government and other debt securities. Second, the flow of money into the open-end funds, the prevailing type of mutual funds in Hungary, does not have a significant impact on the stock market returns. Third, the structural change in the investment fund industry diminished the impact of trade in fund shares on the overall trading volume of the stock market. On balance, our analysis suggests that the still developing domestic Hungarian pension funds and mutual funds have had little impact on the market prices of shares (and their returns) in the last decade.

To our knowledge, the impact of institutional investors on the equity market has not been studied for Hungary (or any other transition economy) before. The reform of the social security system in Hungary attracted policy-oriented research, but the interactions between institutional investors and the liquidity of the equity market were not in its focus. However, there is a large body of related literature on the impact of institutional investors on other capital markets around the world. We reviewed this literature in Chapters 3 and 4 of this dissertation. In this chapter we follow the methodology of some recent empirical papers which focus on the aggregate price impact of institutional trading. We take the price impact of institutional trades as a measure of liquidity. Our empirical analysis builds on the papers by Warther (1995), Mosebach and Najand (1999), and Edelen and Warner (1999), who estimate the relationships between net fund flows, equity market prices and returns and trading volume of shares.

The chapter is organized as follows. In Section 2 we briefly describe the Budapest Stock Exchange and its equity market. In Section 3 we give an illustration of the size of the Hungarian institutional investors and discuss the composition of their assets. We look
separately at pension funds and mutual funds. For pension funds, we provide a qualitative evaluation of their impact on the domestic equity market. Section 4 brings an analysis of the ownership structure of those firms whose shares are listed on the BSE. In Section 5 we analyze the impact of Hungarian open and closed-end mutual funds on the equity market and its liquidity. Section 6 summarizes the main findings and concludes with some suggestions for future research.

6.2 The Budapest Stock Exchange

The Budapest Stock Exchange was founded in 1864 as the Commodity and Stock Exchange. It was closed in 1948 and re-opened on June 21, 1990. The first years of the BSE’s operations in the 1990s were characterized by small market capitalization and low trading volume. Due to Hungary’s low investment grading, the BSE was not attractive enough for foreign investors. The domestic investor base was not there either. As a result, only a few shares had any significant trading volume. With new shares introduced to the market in 1994 and 1995, and the financial position of Hungary stabilizing, the total market capitalization of the exchange grew substantially in the period 1996-1999. Relative to the previous year, it almost doubled in 1996 (see Table 6.1). After 1996, the growth slowed down but remained positive. The total trading volume of the BSE shows a similar pattern, irrespective of whether we look at the annual figures or the average daily numbers.

The BSE has a quote-driven electronic trading system (introduced in 1999), and uses market-makers. In addition to shares, government bonds, treasury bills, corporate bonds, closed-end fund units and compensation notes are also traded on the BSE. The market for shares consists of three segments: A, B and C. The listing requirements for category A are the most stringent. Most shares are listed in category B. The shares of closed-end mutual funds are traded in a separate segment of the exchange. The descriptive statistics in Table 6.1 show that, despite the falling number of total securities traded on the exchange, the number of listed shares has been increasing steadily since 1990.

However, the market for shares was relatively passive and undeveloped until 1995. When foreign investors discovered Hungarian shares, the trading volume and market capitalization of the BSE started to increase fast. The equity market reached record levels in three years (1997-1999). Foreign investors now account for almost 75% of the trading volume of the exchange.³

Relative to GDP, the total equity market capitalization of the BSE rose from 4.2% of GDP in 1994 to 36.6% of GDP in 1997 (see also Figure 6.2). In 1998, it dropped to 29.6%. This drop is also a consequence of the drop in the average level of share prices in that year. The


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<tbody>
<tr>
<td>Number of securities listed on the BSE</td>
<td>6</td>
<td>22</td>
<td>40</td>
<td>62</td>
<td>120</td>
<td>166</td>
<td>167</td>
<td>149</td>
<td>144</td>
<td>135</td>
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<tr>
<td>- of which shares</td>
<td>6</td>
<td>20</td>
<td>23</td>
<td>28</td>
<td>40</td>
<td>42</td>
<td>45</td>
<td>49</td>
<td>55</td>
<td>66</td>
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<tr>
<td>- of which mutual fund units</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>6</td>
<td>20</td>
<td>36</td>
<td>33</td>
<td>20</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Total BSE capitalization (USD million)</td>
<td>267</td>
<td>709</td>
<td>2404</td>
<td>4538</td>
<td>7985</td>
<td>8757</td>
<td>15659</td>
<td>25136</td>
<td>25396</td>
<td>28932</td>
</tr>
<tr>
<td>Total BSE trading volume (USD million, double counted)</td>
<td>97</td>
<td>131</td>
<td>426</td>
<td>2017</td>
<td>1961</td>
<td>2022</td>
<td>7502</td>
<td>36040</td>
<td>64243</td>
<td>67122</td>
</tr>
<tr>
<td>Average daily trading volume (USD million)</td>
<td>0.5</td>
<td>0.5</td>
<td>1.7</td>
<td>8.0</td>
<td>7.8</td>
<td>8.1</td>
<td>30.2</td>
<td>145.9</td>
<td>259.0</td>
<td>268.5</td>
</tr>
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</table>

Source: Budapest Stock Exchange.

The movement of average prices of shares is represented by the stock market index, BUX. The BUX series is plotted in Figure 6.1. BUX remained at relatively low values until 1996, when it started to rise substantially. The sharp drop in 1998 was due to the consequences of foreign investors’ responses to the Russian financial crisis. Its effect faded away by 1999.

The relative importance of the equity market within the BSE exhibits a lot of variation over time. In Figure 6.2 we plot the share of the equity market in the overall BSE capitalization for 1990-1999. The equity market dominated the market capitalization (and the total trading volume) of the exchange in 1990 and 1991. In the following two years, the relative importance of the equity market dropped substantially. It gradually increased in 1994-1997. Equity market has accounted for almost half of the total trading volume and total market capitalization of the exchange in recent years.

The BSE is not the only market for Hungarian shares. Many shares traded in the BSE are...
simultaneously traded on other European exchanges. Some shares are traded exclusively abroad. The figures in Table 6.2 indicate that SEAQ, organized by the London Stock Exchange, is by far the most important market for Hungarian shares in terms of trading volume. That does not apply for all shares, however. There is a lot of variation among shares in this respect. Some of the shares are traded primarily in Budapest, others in London, or elsewhere. The relative share of the trading volume of the BSE in the aggregate has been increasing, mostly at the expense of SEAQ and the Munich Stock Exchange.\(^5\)

The strong presence of foreign institutional investors on the BSE and the increasing relative share in trading volume of the domestic equity market are both relevant for our analysis. Low liquidity of the local Budapest market might be one reason why the majority of trading in Hungarian shares takes place outside the ESE, although not necessarily so.\(^6\) The increasing relative share of the BSE in the overall trading volumes of the Hungarian shares might be due to improved liquidity and recent technological advances. The latter are expected to have a positive effect on market liquidity as well. The growing domestic

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\(^5\) The 'migration' of stocks to London has also been observed in some Western European countries (see for example, De Jong et al. (1995)).

\(^6\) See De Jong et al. (1995)) for other possible explanations for the flight of stocks to London's SEAQ International.
Chapter 6. Institutional investors and the Hungarian equity market

Equity market capitalization (% of GDP)

Figure 6.2: Equity market capitalization as a percentage of GDP and as a percentage of total BSE market capitalization, 1990-1999.

institutional investor base, which we describe in the next section, is another important force that might enhance market liquidity.

6.3 Hungarian institutional investors

Hungary does not have a strong tradition in the investment industry. The non-bank financial institutions like pension funds and mutual funds have a history lasting less than a decade. The investment industry is still in its infancy and considerably lags behind the developed economies in terms of its size and importance for the overall financial sector. With the pension reform adopted in 1997, this picture began to change. Mandatory pension funds that constitute the second pillar of the Hungarian pension system are an important addition to the existing (voluntary) pension funds, open-end and closed-end mutual funds.\footnote{Since April 1, 2000, funds (mutual and pension), banks, insurance companies and capital markets fall under the supervision of one agency.}

As indicated by the numbers in Table 6.3, institutional assets are low relative to GDP,
Table 6.2: Some descriptive statistics on the relative importance of the BSE as a market for Hungarian shares in 1995-1998.

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<tr>
<td>BSE</td>
<td>42</td>
<td>45</td>
<td>49</td>
<td>55</td>
</tr>
<tr>
<td>London</td>
<td>29</td>
<td>31</td>
<td>35</td>
<td>41</td>
</tr>
<tr>
<td>Munich</td>
<td>16</td>
<td>20</td>
<td>20</td>
<td>25</td>
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<td>Vienna</td>
<td>10</td>
<td>10</td>
<td>9</td>
<td>9</td>
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<tr>
<td>Stuttgart</td>
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<tbody>
<tr>
<td>BSE + Hungarian OTC market</td>
<td>24.9%</td>
<td>33.4%</td>
<td>44.0%</td>
<td>44.7%</td>
</tr>
<tr>
<td>London</td>
<td>67.8%</td>
<td>59.3%</td>
<td>55.3%</td>
<td>55.2%</td>
</tr>
<tr>
<td>Munich</td>
<td>7.3%</td>
<td>6.8%</td>
<td>0.6%</td>
<td>0.1%</td>
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<tr>
<td>Vienna</td>
<td>-</td>
<td>0.3%</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>Stuttgart</td>
<td>-</td>
<td>0.1%</td>
<td>0.0%</td>
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but their absolute asset value is growing continuously. In eight years, the total value of institutional assets grew from 2.5% of GDP to over 8% of GDP. Relative to some other OECD countries with more developed financial systems, like the Netherlands (169% of GDP in 1996), the UK (193% of GDP in 1996) or the US (181% of GDP in 1996), the percentage of Hungarian institutional assets in GDP is still low.\(^8\)

The relative size of institutional investors can be illustrated by comparing their asset value to the value of bank deposits of households and corporations (see Table 6.3). Bank deposits have been almost monotonically increasing in the last decade. However, they were growing at a significantly lower rate than the assets of mutual funds and pension funds. The total asset value of mutual funds and pension funds represented 7.2% of bank deposits in 1995. Three years later, at the end of 1998, this percentage was 39.3%. This may be viewed as another indicator of the increasing importance of non-bank institutional investors within the Hungarian financial system. The latter is also reflected in the composition of financial assets of Hungarian households through time, which we show in Table 6.4.

Households still invest the majority of their financial assets in bank deposits and bank securities. The percentage of assets in pension fund accounts and in mutual fund units (coupons) is increasing each year. According to BAMOSZ,\(^9\) the open-end mutual funds are

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\(^8\)Institutional assets include the assets of pension funds, mutual funds and insurance companies. The percentage of total institutional assets in GDP for 1997 and 1998 was estimated using the assumption that the total assets of insurance companies represent about 3% of GDP.

\(^9\)BAMOSZ is the Association of Investment Fund Management Companies of Hungary.

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<tr>
<td>Total asset value of mutual funds</td>
<td>-</td>
<td>5.3</td>
<td>17.9</td>
<td>38.6</td>
<td>59.8</td>
<td>116.6</td>
<td>245.7</td>
<td>335.7</td>
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<tr>
<td>(HUF billion, excl. real-estate funds)</td>
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<tr>
<td>Total asset value of voluntary</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6.8</td>
<td>23.4</td>
<td>57.4</td>
<td>101.6</td>
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<td>private funds (HUF billion)^a</td>
<td></td>
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<tr>
<td>Total asset value of mandatory</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>28.8</td>
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<td>pension funds (HUF billion)</td>
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<tr>
<td>Financial assets of institutional</td>
<td>2.5</td>
<td>2.4</td>
<td>2.6</td>
<td>3.8</td>
<td>4.1</td>
<td>5.7</td>
<td>7.0</td>
<td>8.6</td>
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<tr>
<td>investors as % of GDP^b</td>
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<tr>
<td>Bank deposits of households</td>
<td>567.6</td>
<td>658.1</td>
<td>661.8</td>
<td>743.9</td>
<td>926.8</td>
<td>1157.8</td>
<td>1089.7</td>
<td>1186.3</td>
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<td>and firms (HUF billion)</td>
<td></td>
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<td>Percentage of total financial</td>
<td>13</td>
<td>12</td>
<td>8</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>7</td>
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<tr>
<td>assets of institutional investors in</td>
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<td>shares^b</td>
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^a Includes pension funds, health funds and income-replacement funds.

^b Source: OECD (insurance companies also included).

Source: National Bank of Hungary and OECD.
6.3. Hungarian institutional investors

Table 6.4: Composition of financial assets of Hungarian households in years 1991-1999.

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<tr>
<td>Total financial assets of households (HUF billion)</td>
<td>929.6</td>
<td>1180.4</td>
<td>1393.9</td>
<td>1755.8</td>
<td>2192.0</td>
<td>2964.3</td>
<td>3875.7</td>
<td>4768.2</td>
<td>5645.1</td>
</tr>
<tr>
<td>- of which mutual fund units (in %)</td>
<td>0.2</td>
<td>0.4</td>
<td>1.0</td>
<td>1.8</td>
<td>1.8</td>
<td>3.3</td>
<td>5.4</td>
<td>5.6</td>
<td>6.5</td>
</tr>
<tr>
<td>- of which claims on pension funds (in %)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.01</td>
<td>0.3</td>
<td>0.7</td>
<td>1.5</td>
<td>2.8</td>
<td>4.4</td>
</tr>
<tr>
<td>- of which deposits and bank securities (in %)</td>
<td>68.3</td>
<td>67.9</td>
<td>66.8</td>
<td>64.1</td>
<td>64.2</td>
<td>64.1</td>
<td>58.5</td>
<td>56.3</td>
<td>53.4</td>
</tr>
<tr>
<td>- of which government securities (in %)</td>
<td>0.9</td>
<td>1.7</td>
<td>2.1</td>
<td>5.5</td>
<td>6.8</td>
<td>9.3</td>
<td>10.7</td>
<td>11.9</td>
<td>12.9</td>
</tr>
<tr>
<td>- of which life insurance reserves (in %)</td>
<td>4.0</td>
<td>3.5</td>
<td>3.7</td>
<td>3.3</td>
<td>3.6</td>
<td>3.8</td>
<td>4.1</td>
<td>4.4</td>
<td>5.2</td>
</tr>
<tr>
<td>- of which cash (in %)</td>
<td>20.3</td>
<td>20.8</td>
<td>21.1</td>
<td>19.0</td>
<td>17.4</td>
<td>14.8</td>
<td>12.9</td>
<td>12.4</td>
<td>13.3</td>
</tr>
<tr>
<td>- of which shares and corporate bonds (in %)</td>
<td>6.3</td>
<td>5.7</td>
<td>5.3</td>
<td>6.3</td>
<td>5.9</td>
<td>4.0</td>
<td>7.9</td>
<td>6.6</td>
<td>4.3</td>
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Currently the most rapidly developing household savings facility, with a 7% share of total household assets. The increase in the relative share of mutual funds, pension funds and life insurance companies comes primarily at the expense of bank deposits. The average annual growth rate of the proportion of household assets in domestic mutual funds was over 63% in 1991-1998. The annual growth rate of household assets in pension funds accounts is even higher, namely 120% in 1996-1998. The fall in the relative investment of households in bank deposits and bank securities decreased on average by 2.18% each year in the period 1991-1998. Being flexible enough to move into new lines of business and expand their set of services to include portfolio management, insurance policy sales and others, banks are managing to retain their dominant position.

In the remainder of this section we look separately at pension funds and mutual funds. We describe their history, the size of their assets and their portfolio structures. The latter can
give an indication of the relative importance of corporate shares among the assets of these institutions.

6.3.1 Pension funds

Hungary started the systemic reform of its pension system in May 1996. However, the first private voluntary pension funds were founded in 1994. In September 1997, the necessary legislation was passed and Hungary took on a new three-pillar pension system. As part of the reform, private voluntary health funds and income-replacement funds were also established, but they are relatively unimportant in asset value terms.

The initial growth of pension funds in Hungary was quite impressive and to a large extent due to tax incentives that were provided for the fund members. Still, the assets of the voluntary funds corresponded to 0.1% of GDP in 1995. This percentage was growing at the average annual rate of 63% in the period 1995-1998 (see Table 6.3). It reached 1.1% at the end of 1998. The number of voluntary pension funds was increasing accordingly. It started with 179 funds in 1995 and has stabilized at about 300 funds in recent years.

1998 was the first full year of operation of the mandatory private pension funds in Hungary. Their number underestimates their importance relative to the voluntary funds (there were 38 mandatory pension funds at the end of 1998). They present a higher proportion of GDP than voluntary funds did in their first year of operations (0.3% versus 0.1%). The number of their members after the first year of operations is also higher than was the case of voluntary funds. But the total asset value of mandatory funds is still more than three times smaller than the total asset value of voluntary pension funds.

The creation of private pension funds is expected to have positive externalities for the whole financial sector. Pension funds might stimulate the development and modernization of capital markets, lead to more efficient allocation of savings and promote economic growth (Vittas (1997)). If private pension funds attract savings away from the banking sector, the degree of competition among financial intermediaries is also expected to increase.

Banks and insurance companies soon realized their competitive advantages in marketing and backup capital provision and entered the fund management business. Most of the mandatory pension funds are today managed by insurance companies. It seems that banks...
and insurance companies were able to use the opportunities that the new financial institutions offered and made up for the loss in their traditional activities by providing asset management, insurance and other services.

The pension fund industry in Hungary is highly concentrated. In the case of mandatory funds, nearly 78% of all members were registered with the five biggest funds at the end of 1998. Also, 72% of the total assets were managed by the five biggest funds. The situation is not much different in case of voluntary pension funds. The eight biggest funds managed 40% of the total assets of the voluntary pension funds, and two-thirds of the members were concentrated within the 17 biggest funds at the end of 1998. Depending on their investment strategies, the few biggest funds may have had an impact on the equity market. This impact may not show at the overall market level, but instead on the liquidity of some of the listed shares.

**Portfolio structure of pension funds**

Savings collected by pension funds are channeled through the financial market into the assets of the appropriate quality. Part of these savings is placed in corporate shares through the equity market. In this way, pension funds can influence the liquidity of the organized equity market. Figure 6.3 shows that voluntary private pension funds invested less than 1% of their total assets in shares of Hungarian companies at the end of 1995. This percentage increased in the next two years, and reached almost 17% in 1997. At the end of 1998, voluntary pension funds invested 11% in shares, while almost 74% of their assets comprised treasury bills and government bonds. Mandatory pension funds have a similar composition of assets. Quarterly data for 1998 shows that their investment in shares ranged from 5.2% to 14.5% during the year. Mandatory funds invested up to 78% in government securities during 1998.

Such a portfolio structure of pension funds could be due to the thin local capital market, limited possibilities for investing abroad, the volatility of Hungarian stock prices, and the lack of familiarity with shares (Vittas (1996)). The legal restriction stating that voluntary funds cannot invest more than 40% of their assets in Category A shares of the BSE (Category II investment), and not more than 20% in shares classified as portfolio category III, does not seem to be binding since the equity investment of funds stayed well below these limits.\(^{14}\)

Mandatory pension funds are facing tougher investment restrictions, but they are still allowed to invest up to 30% of their assets in shares listed in Category A of the BSE. Furthermore, the Category B shares of the BSE and shares listed in organized markets of

\(^{14}\)The assets of pension funds are divided into three portfolio categories, ranging from least (Category I) to most risky (Category III). See Pánczky (1999) for details.
Chapter 6. Institutional investors and the Hungarian equity market

OECD countries should jointly not exceed 20% of the mandatory fund’s assets. Statistics show that mandatory funds invested less than 7% of their assets in shares at the end of 1998. Because the newly established funds have to build up a reputation of being safe and trustworthy institutions in the eyes of small investors, they have invested their assets primarily in the less risky financial instruments.

The portfolio composition of Hungarian pension funds resembles the asset structure of pension funds in countries that are usually described as bank-based, like Germany and Japan. Unlike pension funds in the US or UK, German and Japanese pension funds also invest most of their assets in bonds (40%-60%), while their investment in equity does not exceed 15% of total assets. In this respect, Hungarian pension funds are not an exception. Just like German and Japanese pension funds, Hungarian funds can be expected to have little impact on the equity market.

The investment of German pension funds in equity involves less than 10% of their total assets (Allen and Gale (2000)).
The impact of pension funds on the BSE equity market

The descriptive statistics on pension funds suggest that the impact of pension funds on the BSE equity market is probably very small for the following reasons. First, although the assets under the management of Hungarian voluntary and mandatory pension funds have been monotonically increasing, the percentage of assets that they invest in shares has not. Mandatory pension funds, which are subject to stricter investment restrictions, invested less than 7% of their assets in shares at the end of 1998. Voluntary funds invested more, but the percentage of their assets in shares has changed considerably through time.

Second, together with insurance companies, pension funds own less than two percent of the equity traded on the BSE (see Figure 6.7). Even if we assume that pension funds invested exclusively in domestic shares listed on the BSE, their investment in equities represented only 0.4% of the total equity market capitalization of the BSE at the end of 1998. That is obviously not high enough for any important impact on the equity market. However, if pension funds continue to grow with at same pace, the two factors we mentioned may soon be reversed. In particular, their shareholdings in individual companies might be increasing. Without detailed micro data on the ownership structure of Hungarian listed companies, it is hard to draw such conclusions at this stage.

The current impact of pension funds on the BSE equity market can be nicely summarized using the following quote from the 1999 study of the Hungarian State Pension Fund Supervision: "... it is assumed that the (Hungarian) citizens do not associate the (pension) funds with the Budapest Stock Exchange very directly." As long as pension funds hold most of their assets in government securities, the prospects that the current situation may change considerably, are relatively low. Mutual funds, on the other hand, are a different story.

6.3.2 Mutual funds

The legal basis for the establishment of mutual funds in Hungary is the Act on Investment Funds (Act LXIII/1991) passed in 1991. Mutual funds are becoming a more important investment vehicle for households each year. The progress of the pension reform may have additionally stimulated the growth of the fund management industry. From 1992 to 1998, the number of mutual funds increased from 5 to 78 (excluding real-estate funds). The asset value of mutual funds grew from HUF 5.3 to 335.7 billion in the same period. At the end of 1999, the total asset value of mutual funds was HUF 430.7 billion (USD 1.7 billion), and exceeded HUF 500 billion (USD 1.8 billion) in May 2000.

The internal structure of the mutual fund industry changed significantly in a few years.
Table 6.5: Some descriptive statistics on Hungarian closed-end and open-end mutual funds for 1992-1999.

<table>
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</thead>
<tbody>
<tr>
<td><strong>Closed-end funds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Asset value (HUF billion)</td>
<td>5.3</td>
<td>17.7</td>
<td>38.6</td>
<td>46.5</td>
<td>45.5</td>
<td>14.5</td>
<td>11.5</td>
<td>11.2</td>
</tr>
<tr>
<td>Number of funds</td>
<td>4</td>
<td>16</td>
<td>30</td>
<td>33</td>
<td>31</td>
<td>10</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Percentage of assets in shares</td>
<td>2.4</td>
<td>22</td>
<td>20</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trading with fund shares as % of total BSE trading volume</td>
<td>0.09</td>
<td>0.05</td>
<td>0.12</td>
<td>1.35</td>
<td>0.77</td>
<td>0.03</td>
<td>0.01</td>
<td>0.001</td>
</tr>
<tr>
<td>Capitalization of fund shares as % of total BSE market capitalization</td>
<td>0.94</td>
<td>1.20</td>
<td>2.18</td>
<td>3.50</td>
<td>1.74</td>
<td>0.66</td>
<td>0.10</td>
<td>0.09</td>
</tr>
<tr>
<td>Transactions with fund shares as % of total BSE transactions</td>
<td>0.93</td>
<td>2.88</td>
<td>1.38</td>
<td>3.18</td>
<td>1.24</td>
<td>0.32</td>
<td>0.08</td>
<td>0.06</td>
</tr>
<tr>
<td><strong>Open-end funds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Asset value (HUF billion)</td>
<td>0.02</td>
<td>0.15</td>
<td>0.06</td>
<td>13.3</td>
<td>70.8</td>
<td>231.3</td>
<td>324.3</td>
<td>378.6</td>
</tr>
<tr>
<td>Number of funds</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>24</td>
<td>53</td>
<td>69</td>
<td>85</td>
</tr>
<tr>
<td>% of assets in shares</td>
<td>0.2</td>
<td>15</td>
<td>10</td>
<td>6.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Hungarian Banking and Capital Market Supervision and the BSE.

The numbers in Table 6.5 illustrate the most important changes that occurred in the period 1992-1999. Closed-end funds dominated the industry in terms of number and asset value until 1995, mostly because of their favorable tax treatment.

Personal income tax allowances (tax credits) had an important role in determining the structure of the mutual fund industry. The tax credit which investors were entitled to if they invested in closed-end funds gave these funds an important comparative advantage over bank deposits, government securities and open-end mutual funds. When the tax credit was extended to government securities in 1994, closed-end funds lost their advantage. Tax regulations changed considerably in 1995. The new tax regime was less favorable to investors, more complicated and the tax credit was extended to all securities funds. This spurred the growth of open-end funds and contributed to the diminishing role of closed-end funds in the ensuing years. By the end of 1998, open-end funds completely dominated the industry. The total asset value of open-end funds was more than thirty times larger than that of closed-end funds in mid-1999. Most likely, open-end funds will become the
6.3. Hungarian institutional investors

foundation of the Hungarian investment fund industry in the future.

Real-estate funds never really gained a lot of investor interest, but they remain a steady addition to the securities funds in the country (see Figure 6.4). In September 1999, there were six real-estate funds in operation. Their units are listed and traded on the BSE. Because the securities mutual funds probably affect trading with shares on the BSE most directly, we analyze solely the securities funds in the rest of the paper.

![Figure 6.4: Total asset value (in HUF billion) of different types of mutual funds in 1992-1999 (end-of-year values).](image)

6.3.3 Portfolio structure of mutual funds

The first years of mutual fund operations are characterized by high concentration and safe investment strategies. Over 90% of fund portfolios was invested in government securities. Closed-end funds invested only 1% of their assets in shares in June 1996. On the other hand, open-end funds did not hold shares in their portfolios at all. Figure 6.5 shows that the asset structure of mutual funds changed by 1999, but not considerably. At the end of 1998, mutual funds held about 11% of their total assets in shares. 80% of the fund assets were still in government securities, which indicates that their investment strategies did not really alter.
One of the possible explanations for the low percentage of mutual fund assets in shares may be investment restrictions.\textsuperscript{17} Investment funds are restricted by law to invest at most 5\% of their capital in a security of the same issuer. This restriction has been widely criticized for being too strict (Vittas (1996)), especially because it might restrain the funds from becoming active corporate governors. However, there is no empirical evidence to support the hypothesis that investment restrictions are responsible for the low equity investment of mutual funds.\textsuperscript{18}

To obtain more information on the portfolio structure of mutual funds we make use of the quarterly data provided by the Hungarian Banking and Capital Market Supervision (Supervision).\textsuperscript{19} Such micro-level data can tell us more about the investment strategies of mutual funds in recent years. However, it does not allow us to analyze which exogenous factors determine the investment of mutual funds in shares over time. Such an analysis

\textsuperscript{17} Act LXIII of 1991 - On Investment Funds prescribes these restrictions.

\textsuperscript{18} This restriction on investment in shares might have positive consequences for the liquidity of the equity market. The more dispersed the ownership of shares, the higher the number of potential traders and thus liquidity (Coffee (1991)).

\textsuperscript{19} From April 1, 2000, a joint supervision agency for insurance companies, pension funds and banks and capital markets has been in existence.
would require high frequency data on mutual fund portfolio structure and trading, which is not available.

Our dataset consists of nine quarterly panels of data on 74 securities funds (real-estate funds are excluded), covering the period from December 1996 to June 1999. The criterion for inclusion in the sample was at least four quarters of data per investment fund. As a result of this criterion, we exclude the funds which: i) have been established within the last nine months (23); ii) were liquidated in the course of the studied period; or iii) have less than four observations due to missing panels for the last two quarters of 1997. The funds that changed their form from closed-end to open-end are included in the dataset (there are eight such funds in the sample).

An average closed-end fund in the sample is much smaller than the average open-end fund and has the following portfolio structure: 62.2% in treasury bonds, 15% in shares, 13.6% in treasury bills, 4% in cash and bank deposits, 3% in derivatives, 1.6% in corporate bonds and the rest in other assets (compensation units, mutual fund units etc.). The average open-end fund in the sample invests 49.6% in treasury bonds, 21.9% in treasury bills, 15.4% in shares, 9.5% in cash and bank deposits, 2.4% in corporate bonds and 1% in derivatives. The rest belongs to other, less important assets.

Open-end funds invest more in treasury bills, less in treasury bonds, almost twice as much in cash, more in corporate bonds and less in derivatives. The higher proportion of more liquid and safer assets in the case of open-end funds is not surprising if we consider the nature of their operations. Open-end funds are required by law to maintain at least 15% of their portfolio in liquid assets, i.e. cash and call deposits, time deposits with up to three months of maturity, and in the central bank eligible securities. Open- and closed-end funds in the sample do not differ in the percentage of assets they hold in shares.

The average portfolio structure of mutual funds suggests that they pursue relatively conservative investment strategies. The majority of funds' assets is in safe, government securities, with less than a quarter of assets in riskier, long-term securities. Mutual funds in Hungary are diversifying across asset classes although investors could achieve that themselves. They could simply invest in mutual funds that specialize in different asset classes. However, it was probably easier for mutual funds to sell their units while advertising a wide diversification across and within asset types. The existing portfolio structure of mutual funds also reflects the infancy of the Hungarian mutual fund industry. In the search for higher returns, mutual funds will be forced to place their assets in riskier securities in the future. To illustrate their potential for investing in shares, we describe the equities portfolios of a large sample of open-end funds in more detail.

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20 The data for the last two quarters of the 1997 is missing. According to the explanation provided by the Supervision, no major changes occurred in this half-year period.

21 Assets of the average open-end fund in the sample are worth about HUF 2.89 billion, as opposed to HUF 1.12 billion in the case of the average closed-end fund.
Mutual funds’ investment in shares

Hungarian mutual funds invest a relatively small part of their assets in shares (see Table 6.5). This in particular applies to open-end funds, which have been the prevailing organizational form in all respects in the last years. Figure 6.6 shows the frequency distribution of 67 open-end funds according to the number of shares they held in their portfolio at the end of 1998.\(^{22}\) Half of the funds did not invest in shares at all. Only five funds invested in foreign shares. Contrary to the standard portfolio theory, only a few funds have a diversified equity portfolio. Many funds do not invest in shares at all. The biggest outlier is a fund with shares of 55 companies in its portfolio.\(^{23}\) What is strange is that even the so-called equity funds hold lots of bonds and other non-equity assets.

![Figure 6.6: Frequency distribution of open-end funds according to the number of different shares in their portfolio at the end of 1998.](image)

Descriptive statistics of the quarterly dataset on the portfolio structure of mutual funds (described above) give some additional information on the heterogeneity of mutual funds with respect to their investment in shares. The average fund in the sample invested HUF

\(^{22}\)The Hungarian Banking and Capital Market Supervision provided us with detailed reports on the structure of equity portfolios of these 67 funds at the end of 1998.

\(^{23}\)Given that pure equity funds represent less than a quarter of the total net asset value of mutual funds, such a distribution may not be surprising.
406.17 million, or 15.3% of its assets in shares. If we split the sample according to the type of the fund (open-end and closed-end), we see that closed-end funds invested much less in shares than open-end funds (HUF 168.16 million and HUF 446.11 million, respectively). Relative to their total assets, the two types of funds invested about 15% of their assets in shares on average.

Older funds seem to invest more in shares (HUF 546.24 million, or 16.9% of their assets) than funds that are younger than 3 years (HUF 273.42 million, or 9.6% of their assets). The closed-end funds whose units are traded on the BSE invest less in shares (HUF 35.29 million, or 5.7%) than the rest of the funds (HUF 413.42 million, or 15.5%). This can also be due to the size effect. BSE-traded funds in the sample are on average almost eight times bigger than the non-listed funds. We can observe one additional property of the funds in the sample. Open-end mutual funds on average invested much less of their assets in shares during the first years of the investment industry's existence. In the period before June 1997, the average is 6.4%. In the period after January 1998, the percentage of assets in shares increases to 17.6% of the average fund's assets.

These descriptive statistics suggest that the level of investment in shares varies according to the size of the fund (measured by the total asset value), the type of the fund, the age of the fund and the listing of the fund on the exchange. Hence, larger and older open-end funds probably have a stronger impact on liquidity than the rest of the funds.

The analysis of the portfolio structure of mutual funds indicates that there is enough room for mutual funds to increase their investment in shares in the future. Due to the positive relationship between the level of funds' investment in shares and their potential impact on the liquidity of the equity market of the BSE (assuming that the mutual funds that do invest in shares invest primarily in BSE-quoted shares), a stronger influence of mutual funds may be expected in the future. In order to have a significant impact on the market for individual shares, funds need to own larger equity stakes in companies that are listed on the exchange. Hence, we need to look at the ownership structure of the BSE-listed firms.

6.4 Ownership structure of listed firms

In the previous section we established that corporate shares on average account for only a small part of the total assets of Hungarian mutual funds. Hence, we would expect that mutual funds on average hold only a small portion of Hungarian equity. The aggregate data on the ownership structure of the BSE-quoted firms by the National Bank of Hungary supports this premise. Figure 6.7 shows that domestic mutual funds owned only about 1% of the shares of the BSE-listed companies in the period 1997-1999. Their relative share did not exceed 2% in this period.
Foreign investors (the rest of the world) are the largest shareholders of the BSE-traded shares. Their shareholdings increased substantially in the first half of 1999. At the end of June 1999, foreigners owned 75% of shares of the BSE-traded companies. Their ownership is growing at the expense of households, government, non-financial corporations and mutual funds. The largest domestic owners of the equity traded on the BSE in 1997-1999 are non-financial corporations, followed by the government and households. The high share of non-financial companies suggests that there might be a lot of cross-holdings within and across industries.

Among foreign investors, mutual funds probably represent a very important group of shareholders. Because we exclude foreign mutual funds from our analysis and because domestic mutual funds own only a small percentage of Hungarian listed shares, the overall impact of institutional investors on the Hungarian equity market, which we focus on in the next section, will be largely underestimated.
6.5 The impact of mutual funds on equity market liquidity

High and positive growth rates of the asset base of Hungarian mutual funds provide enough motivation for exploring their impact on equity market liquidity, although their low ownership stakes in listed companies and their low investment in shares suggest that their impact on the BSE equity market is probably small at the moment. If domestic mutual funds have any impact on the liquidity of the BSE, this impact should come from open-end funds. However, trading in units of closed-end funds might also affect the liquidity of the BSE.

In this section we discuss three aspects of the impact of domestic mutual funds on the liquidity of the equity segment of the BSE:

1. The importance of trading in units of closed-end funds for the overall equity trading on the BSE.
2. The impact of open-end fund flows on market prices of shares.
3. The impact of net fund flows on the trading volume of the BSE-traded shares.

Before we analyze these three issues, we look at the liquidity of the Hungarian equity market in recent years.

6.5.1 Liquidity of the Hungarian equity market

To illustrate the liquidity of the equity market of the BSE we use four empirical measures: i) daily trading volume (in HUF billion) of all traded shares; ii) the ratio of monthly trading volume to end-of-month market capitalization of all shares; iii) the impact of daily net money flows to open-end funds on the BUX index, a kind of aggregate Kyle’s lambda; and iv) Amihud’s daily illiquidity ratio (see Chapter 3), averaged over one month.

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24 Low ownership stakes of mutual funds also imply that domestic funds cannot (yet) be active shareholders in Hungarian companies. Informal conversations with Hungarian fund managers revealed that mutual funds are currently striving to become respectable portfolio managers with diversified portfolios, and have less ambition to exert control in the companies in which they hold shares.

25 The impact of foreign investment flows would also be interesting, but we have no information on the flows of money of foreign mutual funds that are present in the BSE.

26 Although the equity of closed-end funds is formally in the form of shares, the term ‘fund units’ is often used to distinguish them from other shares. The distinction is necessary because fund ‘shares’ do not give their holders the right to vote.
If we define market liquidity simply as the willingness of market participants to trade we can use trading volume as a proxy for liquidity. In Figure 6.8 we plot the daily traded value of shares (in HUF billion) and the percentage of all BSE-traded shares that were purchased or sold on a particular day. We see that the total traded value was growing substantially in 1997. It started to exhibit a downward trend in January 1999. The percentage of shares that contributed to daily trading volume was increasing in 1999. Both series are characterized by outliers.

Figure 6.8: Daily trading volume (in HUF billion) and the daily percentage of traded stocks on the BSE in the period January 1996-June 1999.

The monthly ratio of traded value of shares to their end-of-month market capitalization is plotted in Figure 6.9. Both series are taken from the IFC's database. The ratio, also known as the market turnover ratio, only gives an indication of the aggregate monthly liquidity of the Hungarian equity market. Market turnover was low in the first years after the (re)opening of the BSE, but it improved in 1993-1994 (not included in this figure). It was the highest in 1998. Because 1998 was characterized by large price fluctuations, market turnover ratio may give a false picture of the overall equity market liquidity over

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27 Amihud (2000) calls trading volume a natural measure of market liquidity. Expressed in currency terms, this measure has many limitations. Among others, it does not control for the value and size of the outstanding equity. In other words, it does not control for market capitalization of shares.
6.5. The impact of mutual funds on equity market liquidity

this year. Monthly market turnover deteriorated in 1999, but remained high relative to its 1990-1997 levels.

Figure 6.9: Monthly market turnover ratio of stocks traded on the BSE, 1996-1999.

If we regress the log of the daily percentage change in the stock market index on the log of net fund flows (expressed in percentages of the previous day’s total net asset value) we get our third measure of market liquidity. Net fund flows can in this case be interpreted as the change in the supply of shares that is caused by one particular group of investors, i.e. open-end funds. To get estimates of the elasticity, we run the regression for each year within the period 1996-1999. A lower coefficient of elasticity is interpreted as higher market liquidity. While none of the coefficients turns out to be statistically significant, their values suggest that market liquidity was increasing between 1996 and 1998. The elasticity of the BUX index to the net fund flows dropped from 0.10 in 1996, to -0.04 in

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28In 1998, the relative difference between the annual trading volume and the end-year market capitalization was strongly affected by the consequences of the Russian crisis, which primarily induced foreign investors to take their money out of the market. This resulted in the drop of equity prices and hence in the low market capitalization at the end of the year. The openness of the Hungarian capital market required its toll.

29In addition to the percentage change in the net asset value that is due to the net flow of money into open-end funds, we add some AR and MA terms as explanatory variables in these regressions. Because the estimates of elasticity are not statistically significant we do not report the regression results here.
In the first half of 1999, the coefficient of the (fund) flow elasticity of prices increased to 0.18, which indicates deteriorating liquidity and concurs with Figure 6.9 in this respect. Because the estimated coefficients are not statistically significant we cannot place too much value on this liquidity measure.

Finally, we calculate two versions of Amihud's (2000) measure of illiquidity: a ratio of daily absolute price change to daily traded value (AmDVAL), and a ratio of daily absolute price change to daily market turnover (AmDMT). Both measures reflect the price impact of daily trades, and resemble Kyle's lambda in this respect. AmDVAL is defined as the absolute value of the daily change in the BUX index per billion HUF of trades, while AmDMT reflects the absolute value of daily change in the BUX per one percent of market turnover. Market turnover is defined as the ratio of daily traded value of shares over the average monthly stock market capitalization. The plots of the two series are in Figure 6.10. The graph of AmDVAL shows that the illiquidity of the BSE's equity market has been decreasing almost monotonically for the last four years. AmDMT exhibits a different path over time. It seems to be driven primarily by the volatility of market turnover ratio (see Figure 6.9).

Figure 6.10: Amihud’s average monthly illiquidity ratios for stocks traded on the BSE, 1996-1999.

30 Again, increasing price volatility may bias this coefficient downward because there is more noise in the data.
6.5.2 Trade in units of closed-end funds on the BSE

Shares of closed-end funds may account for an important part of total trading activity of a particular stock exchange. Mutual funds may also decide not to list their shares on the exchange, or they may place them privately. If listed, the shares of closed-end funds increase the supply of securities traded on the exchange and, preferably, also the liquidity of the market (if they are frequently traded). Trading with shares of closed-end funds which invest (primarily) in shares that are traded on the same market may have a favorable effect on the pricing of the fund shares and on the overall trading activity of the exchange. We would like to know whether the same can be said about the Hungarian closed-end funds.

Closed-end funds dominated the Hungarian mutual fund industry until 1996. This is also reflected in the descriptive statistics on closed-end funds in Table 6.5 and in Figure 6.11, in which we plot the number of transactions and the trading volume of units of the closed-end funds from January 1992 until June 1999. Both Table 6.5 and Figure 6.11 nicely illustrate the 'structural break' that occurred in the mutual fund industry in 1996. Trading in units of closed-end funds reached its peak in the second half of 1996, and gradually decreased afterwards. After June 1999, the trading volume of fund units was back at its 1992 level, i.e. close to zero.

Whether we look at the number of shares listed, the total nominal equity value of listed closed-end funds, their market capitalization, turnover or the number of transactions with units of closed-end funds, the results are similar. Trading in units of closed-end mutual funds has not been of vital importance for trading activity on the BSE. Furthermore, most trading in units of closed-end funds in the last years has taken place in units of real-estate, not securities funds.

Even at its peak, trading of units of closed-end mutual funds did not significantly contribute to the overall trading activity of the BSE. The trading volume of fund units has never reached 1.5% of the total BSE trading volume on an annual basis. Furthermore, market capitalization of closed-end funds never accounted for more than 3.5% of total BSE market capitalization on an annual basis. Hence, we may conclude that the presence of units of closed-end funds on the exchange has had limited impact on market liquidity. It is hard to expect this situation to change in the future, unless the government takes measures that make investing in closed-end funds more advantageous for investors.

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31 The graph indicates the change in the environment, namely the change of tax laws in 1995. This change removed the advantages of investing in closed-end funds for individual investors, and hence affected the monthly number of transactions and the monthly trading volume of fund units.

32 At the end of June 1999, only one closed-end fund had its units traded on the BSE, although seven funds were still quoted.
In Chapter 4 we presented some empirical evidence on the impact of net flows of money to mutual funds on market prices of shares. Here, we perform a similar analysis for the Hungarian equity market. We analyze the impact of net fund flows on the Hungarian stock market index BUX.\textsuperscript{33} We look at how much of the current returns on the stock market index BUX can be explained by past values of net flows of money to open-end mutual funds, and by lagged values of BUX returns. In other words, we perform a Granger causality test. Because regression coefficients of net flows reflect the price impact of mutual fund flows, the coefficients can also be viewed as a proxy for a measure of market liquidity (see Gennotte and Leland (1990)). Due to the lack of data on trading activity of open-end mutual funds and the rest of traders in the equity market, we are forced to find an alternative way of estimating the impact of funds. We first describe the data and the way we construct the

\textsuperscript{33}This relationship is found to be significant in empirical studies of US stock markets. Mosebach and Najand (1999) find evidence that the net fund flows and market index level are cointegrated. More specifically, their results show that the levels of the stock market are influenced by the net mutual fund flows.
variables. Then we estimate the model of the returns on stock market index and discuss the results.

Data

Our dataset consists of daily data on the net asset value and the net asset value per unit of eighty-eight Hungarian open-end funds in the period January 1996 - June 1999. In addition, we use daily values of the BSE market index BUX. Some of the funds were founded during the examined period, others stopped their operations during this three-and-a-half year period but their information is fully taken into account in the period of their operations. Because we aggregate the data and work with totals and averages over all funds, this should not be problematic.\textsuperscript{34}

The total net asset value of open-end funds is depicted in Figure 6.12. Except for the second half of 1998, which was affected by the Russian crisis, the total net asset value of Hungarian mutual funds has been increasing steadily. Compared to the BUX, the graph of the net asset value looks very smooth. Because open-end funds invest only a small part of their assets in shares, this is not so surprising. The change in total net asset value is a result of the returns on the funds’ investments which come in the form of capital gains (changes in market prices of securities in a portfolio), dividends and interest paid, and of sales and purchases of fund units. The difference between the value of units sold and units purchased makes up for most of the net flow of money to the fund. Net fund flows constitute another important building block of the changes in the net asset value of mutual funds.

The net flows of funds can be calculated directly by adding up sales of fund units to new investors, reinvested dividends and the net result of switches among funds in the same group, and then subtracting redemptions by departing investors. Because we do not have such information on individual funds we need to construct a proxy for the total net daily flows to open-end funds. We develop a procedure to extract net money flows from the changes in the total net asset value of all open-end funds and their daily returns (per unit of fund).\textsuperscript{35}

Let us define a unit value of a fund on day $t$, $P_t$, as a ratio of the daily total net asset value of all open-end funds, $V_t$ to the total number of all fund units, $N_t$:

\textsuperscript{34}Averaging is not a problem as long as attrition is not selection. It may be problematic in the sense that we might be losing valuable information in the process.

\textsuperscript{35}Sirri and Tufano (1998) use an almost identical methodology to construct the net fund flows. They define net flows as the net growth in fund assets beyond reinvested dividends. Just like the measure of Sirri and Tufano, our measure of net flows reflects the percentage growth of a fund in excess of the growth that would have occurred had no new funds flowed in and had all dividends been reinvested. Our measure of fund flows differs in the definition (and calculation) of the return on the fund’s assets we apply, $r_t$. 

Figure 6.12: *Daily total net asset value of all Hungarian open-end mutual funds (in HUF billion, left-hand axis) and daily values of the stock market index BUX (right-hand axis), January 1996-June 1999.*

\[ P_t = \frac{V_t}{N_t} \]  \hspace{1cm} (6.1)

The change in the net asset value of funds is a result of two factors: the involvement of new capital, and the return on investment of existing funds. The return, \( R_t \), is proxied by the daily change in a fund’s value per unit:

\[ R_t = 1 + r_t = \frac{P_t}{P_{t-1}} \]  \hspace{1cm} (6.2)

To get an estimate of what the total net asset value would be if it were only affected by the return on the fund assets, \( \hat{V}_t \), we multiply the daily net asset value on the previous day, \( V_{t-1} \), by the current return on the assets of an average fund:
6.5. The impact of mutual funds on equity market liquidity

\[ \hat{V}_t = V_{t-1} R_t \]  

(6.3)

A total net flow on day \( t \), \( F_t \), is defined as the difference between the actual total net asset value and the 'return-affected' net asset value:

\[ F_t = V_t - \hat{V}_t \]  

(6.4)

We define a relative net fund flow, \( f_t \), as

\[ f_t = \frac{F_t}{V_{t-1}} = \frac{P_t}{P_{t-1}} \frac{(N_t - N_{t-1})}{N_{t-1}} = R_t \frac{(N_t - N_{t-1})}{N_{t-1}} \]  

(6.5)

To get rid of the price change component in the flow, we divide \( f_t \) by \( R_t \) and get the relative quantity \( \phi_t \), which we refer to as the relative total net flow from now on:

\[ \phi_t = \frac{f_t}{R_t} = \frac{F_t}{R_t V_{t-1}} = \frac{N_t - N_{t-1}}{N_{t-1}} = \frac{V_t - \hat{V}_t}{\hat{V}_t} \]  

(6.6)

The estimated daily relative total net flows are plotted in Figure 6.13 (as Netflow), together with daily values of the stock market index BUX. The plot of the BUX suggests non-stationarity, so we test for the presence of a unit root. We perform the augmented Dickey-Fuller test on the log of daily BUX values. We do not reject the null hypothesis of a unit root. The log of the BUX is not stationary, even around the trend. It is integrated of degree one, i.e. I(1), meaning that the first difference of the daily logs of the BUX exhibits stationarity. In other words, the daily (percentage) return on the BUX is stationary.

The relative total net money flow is a stationary process, integrated of degree zero (I(0)). Some descriptive statistics related to net fund flows in 1996-1999 are interesting. The mean absolute daily net flow increased from HUF 0.26 billion in 1996 to HUF 0.82 billion in 1997, and further to HUF 1.48 billion in 1998. However, the net fund flow, scaled by the previous day's total asset value, has been decreasing each year. Furthermore, relative to the average daily trading volume of the BSE, the average daily (absolute) net money flow decreased in the last few years. In 1997, it represented 18% of the daily trading volume, but this percentage fell to 3% in 1998. In the first half of 1999, the average daily (absolute) net fund flow represented only 2% of the daily trading volume of the BSE.
Figure 6.13: Daily net flows into Hungarian open-end funds (in HUF billion and on the right-hand axis) and daily values of the BSE market index BUX (left-hand axis), January 1996-June 1999.

Model specification and estimation results

We want to investigate the relationship between relative total net money flows to open-end funds and market prices of shares, as reflected in the stock market index BUX. To prevent the danger that outliers would drive the results, we truncate the values of the largest outliers by assigning them the next-largest value. Due to the non-stationarity of the BUX series, we use the daily percentage return on the BUX, measured as the first difference of the log of the BUX:

\[ r_{BUX,t} = \ln \left( \frac{BUX_t}{BUX_{t-1}} \right) \]  

As we mentioned in the introduction to this subsection, we will employ the methodology of the Granger-causality tests. Granger-causality measures precedence and information content, but does not by itself indicate causality in the standard use of the term. Returns on the BUX can be said to be Granger-caused by net fund flows if the latter contribute...
6.5. The impact of mutual funds on equity market liquidity

to the prediction of BUX returns. Two-way Granger-causation is frequently the case, so we check for it here as well. We test whether the net fund flows and BUX returns of the preceding week jointly explain the current return on the BUX, and whether the preceding week's information on the BUX returns helps explain the current net fund flow. Because we have daily data, the use of up to one week of past information seems appropriate. More formally, we estimate the following two equations, running least squares on daily data in the period January 1996 - June 1999:

\[ r_{BUX,t} = c + \alpha_1 r_{BUX,t-1} + \ldots + \alpha_5 r_{BUX,t-5} + \beta_1 r_{BUX,t-1} + \ldots + \beta_5 r_{BUX,t-5} + \epsilon_t \]  
(6.8)

\[ \phi_t = c + \alpha_1 r_{BUX,t-1} + \ldots + \alpha_5 r_{BUX,t-5} + \beta_1 \phi_{t-1} + \ldots + \beta_5 \phi_{t-5} + \epsilon_t \]  
(6.9)

Based on test results, we can reject the null hypothesis that \( \phi \) does not 'Granger cause' \( r_{BUX} \), and the null hypothesis that \( r_{BUX} \) does not Granger cause \( \phi \) at the 10% confidence level. Formally, we rejected the null hypothesis that \( \alpha_1 = \ldots = \alpha_5 = 0 \) in both cases.\(^{36}\)

Because we are only interested in the impact of net flows on the BUX returns, we proceed with the analysis of Granger-causality in this direction (although the causality in the other direction is much stronger).

We would like to know whether the importance of past information on relative net fund flows for current market returns changes over time. For this purpose, we estimate the Granger-causality test for \( r_{BUX,t} \) separately for each year in the period 1996-1999, and for the overall period. Based on the Akaike and Schwarz information criteria, we include the first three lags of BUX returns in the equation to be estimated. Because there might be day-of-the-week (seasonal) effects present in the data, we use dummy variables for days of the week and check for their significance. Only a dummy variable for Thursday, \( D_{Thursday,t} \) is significant, so we include it in regressions. The regression (and test) results are in Table 6.6.\(^{37}\)

From regression results we see that preceding week's information on net fund flows does not add much to the explanation of current returns on the BUX. Almost all lagged flow coefficients are insignificant. We also have to reject the null hypothesis that the flow

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\(^{36}\)F-statistics of the two tests are 1.82 and 3.89, respectively.

\(^{37}\)Because negative money flows probably have a different impact on market returns than positive flows, we separate the two. The positive relative daily net flow is \( \phi_t^+ = \max(\phi_t, 0) \) and the negative flow is \( \phi_t^- = \min(\phi_t, 0) \). From these two definitions it follows that \( \phi_t = \phi_t^+ - \phi_t^- \). If fund flows have an impact on the stock market returns, then we would expect that negative money flows show a negative, and positive fund flows a positive impact on the current market returns. We estimate the impact of positive and negative net fund flows on the BUX returns in the period 1996-1999. Estimation results confirm that the effect of the two flows differs. However, when we test whether the coefficients of positive and negative flows are equal with opposite signs, we do not reject this hypothesis. For this reason, we only use the combined regressor \( \phi_t \) in further analysis.
Table 6.6: Regression results for daily returns on the BUX (dependent variable) in 1996-1999. Explanatory variables are in the first column. Between parentheses are t-values. Covariances are (White) heteroscedasticity consistent. The Wald test statistics are calculated for the joint hypothesis that all five lagged flow coefficient are zero.

<table>
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<td>$\phi_{t-1}$</td>
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<td>-0.290</td>
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<td>(-1.320)</td>
<td>(1.528)</td>
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<tr>
<td>$\phi_{t-3}$</td>
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<td>-0.134</td>
<td>-0.206</td>
<td>-0.819**</td>
<td>-0.096</td>
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<td>(-0.768)</td>
<td>(-0.792)</td>
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<td>(2.169)</td>
<td>(0.889)</td>
<td>(0.761)</td>
<td>(-2.062)</td>
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<td>$\phi_{t-5}$</td>
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<td>0.287*</td>
<td>0.194</td>
<td>0.417</td>
<td>0.257**</td>
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<td>(0.758)</td>
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<tr>
<td>$r_{BUX,t-1}$</td>
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<td>(0.874)</td>
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<td>-0.131</td>
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<td>$D_{\text{Thursday},t}$</td>
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<td>-0.010</td>
<td>0.006</td>
<td>-0.004*</td>
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<td>(0.998)</td>
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<td>248</td>
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<td>858</td>
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<td>$R^2$</td>
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<td>0.04</td>
<td>0.07</td>
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<td>8.776</td>
<td>8.677</td>
</tr>
</tbody>
</table>

***significant at 1%.
** significant at 5%.
* significant at 10%.
coefficients are jointly zero in all five cases. If we run regressions on complete series, i.e.
including the outliers, the (Wald) test statistics lead to a rejection of the joint hypothesis
(of all five lagged flow coefficients being zero) in 1996 and 1997, and in the overall period

Second, two of the statistically significant flow coefficients in the regression for 1999 have
a different sign than other significant flow coefficients. However, we only have data for
the first half of 1999. The results for the whole year might be more plausible. In the
pooled regression, the signs of the statistically significant flow coefficients are as expected.
Relative net fund flows increase the return on the BUX.

Third, the returns on the stock market index seem to be systematically lower on Thursdays.
Overall, the Granger causality analysis we performed shows that past relative net flows of
money to the Hungarian open-end funds add very little to the explanation of the current
return on the BUX in the period we analyzed. Due to the low percentage of assets that an
average open-end fund invests in shares and the short history of mutual funds in Hungary,
this is not surprising. Interestingly, past returns on the BUX can jointly (and significantly)
explain part of the variation in relative net fund flows. Next, we will consider the impact
of relative net fund flows on the liquidity of shares on the BSE.

6.5.4 The impact of fund flows on the liquidity of the overall
equity market

Because some of the net money flows to open-end funds get placed in the equities that are
traded on the stock exchange, one might expect that fund flows affect the liquidity of the
market as a whole. As the total trading volume of the equity market increases, so may its
liquidity. When funds experience net outflows of money due to redemptions, they need to
trade. Even when the funds are net sellers their trades positively affect the trading volume
of the equity market.

Such reasoning is behind our analysis of the impact of net fund flows on the liquidity of
the overall equity market of the BSE. For this purpose, we will run another regression. As
liquidity measures we will use the two illiquidity ratios we defined at the beginning of this
section (and plotted in Figure 6.10). The volatility of market prices will serve as a control
variable for the general conditions in the market in the estimated period.

Data, estimation and results

We use daily data from January 1996 to June 1999 again. To simplify the notation, we
denote $AmDVAL$ and $AmDMT$ by $l^1$ and $l^2$, respectively. We test both variables ($l^1$ and
for presence of a unit root, which would indicate non-stationarity in the series. We reject the null hypothesis of a unit root in both cases. We truncate the outliers in both series in the same way as we did the relative net fund flows.

To control for general market conditions we use a measure of market volatility, $v_t$. Volatility in this case is the square root of the following variance estimation:

$$v_t^2 = \lambda r_{BUX,t}^2 + (1 - \lambda) v_{t-1}^2$$  \hspace{1cm} (6.10)

The starting value for variance estimation ($v_0^2$) is the variance of the daily return on the BUX over the whole period 1996-1999. $\lambda$ is a weight parameter. Because we want to give most weight to the most recent variance, we choose $\lambda$ to be very small (0.05).\footnote{In this way, variance is estimated as an integrated-GARCH process.}

To see whether relative net fund flows have any influence on market (il)liquidity, we estimate a regression equation for illiquidity ratio $l$ (dependent variable), as a function of its own lags, concurrent and lagged relative net fund flows and the concurrent and lagged volatility. Dummy variables for two days of the week ($D_{Monday}$, $D_{Thursday}$) are added to accommodate for any ‘seasonality’ in the data. We separately run a regression for each illiquidity measure. Results are in Table 6.7.

We can interpret the regression results as follows. First, the larger the concurrent and lagged relative net fund flows, the larger the illiquidity of the overall equity market. Because we measured illiquidity as the price impact of daily trades such a result is not surprising. The larger the flows of money from open-end funds to the equity market, the larger the price changes (per traded value) that make the market index change. Since the funds primarily own shares of the largest Hungarian companies that are also represented in the stock market index, the changes in prices of these shares cause the index to change. However, note that only one of the four flow coefficients is statistically significant. One can expect that the significance of results is very sensitive to the measure of liquidity that is applied.

Second, the impact of market volatility on the illiquidity ratios is ambiguous. While the contemporaneous volatility and its second lag increases illiquidity of the market, its first lag seems to decrease it. We can provide no plausible explanation for this. Overall, the results lead to the conclusion that the impact of domestic open-end funds on the liquidity of Hungarian equity market, controlled for the general market conditions, has hardly been significant in recent years.
Table 6.7: Regression results for daily illiquidity of the equity market of the BSE (dependent variable). Explanatory variables are in the first column. $V$ denotes traded value in HUF billion, while $m$ is daily market turnover ratio. White covariances are used. Between parentheses are t-values.

|                      | $l_t^1 = |\Delta BU X_t| / V_t$ | $l_t^2 = |\Delta BU X_t| / m_t$ |
|----------------------|----------------------------------|----------------------------------|
| constant             | 1.588**                          | 51.925***                        |
|                      | (2.210)                          | (7.562)                          |
| $\phi_t$            | 0.911**                          | 3.903                            |
|                      | (2.015)                          | (0.966)                          |
| $\phi_{t-1}$        | 0.384                            | 1.037                            |
|                      | (1.027)                          | (0.251)                          |
| $v_t$                | 0.001***                         | 0.055***                         |
|                      | (4.105)                          | (7.508)                          |
| $v_{t-1}$           | -0.002***                        | -0.066***                        |
|                      | (-3.696)                         | (-7.040)                         |
| $v_{t-2}$           | 0.0004                           | 0.012***                         |
|                      | (1.427)                          | (3.305)                          |
| $l_{t-1}$           | 0.298***                         | 0.234***                         |
|                      | (3.947)                          | (4.927)                          |
| $l_{t-2}$           | 0.029                            | 0.075**                          |
|                      | (0.514)                          | (2.184)                          |
| $l_{t-3}$           | 0.121**                          | 0.050                            |
|                      | (2.404)                          | (1.343)                          |
| $l_{t-4}$           | -0.031                           | 0.033                            |
|                      | (-0.540)                         | (1.070)                          |
| $l_{t-5}$           | 0.107*                           |                                  |
|                      | (1.745)                          |                                  |
| $l_{t-6}$           | 0.139                            |                                  |
|                      | (1.592)                          |                                  |
| $D_{Monday,t}$      | 1.749*                           | 36.033***                        |
|                      | (1.834)                          | (3.794)                          |
| $n$                  | 857                              | 859                              |
| $R^2$                | 0.33                             | 0.46                             |

*** significant at 1%.
** significant at 5%.
* significant at 10%.
6.6 Concluding remarks

In this chapter we have considered the impact of domestic mutual funds and pension funds on the liquidity of the Hungarian equity market. Both pension funds and mutual funds have grown fast in terms of membership and asset value. They represent an increasingly more important investment alternative for Hungarian households each year. Both types of funds invest primarily in government securities.

Econometric analysis of the data on Hungarian open-end funds shows that their impact on liquidity of the organized equity market has not been substantial so far. To evaluate this impact we have developed a particular methodology that uses net flows of money to the funds. We find some evidence that net fund flows increase the price impact of daily trades of shares on the Budapest Stock Exchange (BSE). This could be interpreted as evidence of the negative impact of fund flows on liquidity of shares. Alternatively, we could also say that fund flows have some impact on market prices of shares. Furthermore, the information contained in past flows of money to open-end funds explains some of the current returns on the stock market index BUX. The low statistical significance of our results can be explained by the low percentage of assets that open-end funds invest in the shares of companies listed on the BSE. Relative to the size of the Hungarian organized equity market, the flows of money to mutual funds and their investment in shares are just too small.

Our analysis raises additional research questions. Given the portfolio structure of mutual and pension funds, what is their impact on liquidity of the market for government bonds and treasury bills? The methodology we have developed in this chapter could easily be applied to such a study. In addition, the analysis of transactions and flows data on foreign mutual funds that trade in Hungary would provide valuable insights in the institutional impact on share prices, trading volume and market liquidity. Finally, recent modifications of investment legislation and financial regulation in Hungary may induce changes in behavior of fund managers regarding their portfolio composition. One interesting question is why they invest so little in shares. Were the risks too high, returns too low, or are the (fund) managers not educated and experienced enough to be able to evaluate the returns they have been missing out on? It might also be the case that domestic funds had better opportunities in other assets that were not accessible to foreigners. These questions remain open for future research.