Electronic trading in Hong Kong and its impact on market functioning

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1. Introduction

The use of electronic trading (ET) platforms has expanded rapidly in recent years, from liquid and homogeneous instruments on organised exchanges, such as stocks and futures, to a wide variety of instruments in foreign exchange and fixed income markets, in both wholesale inter-dealer markets and retail markets. The introduction of ET platforms has the potential to change the way the market functions. Such platforms increase the operational and informational efficiency of the market through reductions in transaction costs and improvements in market access and transparency. However, increased competition could reduce dealers' incentive to make markets and adversely affect market depth. The overall effect of ET on market liquidity is an unresolved issue.

This paper examines the recent emergence of ET platforms in Hong Kong, and discusses its likely impact on financial market functioning, drawing on recent studies by the Committee on the Global Financial System (CGFS) and others, and results from our empirical work. Based on intraday transactable, firm quote prices and trade data in the Hong Kong stock index futures market, we find evidence that ET helps to improve market liquidity by reducing bid-ask spreads (BASs), after controlling for the effects of price volatility and trading volume. Furthermore, BASs widen under ET relative to a floor-based trading system when trading volume increases at times of market stress. However, ET will underperform a floor-based system only under extreme market conditions. As a result, this study sheds some light on how market liquidity behaves under ET during normal times and under stress.

The rest of the paper focuses on two topics. Section 2 describes the characteristics of major trading platforms in Hong Kong in the over-the-counter (OTC) fixed income and foreign exchange markets, as well as in the stock market at the retail level. This will be discussed in a qualitative analytical framework. Section 3 focuses on the impact of ET on market functioning, and presents the empirical evidence on such impact in an organised exchange environment. Section 4 concludes.

2. Electronic trading platforms in Hong Kong

An ET system is a facility that provides some or all of the following functions: electronic order routing (the delivery of orders from users to the execution system), automated trade execution (the transformation of orders into trades), and electronic dissemination of pre-trade (bid/offer quotes and depth) and post-trade information (transaction price and volume data) (CGFS(2001)).

ET systems differ from traditional systems, such as floor-based or telephone trading, in a number of ways. ET is location-neutral, ie users do not need to be in the same physical location, and allows continuous multilateral interaction (whereas telephone trading is bilateral). This facilitates cross-border trading and cross-border cooperation of trading systems. Furthermore, ET offers large scope for economies of scale and reduction of operational costs, as it is cheap and easy to increase trading capacity, which tends to encourage consolidation. Finally, ET allows straight through processing by easily integrating different parts of the trading process, starting from display of pre-trade information, through to risk management.

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[1] The views expressed in this paper are those of the authors and do not necessarily reflect the opinion of the Hong Kong Monetary Authority. We are grateful to Stefan Gerlach, Grace Lau, Tony Latter, Priscilla Chiu, Esmond Lee and internal seminar participants for helpful comments and Polly Lai for excellent secretarial assistance. All remaining errors are ours.

Before discussing the impact of ET on market functioning, it is useful to review how markets are organised. Usually, trading is conducted in either exchange-based or over-the-counter (OTC) markets (Table 1). Centralised markets such as some of the stock and futures exchanges are order-driven with centralised order books. Market participants interact multilaterally and there is no negotiation within the system. In decentralised markets such as fixed income and derivatives markets, often referred to as OTC markets, markets are quote-driven and segmented into an inter dealer and a dealer to customer market. Market participants interact bilaterally, and the price of large orders is negotiated.

Table 1

Key features of market architectures

	Order book	OTC market
Access	No segmentation	Segmentation
Interaction	Multilateral	Bilateral
Price formation	Centralised, usually order-driven	Fragmented, quote-driven
Dealers	Often present, but not necessary	Necessary for trade execution
Transparency	Potentially high	Limited
Anonymity	Usually anonymous	Not anonymous, but limited disclosure
Trading protocols	Standardised	Not standardised
Continuity	Continuous or periodic	Generally continuous

Source: CGFS (2001).

ET increases the operational efficiency in both centralised and fragmented markets. Automation of the trading process lowers order-processing costs, while the integration of the trading process makes straight through processing possible. It also reduces the search costs by automating the collection of pre-trade and post-trade information and increasing the amount and timeliness of information.

Fragmented markets become more centralised under ET through increased use of multi-dealer systems and moving towards order books. ET systems provide the technology to eliminate the intermediaries in segmented markets. The bilateral OTC relationship between dealers can be replaced by a centralised marketplace with better price discovery and transparency, while the dealer-to-customer relationship can be moved from single-dealer to multiple-dealer systems. The speed of price information transmission from inter-dealer markets to customer markets will be improved.

ET is rapidly gaining ground in financial markets, from organised exchanges to a wide variety of instruments in foreign exchange and fixed income markets. This global trend has also been observed in Hong Kong (Table 2). The migration of Hang Seng Index futures and options to the ET system in June 2000 made the Hong Kong Futures Exchange fully electronic (Box 1). ET systems have also been introduced in the inter-dealer and retail markets in bond and foreign exchange trading (Boxes 2 and 3).

3. Impact of electronic trading on market functioning

Through its impact on trading costs and market architecture, ET will have a profound effect on market functioning and financial stability, in terms of market efficiency, liquidity, volatility and resilience during times of stress (CGFS (2001)). Reduced transaction costs and greater efficiency of ET facilitate trading, increase liquidity and reduce price volatility (Habermeier and Kirilenko (2001)). However, competition, in the form of lower costs and increased transparency due to ET, reduces margins, leading to fewer dealers and reducing the amount of liquidity they provide. This also reduces the bargaining power of large market players to negotiate a better price for their positions. The emergence of multiple ET platforms for trading stocks in the United States leads to concerns about market fragmentation, in terms of the dispersal of trading (CRS (2000)).

Table 2

Major ET platforms in Hong Kong

	Organised exchanges	OTC markets
Products traded	Stock and futures contracts	Fixed income and foreign exchanges
Major trading platforms	AMS/3 for stocks and HKATS for futures trading	ABP BIA and BETS for bonds and FXall, Reuters and EBS for foreign exchanges
Ownership	A listed company (went public in June 2000)	Shareholder-owned, mainly banks and information service providers
Date of introduction and implementation	Stocks: first introduced in 1993, fully electronic by March 1997	ABP: launched trading in October 2000 BIA: established in July 2000, trading expected in fourth quarter 2001 BETS: established in March 1999 in the United States, started trading Hong Kong government bonds in December 2000 by JPeX Reuters: launched in 1992 EBS: launched in 1993 FXall: launched in May 2001
Price formation	Order-driven, with strict price and time priority	Quote-driven, multi-dealer trading platforms
Information dissemination	Timely and transparent, through the internet and information service providers	Timely and transparent, through the internet and/or private networks
Trading costs	Trading fee and tariff to the Exchange, brokerage fees to the brokers, and stamp duty	ABP: transaction fees and content subscription BIA: franchise and transaction fees Reuters, EBS: transaction fees BETS and FXall: no transaction fees

Abbreviations:

AMS/3: The third generation of Automatic Order Matching and Execution System

HKATS: Hong Kong Futures Automated Trading System

ABP: AsiaBondPortal

BIA: BondsInAsia

BETS: Bloomberg Electronic Trading System

JPeX: JP Morgan eXpress

EBS: Electronic Brokering System

Sources: Hong Kong Exchanges and Clearing Limited; various websites.

ET improves pricing information collection and transmission to market participants, which leads to better informational efficiency. As a result of improved transparency, market prices reflect better and faster available information about the fundamentals. However, the reduced number of dealers may reduce risk capital from the marketplace and the provision of liquidity by dealers at times of stress. Information regarding counterparty risk is more important during times of stress: the anonymous nature of many ET platforms may affect their performance during times of stress. As ET affects multiple factors that influence the informational and operating efficiency of the market, the impact of ET on market functioning and financial stability becomes an empirical question.

Since the operation of ET platforms in OTC markets (mainly in bond and foreign exchange trading) in Hong Kong has only recently started, and trading data are not readily available yet, we turn to the organised exchange for evidence on the impact of ET on market functioning. In this section, we study the BASs, trading volumes and volatility of HSI futures trading before and after the transition to electronic systems on the Hong Kong Futures Exchange on 5 June 2000. The HSI futures contract was introduced in May 1986. It is among the most heavily traded contracts in the world, with a daily

trading volume of over 17,500 contracts at end-June 2001. Contracts for the spot month, the next two calendar months, and the next two quarterly months are available, with trading concentrated in the spot month contract till the day before it expires (on the business day prior to the last business day of the month).

In the literature, whether market liquidity is better in automated trading systems or in the open outcry markets in the organised exchanges remains a controversial issue (Table 3).[2] On the one hand, it is argued that automated trading systems are less liquid than open outcry markets because automated systems cannot handle periods of intense trading as well as floor-traded systems. This is because automated systems have a higher degree of information asymmetry concerning the identity of the traders, and deprive liquidity providers such as locals and market-makers of some of their trading advantages. The delays in cancelling orders on the automated systems discourage the submission of limit orders as traders are forced to offer free options with a duration longer than those on the floor-traded systems. This effect could be especially important during periods of intensive trading, a reflection of high information arrival. Automated systems can reduce the human errors observed in floor trading, but have experienced delays or system failure when faced with unusually large trading volume.

Table 3

Comparison of open outcry and automated trading systems

	Open outcry trading	Electronic trading
Liquidity	Perceived to be inherently more liquid by some of the world's largest exchanges (CBOT, CME, NYSE)	Recent empirical studies have found evidence that ET may be better
Immediacy	Orders are changed/cancelled faster, and price discovery maintained in markets under stress	Especially during market stress, order cancellation procedure may cause delays and discourage limit orders; system may slow down or fail
Efficiency	Different prices may exist, orders may not fairly matched (front-running and curb-trading), with scope for human errors	Transparent price discovery, reduced frauds and human errors
Cost	High fixed and operating costs	High development costs, low operating costs
Anonymity	Provide more information about counter-party	Adverse selection in block trades, limiting the growth of order size
Global link	Segregated exchanges	24-hour, globally linked trading possible

Source: Adapted from Tsang (1999).

On the other hand, automated systems may enhance market liquidity because they are more cost-effective than floor trading, which leads to higher volume traded. They also offer greater transparency of the order book on prices and volumes away from the best bid and ask, which can reduce information asymmetry and provide more information for market-makers to manage their inventory exposure more effectively. This leads to a reduction in adverse selection costs and lower BASs. Furthermore, trade and quote data are disseminated faster on an automated system, which encourages off-floor participants to provide liquidity.

Empirical studies have been conducted to assess the effect of ET systems on market liquidity. Frino et al (1998) examined the trading of bund futures on the floor-based open outcry London International Financial Futures Exchange (LIFFE) and the automated Deutsche Terminbörse (DTB), which offered two different trading mechanisms operating at the same time for the same security. The paper

[2] For a detailed literature review on this topic, see Frino et al (1998), Tsang (1999) and Frino and Hill (2001).

investigated periods during which each exchange's share of total bund trading was similar and found that BASs were wider on the LIFFE than the DTB, after controlling for trading activity and price volatility. It was also found that BASs on the DTB were higher than LIFFE for a given level of volatility, after controlling for trading volumes. The result implies that ET systems are capable of providing higher liquidity than open outcry, but the relative performance of ET systems deteriorates during periods of high price volatility. Hill (2000) examined intraday trade and quote data for the nearest to maturity Share Price Index (SPI) futures contract traded on the Sydney Futures Exchange (SFE) for the period 30 September to 25 October 1999, a total of 30 trading days around the beginning of ET of the contract on 4 October 1999. The study found that BASs were significantly lower on the screen-traded system, compared to the previous open outcry market. This implies that the screen-traded market structure facilitates higher levels of liquidity than the floor-traded market, highlighting the effect of automation on the efficiency of a futures market. Frino and Hill (2001) examined the transition of trading in stock index futures from open outcry to ET in the LIFFE, SFE and HKFE during 1999-2000. Quote and trade data 50 days prior to the introduction of ET and 50 days afterwards were examined. Similar results to the Frino et al (1998) study were found: ET reduced the BASs across the three exchanges, but may increase spreads when price volatility is higher.

Table 4

Empirical studies on the effect of ET systems on market liquidity

	Frino, McInish and Toner (1998)	**Hill (2000)**	**Frino and Hill (2001)**	**Current study**
Market studied	Bund futures on LIFFE (open outcry) and DTB (automated)	SPI futures contract on SFE around the introduction of ET	Stock index futures on LIFFE, SFE and HKFE around the transition to ET	HSI futures contracts before and after the introduction of ET
Data	Intraday trade and quote data from 14 Oct to 24 Nov 1997 - 30 trading days, over five-minute intervals	Intraday trade and quote data from 30 Sept to 25 Oct 1999 - 30 trading days, over 15-minute intervals	Intraday trade and quote data 50 days pre-ET and 50 days post-ET - 100 trading days	Intraday trade and quote data from July to Sept 1998, Jan to Apr 2000, and Feb to Jun 2001 - 232 trading days
Method	Descriptive statistics for mean and median BASs on DTB and LIFFE, and regression analysis	Descriptive statistics for mean and median BASs, volume and volatility	Descriptive statistics for mean and median BASs, volume and volatility, and regression analysis	Descriptive statistics for mean and median BASs, volume and volatility, and regression analysis
Results	BASs are wider on the LIFFE than the DTB, after controlling for volume and price volatility. BASs on the DTB increase more rapidly as price volatility increases relative to the LIFFE	BASs are found to be significantly lower on the ET system, compared to the previous open outcry system	BASs are lower under the ET system across the three exchanges. However, BASs become wider in response to higher price volatility under ET, relative to floor trading	BASs are significantly lower under ET, after controlling for volume and price volatility. BASs widen under ET, relative to floor trading, when trading volume is higher

Following the methodology used in the previous studies, we examined the intraday trade and quote data for the nearest to maturity HSI futures both before and after the introduction of ET on 5 June 2000.[3] The intraday data are a record of the time and price of every trade and revision in firm (transactable) quotes on the exchange. The use of the intraday quote data avoids major shortcomings of the indicative quotes which are non-transactable prices, typically wider than the quoted spreads, and may be imprecise, especially during intensive trading as traders get too busy dealing to update

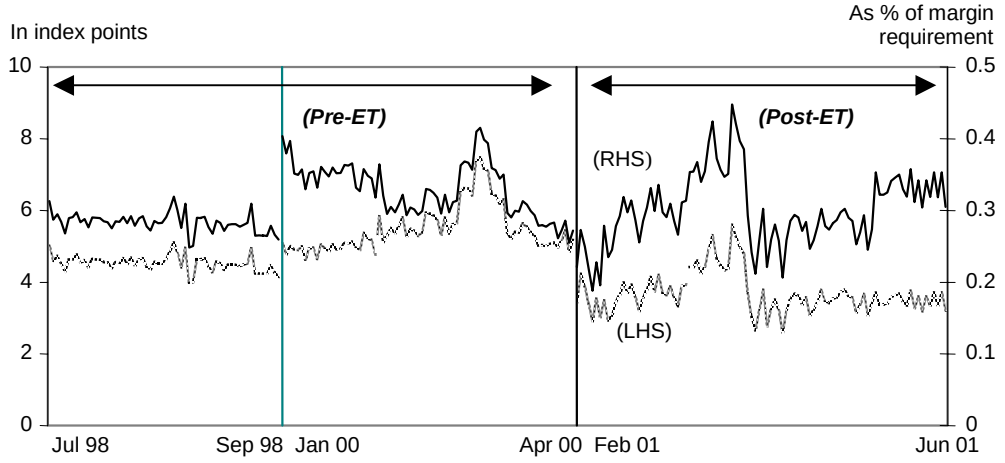
[3] We are grateful to Elton Cheng of the HKEX for providing the intraday HSI futures contract trade and quote data.

their indications (Goodhart et al (1995)). The periods covered are 2 July-30 September 1998, 3 January-28 April 2000 and 1 February-29 June 2001. Altogether, we have 136 observations before the introduction of ET, covering the period during the Asian crisis, and 96 observations afterwards.

BASs are used to measure market liquidity. Being a major part of trading costs, they are commonly used as an important indicator of the quality of the market functioning. Time-weighted, transactable BASs are calculated in index points for each day t: $BAS_t = \sum_{i=1}^{n} BAS_i t_i \Big/ \sum_{i=1}^{n} t_i$, where t_i is the amount of time bid-ask spread i was alive on day t. Time-weighted percentages of BASs are also calculated, with respect to the margin required to trade the futures contract.[4] Price volatility (*Volatility*) is calculated as the time-weighted standard deviation of the midpoint of the bid-ask quote P_i for each day t: $Volatility_t = \sqrt{\sum_{i=1}^{n} (P_i - \overline{P})^2 t_i \Big/ \sum_{i=1}^{n} t_i}$. The trading volume (*Volume*) is measured by the number of contracts traded (Graphs 1-3).

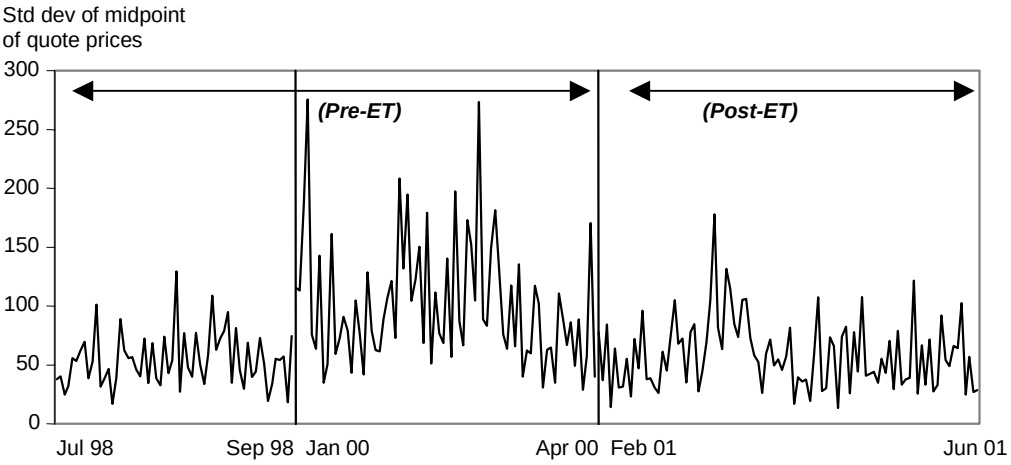
Graph 1

Bid-ask spreads of HSI futures contracts



Graph 2

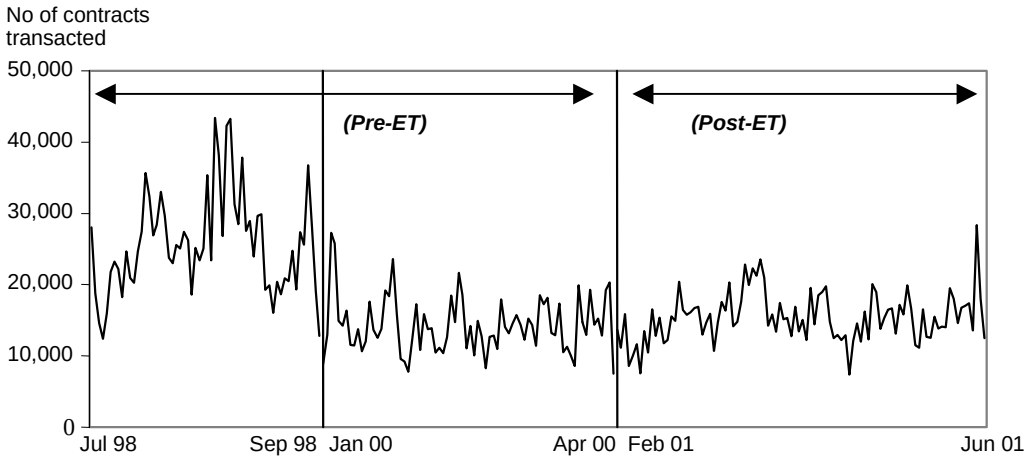
Price volatility of HSI futures contracts



[4] The rationale for the calculation of percentage BASs in relation to the margin instead of the midpoint of the BASs quotes is that the price paid for the futures contracts is the margin, not the index levels.

Graph 3

Volume of HSI futures contracts



Source: HKMA staff estimates.

Preliminary statistical analysis is conducted by comparing the average of BASs before and after the introduction of ET on the HSI futures contracts, using a parametric t-test for the mean and a non-parametric Wilcoxon z-test for the median. This is followed by a more formal regression analysis, incorporating the main determinants of BASs - trading activity and price volatility. Finally we test whether the changes in futures trading volume and price volatility are due to changes in the underlying cash markets or to the introduction of the ET system. The results are presented in Tables 5 to 7.

Table 5 shows that average BASs measured in index points are significantly lower after the introduction of the ET - by over 1 index point compared to the floor trading. Though average BASs measured as a percentage of the margin requirements are also lower, the differences are not significant. Determinants of the BASs (price volatility and trading volume) are also significantly lower during the post ET period, which raises the question whether the lowering of BASs is due to the introduction of ET or to changes in their determinants.

Table 5

Liquidity, volatility and volume of HSI futures contracts, pre- and post-electronic trading

	Bid-ask spreads (index points)			**Bid-ask spreads (percentage)**[1]		
	Pre-ET	**Post-ET**	***t/z***	**Pre-ET**	**Post-ET**	***t/z***
Mean	5.05	3.68	16.16*	0.31	0.30	1.34
Median	4.94	3.58	11.58*	0.30	0.30	1.12
Std dev	0.68	0.56		0.04	0.05	
n	136	96		136	96	
	Time-weighted volatility			**Trading volume**		
	Pre-ET	**Post-ET**	***t/z***	**Pre-ET**	**Post-ET**	***t/z***
Mean	80.40	58.75	3.90*	19,335	15,406	4.56*
Median	67.63	55.30	3.50*	18,195	15,201	3.28*
Std dev	48.28	29.66		7,919	3,478	
n	136	96		136	96	

[1] Bid-ask spreads expressed as a percentage of the margin required for the futures contract.

* Significant at the 1% level.

Source: HKMA staff estimates.

To assess the impact of ET on BASs, the following model is specified to control for differences in the determinants of BASs before and after the introduction of ET:

$$BAS_t = \alpha + \beta_1 ET + \beta_2 Volatility + \beta_3 \sqrt{Volume} + ET \times (\beta_4 \sqrt{Volume} + \beta_5 Volatility) + \varepsilon_t$$

The impact of ET is represented by a dummy variable *(ET)* that is 0 for pre-ET observations, and unity otherwise. The square root of trading volume is for reducing the effect of outliers, consistent with McInish and Wood (1992). The interactive term between ET and trading volume is included to capture the incremental effect of ET on BASs of trading volume, after controlling for changes in price volatility and trading volume. A similar interactive term between ET and volatility is also included.

Two major findings are evident in Table 6: first, ET reduces BASs (whether measured in index points or as a percentage of margin requirements), after controlling for the effect of price volatility and trading volume. Second, the coefficient on the interactive term between ET and trading volume is positive, indicating that higher trading volume will increase BASs under ET, other things being equal. Graph 4 illustrates the relationship between BASs and trading volume, pre- and post-ET, controlling for the effect of price volatility. During the pre-ET period, higher trading volume tends to lower BASs, consistent with the common belief. In the post-ET period, higher trading volume actually raises BASs. However, the combined effect of the introduction of ET (which lowers BASs) and the interaction of ET and higher trading volume (which raises BASs) is to lower BASs during the sample period, which includes high trading volume observed during the Asian crisis (over 40,000 contracts traded daily on a few dates, compared to an average of around 17,500 contracts daily in normal times). This implies that only under extraordinary trading volumes will ET lead to higher BASs, compared to the floor-based system.

All coefficients are highly significant, except the interactive variable between ET and volatility. To address potential problems with serial correlation, Newey-West adjusted t-statistics are used to assess the significance of the estimated coefficients. Regressions with lagged independent variables yield similar results, indicating that our estimates are not affected by the possible endogeneity of the right-hand side variables, as current BASs are unlikely to affect the past trading volume and volatility.

We further examine whether declines in price volatility and trading volume observed after the introduction of ET system are due to changes in the fundamental market conditions or the change in trading system. Following the methodology used in Frino and Hill (2001), we compare the price volatility and trading volume of the HSI futures contract with those of the HSI, as the transition to the ET system only happened in the futures exchange, with no effect on the cash market. Given the availability of comparable data on the cash and futures HSI markets, price volatility is measured by the high-low volatility metric and the trading volume of HSI is measured by an estimated contract turnover, derived from the value turnover data.[5]

Table 7 shows that price volatility of both the HSI cash index and the futures contracts declined significantly after the introduction of the ET system in the futures exchange. However, the difference in price volatility between HSI index and futures contracts does not change significantly during the floor and ET periods. This result shows that the changes in the price volatility in the HSI futures market are similar to the changes in the cash HSI market, implying that the introduction of the ET system in the futures market is not likely to affect price volatility. Similar results were found for trading volume in both the HSI cash and futures markets (in log), which declined significantly after the introduction of ET, with no significant changes in the difference of volumes between HSI cash index and futures contracts across the pre- and post-ET periods. In sum, declines in price volatility and trading volume in HSI futures contracts observed after the introduction of the ET system are due to changes in the fundamental market conditions, and not to the change in trading system.

[5] Volatility is defined as $(log\,H - log\,L)^2 / (4n * log\,2)$, where H and L are the daily high and low prices, respectively, and n the number of observations. Contract turnover is defined as value turnover/ (50*HSI closing index points), as each index point is valued at HKD 50 for HSI futures contracts.

Table 6

Effects of electronic trading on bid-ask spreads of HSI futures contracts

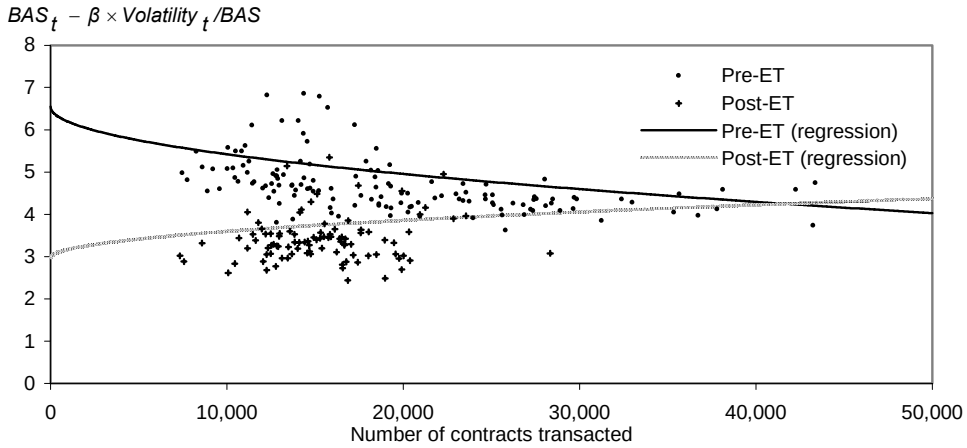
	Coefficient	Newey-West adjusted *t*-statistics	Coefficient	Newey-West adjusted *t*-statistics
			(Lagged independent variables)	
Bid-ask spreads (in index points)				
Constant	6.21	18.89*	6.22	20.68*
Electronic trading	– 3.59	– 4.81*	– 3.69	– 6.65*
Sqrt(volume)/100	– 11.25	– 5.25*	– 11.86	– 6.00*
Volatility/1000	4.74	3.37*	5.62	3.59*
ET*Sqrt(volume)/1000	17.70	2.69*	18.41	3.86*
ET*volatility/100	– 0.20	– 0.08	0.23	0.09
Adj R2		0.66		0.69
F-statistics		89.66		103.48
N		232.00		231.00
Bid-ask spreads (as a percentage of margin requirements)				
Constant	0.36	18.47*	0.37	20.11*
Electronic trading	– 0.20	– 2.81*	– 0.23	– 4.43*
Sqrt(volume)/1000	– 0.50	– 4.17*	– 0.60	– 5.09*
Volatility/1000	0.26	3.41*	0.26	3.33*
ET*Sqrt(volume)/1000	1.58	2.50**	1.75	3.98*
ET*Volatility/1000	– 0.04	– 0.18	0.03	0.15
Adj R2		0.19		0.25
F-statistics		12.04		16.62
N		232.00		231.00

* Significant at the 1% level. ** Significant at the 5% level.

Source: HKMA staff estimates.

Graph 4

Relationship between bid-ask spreads and trading volume



Note: The volatility is held at the sample average for the regression.

Source: HKMA staff estimates.

Table 7

Volatility and volume in the HSI cash and futures contracts, pre- and post-electronic trading

	Changes in volatility (x 10^6)			Changes in trading volume (in log x 10^2)		
	Stock index	**Future**	**Stock - futures**	**Stock index**	**Future**	**Stock – futures**
Mean	0.43	0.47	– 0.04	6.60	7.54	– 0.94
Median	0.26	0.28	– 0.03	6.08	7.81	– 0.79
T	5.62*	4.89*	0.86	3.31*	3.85*	0.48
Z	8.15*	6.71*	1.64	2.78*	3.28*	0.38
N	232.00	232.00	232.00	232.00	232.00	232.00

* Significant at the 1% level.

Source: HKMA staff estimates.

Our results are similar to what has been found by other studies. However, this study covers a longer period of time, and includes observations during the Asian financial crisis, when intensive trading took place. While previous studies found that the performance of ET systems deteriorates during periods of high price volatility, our results shows that intensive trading (measured by volume) might pose a challenge to the functioning of ET systems, but that ET will underperform floor-based trading only under extreme market conditions. These results could be potentially mutually consistent as a period of market pressure could be characterised by either price volatility or intensive trading, or both. Possible explanations for the deterioration of performance of the ET system during market pressure could be that when the market is under pressure, information intensity is high. During a period of intensive information arrival, the information contained in the electronic order book on prices and volumes away from the best bid and ask is of little value, while the delays in cancelling orders on an automated system may discourage the submission of limit orders. In addition, the higher degree of anonymity of the trading parties may lead to greater concerns about counterparty risks under ET during market pressure.

3. Conclusions

ET is a global trend in the international financial markets. Early evidence based on the relative performance of exchange-based ET systems and floor trading has shown that the impact of ET on market functioning is likely to be positive. In particular, it is likely to improve transparency and liquidity of the markets. Our empirical study finds that ET enhances market liquidity by reducing BASs. However, the performance of ET systems deteriorates during times of market pressure with high price volatility or large trading volumes, but ET will underperform floor-based trading only during extreme market conditions.

Further study will be needed to test the robustness of our results, by examining data over a longer period, or taking into consideration interday volatility, in addition to intraday volatility. We also need to deepen our understanding of the effect of ET systems on market functioning, not only in the organised exchanges, but also in OTC markets when data become available. Further study on factors underlying the performance of ET systems under market pressure will also be useful.

Box 1

ET systems in organised exchanges in Hong Kong

Hong Kong has one of the most active stock and futures markets in the Asia-Pacific region. The stock market is the third largest in terms of market capitalisation after Japan and mainland China, and the Hang Seng Index futures contract is among the most heavily traded contracts in the world, with a daily trading volume of over 17,500 contracts at end-June 2001.

Securities are traded through a computerised Automatic Order Matching and Execution System (AMS) on the Stock Exchange of Hong Kong. The AMS system was first introduced in 1993, and all listed stocks were traded under the system by March 1997. AMS is an order-driven system that accepts limit, enhanced limit and special limit orders.[6] Trading is conducted through terminals in trading halls or through the off-floor trading devices at Exchange participants' offices. Orders are executed in strict price and time priority. Order and trade information is disseminated to the market and investors through the Teletext system, market data feed, and the Exchange's website and other information systems. The third generation of the AMS (AMS/3) is a trading system developed by the Stock Exchange of Hong Kong and was launched in October 2000. The Order Routing System under the AMS/3 enables investors to place trading requests electronically over the internet and other access channels (such as mobile phones).

The Hong Kong Futures Exchange (HKFE) has become a fully electronic marketplace since June 2000. It introduced ET in 1995, using the Automated Trading System (ATS). Rolling Forex - a currency futures product - was the first product traded on ATS. The Hibor futures was migrated to ATS in September 1997, leaving HSI futures and options contracts the only two products traded on the floor. The ATS was upgraded to a new electronic screen-based trading system - Hong Kong Futures Automated Trading System (HKATS) - in April 1999 to prepare for the migration of HSI futures and options contracts to HKATS, which was completed in June 2000. Under the HKATS, the HKFE operates the central marketplace and subscribing Exchange participants can directly access the market through computer terminals in their offices. The HKATS automatically matches order in the system based on a price/time priority mechanism. The execution of orders can be made immediately. HKATS allows brokers to provide straight through processing and real-time internet trading.

With rapid technological advances and growing demand for a more efficient trading environment, most brokerage houses and banks in Hong Kong offer online stock trading to retail investors. While Boom Securities, a Hong Kong-based stockbroker, was the first company to offer online trading in Hong Kong-listed companies in 1998, an increasing number of brokers and banks have been providing online stock trading facilities to clients over the past couple of years. These e-brokers, such as Tai Fook Securities, Prudential Brokerage, KGI Securities, 2cube Securities, HSBC Broking Services, Citibank, Wing Hang Bank and Citic Ka Wah Bank, provide clients with a wide range of services, including real-time quotes, market analysis, trade execution and monitoring of account portfolios, from a single point of access. While most e-brokers offer online trading facilities in Hong Kong listed securities, some also offer trading in US securities as well as securities from other overseas markets such as Singapore, Taiwan, Thailand and Korea. With the implementation of the Order Routing System (ORS) to the AMS/3 by the Hong Kong Exchanges and Clearing Ltd. (HKEx) in February 2001, investors are able to place orders through the internet to brokers for approval and submission to the market. In this regard, given that the broker systems are connected to the ORS, securities orders can be passed electronically and directly from brokers to the Stock Exchange, thereby eliminating human intervention. This helps to shorten the time for trade execution and to reduce costs. While online stock trading provides convenient and efficient services to investors, the commission charges of some of these e-brokers are even lower than those of traditional full-service brokers. For instance, the commission charges of some e-brokers are 0.15% or below on transaction amount, much lower than the average 0.25% of traditional full-service brokers. Study has shown that lower transaction costs have positive effects on price discovery, volatility and liquidity, leading to improvement in the informational efficiency of markets (Habermeier and Kirilenko (2001)).

[6] A limit order having a price equal to the best opposite orders will match with opposite orders at the best price queue residing in the System, one by one according to time priority. An enhanced limit order will allow matching of up to two price queues at a time. The ask order price can be input at one spread lower than the current bid price, or the bid order price can be input at one spread higher than the current ask price. Any unfilled quantity after matching will be stored in the System as a normal limit order at the input order price. A special limit order has no restriction on the limit price with respect to the best price on the other side of the market. It will match up to two price queues (ie the best price queue and the secondary queue at one spread away) as long as the traded price is not worse than the limit price input. Any unfilled quantity after matching will be cancelled and not stored in the System.

Box 2

Major ET platforms in the fixed income market in Hong Kong

The main electronic bond trading platforms that cover Hong Kong dollar debt instruments are AsiaBondPortal, BondsInAsia and Bloomberg. These portals provide ET platforms for institutions to complete fixed income deals and offer other services such as market research and information.

1. AsiaBondPortal

AsiaBondPortal (ABP), a Hong Kong-based multi-dealer online trading system for Asian debt instruments, was officially launched in October 2000. ABP is an alliance between ABN Amro, Bank of America, Commonwealth Bank of Australia, Credit Suisse First Boston, Daiwa Securities SMBC, Deutsche Bank, GIC (Government of Singapore Investment Corporation) Special Investments, Income Partners Group, J.P. Morgan and UBS Warburg. ABP currently includes G3 currency denominated bonds (Asian bonds denominated in US dollars, euros or yen) as well as Singapore and Hong Kong dollar bonds, and plans to trade Australian domestic and kangaroo bonds (Australian dollar bonds issued by foreign companies), and ringgitt, baht and rupiah domestic currency bonds in the future.

ABP mainly offers two types of accounts - trading accounts for institutional investors and subscription accounts for groups and individuals who want to access to market analysis and information on the portal. ABP's income is mainly derived from the transaction fees charged to brokers/dealers for each trade and content subscriptions to the portal. As a multi-dealer system, ABP enables institutional investors to trade with various brokers/dealers through a single site, provided that they have sufficient credit lines. Institutional investors can execute trades on firm prices or solicit bids and offers from brokers/dealers and negotiate prices online. ABP provides a platform for secondary bond trading during Japan and Hong Kong trading hours and plans to support 24-hour trading across Asia, London and New York trading times in the future.

It is expected that ABP will enhance price discovery and transparency. More competitive prices might lead to tighter margins for brokers/dealers. The automation of the collection of pre-trade information (executable bids and offers) and post-trade information (trade details) leads to greater transparency and more timeliness of information flows. The accessibility of quotes from several brokers/dealers at the same time contributes to lower search costs. However, complete straight through processing is not possible with the current system, as clearing and settlement of trades remain the same as if the deals are done over the telephone. There is no anonymity in the trading process, as each counterparty in a transaction will know with whom they are dealing.

2. BondsInAsia

BondsInAsia (BIA), a joint venture of Barclays Capital, BNP Paribas, Citigroup, Credit Suisse First Boston, DBS Bank, Deutsche Bank, Hang Seng Bank, HSBC and BRIDGE eMarkets, was established in July 2000. BondsInAsia creates a multi-dealer trading platform for each Asian market, allowing local investors to trade Asian domestic and international fixed income securities, including government and corporate bonds. The platforms provide real-time firm and indicative prices, yield, deal analytics, research and news, and will be linked to offer trading in local and international Asian markets to both domestic and global market participants. BIA's multi-market model encompasses both dealer-to-client and dealer-to-dealer trading. Users can access the BIA system through the internet and other private networks; view and negotiate prices; and execute trades online. They can choose to view a country hub or a central page showing all the markets. The BIA trading system officially went live in November 2001, offering trades in Hong Kong dollar bonds via BondsInHong Kong, Singapore dollar bonds via BondsInSingapore and Asian credits via G3BondsInAsia.

BIA follows a franchise business model. While BIA provides infrastructure, security and operational services for the trading platform, local dealers participate in ownership and governance of the franchise in their market. The sources of BIA's income include the franchise fees from dealers who act as market-makers, and the transaction fees for each trade.

By providing a single point of access to multi-dealer pricing, execution and trade-related information about Asian domestic and international fixed income securities, BIA should help enhance price discovery and transparency of Asian bond markets. Liquidity of Asian fixed income securities will increase if the improved market access can attract more participants, including dealers and investors. BIA supports straight through processing, which should help reduce transaction cost and minimise transaction errors. Unlike ABP, which primarily focuses on the Asian international bond markets, BIA is expected to help internationalise the Asian local debt markets.

Box 2 (cont)

3. Bloomberg

Bloomberg announced in October 2000 that its ET platform, Bloomberg Electronic Trading System (BETS), was starting to offer trading in Asian fixed income securities. BETS were first launched in the United States in March 1999 and was subsequently introduced in Europe. In addition to US and Europe government, agency and corporate bonds, BETS currently offers Asian government bonds of the Philippines, Hong Kong, Japan and Singapore. The online trading of Hong Kong and Singapore government bonds is currently offered by JP Morgan eXpress (JPeX), which runs on BETS. JPeX focuses on sovereign bonds while ABP offers emerging market corporate bonds. BETS is available to Bloomberg Professional service subscribers to view real-time two-way prices from multiple dealers on a single screen and to execute transactions online with straight through processing capabilities. As a leverage network of current terminals, trading via BETS incurs no transaction fees, and participating dealers' revenue is mainly derived from BASs.

With a worldwide customer base of corporations, issuers, financial intermediaries and institutional investors, BETS allows extensive market access to the platform. BETS also supports straight through processing. BETS helps to enhance price discovery as clients can view and trade on real-time bid/offer prices provided by multi-dealers. BETS captures other trade-related information such as real-time positions, profit and loss results, and historical performance review.

Box 3

Major ET platforms in the foreign exchange market in Hong Kong

Among the different FX ET platforms, also including Atriax, Currenex, FX Connect, and STN Treasury, FXall is the only one that has a presence in Hong Kong and is approved as a money broker by the HKMA.[7] Other ET systems that are approved by the HKMA as money brokers include Reuters and EBS, which only serve the interbank trading community. Other institutional customers such as corporate treasurers and hedge funds cannot access these systems.

Reuters Dealing 2000-2 was launched in 1992, the first international computerised matching service for foreign exchange trading. The Electronic Brokering System (EBS) was established in September 1993 by a dozen leading banks in foreign exchange and Quotron, an electronic information screen competitor with Reuters. Before the introduction of these ET systems, banks had to rely on voice brokers or direct telephone dealing to execute trades, which are characterised by slow price formation and opaque market information.

FXall, a multibank ET platform for foreign exchange, including FX spots, forwards, swaps and options, was launched in May 2001 and established an office in Hong Kong in September 2001. Owned by 15 banks - Bank of America, Bank of New York, Bank of Tokyo-Mitsubishi, BNP Paribas, Credit Agricole Indosuez, Credit Suisse First Boston, Dresdner Kleinwort Benson, Goldman Sachs, HSBC, JP Morgan Chase, Morgan Stanley Dean Witter, Royal Bank of Canada, Royal Bank of Scotland, UBS Warburg and Westpac Banking Corporation FXall offers institutional clients foreign currency trade execution, access to research, straight through processing and 24-hour access to a multilingual support centre.

FXall can be accessed via the internet or private networks. With 50 global banks acting as liquidity providers, clients can trade on FXall and request executable quotes from several liquidity providers at once, provided that they have trading relationships with the specified liquidity providers. In addition, both clients and others can access indicative foreign exchange quotes, which are blended rates of the liquidity providers' quotes. Clients can also chat with liquidity providers online. Income of FXall is mainly derived from the price makers, as there is no fee for transactions or access to research for clients and others. FXall is the only fully automated multibank ET platform for foreign exchange in Hong Kong, with straight through processing capability. Price discovery and transparency should be enhanced as both clients and others are able to view indicative quotes aggregated from liquidity providers, though only clients are allowed to view real-time executable quotes from several individual liquidity providers at once.

[7] A money broker refers to a person who acts as an intermediary between independent counterparties, one of which is an authorised institution, in foreign exchange and money market transactions. In Hong Kong, money brokers are required to be approved by the Monetary Authority under the Banking Ordinance.

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