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Market microstructure and securities values: Evidence from the Tel Aviv Stock Exchange

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Abstract

This paper examines the value effects of improvements in the trading mechanism. Selected stocks on the Tel Aviv Stock Exchange were transferred gradually from a daily call auction to a mechanism where the call auction was followed by iterated continuous trading sessions. This event was associated with a positive and permanent price appreciation. The cumulative average market-adjusted return over a period that started five days prior to the announcement and ended 30 days after the stocks started trading by the new method was approximately 5.5%. In addition, we find positive liquidity externalities (spillovers) across related stocks, and improvements in the value discovery process due to the improved trading method. Finally, there was a positive association between liquidity gains and price appreciation.

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1. Introduction

Securities markets around the world are making major investments to improve their trading technology. The London Stock Exchange is phasing in an

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automated, order-driven trading system to improve liquidity and reduce trading costs (see, London Stock Exchange, 1996). The current plan is to implement the system for the FTSE-100 stocks while preserving the traditional quote-driven system for large block trades. Other European stock exchanges (e.g., the French, Italian, Spanish and Swedish markets) have converted their trading systems from the traditional call market to computer-based continuous trading alternatives. The stock exchanges of Toronto, Montreal, Vancouver and Alberta have recently changed their trading systems to support decimal pricing 'in a bid to increase liquidity' (Reuters, 1996). In the US, the Securities and Exchange Commission has introduced new rules requiring market-makers to incorporate in their public quotes both customer limit orders and orders they quote on electronic communication networks such as Instinet and Selectnet. These rules are intended to improve liquidity through increased market transparency and enhanced quality of execution (see, Securities and Exchange Commission, 1996). These reforms were partly triggered by the studies of Christie and Schultz (1994) and Christie et al. (1994), who presented evidence that market makers implicitly colluded to maintain high bid–ask spreads, and Huang and Stoll (1996), who showed that Nasdaq spreads exceeded NYSE benchmarks. Further, emerging markets are evaluating and implementing new trading systems, and are making considerable investments in improving their microstructure.

A question of interest for both financial economists and practitioners is whether investments in improving the market microstructure have positive value. The answer relates to the raison d'être of market microstructure research, and it can quantify the benefits of improving trading mechanisms. This paper examines the value of an improvement in the market microstructure for selected stocks on the Tel Aviv Stock Exchange (TASE).

In April 1987, the TASE introduced a new trading method, stating: 'The objective of the new method is to create an efficient and well-functioning market for trading securities'. (TASE, 1987). The TASE transferred stocks to the new trading method gradually, periodically selecting stocks on the basis of their perceived 'marketability'. Before the transfer, the selected stocks were traded once a day in a call auction. After the transfer, these stocks traded in repeated continuous trading sessions following an opening daily call auction. Continuous trading after the call auction is expected to improve value discovery and trading efficiency and increase stock liquidity (see, Amihud, Mendelson and Murgia, 1990). Indeed, a TASE study (Tamari and Resnik, 1990; Lauterbach and Ungar, 1992) documented improvements in the market microstructure-related characteristics of volume and volatility under the new trading method. If improvements in market microstructure are valuable, the prices of stocks selected for trading under the new method should increase upon the announcement of the change in their trading mechanism.

Improved liquidity is expected to increase securities values because rational investors discount securities more heavily in the presence of higher trading costs, holding other things equal. This proposition, first made by Amihud and Mendelson (1986), was empirically supported in various studies. Cross-sectionally, risk-adjusted returns on stocks and bonds were found to be increasing in their illiquidity, measured by the bid–ask spread (Amihud and Mendelson, 1986, 1989a, 1991a; Kamara, 1994; Eleswarapu, 1995) or the price impact of trades (Brennan and Subrahmanyam, 1996), or decreasing in their liquidity, measured by volume or turnover ratio (Datar et al., 1996; Haugen and Baker, 1996). Silber (1991) found that, on average, restricted stocks that are not allowed to trade on public exchanges are lower in value by 33.75% on average compared with identical publicly traded stocks. Amihud, Mendelson and Wood (1990) found that during the stock market crash of 19 October 1987, price declines were greater for stocks whose liquidity suffered most, and price recovery was greater for stocks whose liquidity subsequently improved.

We therefore expect that stocks transferred to the improved trading mechanism should increase in value. The TASE's board of directors announced a list of stocks to be transferred to the new trading method every few months, and the actual transfers took place a day or more after each announcement. We estimated the market-adjusted price changes of the transferred stocks over a test period that begins five days before the TASE announcement and ends 30 days after these stocks started trading by the new method. The cumulative abnormal return on the transferred stocks over the test period averaged about 5.5%. This suggests a significant value gain, especially compared with the moderate cost of the improvement. In December 1995, the market value of the 100 securities traded under the new method was about $26 billion. Assuming that the new trading mechanism gave rise to a permanent price increase of 5.5%, its introduction contributed at least $1.35 billion to the market value of securities traded on the TASE. The cost of this system was estimated at less than $10 million, according to the Chief Executive Officer of the TASE, Mr. Sam Bronfeld. This estimate includes the cost incurred by the brokers and banks using the system. Comparing these costs with the subsequent stock price appreciation demonstrates the value of investments in improving the market microstructure.

The value of the new trading method exceeded the price appreciation of the transferred stocks since trading is characterized by *liquidity externalities* or spillover effects: when the prices of two securities are correlated, an improvement in the liquidity of one should improve the liquidity of the other (Amihud and Mendelson, 1988b, 1990, 1991c). This results in part from the fact that improved value discovery for one security facilitates value discovery for the other (correlated) security. We test this effect using data on 'twin stocks', i.e., two different classes of stock of the same company of which the 'primary stock' was transferred to the new trading method while the 'secondary stock' was not. Liquidity externalities would imply that the price of the secondary stock should increase upon the transfer announcement of the primary stock, but by a smaller magnitude. Our results support this hypothesis.

Our study is related to research on the effects of exchange listing for stocks that previously traded over the counter. Presumably, the motivation for listing is improved liquidity and value (Cooper et al., 1985; Amihud and Mendelson, 1986, 1988a). Indeed, Christie and Huang (1994) found that exchange listings of Nasdaq stocks sharply reduced trading costs, especially for the less liquid stocks. Grammatikos and Papaioannou (1986) and Kadlec and McConnell (1994) found that listing announcements led to price increases which were positively associated with liquidity improvements.

Our paper adds an important dimension not captured by these previous studies. Exchange listing is a voluntary, endogenously-determined decision of a firm, reflecting some optimization by management, and it can be associated with its private information. Companies are not obliged to list on an exchange, and in fact, hundreds of large companies that are eligible to list choose to remain unlisted. Thus, listing reflects an inherent self-selection: we only observe those cases where management expected listing to have a beneficial outcome. It is therefore impossible to examine the general effect that changing the market microstructure has on securities values.

In contrast, the event studied here is *exogenous* to the firm: the transfer decision was made by the TASE's board of directors, not by the firm's management. The TASE's decision was based on its evaluation of the stock's marketability at the time of the decision, and not on any private information about the firm's prospects. Therefore, the price appreciation reflects the value of improved market microstructure rather than any information generated by firms, and there is no self-selection bias. This should not be construed as a criticism of studies on the effects of exchange listing. Rather, we point out that these studies have different objectives and hence they were not designed to examine the issue under study here.

Our study is also related to studies that examined the effects of the announcement of adding stocks to the S&P 500 Index. Harris and Gurel (1986) and Shleifer (1986) found a temporary price increase which, they claimed, reflected a buying pressure by index funds that must invest in these stocks. For the more recent period, Shleifer (1986) and Lynch and Mendenhall (1996) found a permanent price increase, explained by the growing importance of index funds.

Our results cannot be attributed to the demand by index funds. Index funds currently represent only a small portion of the market for stocks transferred to the new trading method. As of December 1995, funds that invested in stocks available through the new trading method constituted only 1.3% of the market value of these stocks. Some of these funds confine their investment to a subset of these stocks. More importantly, these funds were introduced only in the last two years of our sample period. We found that the price appreciation of stocks that were transferred to the new trading method was the same in the earlier and later transfers. We therefore suggest that in both our study and in those on the

S&P 500, the price appreciation of stocks included in the S&P 500 index is due to the improvement in their liquidity, following Amihud and Mendelson (1986). This hypothesis was tested and supported by Edmeister and Pirie (1995). The reason that the more recent period shows permanent price appreciation may reflect the recent relative improvement in the liquidity of the S&P 500 stocks, documented by Jones et al. (1991). Our results on liquidity externalities can also explain Dhillon and Johnson's (1991) findings that for firms whose stocks were added to the S&P 500, other traded securities appreciated. They attributed this finding to favorable information; however, the selection for the S&P 500 list is not based on private information. We suggest that the inclusion of a stock in the S&P 500 Index enhances its liquidity and generates spillover effects that favorably affect the other securities of the same firm.

The next section describes trading mechanisms on the TASE and the market microstructure change that occurred when the new trading system was introduced. Section 3 presents our empirical results. We show in Section 3.2 that the value effects due to the new trading mechanism are positive, persistent and significant. In Section 3.3 we introduce liquidity externalities and examine their impact. In Section 3.4 we demonstrate how the new trading mechanism affected the liquidity and efficiency of the transferred stocks, and Section 4 offers a brief summary of our results and their implications.

2. Trading mechanisms on the Tel Aviv Stock Exchange

The Tel Aviv Stock Exchange is the only securities market in Israel. As of June 1995, it had 672 listed stocks in addition to other corporate securities (warrants and bonds) and government bonds (TASE, 1995). The market value of the stocks listed on the TASE was about one half of Israel's annual GNP. The stock market became more important in the last decade due to the economic growth that occurred following the country's 1985 anti-inflation program, the liberalization of the Israeli capital market, the intensified privatization of government-owned firms and the immigration which brought about a sharp increase in investment.

In 1987, the TASE made a fundamental change in its trading system, introducing a new method that enabled continuous trading facilitated by a number of daily trading sessions. We describe below the traditional call method of trading, the new Variable Price trading mechanism and the process of transferring stocks from the old to the new method.

2.1. The call method

Prior to 1987, all stocks listed on the TASE were traded once a day in a call auction (the Call Method or the C-Method). Until 1991, the auction was conducted by a human auctioneer. Limit and market orders were submitted to the TASE by investors before the opening, or were retained by the brokers. Stocks were called in a predetermined sequence by an auctioneer, who first announced the stock's excess demand, positive or negative, at the previous day's closing price and then changed the price based on the direction of excess demand, proceeding at fixed price increments. As the announced price changed, the excess demand decreased (in absolute value) until an equilibrium was reached. If an equilibrium could not be reached at a daily price increase of 10%, the stock was announced as 'buyers only' and the price was set at the previous day's price plus 5% without executing any order. After two days of 'buyers only', the price was allowed to move without bound. Price declines were treated analogously.

The auction process of the C-Method was computerized in 1991. Traders route orders to the TASE which electronically communicates the excess demand at the previous day's closing price. Traders observe the excess demand and have a short time interval during which they can send additional 'offsetting orders' which can be only sell orders when the excess demand is positive, or buy orders when the excess demand is negative. Afterwards, the new excess demand, reflecting the offsetting orders, is announced, and traders can submit offsetting orders again. Following this round, the system computes the new equilibrium prices that are announced simultaneously for all stocks.

There are a number of problems with the C-Method. First, an investor who submits an order for a particular stock does not know its clearing price, nor the prices of related stocks. Once the price information for all stocks is broadcast after the call transaction, investors may want to adjust their trades for a particular stock. However, under the C-Method, such adjustments must be postponed until the following trading day. Second, investors are reluctant to place large orders that could result in significant price impacts. Instead, they may break large orders into smaller ones and trade them over a number of days, thereby bearing the costs of illiquidity, delay and risk. The C-Method can also result in partial executions that may require additional trading on the following day. Finally, traders bear significant inventory risk when taking a position in a security because it can only be unwound on the following day. This diminishes the willingness of traders to provide liquidity by acting as market makers and absorb temporary demand or supply shocks. These shortcomings of the C-Method are particularly important in a thin and highly volatile market such as the TASE.

2.2. The variable price method

In 1987, the TASE started experimenting with a new method of trading securities, called the Variable Price Method (V-Method). The TASE engaged in a process of learning by doing and changed the V-Method during its initial period of operation. The following describes the method as adopted in its final form on 6 December 1987.

Under the V-method, trading is opened by a call auction similar to the C-Method. Continuous trading then commences through a series of sequential trading sessions in an arena which resembles a trading pit. In each session, stocks are announced in a predetermined order, and traders in the arena can execute bilateral trades continuously, until the demand for trading is satisfied (usually within 1–3 minutes). At first, there was a single arena in which all V-Method trades occurred. Due to the increase in the number of stocks traded under this method, there are now three trading arenas operating simultaneously. On a typical day, there are 3–5 rounds of continuous trading, and each stock is traded a number of times in each round. In 1994, the mean daily number of transactions in the continuous trading stage was 24.4 per stock, and the median was 17.1 (calculated from data in TASE, 1994).

The V-Method was designed to increase liquidity and efficiency. Traders' ability to execute multiple transactions within the day mitigates the price impact of large orders. Traders can also correct pricing errors after observing the transaction prices of the same and similar stocks and after obtaining additional market information. Such correction of pricing errors in response to market-wide information is typical of exchanges that open with a call auction followed by continuous trading (see, Amihud, Mendelson and Murgia, 1990 for the Milan Stock Exchange; Amihud and Mendelson, 1991b for the Tokyo Stock Exchange). The V-Method thus facilitates the convergence of prices to new information and contributes to a smoother value discovery process. Finally, the ability to take a position and unwind it during the same day reduces the risk of carrying unwanted inventory. This increases traders' willingness to absorb temporary demand shocks into their inventory and increases liquidity (Amihud and Mendelson, 1980; Ho and Stoll, 1981).

Indeed, stocks transferred from the C-Method to the V-Method enjoyed an improvement in efficiency and liquidity and a decline in volatility (see Section 3.4 below). By the first-half of 1995, trading in V-Method securities accounted for 73% of the total equity trading volume on the TASE, including convertibles. About 40% of the volume in V-Method securities was traded at the opening call auction, and 60% in the subsequent rounds of continuous trading (TASE, 1995).

A large proportion of trades are still executed at the open, partly because of a required minimum order size of \$3000 (which was increased to \$5000 during part of our sample period) in the continuous trading sessions, although brokers may combine small orders with the same limit price into a larger order. Also, on the opening transaction all orders are executed at a single price, while in the continuous trading that follows there may be a difference between the buying and selling prices, resulting in a higher cost of trading (Amihud and Mendelson, 1985). For some traders, the concentration of trading at the opening enhances liquidity (Mendelson, 1985; Admati and Pfleiderer, 1988), and some are unwilling to delay their trades. As a result, both the opening call and the continuous trading sessions attract significant volume. Thus, the V-Method makes alternative trading methods available on the same stock exchange (as proposed by Amihud and Mendelson, 1985, 1988b), and investors can choose between them.

2.3. Transfer procedure

Stocks were phased into the new V-Method gradually. A TASE executive committee periodically selected groups of securities for transfer and made a recommendation to the TASE board of directors. Subsequent to this recommendation, and usually within 5 trading days, the TASE board of directors would publicly announce a new list of securities to be transferred. The announcement day in our study is the day of the board's announcement. The actual transfer took place a few days following the public announcement. The V-Method was designed for stocks with 'high marketability' (TASE, 1988), and this constituted the main selection criterion.[1] The number of securities traded under the V-Method grew gradually, and now stands at one hundred securities.

3. Methodology and empirical results

Our main hypothesis is that the improved market microstructure under the V-Method had a positive effect on the prices of stocks transferred from the C-Method. We tested this hypothesis by conducting an event study of the transferred stocks. The transfer of stocks to the V-Method is virtually *a pure microstructure event.* Consequently, any price effect of the TASE transfer decision can be attributed entirely to the change in the trading mechanism.

3.1. The data

Stocks were transferred from the C-method to the V-method in groups, a few stocks at a time. We study all 120 stock transfers that occurred between 6 December 1987, when the TASE implemented the final and current form of the V-Method, and the end of 1994. The 120 stocks were transferred in 17 batches; the average number of stocks in each transfer was 7 and the median was 6. Part of the 120 transferred stocks were dropped at various times. The net effect of these additions and deletions is that 100 securities are currently traded under the V-Method.

[1]Christie and Huang (1994) showed, however, that when stocks were transferred from Nasdaq to US stock exchanges, the greatest liquidity benefits accrued to the less marketable stocks.

Data on the stocks transferred, the TASE announcement dates and the subsequent transfer dates was obtained from 'This Month in the TASE', an official TASE publication. We designated the date of the transfer decision by TASE's board of directors as the announcement day. Announcements were made immediately after the market's closing, and thus affected stock prices on the following day. The transfer date was announced as part of the board's decision; it was between one and seven business days after the announcement day (the median was 3 days). We denote the announcement day by 'A' and the transfer day by 'T'. Daily closing prices, adjusted for cash and stock dividends, were obtained from the Israeli financial data services firm Tochna Lainyan and from the database of the Faculty of Management at Tel Aviv University.

3.2. Cumulative abnormal returns

We first present descriptive event-study data documenting the Cumulative Abnormal Returns (CAR) (see Brown and Warner, 1980). The event window is from 5 days before the announcement day ($A - 5$) until 30 days after the transfer day ($T + 30$). We start from day $A - 5$ to account for possible leaks of the TASE executive committee's recommendation regarding the list of stocks to be transferred, and allow for a long post-event period to examine whether the effect on stock prices was permanent.

We estimated the market model regressions

$$R_{nt} = \alpha_n + \beta_n \mathrm{RM}_t + \varepsilon_{nt}, \tag{1}$$

where R_{nt} is the return on stock n on day t and RM_t is the daily return on the value-weighted TASE index (returns are the logarithms of the relative price changes, presented in percentage points), α_n and β_n are constant coefficients, and ε_{nt} are the residuals. The market model is estimated over days $T + 31$ to $T + 160$, except for the last transfer event which had data available only through day $T + 103$. The estimation of the market model using post-event data was done in order to avoid an ex-post selection bias.[2] The selection criteria of the TASE may induce a bias in the estimated market-model parameters if we use pre-event data to estimate the model. This is because the TASE is more likely to select stocks that reached high volume and capitalization, which could imply that they performed unusually well prior to their selection.

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[2]Copeland and Mayers (1982) estimated the market model using post-ranking data in their study of the Value-Line enigma to avoid the problem of ex post selection bias. Brown et al. (1995) discuss biases in event-study results where parameters are estimated from pre-event data while the test is conditional on ex post information. In their study of the effect of listing, Kadlec and McConnell (1995) used post-listing data to estimate the market model.

We then calculated the abnormal returns

$$\mathrm{AR}_{nt} = R_{nt} - (\alpha_n + \beta_n \mathrm{RM}_t) \tag{2}$$

for each day t in the event window, days $A - 5$ through $T + 30$, where the parameters α and β are estimated by the market model (1). The cumulative abnormal returns are

$$\mathrm{CAR}_{ns} = \sum_{t=A-5}^{s} \mathrm{AR}_{nt}, \tag{3}$$

for the event days $s = \mathrm{A} - 5, \mathrm{A} - 4, \ldots, T + 30$. Then, we averaged the CAR_{ns} across all stocks to obtain CAR_s. The days between the announcement A and the last day before the transfer, $T - 1$, which varied, were combined.[3]

As shown in Fig. 1, the average cumulative abnormal return rises slightly during days $A - 5$ to $A - 1$, possibly reflecting news leaks or market anticipation. The CAR for days $A - 5$ through $A - 1$ was 2.15%, mostly due to the abnormal return on day $A - 4$, which was 1.235% (SE = 0.211%). It then rises sharply at the announcement and through the transfer day T, where $\mathrm{CAR}_T = 6.80\%$. The average CAR then declines slightly and hovers between +5% and +6% through the end of the event window. These results show that the transfer of stocks into the V-Method generated a permanent price increase of about 5% on average.

The estimated abnormal return around the announcement and transfer days may underestimate the full effect of the transfer to the V-Method. Because the selection criterion was based on the executive committee's assessment of high marketability, the market could partly anticipate which stocks were likely candidates for transfer to the V-Method, and their prices could have risen well before the announcement. While the TASE decision on the specific stocks to be transferred to the V-Method was made within five days before it was announced, there could be earlier speculation regarding the identity of these stocks. The timing of the transfer decisions and the number of stocks in each transfer were unpredictable. For example, *Haaretz* (a leading Israeli Newspaper) reported on 20 February 1991, that the TASE was building a new trading arena which would enable trading of 40 additional securities by the V-Method. The report suggested 11 stocks as candidates for the transfer. Two months later, the TASE selected 8 stocks from that list for transfer. We examined the price changes of these 8 stocks. The CAR on the day of the newspaper story and the day that followed was 2.27%. From the story day to day $A - 6$ we had

[3]A similar methodology was used in a takeover study by Asquith (1983), who combined the abnormal return from the announcement day to the outcome day since, as here, the time interval varied for each case in his sample.

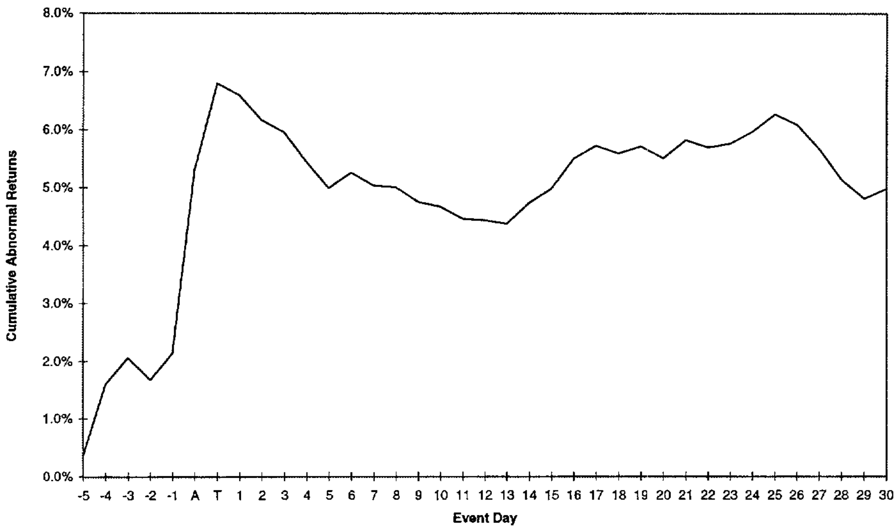

Fig. 1. Cumulative abnormal returns for stocks transferred to the V-Method. Average cumulative abnormal returns (CAR) for 120 stocks that were transferred from the C-Method to the V-Method of trading on the Tel Aviv Stock Exchange (TASE) between 6 December 1987 and the end of 1994. 'A' on the event day axis aggregates the time period from the day of the announcement by the TASE of the stocks selected for transfer through the day before the transfer (the number of days in this period varied). 'T' is the transfer day. The CAR for each stock was estimated over the period $A-5$ through $T+30$. The market model from which the parameters were estimated is $R_{nt} = \alpha_n + \beta_n \mathrm{RM}_t + \varepsilon_{nt}$, where R_{nt} is the return on stock n on day t and RM_t is the daily return on the TASE value-weighted index (returns are the logarithm of relative price changes). α_n and β_n are constant coefficients, and ε_{nt} are the residuals. (The market model was estimated over days $T+31$ through $T+160$.)

CAR = 6.08%, and from day $A-5$ to $A+1$, CAR = 3.90%. This case illustrates our suggestion that the price increase of stocks that were transferred to the V-Method exceeds the CAR estimated by us around the days of the public announcement of the transfer.

For explicitly testing the effect of the transfers to the V-Method, the ordinary event-study test procedure may be inappropriate. Because stocks were transferred in batches, the returns of stocks in the same batch could be cross-sectionally dependent, thereby biasing the variance estimates. We therefore carried out the event study tests for portfolios of stocks transferred in the same batch, referring to these as transfer portfolios. Each of the 17 transfer events i, $i = 1, 2, \ldots, 17$ is identified by its announcement date A_i and transfer date T_i. The following model was estimated for each event i over days $A_i - 5$ through $T_i + 160$:

$$R_{it} = \alpha_i + \beta_i \mathrm{RM}_t + \sum_{j=1}^{3} \gamma_{ij} D_{ijt} + \varepsilon_{it}, \tag{4}$$

where R_{it} is the equally-weighted day-t return on transfer-portfolio i, $i = 1, 2, \dots, 17$, RM_t is the daily return on the value-weighted TASE index, and α_i, β_i and γ_{ij} are constant coefficients. The abnormal return was estimated by using dummy variables, defined as follows:

$$D_{i1t} = \tfrac{1}{5} \text{ on days } A_i - 5 \text{ to } A_i - 1, \tag{5}$$

$$D_{i2t} = \tfrac{1}{2} \text{ on days } A_i \text{ and } A_i + 1, \tag{6}$$

$$D_{i3t} = 1/k_i \text{ on days } A_i + 2 \text{ to day } T_i + 30, \tag{7}$$

k_i being the number of days during this period (see, Thompson, 1985; Malatesta, 1986; Karafiath, 1988). In the model displayed in Eq. (4), the regression coefficients γ_{ij} measure the cumulative abnormal return over each of the three time intervals associated with the three dummy variables. We also calculated the sum of the dummy-variable coefficients for each event

$$\text{SUM}_i = \gamma_{i1} + \gamma_{i2} + \gamma_{i3}, \tag{8}$$

where SUM_i represents CAR_i over days $A_i - 5$ to $T_i + 30$. For our tests, we calculated the averages of the estimated coefficients across the 17 events, $A\gamma_j = \sum_i \gamma_{ij}/17$, $j = 1, 2, 3$, and the average of SUM_i. The t-statistics are calculated in the ordinary way: $t(A\gamma_j) = A\gamma_j/(\text{SD}\gamma_j/17^{1/2})$, where $\text{SD}\gamma_j$ is the cross-sectional standard deviation of the 17 estimated coefficients γ_{ij}.

The estimation results, presented in Table 1, show a highly significant price increase at the announcement of the transfer of stocks to the V-Method. The mean CAR over the pre-announcement period, $A\gamma_1$, and over days A to $A + 1$, $A\gamma_2$, are positive and significant, as evidenced by their t-statistics. $A\gamma_3$, the post-announcement CAR, is insignificantly different from zero. SUM, which estimates the CAR over the entire period $A - 5$ to $T + 30$, has a mean of 5.517% which is highly significant. Further tests on the significance of the 17 estimated t-statistics, t_{ij}, which are homoskedastic, confirm the robustness of our results (see Table 1, Column (2)).

Given the relatively small number of transfer events, the means could be affected by outliers. Column (3) presents the medians of the estimated regression coefficients of model (4) and of SUM (Eq. (8)). We observe that the key medians are similar in magnitude to the means.

Column (4) of Table 1 presents the number of positive and negative coefficients γ_{ij} for each j, and the respective binomial probability of observing the indicated number of negative γ_{ij} under the null hypothesis that the probability is 0.5. The results show that the null is soundly rejected at better than the 0.05 level for γ_{i2} and for SUM.

While the improvement in liquidity after the transfer was anticipated on the announcement day, its full benefit could be consummated only in trading that

Table 1
Estimated value effects of stock transfers to the new variable price trading method.

Results for the event-study model $R_{it} = \alpha_i + \beta_i \mathrm{RM}_t + \Sigma_{j=1}^{3} \gamma_{ij} D_{ijt} + \varepsilon_{it}$, for 120 TASE stocks that transferred from the call trading method to the variable price method over the period 1988–1994, aggregated in 17 transfer events.

Variable	Mean ($A\gamma_j$) (t-statistic) (1)	$t(At\gamma_j)$ statistic (2)	Median (3)	Pos:Neg (Binomial Probability) (4)	Weighted Mean (t-statistic) (5)
Intercept	− 0.07 (− 2.19)	− 2.39*	− 0.11	5:12 (0.98)	− 0.07* (− 2.41)
β	1.14** (26.49)	10.64**	1.14	17:0 (0.00)	1.11** (27.82)
$D1$ $A - 5$ to $A - 1$	2.13* (2.30)	2.34*	0.97	12:5 (0.07)	2.36* (2.61)
$D2$ A to $A + 1$	3.04** (4.42)	5.36**	3.33	15:2 (0.00)	2.86** (4.48)
$D3$ $A + 2$ to T + 30	0.35 (0.21)	0.56	0.13	9:8 (0.50)	1.10 (0.70)
SUM $A - 5$ to $T + 30$	5.52** (3.05)		6.38	13:4 (0.03)	6.31** (3.95)
SUMT $A - 5$ to T	7.55 (6.95)		7.65	17:0 (0.00)	6.99** (6.16)

*Significant at 0.05.
**Significant at 0.01.

R_{it} is the equally-weighted day-t return on transfer-portfolio i, $i = 1, 2, \ldots, 17$, RM_t is the daily return on the value-weighted TASE market index (returns are in percentage points, with 1% presented as 1) and α_i, β_i and γ_{ij}, $j = 1, 2, 3$ are constant coefficients. The announcement day is denoted by A and the transfer day by T. For each event i, $i = 1, 2, \ldots, 17$, the model was estimated for the portfolio of transferred stocks from day $A_i - 5$ to day $T_i + 160$. The coefficients of the three dummy variables D_{ij} estimate the cumulative abnormal returns (CAR) over three periods, as follows: D_{i1} for day $A_i - 5$ to $A_i - 1$; D_{i2} for day A_i to $A_i + 1$; and D_{i3} for day $A_i + 2$ to $T_i + 30$. $\mathrm{SUM}_i = \gamma_{i1} + \gamma_{i2} + \gamma_{i3}$ is the cumulative abnormal return from day $A_i - 5$ to day $T_i + 30$. The last row documents the results from the event-study model where the dummy variable D_{i2} is for day A to T, D_{i3} for day $T + 1$ to $T + 30$ and $\mathrm{SUMT}_i = \gamma_{i1} + \gamma_{i2}$, the CAR from day $A - 5$ to day T.
(1): average of the estimated coefficients across events (t-statistic in parentheses).
(2): $t(At\gamma_j)$, the t-statistic for the means of the 17 sample $t\gamma_{ij}$ statistics from the regression of the event-study model, $t\gamma_{ij} = \gamma_{ij}/\mathrm{SE}(\gamma_{ij})$. The mean and standard deviation of the 17 t-statistics, $At\gamma_j$ and $\mathrm{SD}t\gamma_j$, are used to calculate the ordinary t-statistic $t(At\gamma_j) = At\gamma_j/(\mathrm{SD}t\gamma_j/17^{1/2})$. The t-tests for α and β are analogous.
(3): medians of the 17 estimated coefficients.
(4): number of positive and negative estimated coefficients. In parentheses: the binomial probability that γ_{ij} is equally likely to be positive or negative, against the alternative hypothesis that it is positive.
(5): weighted average of the estimated coefficients of model (1) over the 17 estimations, the weights being the number of stocks in each transfer portfolio (t-statistics are in parentheses).

started on the transfer day. Similarly, Christie and Huang (1994) showed that when stocks transfer from Nasdaq to the NYSE, the bid–ask spread narrows only from the day of the transfer. Only then were investors able to exploit the higher liquidity and lower transaction costs, which would induce them to pay more for these stocks. Thus, we also estimated the CAR from day $A - 5$ through (including) the transfer day T, defining the dummy variable D_{i2t} in the event-study model (Eq. (4)) over days A_i to T_i and calculating $\mathrm{SUMT}_i = \gamma_{i1} + \gamma_{i2}$. In six of the 17 transfers, day T was day $A + 1$, whereas in 11 cases the transfer occurred after day $A + 1$. The results show that SUMT_i was positive for all 17 events. The mean of SUMT_i was 7.547% ($t = 6.95$) and its median was 7.650%.

Overall, the results strongly support the existence of a positive price effect due to the transfer of stocks to the V-Method. The price increase was permanent, economically meaningful and statistically significant.

3.3. Liquidity externalities

Amihud and Mendelson (1988b, 1990, 1991c) postulated that trading is characterized by liquidity externalities, or spillovers, across securities.[4] When the values of two securities, A and B, are correlated, an improvement in the trading mechanism for security A will have a positive effect on the liquidity of B. The source of this improvement is that a more efficient trading mechanism improves value-discovery for A, allowing traders in B to use the (improved) observed prices of A to make a more informed inference on the value of B. However, when the returns on A and B are highly correlated, the two securities may serve as partial substitutes in investors' portfolios.

We examine the existence of liquidity externalities as follows. A subsample of TASE companies have two classes of stock with identical claims on capital (including cash distributions and liquidation) but different voting rights.[5] We call such stocks *twin stocks*. The two classes of twin stocks typically have differences in liquidity due to differences in the number of shares outstanding and differences in float. We consider twin stocks where the *primary stock* – usually the more liquid of the twins – was transferred to the V-Method, while the *secondary stock* continued to be traded by the C-Method. The sample includes 23 twin stocks in 12 transfer events.

The null hypothesis is that the transfer of the primary stock to the V-Method had no effect on the corresponding secondary stock. There are two alternative hypotheses:

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[4]Liquidity externalities for individual securities were introduced in Mendelson (1985). On the public-good type externality of services provided in the securities markets, see Cohen et al. (1986, ch. 8).

[5]The ratio of voting rights between the two classes is usually 5:1.

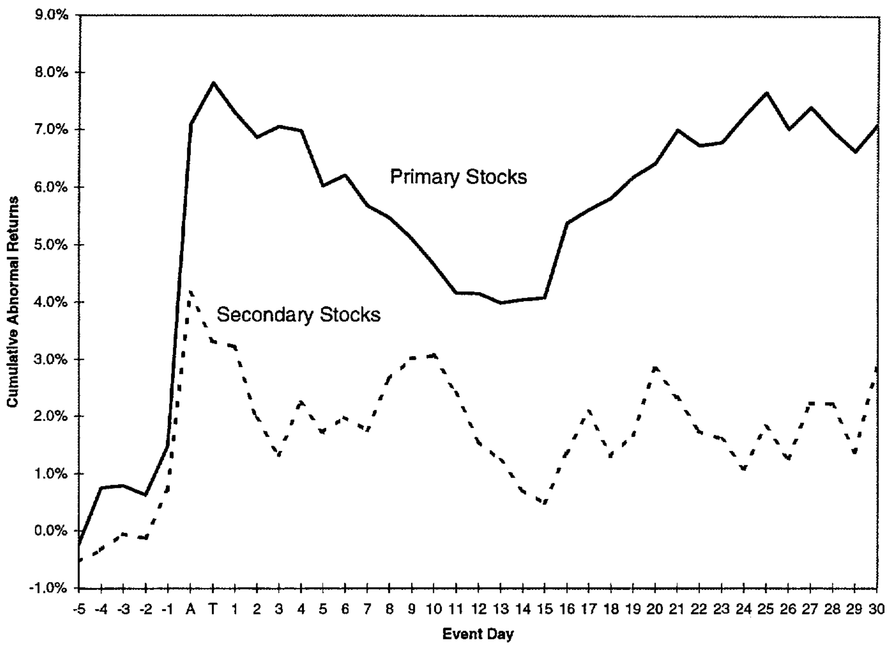

Fig. 2. Cumulative abnormal returns for twin stocks. Average cumulative abnormal returns (CAR) for 23 twin-stock pairs in 12 transfer events on the TASE. In each case, the firm had two classes of stock listed. One class (the 'primary' stock) transferred from the C-Method to the V-Method of trading while the other class (the 'secondary' stock) continued to be traded under the C-Method. See Fig. 1 for more details regarding the data and estimation. '*A*' on the event day axis aggregates the time period from the day of the announcement by the TASE of the primary stocks selected for transfer to the V-Method through the day before the transfer (the number of days in this period varies). '*T*' is the transfer day.

The liquidity externality hypothesis. Section 3.2 demonstrates that stocks gain when they are transferred to the improved trading mechanism of the V-method. If there are positive liquidity externalities, the secondary stock should also enjoy some of the benefits of the improved trading method for the primary stock, resulting in a price increase for the secondary stock. The hypothesis is thus that at the announcement, (i) the price of the secondary stock increases, but (ii) by less than the price increase of the primary stock.

The substitution hypothesis. If investors' demand for the twin stock is not perfectly elastic (see, Shleifer, 1986), the improved liquidity of the primary stock makes it more attractive relative to the secondary stock, thereby reducing the demand for the secondary stock. Under this hypothesis, the secondary stock's price will decline.

These hypotheses are examined using our subsample of 23 twin stocks. Fig. 2 shows the average CAR over days $A-5$ through $T+30$ for both primary and secondary stocks. The CAR for the secondary stocks from day $A - 5$ to day T (transfer) was 3.3% compared with 7.8% for the primary stocks. This result supports both parts of the liquidity externality hypothesis: (i) the prices of secondary stocks increase even though the improved trading method is available only to the primary stocks; and (ii) the price increase is greater for the primary stocks, which directly benefit from the improved trading method.

To test the statistical significance of these results, we estimated the model in Eq. (4) for the secondary stock portfolios, with the dummy variables set to measure the CAR over the period $A - 5$ to T. The secondary stocks' estimation model includes a lagged market return because, being traded on the C-Method, some of these stocks adjust their prices gradually to the market. (See analysis in Section 3.4.2 below.) The mean SUMT was 4.88% ($t = 2.83$) and the median was 4.62%. This supports part (i) of the liquidity externality hypothesis: there was a significant increase in the price of the secondary stocks that continued to trade under the C-Method when their twins were transferred to the V-Method.

To test part (ii) of the liquidity externality hypothesis we calculated DR_{it}, the difference between the portfolio returns on the primary and secondary stocks in event i on day t. Using DR_{it} as the dependent variable in the event-study model shown in Eq. (4), we found that the cumulative differential return over the period $A - 5$ to T, SUMT, had a mean of 4.25% ($t = 2.34$) and a median of 5.07%. This shows that the price increase of the secondary stocks, which enjoyed a liquidity externality, was significantly lower than the price increase of the primary stocks that directly benefited from higher liquidity under the V-Method.

3.4. Liquidity, efficiency and the trading mechanism

The V-Method was expected to improve market quality compared to the C-Method. Next, we examine how the liquidity and efficiency of trading were affected by the transfer from the C-Method to the V-Method.

3.4.1. Liquidity

Liquidity in the TASE cannot be measured by bid–ask spreads. There are no designated market-makers or specialists who post bid and ask quotes. In trading by the V-Method, brokers and dealers call out prices and quantities and transactions are carried out. While it is theoretically possible to impute a bid–ask spread from the limit prices of the marginal buy and sell orders that could not be executed, these data are unavailable. We therefore use two common measures of liquidity: the stock's trading volume and the stock's liquidity (or Amivest) ratio.

(1) *Trading volume* (V): Theoretically, the trading volume or trading frequency of a given security is an increasing function of its liquidity, other things equal (Mendelson, 1982, 1985; Amihud and Mendelson, 1986). Thus, an increase

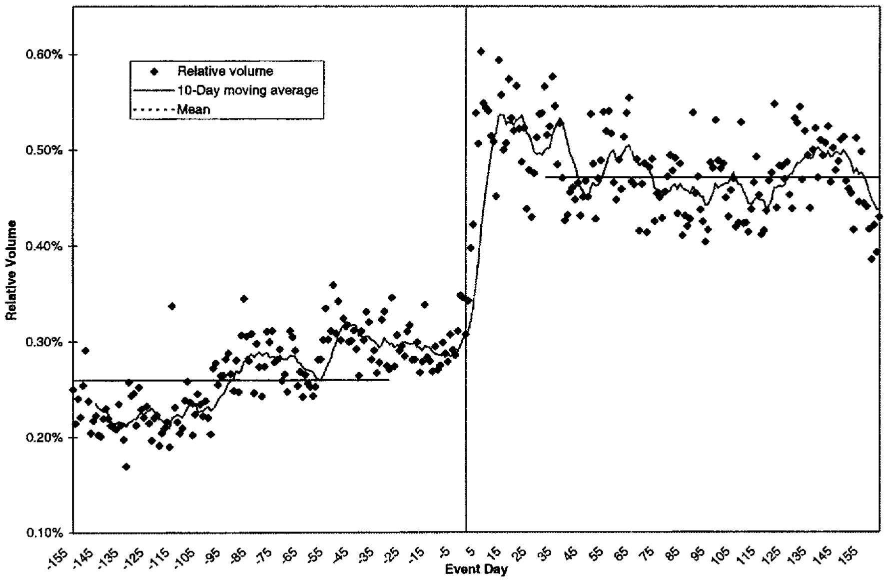

Fig. 3. Relative volumes before and after stock transfers to the V-Method. Trading volumes are relative to the market volume for the 120 stocks that were transferred from the C-Method to the V-Method on the TASE. For each day t, the daily trading volume of each stock was calculated as a percentage of the market volume on the same day. The results were then averaged over the 120 transferred stocks for each event day. The curved line shows 10-days moving averages for the relative volume time series, and the two steady lines labelled 'mean' represent the mean relative volume before (days $A - 155$ through $A - 31$) and after (days $T + 31$ through $T + 160$) the event period, where A denotes the announcement day and T denotes the transfer day.

in the trading volume of a stock after its transfer to the V-Method reflects an increase in its liquidity.

We calculated the relative volume of each stock, calculating the stock's volume as a percent of the market volume, for each event-day s, and then averaged the relative volumes across the 120 stocks. The resulting time series are presented in Fig. 3. Clearly, the transfer of stocks to the V-Method is associated with a dramatic increase in their trading volumes (see also, Lauterbach and Ungar, 1992). The upward trend in the relative trading volume of the transferred stocks prior to the announcement is noteworthy. This trend probably contributed to the likelihood that these stocks would be selected for transfer to the V-Method.

To test the rise in volume for our sample, we define the change in the relative volume as

$$DV_j = \log(V_j/VM)_{AFTER} - \log(V_j/VM)_{BEFORE}, \tag{9}$$

where V_j and VM are, respectively, the average daily trading volume on stock j and on the market (in monetary units), and the subscripts indicate 'before the announcement' (days $A-155$ through $A-31$) and 'after the transfer' ($T+31$ through $T+160$). The change in the relative volume, DV_j, was positive for 78% of the transferred stocks; its mean was 0.492% ($t = 7.27$), and the median was 0.421%.

(2) *Liquidity Ratio* (LR): The liquidity ratio, also called the Amivest measure of liquidity, measures the trading volume associated with a unit change in the stock price. A higher LR implies greater market liquidity or depth. The liquidity ratio is defined as

$$\mathrm{LR}_j = \sum_t V_{jt} / \sum_t |\mathrm{R}_{jt}|, \tag{10}$$

where V_{jt} and R_{jt} are, respectively, the volume and return on stock j on day t, and the summation is over the days in the estimation period (see, Cooper et al., 1985; Khan and Baker, 1993). The relative change in the liquidity ratio (LR) for stock j is defined by

$$\mathrm{DLR}_j = \log\,(\mathrm{LR}_{j,\mathrm{AFTER}}/\mathrm{LR}_{j,\mathrm{BEFORE}}), \tag{11}$$

where the subscripts are as defined above. DLR was positive for 85% of the transferred stocks, with a mean of 0.87 ($t = 10.90$) and a median of 0.87. That is, after the transfer to the V-Method, there was an increase in the trading volume that was associated with a change of 1% in the stock price. This means that the market had more depth. In summary, the transfer to the V-Method was associated with a significant increase in liquidity.

The results are thus consistent with our hypothesis on the positive relation between liquidity and stock values: the stocks transferred to the V-Method enjoyed both substantial liquidity gains and significant price increases. Naturally, the impact of the transfer varied across stocks. Thus, a further examination of our hypothesis is provided by estimating the cross-sectional model

$$\mathrm{CAR}_j = \delta \cdot \mathrm{DLIQ}_j + \sum_{k=1}^{16} \zeta_k \cdot \mathrm{DUMEVENT}_{kj} + \kappa_j, \tag{12}$$

where CAR_j is the cumulative abnormal return on stock j from day $A-5$ to day $T+30$, DLIQ is the change in liquidity as measured by DV or DLR, and $\mathrm{DUMEVENT}_{kj} = 1$ when stock j is in event k (zero otherwise). By our hypothesis, $\delta > 0$.

The estimation results were as follows. For DLIQ defined as DV, $\delta = 5.10$ ($t = 2.03$), and for DLIQ defined as DLR, $\delta = 4.17$ ($t = 1.80$). The standard errors were estimated using White's (1980) method. The estimated coefficient δ is possibly downward biased towards zero due to the problem of errors-in-the-variables. The explanatory variable, DLIQ, is a noisy estimate of the improvement in liquidity of the transferred stocks, and thus its estimated effect is smaller than its true effect. Still, both estimated coefficients are significantly positive at better than 5% (one tail test). This shows that across stocks too, the price increase after the transfer to the V-Method was related to the improvement in liquidity.

3.4.2. *Efficiency*

Improving market efficiency was a stated objective of the TASE in instituting the V-Method (TASE, 1987). This objective implies an improvement in the value discovery process by which information is incorporated into stock prices. Continuous trading enables investors to obtain information about the value of a stock after having observed both contemporaneous market movements and the transaction prices of the same stock and related (similar) securities. This is consistent with the existence of liquidity externalities, discussed in Section 3.3. Amihud, Mendelson and Murgia (1990) observed that in the Milan *Borsa*, pricing errors in the call auction were reversed towards the market during the continuous trading session that followed the call. The V-Method should enable investors to incorporate information into the stock price more quickly and with greater precision compared to the C-Method. Therefore, under the V-Method the pricing errors relative to the contemporaneous market index should be smaller because of both a faster adjustment to changes in the market index, and smaller firm-specific errors given the information available from the observed prices of the same and related stocks. In what follows, we first examine the pricing errors before and after the stock transfer to the V-Method, and then study their sources.

Amihud and Mendelson (1989b, 1991b) introduced the Relative Return Dispersion, based on the variance of returns across securities, as a descriptive measure of the efficiency of a trading mechanism. Christie and Huang (1990, 1995) used the cross-sectional dispersion of equity returns to study the tendency of asset prices to move together over the business cycle and in extreme market moves. The Relative Return Dispersion (RRD) is defined by

$$\mathrm{RRD}_s = (1/120)\cdot \sum_{i=1}^{120} \varepsilon_{is}^2, \tag{13}$$

where ε_{is} is the simple market-model residual of stock i on event-day s. The market model was estimated separately before and after the announcement date. The RRD measures, for each day s, the dispersion of the returns on the individual stocks around the market. Since the dispersion of values due to firm-specific information should be independent of the trading mechanism, systematic differences in RRD between the 'before' and 'after' periods indicate differences in efficiency.

The behavior of RRD_s, shown in Fig. 4, is consistent with greater efficiency after the transfer to the V-Method. The average of RRD_s over days $A - 155$

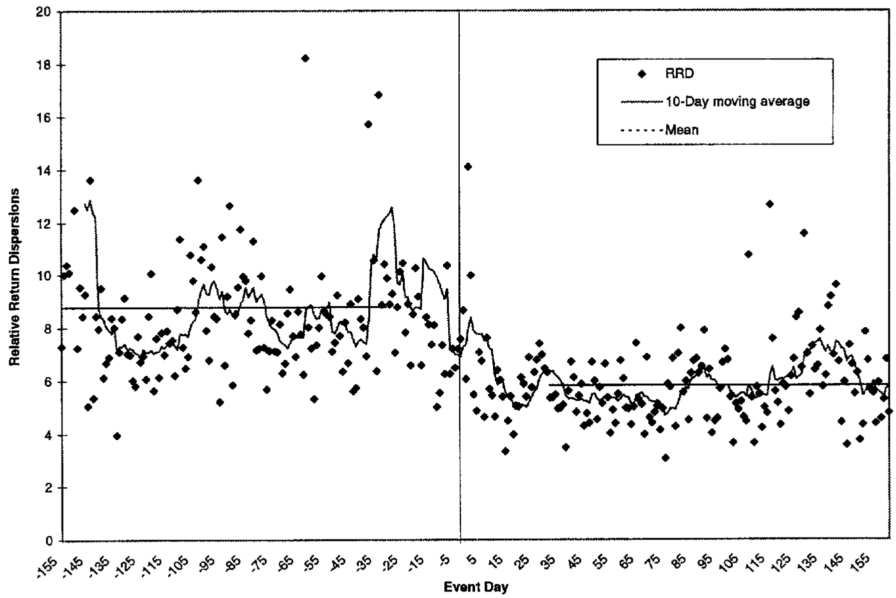

Fig. 4. Relative Return Dispersions (RRD) before and after stock transfers to the V-Method. Relative Return Dispersions (RRD) of 120 stocks that were transferred from the C-Method to the V-Method on the TASE. The Relative Return Dispersion for event-day s is defined by $\mathrm{RRD}_s = (1/120)\cdot\sum_{i=1}^{120}\varepsilon_{is}^2\cdot\varepsilon_{is}$ is the simple market-model residual of stock i on event-day s, where the market-model was estimated separately before and after the event day. The curved line shows the 10-day moving average of the RRD series, and the two steady lines labelled "mean" represents the mean RRDs before (days $A-155$ through $A-31$) and after (days $T+31$ through $T+160$) the event period, where A denotes the announcement day and T denotes the transfer day. On three days, the RRD exceeded 20; the corresponding data points are out of scale (and hence, are not shown in the figure), but they were included in the mean and the moving average calculations.

through $A-31$ was 8.79, compared with 5.79 over the period $T+31$ through $T+160$.

We next examine the change in the two factors that may contribute to inefficiency under the C-Method: (a) lagged adjustment to changes in the market index, and (b) high firm-specific noise. We estimated for each stock the lagged market model regression

$$\mathrm{R}_{jt} = \alpha_j + \beta_j\cdot\mathrm{RM}_t + \mathrm{l}\beta_j\cdot\mathrm{RM}_{t-1} + \varepsilon_{jt}, \tag{14}$$

where R_{jt} is the return on stock j on day t, RM_t is the market return, β_j and $\mathrm{l}\beta_j$ are the coefficients for current and lagged RM, respectively, and ε_{jt} is the residual whose variance is denoted by Var(ε). The model was estimated separately over two periods: before the announcement, days $A-155$ through $A-31$, and after the transfer, days $T+31$ through $T+160$.

Table 2
Improvements in efficiency under the variable price trading method.

Estimated parameters of the market model $R_{jt} = \alpha_j + \beta_j \cdot \mathrm{RM}_t + 1\beta_j \cdot \mathrm{RM}_{t-1} + \varepsilon_{jt}$.

R_{jt} is the daily return on stock j on day t, RM_t is the market daily return and ε_{jt} is the residual return. β_j and $1\beta_j$ measure the beta coefficients for contemporaneous and lagged RM, and Var(ε) is the estimated residual variance. There are 120 stocks transferred to the V-Method over the 1988–1994 period. The 'before' period is days $A - 155$ through $A - 31$ and the 'after' period is days $T + 31$ to $T + 160$ (A is the announcement day and T is the transfer day).

Period	β	1β	Var(ε)
Before announcement			
Mean	0.929#1	0.146*0	8.791
(Std. Error)	(0.027)	(0.022)	(0.743)
Median	0.959	0.118	6.251
After transfer			
Mean	1.108*1	−0.008#0	5.929
(Std. Error)	(0.026)	(0.017)	(0.522)
Median	1.091	−0.020	4.289
Difference			
After-*Before*			
Mean	0.180*0	−0.154*0	−2.862
(Std. Error)	(0.037)	(0.023)	(0.578)
Median	0.104	−0.130	−2.010
Positive:Negative	77:43+	35:85+	23:97+

*0, *1: The mean is significantly different from 0 or 1, respectively (at the 0.05 level).
#0, #1: The mean is not significantly different from 0 or 1, respectively (at the 0.05 level).
+ : The proportion of cases which are positive is significantly different from 0.50 (at the 0.05 level).

The results, presented in Table 2, are consistent with the hypothesis that the V-Method (in particular, the ability to trade throughout the day) improved efficiency.

(a) *Adjustment to market information.* Participants in the V-Method were able to make better adjustments in response to market information. Under the C-Method, there was a significant adjustment lag to the market index: the mean of 1β was 0.146 and highly significant. After the transfer to the V-Method, 1β declined for most stocks and its mean became practically zero, implying that stock prices adjusted promptly to market information. The coefficient β of the contemporaneous market return correspondingly increased after the transfer so that the mean of $\beta + 1\beta$ remained about the same (1.075 before vs. 1.100 after). Thus, while the fundamental relation between the returns on individual stocks and the market was unaffected by the change, traders' ability to react to market movements on the same day, rather than having to wait for the following day's call, increased market efficiency. While this outcome is directly predictable given the change in the trading mechanism, it is reassuring that the results are strong and statistically significant.

(b) *Firm-specific information.* Continuous trading enables traders to trade on the firm-specific information they have and learn this information from other traders' transactions through the same trading day. Thus, we examined whether the transfer to the V-Method lowered the variance of the residuals from the *lagged* market model (Eq. (14)), which controls for the effects of delayed adjustment to the market. Indeed, the results in Table 2 show that after the transfer the residual variance, Var(ε), declined for most stocks, and its average was lower by about a third. While the change in market microstructure should not have changed any fundamental information about the stocks (other than the change in their liquidity), it had a favorable effect on the precision with which new firm-specific information was incorporated in stock prices.

3.4.3. The interaction of liquidity and efficiency improvements

Finally, we propose that the improvements in liquidity and efficiency, brought about by the improvement in market microstructure, are positively correlated (Amihud and Mendelson, 1988b). To test this hypothesis, we used the two measures of change in efficiency, discussed above: the change in the β coefficient of the lagged RM,

$$\mathrm{dl}\beta_j = \mathrm{l}\beta_{j,\mathrm{AFTER}} - \mathrm{l}\beta_{j,\mathrm{BEFORE}}, \tag{15}$$

and the change in the variance of the market model residuals,

$$\mathrm{dVar}(\varepsilon)_j = \log(\mathrm{Var}(\varepsilon)_{j,\mathrm{AFTER}}) - \log(\mathrm{Var}(\varepsilon)_{j,\mathrm{BEFORE}}). \tag{16}$$

Both measures were obtained from the lagged market model regression (Eq. (14)), estimated over both the 'before' and 'after' periods. We then estimated the cross-sectional models

$$\mathrm{dl}\beta_j = \eta \cdot \mathrm{DV}_j + \sum_{k=1}^{16} \zeta_k \cdot \mathrm{DUMEVENT}_{kj} + \kappa_j, \tag{17}$$

and

$$\mathrm{dVar}(\varepsilon)_j = \theta \cdot \mathrm{DV}_j + \sum_{k=1}^{16} \zeta'_k \cdot \mathrm{DUMEVENT}_{kj} + \kappa'_j, \tag{18}$$

where DV_j is the change in volume as defined above, and the dummy variables $\mathrm{DUMEVENT}_{kj}$ are as defined in model (2).[6] By our hypothesis on the

[6] We did not use the liquidity ratio as a measure of liquidity for this test because both DLR and the efficiency measures were generated from the same return data, raising the possibility of a spurious relation between them. Regressions using DLR gave rise to similar results: $\eta = -0.106$ ($t = 3.69$), and $\theta = -0.184$ ($t = 3.90$).

interaction between liquidity and efficiency changes, we expect $\eta < 0$ and $\theta < 0$. That is, improved liquidity should reduce the lag in price adjustment and the return noise.

The estimated coefficients were $\eta = -0.114$ ($t = 4.05$) and $\theta = -0.062$ ($t = 1.20$). The regression standard errors were estimated using White's (1980) method. Again, the estimated coefficients are possibly biased towards zero due to the problem of errors-in-the-variables (see Section 3.4.1). Both η and θ had the expected sign, although only η was significantly different from zero. In addition, we estimated the relation between the change in β itself and DV, obtaining a regression coefficient of 0.18 with $t = 6.23$, consistent with our hypothesis. This is the mirror image of the results for dlβ, given no change in the fundamentals.

In summary, the results suggest that improvements in liquidity are associated with greater efficiency in the dissemination of information into stock prices.

4. Conclusions

In this paper we showed that improvements in market microstructure are valuable. Specifically, we found that stocks that were transferred to a more efficient trading method in the TASE enjoyed significant and permanent price increases. Since the transfer of stocks was mandated by the TASE and was not a decision made by the companies' managements, it represents a pure market microstructure event: the transfer does not reflect private information of the companies' insiders and the results are not due to self-selection. Rather, the price appreciation found for stocks transferred to the new trading method reflects the value of improved market microstructure that brings about improvement in liquidity.

Stock liquidity improved following the transfer to the new trading method: there was a large and significant increase in both the market-adjusted trading volume and in the liquidity ratio. Across stocks transferred to the new method, the value gains were positively associated with the increase in liquidity. The new method also led to improved efficiency of the value-discovery process. Stock prices adjusted faster to market information, and the noise in stock prices declined. These efficiency gains were positively related to the liquidity improvement across stocks. The greater efficiency made stock prices more informative, and the improved trading system benefitted the market as a whole. We also found that the benefits of the improved trading method generated positive externalities (or spillovers) for related stocks which continued to trade under the old trading method. These stocks, although not directly affected by the more liquid new trading method, also appreciated when their 'twin' stocks were transferred to the new method.

Our results highlight the value of improving the quality of trading mechanisms (Amihud and Mendelson, 1988b). In Israel, the value benefits were a very large multiple of the investment in the improved trading system. Our methodology can be extended to the study of liquidity events in other securities markets that changed their microstructure, such as in Europe and in emerging markets. It would be interesting to define the market-microstructure events for the changes occurring in these markets and to study their impact on securities values.

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