



## TEL-AVIV STOCK EXCHANGE

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### **The King (Call Market) Is Dead. Long Live the King (Continuous Trading)?**

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#### **1. Background**

For 60 years, the Tel Aviv Stock Exchange used a call market as its major trading method. For the first 50 of those years, in fact, the floor-based call market was the TASE's only trading system.

This paper aims to show how and why the introduction of computerized continuous trading reduced the use of call-market trading.

In 1987, the call market remained the sole form of trading for most shares and all bonds. But that year, the more liquid shares began trading on the call market as well as in an open-outcry semi-continuous method called the Varying Prices (or in Hebrew, Mishtanim) method.

Four years later, the TASE introduced a computerized call market, and price discovery in the call market became fully automated. That move led the exchange to end floor-based trading in 1000 shares and convertible securities and in 400 bond series. The move to a computerized call market also tripled, to three, the number of available floors on which semi-continuous trading, in liquid shares, was conducted.

Nevertheless, the system remained rather primitive. At the Symposium on Electronic Call Market Trading, held at New York University in 1995, participants understood that the TASE had developed a sophisticated piston-engined aircraft – the computerized call market – while Europe's stock exchanges were already flying supersonic jets, some of which were already into their second generation.

That same year, the TASE began examining the introduction of automated, order-driven continuous trading, following the mainstream trading system in use at dozens of stock

exchanges. And in August 1997, the new trading system – the Tel Aviv Continuous Trading, or TACT, system – started up.

The TACT system was jointly developed by the TASE staff and by a subsidiary of the Chicago Stock Exchange (now called DST Catalyst). The TACT system is based on software installed by the Chicago Stock Exchange in the stock exchanges of Bangkok, Manila and Johannesburg.

The TACT is a second-generation open system; it routes orders to the trading computer from thousands of workstations located at the branches of TASE members and at the premises of institutional investors. It's a flexible system, enabling trades of various types of securities including shares, warrants, convertible bonds, straight bonds and Treasury bills.

And it has proved a great success: Domestic traders, as well as brokers acting on behalf of international investors, are highly satisfied with the system. The launch was smooth, and despite the system's technological complexity, no malfunctions have been reported, and trading has never been interrupted. In just 16 months, all shares, convertible bonds, warrants, bonds and T-bills (some 1,400 in number) were transferred to TACT.

Also worth noting is that the TACT has won praise within academic circles. The senior TASE executives who managed the project received the prestigious Adams Institute for Business Management Information Systems annual award for the system's establishment and successful operation.

Before the TACT system was introduced, about half of trading in the most liquid 100 shares was conducted using the computerized call market system (in Hebrew, the Meretz system) and half in the semi-continuous open-outcry system. The 50% figure for each of the two systems represents the average over four years, but the actual proportions for each year didn't vary much from 50-50.

With the onset of TACT, call-market trading volume declined. As we will see, however, call-market trading eased not because traders simply disregarded its many attributes, which have been clearly demonstrated by market microstructural studies. Rather, the drop in call-market trading can be explained to a large extent by factors that are unique to Israel's capital market.

## **2. The Tel Aviv Continuous Trading (TACT) System**

The TACT is a mainstream system whose counterparts can be found in dozens of stock exchanges. The following account focuses on the version for trading in shares, including convertible bonds and warrants:

- A pre-opening phase runs from 8:30 until 10:00 a.m. As of 9:00, the TASE disseminates projected, or theoretical, prices and trading volumes for all shares, as well as the projected TA 100 and TA 25 indexes. In the pre-opening phase, market, limit and at-the-open orders of any size may be placed.
- The opening phase for the TA 100 shares, conducted with the call-market method, begins at 10:00 and lasts about one minute. In this phase, the prices prescribed may not fluctuate more than 10% up or down from the previous day's closing prices. Orders not executed in the opening phase are automatically transferred to the next phase – continuous trading. At 10:30, a similar opening phase takes place for the rest of the shares, the less-liquid ones.
- Continuous trading in each share begins immediately after its opening price has been discovered and continues until 3:30 p.m. In this phase, price fluctuations are unrestricted. The minimum order value is \$500 for small-cap stocks and \$2,000 for the TA 100 shares.
- At the closing-price phase of trading, shares are traded bilaterally at their closing prices. This phase runs from 3:30 to 3:45 p.m. and there is no price discovery. Closing prices are calculated as a rather complex volume weighted average of the prices discovered toward the end of the continuous-trading phase.
- In the closing phase, like the pre-opening phase, orders of any size may be placed.
- After trading closes at 3:45, no orders may be submitted until the pre-opening phase on the following trading day.

- The system does not incorporate designated market makers. Each trader is entitled to place orders, and because this is an open system, it is highly accessible.
- The decision not to include market makers in TACT was based on the experience of European stock exchanges and was not controversial. As the TASE has never incorporated designated market makers, the problem of protecting their interests during the shift to computerized trading did not arise.
- Trading rules are almost identical for all 1,000 shares, convertible bonds and warrants traded on the TACT system. Moreover, these rules also apply to trading in T-bills and straight bonds, although here, trading parameters, such as trading hours, minimum order size in the continuous phase, and others, are different.

The decision to use a single trading method was not an easy one, since the TASE staff was fully aware of the vast difference in the liquidity of the various shares traded via TACT. The desire to introduce a second trading method – one better suited to the less-liquid shares – was rejected because the TASE needed to allocate information-technology resources to computerizing trading in derivatives. The TASE made only one modification for the small cap (“YETER”) shares: These shares’ opening phase now begins half an hour after the TA 100 shares’ opening phase. The Exchange hopes that this modification will make trading the less-liquid securities easier for investors.

In the interim, traders in the less-liquid securities were obliged to make less use of the continuous phase and to trade on the call market, as explained below.

- The system described above has a single order book and a single board, which greatly facilitates the technological aspects. This architecture was prescribed following the shortage of information-technology resources that occurred at the TASE in the late 1990s. The exchange hopes that the next-generation system will address these aspects in a more sophisticated manner, should this prove necessary.

We will conclude the description of the TACT by highlighting the attributes introduced to the system to enhance the fairness and liquidity:

- To prevent errors, the system automatically rejects any limit orders for execution at prices that deviate from the previous trade price by more than 35%. This filter was

introduced following several cases in which keyboarding or other errors occurred while orders were being submitted.

- In the last 15 minutes of the pre-opening phase, book orders are frozen and no changes may be made in orders participating in determining the theoretical prices. In addition, the order in which prices are discovered is determined randomly each day. These measures were prescribed to prevent manipulation, and although similar tools are in use in many stock exchanges, the length of the freezing period in TASE is exceptional.

We should emphasize that the opening prices of the shares included in the TA 25 index serve as the settlement price for the exercise of options on this index. Therefore, it was especially important to create a mechanism to foil manipulators. A 15-minute freezing period also may deter, however, placing orders in the pre-opening phase and contributes to the preference for continuous trading.

- Limiting fluctuations in opening prices to 10% is designed to protect investors in the less-liquid shares, but it causes more than a few operational difficulties. This restriction is probably unnecessary with respect to the liquid shares, but as we have seen, constraints resulting from a shortage of information-technology resources prevented the TASE from developing a separate version for trading in the liquid shares. This cap is important mainly to traders placing at-the-open orders.
- The TACT has solved the problem of odd lots rather effectively. The TASE solution allows orders of any size to be submitted (even a single share) in the pre-opening phase and in the closing phase. Originally, in the continuous phase, only orders of at least \$5000 were allowed.

This approach stemmed from the desire to prevent continuous trading from being flooded with small orders, clogging the communications network. But as the less-liquid shares were moved to the new trading system, concern arose regarding possible exaggerated price volatility in the continuous trading phase. The \$5,000 minimum order was thus instituted to divert the majority of orders in the less-liquid shares to the opening and closing phases.

The decision reflects the faith of the TASE and the Israel Securities Authority in the call-market trading for less-liquid securities, to the point that traders and investors are given no choice in the matter.

Trading at closing prices is not conducted on a call market, in line with accepted practice in many stock exchanges. Instead, the TASE opted for bilateral trading, which is conducted at a predetermined closing price, described earlier.

Here, the TASE determined that the final phase of trading should be extremely brief. The preference was to conclude trading in a closing phase that, like the opening phase, would be based on the call market. This was rejected, for the time being, for operational reasons. As we explain in the next section, the tendency to trade in the closing phase is low, and the TASE does not intend, at least for now, to invest in converting it to call market.

Trading in a share is suspended for 45 minutes when a company disseminates a substantive, price-sensitive report to its shareholders. After the suspension, trading is renewed on the call market. For the first 15 minutes after dissemination, the book is closed and no orders may be submitted. The next 30 minutes consist of the pre-opening phase, after which the price is discovered in the call-market procedure.

- Last but not least, the disseminated depth of the order book is the same for TASE members and all other traders.

To sum up, the TACT's structure reflects the experience of many stock exchanges, and a great belief in the advantages of the call market (which is understandable in view of the TASE's history). To date, the TASE's version of an order-driven continuous system also reflects the constraints during the Exchange's evolution. The urgent need to adapt the TACT system to trading in derivative products is determining the priorities of the TASE and its members. Therefore, only minimal information-technology resources can be allocated to fine-tuning the TACT for the needs of less-liquid shares. Most resources in 1999-2000 are to be channeled to developing a computerized system for trading in derivatives and in completing readiness for Y2K.

### **3. Trading on the TASE in the TACT Era**

#### **The Decline in the Call Market's Importance**

How did the transition to the TACT affect trading on the TASE? We have not yet been able to conduct in-depth studies on the subject, but using partial data and initial experiences, we can illuminate a number of points.

The salient characteristic of the TACT is that the weight of trading in the call-market opening phase is low compared with that in the pre-TACT era. The weight of call-market opening trading in the 100 most liquid shares is about 10% (Table 1), whereas in the computerized call market system their weight was almost 50%.

The drop in the importance of opening trading is surprising in view of the improvements of call-market opening trading in TACT compared with the old CCM. The CCM was cumbersome and insufficiently transparent and interactive (price discovery process took a couple of hours). By contrast, in TACT the opening phase is very interactive, in real time, and as of 9:00 until opening prices have been discovered, the TASE disseminates projected, or theoretical, prices and turnover in addition to data on the depth of the order book.

The decline in the weight of trading in the call-market opening phase surprised the TASE management, as it seemingly indicates a preference for continuous trading over the call market. As we will explain, however, this impression resulted from a combination of factors that are unconnected to the positive features of the call market.

The factors that affected the newly discovered preference are:

- The old, semi-continuous trading was floor-based and did not enjoy the full anonymity that is typical of the TACT system. It followed that institutional investors, wishing to operate anonymously, were obliged to submit orders to the CCM, as there was no other way to trade anonymously in the floor-based, semi-continuous trading system. In the TACT, this does not pose a problem, as the continuous phase is fully anonymous.

- In the semi-continuous trading method, the value of the lots traded was \$7,600, whereas in the TACT system the minimum order sizes are \$500 or \$2,000 . Consequently, part of the CCM trading resulted from small orders that could not participate in the semi-continuous trading and were therefore submitted to the CCM.
- A non-technical factor also may have an even greater impact on the preference for continuous trading. Opening trading in Tel Aviv takes place at 8:00 a.m. London time, when the picture of trading in Europe – which has a crucial effect on trading in Tel Aviv – is still unclear. In the early hours of the morning, all the information investors on TASE have is the previous end-of-day trading data from the U.S. and new trading data only from the Far East.

It is conceivable that in the period of economic unrest and volatility in international markets that has prevailed since the TACT system was launched in summer 1997, investors in Tel Aviv have tended to postpone submitting orders until they received a clearer indication of trends in European stock exchanges. This point may be of considerable importance because of the significant part that international investors, based mainly in London, have played on the TASE in recent years.

It has been pointed out that international investors tend to instruct their Israeli brokers not to exceed a certain proportion of total trading volume. Therefore, the brokers tend to place such orders not too early and only after getting some notions about the expected trading volumes.

- An anti-manipulation mechanism has been introduced in pre-opening trading, preventing changes to orders in the 15 minutes that precede opening trading. This period is significantly longer than the one customary in other stock exchanges, and it may deter professional investors from trading in the opening phase.
- Finally, it seems that traders on TASE are absorbed with their new “toy” – continuous, transparent and interactive trading. Many are fascinated by their new-found ability to simply keyboard in an order and then see it enter the order book within a second or two. This is easy to understand in a stock exchange where trading had never been continuous and simultaneous, neither on the floor nor by computer.

It is easy to believe that novices on TASE also attribute considerable value to the immediacy of continuous trading and to the fact that spreads are not large (see below), despite the market being fairly volatile.

### **The call market is more desirable for the less-liquid shares**

The facts presented in the previous section may well disappoint call-market devotees. At the same time, however, an analysis of the data indicates that the fundamental characteristic of the call market – its ability to damp random fluctuations and to improve the quality of the price discovery process – still affects traders in Tel Aviv.

Table 1 indicates that the lower a share's liquidity, the greater the weight of trading in the opening phase. These findings are consistent with the theoretical advantages of the call market.

**Table 1 - Distribution of Trading during the three Phases of TACT**

**October & November 1998**

<b>Decile</b>	<b>Average daily turnover per share (US \$ thousands)*</b>	<b>Weight of opening phase trading</b>	<b>Weight of continuous phase trading</b>	<b>Weight of closing price phase trading</b>
1	622	8.4%	88.5%	3.1%
2	28	10.1%	87.1%	2.8%
3	10	14.2%	83.1%	2.7%
4	5	18.5%	78.4%	3.1%
5	3	19.0%	75.8%	5.2%
6	2	21.3%	75.8%	2.9%
7	1	26.3%	69.4%	4.3%
8	1	37.1%	58.9%	4.0%
9	1	65.1%	31.1%	3.8%
10	1	0.0%	0.0%	0.0%
<b>Total 685 Shares</b>	<b>67</b>	<b>8.7%</b>	<b>88.2%</b>	<b>3.1%</b>

In the 68 shares included in the top decile, opening call-market trading reaches only 8.4% of the total volume, but it goes up monotonously, in reverse relation to the liquidity of the shares.

### **TACT Has Slightly Increased Trading Volumes**

One of the most interesting questions is whether the transition to TACT has significantly increased trading volumes. Such growth was reported by European stock exchanges that use order-driven computerized trading methods.

Again, we haven't yet completed definitive studies of the subject. But data collected by TASE staff and by researchers at Tel Aviv University and the Israel Securities Authority (see reference) indicate that total volumes in liquid shares have increased following the move to the TACT. At the same time, the TASE staff and members had expected more significant growth in volume.

The shortfall in volume increases may be explained on several levels:

- Trading volumes on the TASE are highly volatile, and statistical methods probably have not completely isolated the net impact of the change in the trading system.

- In 1998, trading volumes on the TASE were on the low side, and the advantages of continuous computerized trading were probably not fully realized. The problem definitely does not stem from traders moving slowly to adapt to the new computerized tools. On the contrary, Israeli and international traders skillfully and enthusiastically adopted the new method.

The bottlenecks, so typical of floor-based trading, apparently did not significantly limit trading volumes in low-intensity periods like 1998. Consequently, the advantages of computerized trading in breaking through physical bottlenecks are not yet very tangible.

- The very tangible manifestation of eliminating bottlenecks was felt on some trading days in single shares, where trading surged to volumes not previously achieved. This is true of days on which there were struggles for control in particular companies, or on the initial days of trading following an IPO, and on the last trading day in 1998.

### **Data on Spreads**

A famous myth in the market microstructure community goes that Bob Schwartz discovered the call market in 1977, during a visit to the TASE as guest of his colleague, Amir Barnea. When Schwartz asked Barnea what the TASE's typical spread was, Barnea replied that in the TASE trading system there are no spreads. Schwartz, who was raised on Western trading methods, refused to believe his ears and was therefore treated to an introductory lecture presenting the call market. The rest is history.

Twenty years after the mythological encounter between Schwartz and the call market, TASE is able to boast that it, too, has spreads. Spreads in the shares that comprise the TA 25 index (the 25 most liquid shares) range from 0.25% to 0.5%. Considering the low trading volumes characteristic of the TASE in 1998, the spreads are quite reasonable and may offer some explanation of the lack of eagerness to trade in the opening phase.

### **4. Summary**

The trading method chosen by the Tel Aviv Stock Exchange indicates the high regard for the call market and its importance in discovering prices for patient traders. The call market was incorporated in the TACT system in the following manner:

- Opening trading is carried out on a call-market system.
- Following suspension during the day, trading is renewed on the call market. This refers to both a general suspension after a circuit breaker is triggered, and to suspended trading in a specific share after a price-sensitive report has been disseminated. Moreover, were it not for technical constraints, closing trading would also be conducted in the call-market method.
- The prices discovered in opening trading are final settlement prices for options and futures contracts.

The drop in the weight of call-market volumes following the introduction of the TACT system came as something of a surprise. As we have seen, though, the decline results from several unique factors and does not necessarily indicate an all-out trader preference for continuous trading.

## **References**

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