

Bundesverband der Wertpapierfirmen an den deutschen Börsen e.V.  
Börsenstraße 14, 60313 Frankfurt/Main

## European Commission

Internal Market and Services DG  
Financial Services Policy and  
Financial Markets

Mail: Markt-G3@cec.eu.int

your reference

your message dated

city\_date

**Frankfurt/Main, 15.08.2005**

## Markets in Financial Instruments Directive (MiFID)

Here: "Working Document on Transparency and Admission to Trading" (Working Document ESC/20/2005-Rev. 1 dated 29.07.2005) and "Explanatory note: Principal differences between working document ESC/20/2005 and the CESR advice, and issues for discussion" (Working Document ESC/21/2005 dated 17.06.2005)

### Dear Sir, Dear Madam,

The *Bundesverband der Wertpapierfirmen an den deutschen Börsen e.V.* (bwf) is a federal association representing securities trading firms and brokers at the stock markets throughout Germany. bwf expressly welcomes the opportunity to participate in the consultations on the aforesaid draft documents of the European Commission.

We would like to make the following comments concerning the pre-trade transparency obligations and the treatment of not immediately executable client limit orders:

### Article 3 working document - Pre-trade transparency obligation

For German securities trading firms a central concern in the course of the CESR consultation process has been to safeguard that the market model, which is typical for floor trading here and has proven its worth over many years, can continue to operate in future within the legal framework of the MIFID. Typical for this market model is the price determination by means of so-called "closed order books" by investment firms to whom this is entrusted (so-called "Skontroführer") and who

#### **Bundesverband der Wertpapierfirmen an den deutschen Börsen e.V.**

*Federal Association of Securities Trading  
Firms at the German Stock Markets –  
a registered association*

**Registered Seat**  
Fasanenstraße 3  
D-10623 Berlin

**Postal Address & Office**  
Börsenstraße 14  
D-60313 Frankfurt/Main

Tel.: +49 (0) 69 92 10 16 91  
Fax: +49 (0) 69 92 10 16 92  
mail@bwf-verband.de  
www.bwf-verband.de

#### **Managing Board**

Claus-Jürgen Diederich (Vorsitzender)  
Dr. Jörg Franke  
Dirk Freitag  
Bernd Gegenheimer  
Kai Jordan  
Peter Koch  
Klaus Mathis  
Ralf Nachbauer  
Michael Wilhelm

#### **Secretary General**

Michael H. Sterzenbach  
m.sterzenbach@bwf-verband.de

#### **Legal Adviser**

Dr. Hans Mewes  
Herrengraben 31, D-20459 Hamburg  
Tel.: +49 (0) 40 36 80 5 -132  
Fax: +49 (0) 40 36 28 96  
h.mewes@bwf-verband.de

#### **Banking-Account**

Deutsche Bank PGK Frankfurt  
Swift: DEUTDEFFXXX / DEUTDEBFRA  
Bank Code: 500 700 24  
Account: 0 18 32 10 00

are bound to strict neutrality and are under the constant supervision of the Trading Surveillance Offices.<sup>1</sup>

In so far it is felt to be extremely important and is to be expressly welcomed that the European Commission, wholly in keeping with the original intention of the MiFID of furthering the competition among different trading venues, has now clarified in an unequivocal way that none of the trading systems in existence today will be compelled to cease operating as a consequence of the provisions of the MiFID.<sup>2</sup>

In the course of the CESR consultations bwf had expressly argued in favour of regulating the continued operation of the described market model by way of an exemption from the pre-trade transparency rules according to the market model – an option, expressly provided for in the MiFID. Such an exemption ruling appeared to us to provide the greatest legal certainty since the wording of the directive with regard to pre-trade transparency<sup>3</sup> also expressly requires publication of the "*depth of trading interest*", a requirement which an "*indicative price range*", which is the typical form of pre-trade transparency of this market model, is not able to fulfil in the narrow sense.<sup>4</sup>

Even though CESR did not adopt the proposal for an exemption ruling, it has made clear that market models where the individual orders are not visible and the investors are informed about the market situation in the pre-trade phase by means of an "*indicative price or price range*" should be able to continue to operate in future.<sup>5</sup> This is to be achieved – and here the approach adopted by the Commission working document follows the CESR proposal<sup>6</sup> – by a catch-all provision in

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<sup>1</sup> For a detailed description of the market model please refer to the attached typology paper "*Principles of Closed Order Book Price Determination*" which was prepared together with Deutsche Börse AG and the Hamburg, Munich and Stuttgart Stock Exchanges.

<sup>2</sup> cf. European Commission, Working Document ESC/21/2005, "*Explanatory note: Principal differences between Working Document ESC/20/2005 and the CESR advice, and issues for discussion*", Brussels 13/06/2005, page 4, Annex: Remarks on content of pre-trade transparency, Internet: [http://europa.eu.int/comm/internal\\_market/securities/docs/isd/dir-2004-39-implement/esc-21-2005-explanatory\\_en.pdf](http://europa.eu.int/comm/internal_market/securities/docs/isd/dir-2004-39-implement/esc-21-2005-explanatory_en.pdf)

<sup>3</sup> MiFID, Article 29(1) & Article 44(1)

<sup>4</sup> The advantage of an "*indicative price range*" – especially in the case of less liquid stocks – on the other hand is that investors can be suitably informed about the order situation even if buy and sell orders are not matching and neither a "*theoretical equilibrium price*" nor a "*theoretical tradable volume*" can be determined.

<sup>5</sup> cf. "*CESR's Draft Technical Advice on Possible Implementing Measures of the Directive 2004/39/EC on Markets in Financial Instruments*", Second Consultation Paper, March 2005, Ref.: CESR/05-164, page 48, section 38, Internet: [http://www.cesr-eu.org/data/document/05\\_164.pdf](http://www.cesr-eu.org/data/document/05_164.pdf)

<sup>6</sup> cf. "*CESR's Technical Advice on Possible Implementing Measures of the Directive 2004/39/EC on Markets in Financial Instruments - 1st Set of Mandates where the deadline was extended and 2nd Set of*

the form of Article 3(5) for such market models that cannot be subsumed under the cases set forth in Article 3(2 to 4).

However, since the "closed order book" market model is an auction-based price discovery process, the approach proposed by CESR and now adopted by the European Commission harbours the danger, in our view – though not intended by the legislator – of its subsumability under one of the auction models explicitly named in Article 3(2) and Article 3(4) of the working document. This could have the clearly undesired consequence that the requirements with regard to pre-trade transparency would have to be fulfilled in the manner specified in Article 3(2 or 4) and consequently that German floor trading could not continue to operate in its characteristic form.

It therefore appears all the more urgent that the broad legal concepts of "continuous auction order book trading system", Article 3(2,) and "periodic auction system", Article 3(4), should be made more specific in the interest of a clarification of content and a clear-cut delimitation so that it is made sufficiently clear that e.g. the "closed order book" market model, which is also based on a sequence of recurring auctions over time, is not subsumable under the two aforesaid market models.

For this purpose we propose the following clarifying drafting changes:

#### **Article 3(2) working document - continuous auction order book trading system**

To our knowledge, the provision relates primarily to continuous trading in fully electronic trading systems. Such systems are based on an open order book on which buy and sell orders are placed that are electronically matched without any time lag ("continuously") according to a price/time preference and are thereby executed or, if not immediately executable, are displayed to the other system users as executable. For clarity Article 3(2) should therefore be worded as follows:

*"2. Regulated markets, investment firms and market operators operating an MTF which (in each case) operate an automatic electronic continuous auction order book order matching trading system shall, for each such share, make public continuously throughout its trading hours the aggregate number of orders in terms of monetary volume and the shares they represent at each price level, for at least the five best bid and offer price levels."*

#### **Article 3(4) working document - periodic auction trading system**

In the case of Article 3(4) the proposed scope of application appears, in our view, to be even less clearly defined than under Article 3(2). Furthermore, the chosen demarcation between the two described auction-based market models on the

time criteria of "*continuous*" on the one hand and "*periodic*" on the other has to be regarded as unfortunate on the whole on account of the unclear delimitation of the two concepts and possible overlaps that might arise.

In the course of the CESR consultation process it was learned that "*periodic auction trading system*" is intended to refer especially to opening and closing auctions of the kind also implemented as specific trading phases in fully electronic systems. This is indicated, moreover, by the wording chosen by the European Commission insofar as reference is made, with regard to the price determination in such systems, to a "*trading algorithm*".

By comparison, the price discovery process in the German "*Skontroführer*" trading system is also based on a catalogue of rules but the element of human judgement embodied in the process which aims to balance the not always conflict-free price determination rules<sup>7</sup> in a way appropriate to the "*true actual market situation*" is not adequately covered by the purely technical concept of a (rigid) calculation rule.

However, since the interval of time between the individual price determinations can vary to differing extents, especially as a result of differences in the market liquidity of the individual stocks, and can quite possibly be of a "*periodic*" nature at times, in our view, the danger of an unintentional subsumption of the German "*Skontroführer*" trading system under the concept of "*periodic auction*" in a similar way as argued above in the case of the term "*continuous auction*" remains. In so far it should be clarified that the scope of application of Article 3(4) is restricted to auction processes within fully electronic systems without any human interaction in the price determination:

*"4. Regulated markets, investment firms and market operators operating an MTF which (in each case) operate a fully electronic periodic auction trading system shall, for each such share, make public and continuously update throughout its trading hours the price at which the auction trading system would best satisfy its trading algorithm and the volume that would potentially be executable at that price by participants in that system."*

The reference to fully electronic systems appears necessary insofar as the price determination by the German "*Skontroführer*" is done today by means of an electronic order book in which the buy and sell orders are collected.

#### **Table 1 in the Annex**

For the purposes of further clarification and better delimitation we suggest that the "*system descriptions*" in Table 1 of the Annex, which currently represent little more than a paraphrasing of the "*system type*", should be made more specific.

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<sup>7</sup> These are in particular: principle of maximum execution, price continuity, avoidance of partial executions, neutrality of the market personnel and priority for the brokering activities.

Table 1: Information to be made public in accordance with Article 3

<b>Type of system</b>	<b>Description of system</b>	<b>Summary of information to be made public, in accordance with Article 3</b>
<u>automatic electronic continuous auction order book order matching trading system</u>	a system that by means of an <u>open order book automatically matches sell orders with matching buy orders on the basis of the best available price on a continuous basis</u>	the aggregate number of orders and the shares they represent at each price level, for at least the five best bid and offer price levels
<u>fully electronic periodic auction trading system</u>	a system that matches orders on the basis of <u>a periodic recurring auctions taking place at different moments in time determined by the rules of the trading system</u>	the <u>potential</u> price at which the auction system would best satisfy its trading algorithm and the volume that would potentially be executable at that price
...	...	...

**Article 14(5) working document - Publication and availability of data, here: disclosure of not immediately executable client limit orders**

On the question of the treatment of not immediately executable client limit orders in respect of shares which are admitted to trading on a regulated market CESR proposed that the investment firm concerned can regularly meet its obligations under Article 22(2) MiFID – subject to a corresponding regulations in the member states (implementation proviso) – by transmitting the client orders to an “order driven” regulated market or MTF. On the other hand, the transmission of the orders to a “quote driven” regulated market or MTF would, in CESR's view, expressly not meet the requirements of Article 22(2) MiFID owing to the lack of “visibility” of the order.<sup>8</sup>

It appears to be the intention of the European Commission, at least according to our understanding of Article 14(5) of the working document, to make the rule proposed by CESR even more restrictive insofar as only regulated markets and MTFs which operate a “continuous auction order book trading system” regularly meet the requirements of Article 22(2) MiFID.

We consider this approach based on a particularly narrow interpretation of the “accessibility and visibility” concept underlying the CESR proposal to be misguided

<sup>8</sup> cf. “CESR’s Technical Advice on Possible Implementing Measures of the Directive 2004/39/EC on Markets in Financial Instruments 1st Set of Mandates where the deadline was extended and 2nd Set of Mandates”, April 2005, Ref.: CESR/05-290b, page 74, section 51, Internet: [http://www.cesr-eu.org/data/document/05\\_290b.pdf](http://www.cesr-eu.org/data/document/05_290b.pdf)

in a number of respects. A legal privilege for one specific market model, translated into economic terms of order flow allocation could clearly have a distorting effect on competition between the different trading venues as one of the leading objectives of MiFID. Furthermore, aside from the problem - discussed already in our comments on Article 3(2) of the working document - as to what is to be understood exactly by the term "*continuous auction order book trading system*" and where the dividing line is to be drawn in relation to other forms of auction-based trading systems, such an implementing measure would, ultimately, even harbour the danger of running counter to the actual purpose of the provision, namely to allow the earliest possible execution of the client orders concerned.

It may be assumed that, in practice, the not immediately executable client limit orders are likely, for the most part, to be orders in respect of shares with comparatively low liquidity. However, especially for such shares a "*continuous auction order book trading system*" (insofar as this is to be understood to refer to the market model of electronic order matching systems, as discussed in our comments on Article 3(2) of the working document) is frequently not the form of trading in which the earliest execution of the customer order is probable in every case. While electronic order matching systems have essentially proven their efficiency in recent years in the trading of highly liquid shares, this applies only to a far more limited extent in the case of less liquid shares. In this case, trading systems where investment firms act as "*liquidity providers*" in individual shares - which, incidentally, can be "*order driven*" as well as "*quote driven*" - are in many cases still superior to fully electronic trading.

To conclude, to give general precedence to a single market model cannot be consistent with the provision's sole purpose of enabling earliest possible execution. However, fault is to be found not only with the restriction to "*continuous auction order book trading systems*" in Article 14(5) sentence 1 of the working document but also with the newly added demand in Article 14(5) sentence 2 of the working document for a purely formal "*visibility*" – which, in our view, is not derivable from the text of the Directive. Ultimately, this would create additional transparency requirements which de facto would compete with the provisions of Articles 44 and 29 MiFID<sup>9</sup>. We therefore propose that Article 14(5) of the Working Document should be adapted as follows:

*"5. An investment firm shall be deemed to have met its obligations under Article 22(2) of the Directive to disclose client limit orders which are not immediately executable if it transmits the order to a regulated market or MTF that operates a continuous auction order book trading system.*

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<sup>9</sup> cf. in this matter also bwf's position statements to CESR of 20.01.2005 and 04.04.2005, Internet: [http://www.bwf-verband.de/fileadmin/user\\_upload/Stellungnahmen/050120\\_bwf\\_com\\_e.pdf](http://www.bwf-verband.de/fileadmin/user_upload/Stellungnahmen/050120_bwf_com_e.pdf) and [http://www.bwf-verband.de/fileadmin/user\\_upload/Stellungnahmen/050404\\_bwf\\_com\\_en.pdf](http://www.bwf-verband.de/fileadmin/user_upload/Stellungnahmen/050404_bwf_com_en.pdf)

*Where an investment firm does not transmit the limit order to a regulated market or MTF in accordance with the preceding sub-paragraph, in order to meet its obligations under Article 22(2) of the Directive it shall ensure that the order is made available to other market participants (~~including by being made visible~~) and can be easily executed once market conditions allow.”*

Should the Commission wish to exclude “quote driven” trading systems under Article 22(2) MiFID , despite the arguments put forward here, we would propose alternatively that, in alignment to the CESR proposal, the formulation of Article 14(5) sentence 1 of the Working Document should at least have the general tenor that regulated markets or MTFs regularly meet the requirements of Article 22(2) MiFID insofar as they operate “order driven” trading systems. Article 14(5) of the Working Document could then read as follows:

*“5. An investment firm shall be deemed to have met its obligations under Article 22(2) of the Directive to disclose client limit orders which are not immediately executable if it transmits the order to a regulated market or MTF that operates an continuous auction order driven book-trading system.”*

In view of the aim that implementation of the MiFID should not jeopardize the continued operation of the existing trading systems but foster the competition among the different trading venues, we would kindly ask the European Commission to consider the deliberations and drafting changes proposed herein in the redrafting of the working document within the framework of finalizing the MiFID implementing measures.

Yours faithfully,

Michael H. Sterzenbach  
Secretary General

## Principles of Closed Order Book Price Determination

*The discussion surrounding the future measures for implementing the Markets in Financial Instruments Directive (MiFiD) has made it clear that there is evidently a considerable need for clarification regarding the market model of "closed order book trading" by market members acting as market personnel (so called "Skontroführer") authorised for price determination in a specific security. The guiding principles as well as the technical procedures of this market model which has been long established in Germany and especially predominates in floor trading are thus described and explained below.*

### General Characteristics

The market model of closed order book price determination is based on the principle of *continuous auction trading*. All buy and sell market and limit orders are first collected in the electronic order book, to which only the assigned market personnel authorised to determine prices in the respective security has access. In performing this function, he is bound to the strictest neutrality and is under the constant and closely scrutinised supervision of the Trading Surveillance Office ("*Handelsüberwachungsstelle*" or "*HüSt*" for short) at the respective stock exchange.

### Operational Procedure

#### Phase I – Order Placement

Orders can be placed either verbally (on the floor or by telephone) as well as electronically through the exchange's order routing system, thus avoiding any discrimination in the way that orders are placed. An order entrusted to a bank by an investor who is not admitted to trading on the stock exchange is immediately electronically entered in the order book. Floor traders who place verbal orders with the market personnel, which are then entered into the order book by the market personnel via the exchange's computer system, are therefore not put in any type of privileged position.

#### Phase II – Market Information

Prior to the actual price determination, the market personnel discloses an indicative price range (so called "*Taxe*"), which informs the market about the bid and ask prices based on the current order book status, between which the price can be determined. This indicative price range is necessarily *not* "firm", since it is based on a "snapshot" of the momentary order book status, which can change continuously up until the time of the actual price determination.

As opposed to displaying a theoretical equilibrium price, the investor is informed indirectly, via the spread of the indicative price range, as to how the buy and sell orders are distributed in the order book. With the entry of the indicative price range into the exchange's computer system, the information is immediately displayed and accessible to *all* investors.

Based on the information provided by the indicative price range, all investors, regardless of whether or not they are admitted to trading on the exchange, can therefore react and if need be, (re-)adjust their orders in due time, in accordance with the liquidity in the respective security, before the price is determined. On the other hand, for an investor just coming to the market, the indicative price range serves as a basis for deciding whether to place his or her order with the market personnel at a specific exchange or whether to place it in the electronic trading system alternatively.

Traditionally and in accordance with the stock exchange regulatory framework, the market personnel is obliged to submit a binding offer on the basis of the order book status by open outcry to the traders on the floor or in response to an enquiry from a market member. The market personnel can – and generally will – refrain from doing so if there is no apparent demand for this on the floor.

Given the major structural changes taking place in floor trading, which practically no longer exists in the strict sense of the word, the offer by open outcry has for all practical purposes entirely lost its importance. Its



original function of generating liquidity has been very largely replaced by the combination of the electronically published indicative price range and electronic order routing.

Against the setting of today's modern stock exchange infrastructure, the offer by open outcry is no longer a constitutive element of the market model. Today, an estimated 99% of all exchange prices are determined without offers being made beforehand by open outcry.

**Phase III - Price Determination**

For the purpose of actually determining the price, the market personnel "locks" the order book, in other words, no more buy and sell orders are accepted. The price is then determined, based on all the buy and sell orders currently represented in the order book at this time.

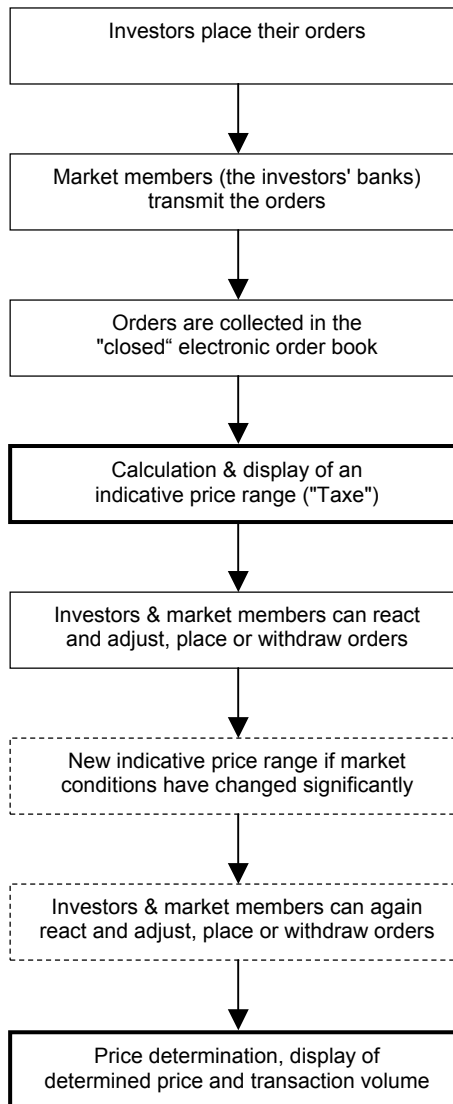
The fundamental rule of price determination is the principle of "maximum execution", i.e. the price to be determined is that which will allow the greatest turnover of shares with the least carryover of unexecuted trades. If, on the basis of this principle, there is more than one possible price, the principle of *greatest possible price continuity* requires that the price determined should be the one that is the closest to the price that was last determined.

Example:

Volume	Buy (Bid)	Pricing	Sell (Ask)	Volume
(50)	104		106	(200)
(50)	103		104	(150)
(100)	102	<b>102</b>	102	(100)
(50)	101		101	(50)
(50)	100		100	(50)
(100)	98			

Each price that is determined is published together with the number of shares traded via the exchange's computer system and thus accessible to all investors.

Technical sequence:



———— indicates the order book is "locked"

**Equal Treatment of All Orders and Market Personnel Neutrality**

It is characteristic for auction-based price determination that all buy and sell orders, including market orders with no price limit, are executed at the one price regardless of when they were placed and the size of the order. This distinguishes the system from market maker systems as well as from forms of electronic trading where orders are executed according to a price/time prioritisation. As opposed to a conventional market maker

system, where the market maker pockets the bid-ask spread, thus leading to an inherent conflict of interests between investors – who are interested in the spread being as narrow as possible – and the market maker, who *ceteris paribus* strives for a wide spread, the market personnel acts as a neutral agent between the buying and selling side and thus guarantees equal and neutral treatment of all placed orders. In return, the market personnel receives a volume-based brokerage fee (so called “*Courtage*”) from the seller and the buyer.

### Market personnel acting as “Liquidity Providers”

In addition to the actual price determination, market personnel are also increasingly assuming the function of “liquidity providers” by voluntarily self dealing (“*Selbsteintritt*”), “absorbing” the carryovers on the buy or sell side that can still exist upon application of the maximum execution principle. As liquidity providers the market personnel supports the market particularly in less liquid securities by increasing the marketability and negotiability of the securities and reducing the risk of costly partial executions.

The market personnel's act of self dealing is governed by a set of rules that again commit him or her to strict neutrality and prevent investors from being placed at a disadvantage by the market personnel's self-dealing interests. In particular, the brokering activities must take priority and the self-dealing may not have an accentuating effect on price developments. All transactions or trades that a market personnel voluntarily executes in the course of self-dealing are also subject to the constant and closely scrutinised supervision of the competent Trading Surveillance Office at the respective stock exchange.

### Benefits of Closed Order Book Price Determination

While the market model of closed order book price determination shares the general characteristic of all auction systems by granting all investors a due response time in the

pre-auction phase, the closed order book offers additional benefits, making it attractive in particular but not solely to retail investors, especially in trading less liquid shares:

While in an *open* order book environment the “costs” of market impact can be anticipated by investors, the attempt to drive the price in a specific direction incorporates a much higher risk when prices are determined on the basis of a *closed* order book.

As a result, the closed order book “protects” the orders of investors and increases their willingness to place both orders with wider limits<sup>1</sup> and market orders<sup>2</sup> alike, thus *ceteris paribus* increasing liquidity in a specific security. In addition it facilitates and enhances the willingness of the market personnel to act as a liquidity provider, since the amount of market risk he/she “absorbs” in the course of voluntary self-dealing won't be disclosed to the market, preventing other market participants from “playing” against his or her account under one-directional market conditions.

In accordance with these characteristics, it is not surprising that academic research seems to affirm the positive impact of closed order book price determination on market integrity. In fact, a recent global empirical analysis by Aitken/Siow<sup>3</sup> even comes to the conclusion that the closed order book market model offers the comparably best protection against price manipulation since the uncertainty about the trading volume required to obtain a desired market impact detracts market participants from manipulative behaviour.

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<sup>1</sup> The closed order book mitigates the “*free trading option*” problem: In an open order book environment, limit orders can be viewed as providing the market with a free put (call) option to sell (buy) shares whenever new information arrives at the market which justifies a price lower (higher) than the stated limit.

<sup>2</sup> Especially in less liquid markets when a market order can not be executed instantly, an open order book could generate a “*second mover advantage*” for somebody placing a price-setting limit order which would enable him or her to extract value from the market order.

<sup>3</sup> Michael Aitken, Audris Siow. Ranking World Equity Markets on the Basis of Market Efficiency and Integrity, November 2003 (working paper attached to this document)

# **RANKING WORLD EQUITY MARKETS ON THE BASIS OF MARKET EFFICIENCY AND INTEGRITY <sup>+</sup>**

Michael Aitken<sup>1</sup> and Audris Siow<sup>2</sup>

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+ An earlier version of this paper has been published in the “Hewlett-Packard Handbook of World Stock, Derivative & Commodity Exchanges 2003” – July 2003

<sup>1</sup> Chair of Capital Markets Technologies – University of New South Wales ([www.unsw.edu.au](http://www.unsw.edu.au)) and Director Capital Markets Cooperative Research Centre (CMCRC), Mail: CMCRC, PO Box 970, NSW 2001 Australia. Phone: (612) 9236 9154 Email: [aitken@cmcrc.com](mailto:aitken@cmcrc.com)

<sup>2</sup> PhD Student, University of New South Wales, Mail: CMCRC, PO Box 970, NSW 2001 Australia. Phone: (612) 9236 9154 Email: [audris@sirca.org.au](mailto:audris@sirca.org.au)

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## Abstract

This study ranks twenty-five world equity markets from the North American, European, Middle-eastern and Asia-Pacific regions on the twin objectives of market efficiency and integrity. Though rhetoric from the chosen markets suggest that these are equally important goals we find evidence that their importance varies significantly across markets. The key findings of the study are that the Deutsche Boerse and the New York Stock Exchange stand out among their international peers as markets of high efficiency and integrity. Notwithstanding the performance of these markets, European markets hold eight of the top ten places while the top three Asia-Pacific markets are New Zealand, Tokyo and Hong Kong exchanges ranked 11<sup>th</sup>, 12<sup>th</sup> and 14<sup>th</sup> respectively. While the Deutsche Boerse –floor trading in Frankfurt, holds the mantle as the market with the highest integrity, its ranking on efficiency is much lower at 14<sup>th</sup>. This is symptomatic of a more pervasive result, namely, that efficient markets are not necessarily markets with higher integrity and vice versa. Euronext Paris which is ranked 2<sup>nd</sup> on efficiency is only ranked 19<sup>th</sup> on integrity is evidence of the latter. Given the disparity between the two goals, scope appears to exist for international alliances among securities markets with the objective of enhancing one or the other goal.

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*JEL Classification : G10, G14*

*Keywords : Market Efficiency, Market Integrity, Manipulation*

# RANKING WORLD EQUITY MARKETS ON THE BASIS OF MARKET EFFICIENCY AND INTEGRITY

## Introduction

The objective of this research is to discuss and ultimately construct a league table that helps international investors rate security markets on the basis of their demonstrated commitment to the twin goals of market efficiency and market integrity. More specifically we rate a broad cross-section of twenty-five world equity markets<sup>3</sup> representing North American, European, Middle-Eastern and Asia-Pacific sectors of the markets on these characteristics. Besides an overall ranking, we test whether there is any obvious relationship between market efficiency and market integrity.<sup>4</sup> In particular we pose the question - Are more efficient markets likely to display higher market integrity or vice versa?

Notwithstanding significant issues associated with such a comparison, we find it curious that there are no public “league rankings” on the two and in particular no attempt to relate one to the other. The closest to a market rating we can observe are implicit rankings by the World Federation of Exchanges on aspects such as the numbers of securities listed, market capitalisation and turnover. Aside from these rankings we also note a fair number of academic papers comparing transaction costs and volatility, but mostly for limited numbers, usually two, markets. The absence of a substantial cross-market ranking is the primary motivation for the current research.

Such a ranking might be useful for at least three reasons. First, it might provide tangible benefits, in terms of encouraging investor interest, in those markets making a “real” effort in these areas. Faced with uncertainty even institutional investors have little option but to increase their required rates of return, in turn increasing the cost of funds in markets/investments where efficiency and integrity are perceived problems. Second, such a league ranking might provide greater motivation for markets that have comparative problems with efficiency and financial integrity to be more proactive in these areas. Indeed it might help

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<sup>3</sup> The markets analysed represent lead exchanges in the North American (4), European (10 entries but 9 countries, 2 representing Deutsche Boerse), Middle-Eastern (2) and Asia-Pacific regions (9). In forthcoming research we will present additional evidence on South American, African and Middle Eastern Exchanges.

<sup>4</sup> That efficiency and integrity are key objectives of all major equity markets is clear from the web sites of the world’s leading exchanges. Appendix 1 contains a sample of relevant statements.

determine appropriate partners in international alliances. Finally, such a ranking may serve to motivate debate in order, ultimately, to achieve an acceptable basis for such a comparison.

We begin in the next section by examining the relationship between market efficiency and integrity. In section 2 we discuss appropriate methods to proxy/measure these two elements. Section 3 describes the data set and its limitations before setting out the key findings in section 5. The final section concludes the paper highlighting possible research extensions.

## **Efficiency and Financial Integrity Defined**

The first task is to define and relate market efficiency and market integrity. Appendix 1 provides evidence from a number of exchange web sites of the professed importance of both goals. Notwithstanding the use of slightly different terminology, it is clear from these statements that efficiency and integrity are of equal importance to most exchanges as one might expect. A question that we address in this paper is whether the rhetoric can be supported by hard evidence. Our answer is that it cannot.

## **Market Efficiency**

We shy away from traditional academic notions of market efficiency that tend to focus on information efficiency to a more all encompassing definition which concerns itself with the ability to instantaneously convert cash into securities and back again. The more efficient the market the cheaper is the conversion process; or more conventionally, the lower are transaction costs. Based on this definition we need to measure transaction costs in order to measure market efficiency<sup>5</sup>. To do this we need to take account of two measurement complications. First, the fact that there are a large number of securities in each market each with quite a different transaction cost profile. Second, that there are a number of distinct components of transactions costs none of which can be easily observed and therefore measured.

Addressing the latter issue first – How do we measure transaction costs? Key components of transaction costs include brokerage costs, market impact costs, and opportunity costs.

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<sup>5</sup> Under this definition efficiency can change as a consequence of changes in technology, regulation, participants, financial instruments as well as changes in information.

Unfortunately none of these is directly observable in the Reuters data available to us<sup>6</sup>. In the absence of data to measure transaction costs directly, we proxy transaction costs by measuring the time weighted relative spreads of securities<sup>7</sup>. While it would be preferable to have knowledge about the volume of securities available at the best bid/asks, this type of information is not freely available from most markets in order to foster a comparison, and neither is it available through the Reuters database we have at our disposal. Having said this, the relative bid/ask spread is a widely used and accepted measure to proxy transaction costs.

Addressing the second issue, the question is - How do we come up with an efficiency measure for a market that is made up of hundreds of different securities, each one of which potentially has their own efficiency measure? In the absence of an obvious method, we have adopted a simple averaging process based upon the combination of three different groups of securities. In the first group, we concentrate on estimating transaction costs for securities that make up the major 'investable' indices. We measure the average time weighted relative spreads of this group and compare the result across markets.

For the second and third groups we seek to take account of a wider group of securities than those in the major 'investable' indices. For this purpose, we isolate the top and bottom 10% of securities in each market based on trading turnover during the sample period and again estimate the time weighted relative spread for the top and bottom 10% of securities adopting a simple average for each group. Although it is customary in cross-market comparisons to compare the efficiency of securities with similar turnover/liquidity, or to weight comparative measures by turnover, because such comparisons ignore 99% of the securities in markets, we argue that such a measure does not provide a true picture of the costs for the average investor (other than institutional investors) dealing in that market. Irrespective of which method is preferred, we argue that adopting the same relative measure for each market mitigates potential comparison problems.

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<sup>6</sup> Note that this Reuters data provides intra-day trade and quote data for 240 world markets and so for the purpose of market comparison, it is the best available for the task at hand short of getting the data from each individual exchange, many of which provide no more than what Reuters has made available.

<sup>7</sup> The relative spread is simply the spread divided by the midpoint and then weighted by the time that particular spread was available over the estimation period.

## Market Integrity

Consistent with the overarching goal of maintaining market integrity, a key goal of a securities market must be to ensure that no one investor can manipulate prices for their benefit, that is, deliberately cause a short term supply/demand imbalance. The ability to manipulate a market would be difficult if individual investors were to invest primarily on their own account. However, given that investors now congregate in funds, the effective size of these new types of investors means that manipulation is possible if not probable. Although wide-ranging rules seek to preclude such behaviour, examples of such activity seem commonplace. A recent example follows:

*On Friday, 29<sup>th</sup> June 2001 between 4 and 4.15pm the Standard & Poor's ASX 200 Index (SPI 200) increased 45.5 points following the closing single price auction (CSPA) on the ASX. By market open on the following Monday, this unusual increase was reversed. The last trading day of the financial year always pushes share prices a little higher, but on 29 June the All Ordinaries Index rose by 67 points, or two per cent, and the ASX is concerned market manipulation may have been involved. On 2 July, the index fell by 54 points, as the "ramping" buyers, believed to be fund managers and derivative players, withdrew (Rennie, 2001).*

Following this incident, the ASX and the SFE altered the method by which index futures contracts were settled breaking the link between the ASX closing price for the share market and the settlement price for the index futures contract in November 2001<sup>8</sup>. Moreover, the Australian Securities and Investments Commission ruled on 22 January 2001 that the party attributed with causing the event adhere to certain restricted trading conditions under their license.

In another US example, a supermarket chain, Safeway, was to be added, as of the close, to the S& P 500 on November 12, 1998, following an announcement made the previous week. High demand by index funds seeking to add Safeway security to their portfolios at the closing price on this day resulted in a large order imbalance at the close. To accommodate the excess demand, the NYSE specialist for Safeway, Spear Leeds, set a closing price of \$55, up 11%

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<sup>8</sup> It is important to note that our data set includes this particular instance where index arbitrage was present. The cases were included because the eventual outcome by the court had deemed such actions as 'manipulative'.



from the previous trade. In subsequent overnight trading Safeway security fell in price, closing at \$51.1875 the following day. Many institutional investors who paid large premiums to acquire Safeway at the close on November 12 were highly critical of the manner in which the closing price was determined. These traders argued that the order imbalance should have been more widely publicised to alert potential buyers that they would trade at a substantial premium while simultaneously attracting counter-party interest to dampen the temporary price pressure at the close.

The high level of concern about the possibility of manipulation at the close is evident in recent decisions by a number of securities markets to implement special mechanisms for the determination of closing prices. Different markets have a range of different rules to inhibit or minimize manipulative behaviour. For example, the Australian Stock Exchange (ASX) has implemented a batch close in which the last price is the weighted average price of the last buy order and the last sell order matched just prior to the first non-overlapping bid and ask price. The Stock Exchange of Hong Kong takes the median of 5 nominal prices in the last minute of the trading hour. Their system takes 5 snapshots on the nominal prices<sup>9</sup> at 15-second intervals starting from 3:59:00pm. Alternatively, the New Zealand Stock Exchange implements a random close for the day's trading between 3.55 – 4.00 pm.

Recently, even the New York Stock Exchange has begun to post the 'official' closing prices in its listed securities on its website.<sup>10</sup> They argue that the action was intended to ensure the availability of reliable pricing information that reflects the outcome of full market participation in the NYSE auction market. Previously, isolated off-NYSE small trades at anomalous prices after the NYSE close were being reported on the consolidated tape and via data vendors often as the last sale of the day and in some cases appeared in security tables of the newspapers the next day. Such price dislocations are not uncommon and should not be surprising in after-hours markets, where volumes are lower and specialists are not available to help maintain the balance in the market. These prices have been shown to be unrepresentative of the true market price in an affected security at the close of trading, which can mislead investors and substantially change a company's reported market valuation.

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<sup>9</sup> Nominal price on the HKEx is determined by comparing the current bid price, the current ask price and the last recorded price in accordance with Rule 101 of the Rules of the Exchange.

<sup>10</sup> *The Exchange* April 2000, p4, monthly magazine from the NYSE

Based on these examples, we have determined that a useful way (although not the only way) to estimate the potential for a market to be manipulated is to observe pricing behaviour of index securities at the market close, particularly at month and quarter ends, when institutional investor mandates and management profit incentives are likely to provide the greatest chance of observing behaviour consistent with manipulation. The use of index securities is dictated by the current dominance of institutional investors in the market place and seeks to address a widely held view that manipulation is no longer the exception, but rather the rule. Further, while smaller securities can and are manipulated, it is the potential manipulation of larger securities that has the greatest potential to undermine the integrity of a marketplace. Note however, that we provide results for larger and smaller security groupings.

Efficiency and integrity, though often referred to as the twin pillars of a properly functioning marketplace, do not necessarily go together<sup>11</sup>. Indeed there are situations when the two may be in conflict. For example, it may be efficient, in terms of encouraging greater liquidity, to reduce market transparency. However, reducing market transparency can also lead to perceived problems with market integrity. Further, while failure to prosecute insider trading would clearly be thought of as a problem for market integrity, plenty of academics (beginning with Henry Manne<sup>12</sup>) have been prepared to argue that permitting insider trading may actually lead to greater market efficiency by ensuring that prices fully reflect all available information. The point being made here is that market efficiency and market integrity are not necessarily good bedfellows. Accordingly, one objective in this research is to determine the extent to which they are related or not. We might expect better markets to show demonstrated commitment to both goals.

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<sup>11</sup> See Results section where we show a weak positive correlation between the measures of efficiency and integrity.

<sup>12</sup> Manne, Henry G., (1965), "Mergers and the Market for Corporate Control", *The Journal of Political Economy* Vol 73, Issue 2 (April), 110-120; (1966a), "Insider Trading and the Stock Market", *New York, NY : The Free Press*; (1966b) "In Defence of Insider Trading", *Harvard Business Review*, Vol. 44 , 113-122.

## Data

The data is obtained from the Reuters database maintained by the Securities Industry Research Centre of Asia-Pacific (SIRCA). This database contains intra-day trade and quote data for seven years for more than 200 world markets including most of the equity markets. The period of analysis for this particular study extends from October 1999 to March 2002<sup>13</sup>. The period of September 1999 is used to generate initial benchmarks<sup>14</sup> and to provide general descriptive information about the markets such as average trading activity and typical trading periods. The ranking score is applied from the period of October 1999 to March 2002, encompassing 30 months and 10 quarter ends.

Three sets of securities are analysed in this study. The first set examines the most common stocks that are usually held by fund managers in each market. They usually constitute the commonly watched index, e.g. FTSE100 for the London Stock Exchange. The second set examines a wider group of securities that comprise the top 10% of securities from each market. The third group involves the bottom 10% of securities from each market. Transaction costs are estimated for all three groups with a view to estimating a comparative cost of dealing in each market.

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<sup>13</sup> This period is arbitrary.

<sup>14</sup> Note however that we adopt a rolling benchmark in which test months are compared against the immediately preceding month.

## Measurement

### Efficiency

Time weighted relative spreads for the month of January 2002<sup>15</sup> are calculated to proxy for the costs of dealing in each market for the three groups of securities.

To calculate the relative spread for each security, the following formula is used:

$$\text{Relative spread} = ((\text{ask}-\text{bid}) / ((\text{ask} + \text{bid})/2)) \text{ at each change in spread}$$

The time weight was calculated by taking the time that each spread existed during a trading day. A summation of the changes in spreads multiplied by the time it was available is created for each security for each trading day using the following:

$$\Sigma (\text{time weights}) \times (\text{relative spread})$$

where :

$$\text{time weight} = \frac{\text{the amount of time the spread was in existence}}{\text{total time during the day}}$$

To obtain the final estimates, the time weighted relative spreads are averaged across all trading days in the analysis period for each security and then each security group. Negative spreads and instances where one side of the spread was absent were removed from the sample.

We argue that the lower the spreads, the less costly it is for investors to convert their cash into securities and vice-versa, hence the greater the efficiency of the market.

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<sup>15</sup> This month was selected randomly from the Reuters database. Shortly, we will present monthly updates of these metrics for these and other markets through the CMCRC website [www.cmcrc.com](http://www.cmcrc.com).

## **Integrity**

In order to practically determine the likelihood of a security being subject to manipulation at the close three conditions need to be met. The first condition is that the closing price is in the far right hand tail of a distribution of traded prices taken from a previous trading period. A security is more likely to be the subject of ramping if the price change in the last minutes of a month is greater than the top 1 percent of price changes during a benchmark period. In this study, the benchmark period is the trading activity during the previous month. This approach is best explained using an example.

In order to identify the top 1 percent of price changes for a security during the benchmark period, returns (price changes) are sampled every 15 minutes during the day. Assuming that there are approximately 20 trading days in a month and twenty-four 15 minute intervals in each trading day (assuming 6 trading hours per day), there are approximately 480 return observations each month. If these observations are sorted, the largest 4.8 returns (or 1 percent of the distribution) can be identified. The value of the fifth return is where the threshold for ramping for that security is set. For example, if the fifth highest return for Microsoft was 0.5% during the September, then the security is deemed to have been subject to ramping if the return in the last 15 minutes of 31 October was greater than 0.5%. While not conclusive many exchanges use variants of such measures to identify potential price manipulation at the close.

The second condition that needs to be met is that the price breaks through the best ask to new price levels establishing new best ask prices. The larger the number of price steps that are broken through the greater the likelihood of manipulation. The third condition for ramping to be established is that the traded prices in the next trading session revert to levels approximately equal to the benchmark price (possibly the volume weighted average price over the last month) calculated in condition 1. In order to test this latter condition it is also important that the trades of the party accused of manipulation are excluded from the determination of whether the prices reverts to the original benchmark. Regrettably we do not have data to estimate the second condition (full order level details) and so we are forced to adopt conditions 1 and 3 only as our proxies. In the absence of the ability to determine condition 2, our measures must therefore at best be indicative rather than conclusive. Accepting these limitations we argue that the lower the number of incidents of price reversals preceding potential ramping behaviour *and* the smaller the magnitude of price ramping, the higher the level of integrity in the market.

## Descriptive Statistics

This section presents general information about the markets examined in this study. Panel A shows the statistics for the first group – namely, index securities. It provides the details of the percentage trading activity for each sample of index securities against the entire market.

### **PANEL A : MARKET SUMMARY AND SAMPLE TRADING ACTIVITY FOR INDEX SECURITIES DURING SEPTEMBER 1999**

Market	Index Used	Market Trading Value* ('000,000)	Sample Security Trading Value* ('000,000)	Sample Trading Value as a % of Market Trading Value	Average Number of Trades per day in group	Number of Securities in Index
American Stock Exchange	Top 100+	39,725	38,478	97%	10,502	100
Australian Stock Exchange	ASX200	18,935	14,908	79%	19,134	200
Borsa Italia	MIB30	45,446	21,613	48%	19,813	30
Cairo & Alexandria Exchanges	CASE50	2,826	2,306	82%	2,448	50
Copenhagen Stock Exchange	KFX	40,439	568	14%	678	20
Cyprus Stock Exchange	CYSE100	171	116	68%	2,907	100
Deutsche Boerse-Xetra (electronic)	DAX	43,356	27,840	64%	12,553	30
Deutsche Boerse - Frankfurt (floor)	DAX	10,745	1,344	13%	1,760	30
Euronext Paris	CAC40	66,499	46,826	70%	54,306	40
Helsinki Stock Exchange	HEX	6,638	5,422	82%	3,254	20
Hong Kong Stock Exchange	Hang Seng	175,060	59,144	34%	7,592	33
Istanbul Stock Exchange	ISE100	2,099,110	1,639,650	78%	22,437	100
Jakarta Stock Exchange	LQ45	1,086,460	79,25,400	73%	8,628	45
Kuala Lumpur Stock Exchange	KLSE Composite100	9,346	4,826	52%	7,468	100
London Stock Exchange	FTSE100	106,117	55,860	53%	33,892	100
NASDAQ Stock Market	NASDAQ	864,530	493,609	57%	427,451	100
New York Stock Exchange	NYSE100	652,125	243,201	37%	80,911	100
New Zealand Stock Exchange	NZ40	1,295	956	74%	1,097	40
Oslo Børs	OSEBX	43,173	25,308	59%	2,597	55
Philippines Stock Exchange	PSE Composite	53,341	16,646	31%	540	33
Singapore Stock Exchange	Straits Times	11,457	6,073	53%	5,798	55
Stockholmsbörsen	OMX	271,803	74,093	27%	5,488	30
Taiwan Stock Exchange	TSEC Taiwan 50	2,143,000	1,862,000	87%	38,943	50
Tokyo Stock Exchange	TOPIX	16,485,000	9,708,180	59%	44,619	150
Toronto Stock Exchange	TSE60	37,646	17,910	48%	18,493	60

\* denominated in local currency

Panel A shows that the American Stock Exchange provides the greatest coverage of the market as almost 100% of the market is captured in this sample. The number of trades per day in each market is provided in part to appreciate the differences in liquidity levels of the securities within the sample (see fifth column from left). On this measure the NASDAQ market is the most liquid market.

Panel B shows the statistics for the securities belonging in the first and tenth deciles of each market. Deciles in each market are determined by dividing the total number of securities in each market into 10 groups, based on their trading turnover.

**PANEL B: MARKET SUMMARY AND TRADING ACTIVITY FOR TOP AND BOTTOM DECILE SECURITIES DURING SEPTEMBER 1999**

Market	Market Trading Value* ('000,000)	Sample Security Trading Value* ('000,000)	Sample Trading Value as a % of Market Trading Value	Average Number of Trades per day in group	Number of Securities identified in both deciles
American Stock Exchange	39,725	37,600	95%	7,455	201
Australian Stock Exchange	18,935	15,900	84%	22,861	261
Borsa Italia	45,446	32,277	71%	37,115	485
Cairo & Alexandria Exchanges+	2,826	2,535	90%	1,535	27
Copenhagen Stock Exchange	40,439	28,000	69%	3,586	62
Cyprus Stock Exchange+	171	143	83%	3166	28
Deustche Boerse-Xetra (electronic)	43,356	36,749	85%	19,395	767
Deustche Boerse -Frankfurt (floor)	10,745	5,930	55%	7,694	282
Euronext Paris	66,499	57,500	86%	78,466	244
Helsinki Stock Exchange	6,638	5,642	85%	1,770	35
Hong Kong Stock Exchange	175,060	81,100	46%	29,686	169
Istanbul Stock Exchanges+	2,099,110	1,339,887	64%	13,667	67
Jakarta Stock Exchange	1,086,460	810,000	75%	8,793	105
Kuala Lumpur Stock Exchange	9,346	7,030	75%	15,891	147
London Stock Exchange	106,117	71,460	67%	45,524	584
NASDAQ Stock Market	864,530	743,034	86%	890,028	678
New York Stock Exchange	652,125	495,571	76%	202,444	560
New Zealand Stock Exchange	1,295	897	69%	952	34
Oslo Børs	43,173	31,800	74%	3,277	46
Philippines Stock Exchange	53,341	30,800	58%	2,089	38
Singapore Stock Exchange	11,457	5,100	45%	6,640	93
Stockholmsbörsen+	271,803	228,002	84%	25,870	83
Taiwan Stock Exchange	2,143,000	1,531,000	71%	28,115	121
Tokyo Stock Exchange	16,485,000	11,064,589	67%	57,957	427
Toronto Stock Exchange	37,646	33,200	88%	43,934	471

\*denominated in local currency

+ non-zero trading values for decile 10 securities

As one might expect the addition of the lower decile of securities adds little to the market coverage statistics. Once again the NASDAQ market is the most liquid market and the New Zealand Stock Exchange is the most illiquid market, averaging only 952 trades per day from its top and bottom 10% of securities.

## Results

Table 1 provides the average time weighted relative spreads for the three groups of securities, namely, index securities, decile 1 securities and decile 10 securities. The lower the spreads the higher the efficiency of the market. Although we have a ratio scale on which to rank each market, we have chosen to simply rank them 1 to 25 based on the lowest to highest spreads. The overall rank (in the far right column) comes from an effective equal weighting of each of the 3 individual scores. Note that decile 1 spreads are in some markets lower than the index securities. This arises because the numbers of securities in decile one are, for several markets, particularly the smaller ones, less than the number of securities in the index.

**Table 1**

**Market Efficiency Rating based on the Size of the Average Time Weighted Relative Spreads**

Market	Index						Overall
	Securities	Rank	Decile 1	Rank	Decile 10	Rank	
New York Stock Exchange	0.09%	1	0.12%	1	2.41%	3	1
Euronext Paris	0.15%	2	0.19%	2	12.80%	20	5
Deustche Boerse- Xetra (electronic)	0.21%	3	0.62%	12	2.46%	4	4
Borsa Italia	0.23%	4	0.58%	11	39.49%	25	11
Toronto Stock Exchange	0.23%	5	0.68%	14	4.26%	7	6
Tokyo Stock Exchange	0.29%	6	0.30%	3	3.66%	6	2
Stockholmsbörsen	0.42%	7	0.41%	4	17.01%	22	8
London Stock Exchange	0.44%	8	1.14%	18	9.68%	14	12
Taiwan Stock Exchange	0.51%	9	0.48%	6	0.74%	1	3
Hong Kong Stock Exchange	0.53%	10	0.81%	16	2.86%	5	7
Helsinki Stock Exchange	0.59%	11	0.57%	10	9.50%	13	9
Copenhagen Stock Exchange	0.62%	12	0.62%	13	9.88%	15	13
Australian Stock Exchange	0.66%	13	0.48%	7	12.06%	19	10
Deustche Boerse -Frankfurt (floor)	0.67%	14	1.88%	24	7.94%	10	18
NASDAQ Stock Market	0.83%	15	1.41%	22	10.53%	17	22
New Zealand Stock Exchange	1.04%	16	0.52%	9	10.26%	16	14
Singapore Stock Exchange	1.06%	17	0.84%	17	14.94%	21	23
Kuala Lumpur Stock Exchange	1.07%	18	0.76%	15	9.12%	12	17
Istanbul Stock Exchange	1.54%	19	1.56%	23	7.52%	8	19
Oslo Børs	1.59%	20	0.52%	8	17.31%	23	20
American Stock Exchange	1.64%	21	0.41%	5	10.88%	18	16
Cairo & Alexandria Exchanges	1.99%	22	1.19%	19	1.17%	2	15
Cyprus Stock Exchange	2.20%	23	1.28%	20	7.77%	9	21
Jakarta Stock Exchange	2.51%	24	2.07%	25	8.43%	11	24
Philippines Stock Exchange	3.41%	25	1.39%	21	18.14%	24	25

Though we have chosen to rank on index securities in table 1, placing two North American, and three European markets in the top five, the results vary somewhat when the other deciles are included; although three of the top five remain in the top five. Paris, Italy, and Toronto



with higher costs in the lower deciles swap positions with the Taiwan, Cairo and Hong Kong exchanges. The most interesting result is the very low costs for the smallest stocks in the Taiwan market. We have confirmed this result, however, at this stage we are not able to explain what makes trading in this market 3 times more efficient in the lower deciles than its closest competitor, New York, although clearly there are approximately 5 times more securities available for trading in the New York in this section of the market as there are in Taiwan.

Table 2 provides the number of potentially ramped securities (condition 1) among the three groups. We calculate both the number of ramping incidents and the average absolute price change across these ramped securities as a means of ranking markets on integrity. Further, we provide the incidence of non-month end window dressing in order to provide a basis for focusing on the last day of the month and quarters. On the face of it there does seem an obvious increase in the number of incidents of ramping at month rather than non-month end although it is possible that even the non-month ends results are driven by events such as triple witching dates<sup>16</sup> that we have not accounted for here. For the index stocks, we also present the incidence of price reversals on the next trading day for month-end cases (condition 3). Again we provide a simple ranking of 1 to 25 based on these respective measures.

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<sup>16</sup> Triples witching days are when the contracts for stock index futures, stock index options and stock options all expire on the same day. Triple Witching Days happen four times a year: the 3rd Friday of March, June, September and December. It is sometimes referred to as "Freaky Friday".

**Table 2**

Securities ramped in the last 15 minutes of trading at month and non-month end for index securities, decile 1 securities and decile 10 securities ranked initially on the average number of index securities with month-end price reversals per month and then the average price change in last 15 minutes over a 30 month period.

Market	Index Securities						Decile 1 securities				Decile 10 securities			
	ave # mth-end cases reverting to level of pre-ramped VWAP next day		Average # cases		Average Price Change in last 15 min		Average # cases		Average Price Change in last 15 min		# cases* (totals across period)		Average Price Change in last 15 min	
	# of cases	% fall from ramp to next day	Month-end	Ave non month-end	Month-end	Ave non month-end	Month-end	Ave non month-end	Month-end	Ave non month-end	Month-end	Ave non month-end	Month-end	Ave non month-end
Deustche Boerse -Frankfurt (floor)	0	NA	0.20	0.15	0.27%	0.93%	2	1	1.98%	3.16%	0	0	0%	0%
Copenhagen Stock Exchange	0	NA	0.30	0.26	3.17%	2.26%	1	1	2.46%	2.46%	0	0	0%	0%
Cyprus Stock Exchange	0.03	0.08%	0.13	0.11	0.70%	3.21%	0.17	0.1	5.18%	3.17%	0	0	0%	0%
Philippines Stock Exchange	0.03	24.70%	0.40	0.22	4.79%	10.67%	0.43	0.48	3.38%	4.33%	0	0	0%	0%
Deustche Boerse- Xetra (electronic)	0.07	0.49%	0.63	0.54	0.60%	1.32%	6	4	3.94%	3.95%	0	0	0%	0%
Helsinki Stock Exchange	0.07	0.65%	1	1	1.02%	1.72%	0.33	0.35	0.78%	1.78%	0	0	0%	0%
Stockholmsbörsen	0.07	0.13%	2	1	1.03%	1.44%	2	2	1.19%	1.93%	1	1	9.40%	0.68%
Cairo & Alexandria Exchanges	0.10	0.56%	1.23	1.14	2.13%	2.78%	0.23	1	1.65%	2.14%	1	1	2.94%	3.33%
Oslo Børs	0.10	0.34%	3	2	5.06%	2.86%	0.30	0.40	2.92%	2.48%	0	0	0%	0%
New Zealand Stock Exchange	0.20	1.33%	2	1	1.32%	1.62%	0.40	0.26	2.48%	2.19%	0	0	0%	0%
I Borsa Italia	0.20	0.76%	1	1	1.65%	1.60%	4	3	2.76%	2.86%	0	0	0%	0%
London Stock Exchange	0.20	1.24%	4	4	3.88%	3.67%	10	12	2.94%	3.68%	0	0	0%	0%
Hong Kong Stock Exchange	0.23	0.66%	2	1	1.75%	2.03%	0.37	1	1.51%	6.07%	0	3	0%	0.35%
Singapore Stock Exchange	0.23	0.85%	2	1	2.23%	2.26%	1	1	1.70%	2.73%	0	0	0%	0%
Toronto Stock Exchange	0.33	1.62%	3	2	1.31%	2.07%	8	5	3.90%	4.00%	0	0	0%	0%
New York Stock Exchange	0.5	0.68%	3	2	1.71%	1.43%	9	5	2.56%	2.10%	18	10	1.95	2.09%
Jakarta Stock Exchange	0.53	1.85%	5	4	3.98%	3.67%	2	2	6.74%	6.08%	0	0	0%	0%
Taiwan Stock Exchange	0.60	1.78%	8	6	1.80%	1.99%	2	2	1.84%	3.18%	29	26	2.27%	3.18%
Istanbul Stock Exchange	0.77	4.06%	7.9	5.78	2.58%	3.01%	4	3	14.11%	2.74%	5	3	3.17%	3.12%
Kuala Lumpur Stock Exchange	0.83	2.71%	10	6	2.74%	2.35%	4	1	2.91%	2.61%	1	16	16.70%	2.34%
NASDAQ Stock Market	1.00	4.77%	6	3	1.74%	3.05%	14	9	4.64%	4.72%	12	3	0.38%	0.75%
Australian Stock Exchange	1.20	2.40%	10	5	1.94%	1.73%	5	2	2.48%	2.19%	0	0	0%	0%
Euronext Paris	1.40	1.62%	3	2	1.02%	1.16%	8	5	1.47%	1.73%	0	0	0%	0%
Tokyo Stock Exchange	1.50	6.56%	12	4	1.59%	1.76%	15	19	1.87%	2.09%	0	0	0%	0%
American Stock Exchange	2.40	6.65%	5	3	3.32%	2.13%	4	2	4.75%	4.88%	1	2	2.60%	0.05%

**Table 2 a**

**Market Integrity Rating based on average number of price reversals on index securities per month (from October 1999 to March 2002) relative to the number of securities in the index AND the average ramp movement**

Market	ave # mth-end cases reverting to level of pre-ramped VWAP next day	% of index securities ramped and then reverting to pre-ramp VWAP levels per month	% price fall from ramp to next day	Average # securities Ramped per month	# securities in Index	% of index securities ramped per month	Average Price change in the last 15minutes	Rank 1	Rank 2	Overall
Deustche Boerse -Frankfurt (floor)	0	0.00%	NA	0.20	30	0.67%	0.27%	1	1	2
Cyprus Stock Exchange	0.03	0.15%	0.08%	1.2	20	6.00%	0.70%	4	3	7
Helsinki Stock Exchange	0.07	0.23%	0.65%	1	30	3.33%	1.02%	8	4	12
Deustche Boerse- Xetra (electronic)	0.09	0.30%	0.49%	0.63	30	2.10%	0.60%	10	2	12
Stockholmsbörsen	0.07	0.23%	0.13%	2	30	6.67%	1.03%	9	6	15
New Zealand Stock Exchange	0.20	0.50%	1.33%	2	40	5.00%	1.32%	13	8	21
Toronto Stock Exchange	0.33	0.55%	1.62%	3	60	5.00%	1.31%	14	7	21
Copenhagen Stock Exchange	0	0.00%	NA	0.30	20	1.50%	3.17%	1	20	21
Cairo & Alexandria Exchanges	0.10	0.20%	0.56%	1.23	50	2.46%	2.13%	6	16	22
New York Stock Exchange	0.50	0.50%	0.68%	3	100	3.00%	1.71%	12	11	23
Borsa Italia	0.20	0.67%	0.76%	1	30	3.33%	1.65%	16	10	26
Philippines Stock Exchange	0.03	0.09%	7.74%	0.40	33	1.21%	4.79%	3	24	27
Singapore Stock Exchange	0.23	0.42%	0.85%	2	55	3.64%	2.23%	11	17	28
London Stock Exchange	0.20	0.20%	1.24%	4	100	4.00%	3.88%	7	22	29
Australian Stock Exchange	1.20	0.60%	2.40%	10	200	5.00%	1.94%	15	15	30
Hong Kong Stock Exchange	0.23	0.70%	0.66%	2	33	6.06%	1.75%	17	13	30
Tokyo Stock Exchange	1.50	1.00%	6.56%	12	150	8.00%	1.59%	21	9	30
Oslo Børs	0.10	0.18%	0.34%	3	55	5.45%	5.06%	5	25	30
Euronext Paris	1.40	3.50%	1.62%	3	40	7.50%	1.02%	25	5	30
NASDAQ Stock Market	1.00	1.00%	4.77%	6	100	6.00%	1.74%	20	12	32
Istanbul Stock Exchange	0.77	0.77%	4.06%	7.9	100	7.90%	2.58%	18	18	36
Taiwan Stock Exchange	0.60	1.20%	1.78%	8	50	16.00%	1.80%	23	14	37
Kuala Lumpur Stock Exchange	0.83	0.83%	2.71%	10	100	10.00%	2.75%	19	19	38
Jakarta Stock Exchange	0.53	1.18%	1.85%	5	45	11.11%	3.98%	22	23	45
American Stock Exchange	2.40	2.40%	6.65%	5	100	5.00%	3.32%	24	21	45

Markets are tabulated in table 2a by a double ranking system. First, we calculate the average number of month-end cases that were ramped at the end of the previous trading day which subsequently revert to pre-ramped benchmark levels as a percentage of the number of index stocks. We rank them low to high, the former being the better. Where this result provides equivalent results we then rank by the magnitude of the price reversal (see Rank 1). Second,

we rank by the average price change in the last 15 minutes prior to the close of trading at the end of month for the affected securities (see Rank 2).

Table 2a reveals that over the 30-month period, the number of potential ramping incidents is approximately 6 on the Frankfurt floor. Initial attempts to explain the Frankfurt result suggest that it arises partly as a result of proprietary price stabilisation algorithms and partly from close regulatory scrutiny of major price variances through market making of floor traders at these times. To rank markets on integrity, we compared the number of incidents of price reversals to the numbers of securities in the respective indices (frequency) *and* the average ramp movement (magnitude). A summarised score of equal weights for the two rankings is computed for each market to produce an overall integrity score.

Table 3 provides an overall league ranking based on index securities alone. We assume equal weight to market integrity and efficiency and accordingly sum both ranks on efficiency and integrity to get an overall score for each market. The lower the score the better the market. (Where two markets have the same score, we favour the market with the least worst score in either of the two rankings, i.e. 5<sup>th</sup> in integrity and 8<sup>th</sup> in efficiency will beat 1<sup>st</sup> in integrity and 12<sup>th</sup> in efficiency, even though both sum to 13) Using this ranking procedure, XETRA (the Deutsche Boerse's electronic market) is the clear winner ranking 3<sup>rd</sup> on efficiency and 4<sup>th</sup> on integrity. The New York Exchange follows closely behind being 1<sup>st</sup> on efficiency but faring a lower score of 10<sup>th</sup> for integrity. Both Stockholmborsen and the Toronto Exchange secure the third spot whilst five European markets including Helsinki, Italy, Copenhagen and Paris hold the next positions. The top three Asia-Pacific exchanges, New Zealand, Tokyo and Hong Kong exchanges come in 11<sup>th</sup>, 12<sup>th</sup> and 14<sup>th</sup> overall. Note that New York is the highest ranking North American exchange on market integrity while the other North American markets some way behind.

In Europe, the Deutsche Boerse- Frankfurt has the highest integrity ranking, followed by Cyprus, Helsinki and XETRA (Deutsche Boerse's electronic market). In the Asia-Pacific region, the New Zealand exchange at 6<sup>th</sup> is followed by Philippines, and Singapore ranked 12<sup>th</sup> and 13<sup>th</sup> respectively. One possible reason for the New Zealand result may be the fact

that this market does not have a developed funds management industry, one of the key reasons often cited for the likelihood of incentives to manipulate.

Perhaps the most interesting result is the weakly positive correlation between efficiency and integrity. This suggests that there is no strong relationship between integrity and efficiency. This result is best exemplified by Frankfurt, Cyprus and Helsinki, which scored high on integrity but lower on efficiency, and Paris, Italy and Tokyo which scored high on efficiency but lower on integrity. The Euronext Paris result is very stark. Ranked 2<sup>nd</sup> on efficiency but only 19<sup>th</sup> on integrity is a result that suggests that Euronext Paris may need to give more attention to systems to promote market integrity. An unexpected result is the low ranking of both the American Stock Exchange and the NASDAQ markets on both efficiency and integrity, particularly the latter which has reportedly spent significant sums on improving its regulatory division and its electronic surveillance systems. On the face of these results, this investment is yet to pay off. Future research is required to probe these results in order to understand how they arise.

Perhaps not so unexpected, though stark in its nature, is the frequent appearance of Asia/Pacific in the bottom half of the table. Tokyo is a case in point. As one of the world's largest markets, this result does not bode well for the reputation of the Tokyo market. Though ranked 6<sup>th</sup> on efficiency its rank of 17 out of 25 on market integrity suggest the need for urgent remedial action. Looking at these results in a more positive light, likely global alliances between markets in the future might be encouraged by the ability of one or other of the partners to contribute to greater market efficiency and/or integrity to the alliance.

**Table 3****Overall League Rankings on Market Efficiency and Market Integrity**

<b>Market</b>	<b>Integrity</b>	<b>Efficiency</b>	<b>Overall</b>
Deustche Boerse- Xetra (electronic)	4	3	7
New York Stock Exchange	10	1	11
Stockholmborsen	5	7	12
Toronto Stock Exchange	7	5	12
Helsinki Stock Exchange	3	11	14
Borsa Italia	11	4	15
Deustche Boerse -Frankfurt (floor)	1	14	15
Copenhagen Stock Exchange	8	12	20
Euronext Paris	19	2	21
London Stock Exchange	14	8	22
New Zealand Stock Exchange	6	16	22
Tokyo Stock Exchange	17	6	23
Cyprus Stock Exchange	2	23	25
Hong Kong Stock Exchange	16	10	26
Australian Stock Exchange	15	13	28
Singapore Stock Exchange	13	17	30
Cairo & Alexandria Exchanges	9	22	31
Taiwan Stock Exchange	22	9	31
NASDAQ Stock Market	20	15	35
Philippines Stock Exchange	12	25	37
Oslo Bors	18	20	38
Istanbul Stock Exchange	21	19	40
Kuala Lumpur Stock Exchange	23	18	41
American Stock Exchange	25	21	46
Jakarta Stock Exchange	24	24	48
<b>Correlation</b>	<b>0.226154</b>		

## Conclusion and Further Research

Our purpose in this research was to provide an indicative ranking on market efficiency and integrity for 25 world equity markets from the North American, European, Middle-eastern and Asia-Pacific time zones. Accepting the limitations of our design and data, the results suggest that the German XETRA (electronic) market and the New York Stock Exchange stand out among their international rivals as markets of high efficiency and integrity. Somewhat surprisingly however, the other North American markets (in particular NASDAQ and the American Stock Exchange) do not complement this image and overall European markets dominate eight of the top ten places. With some exceptions Asia-Pacific exchanges tend to lag their international competitors on both efficiency and integrity.

We found little correlation between efficiency and integrity leading us to speculate that in the interest of generating revenues, markets may have focused too much on the building of trading and settlement systems rather than surveillance and other regulatory systems in the past decade. Perhaps markets surveillance is being thought of as an adjunct to trading systems rather than a discipline in its own right requiring dedicated resources. It will be interesting, for example, as the subject of further research, to see whether other members of the Euronext alliance<sup>17</sup>, have similar integrity rankings to Paris<sup>18</sup>. Should this be the case it might have implications for the amount of effort the alliance devotes to market surveillance as opposed to trading and settlement. Somewhat unexplained are the results for NASDAQ, a group that has dedicated significant resources to developing their regulatory and in-house electronic surveillance systems over the last decade. Future research might investigate the effectiveness of this expenditure and/or whether there are natural lags between expenditure and results.

In an effort to cover as many markets as possible we restricted our analysis to one specific proxy for market efficiency and market integrity. Future research might use a multi-factor

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<sup>17</sup> Euronext is the largest integrated, cross-border European market in the euro region that includes member organizations such as the Paris Bourse, Amsterdam and Brussels exchanges etc.

<sup>18</sup> We are currently undertaking similar analysis for Brussels and Amsterdam exchanges to test this theory. Interested readers are welcome to write to us for the results. Also, if you are associated with a market not

approach, one objective of which might be to test whether these results stand up. Further research needs to test the robustness of these results to the assumptions made. That evidence which was provided in this vein, using different groups of securities based on size, suggests that while the results do vary, they did not change significantly.

Future research should also extend the analysis to the derivative markets and consider the impact of other periods (e.g. option expiry dates) to single out other market events that may have impacted our results. Finally, more detailed order book data (including volume weighted spreads) and the possibility of using longer time series might also allow us to determine whether there are perceptible changes in these ratings consistent with new regulatory and efficiency initiatives by particular markets. This involves gaining a deeper understanding of the structure of the respective markets and how this structure has changed through time. This might be achieved by an alliance of researchers from each of these markets.

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covered by this study we expect to have a more comprehensive market coverage to July 2003. We invite interested readers to register their interest in a particular market for subsequent communications.



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## Appendix 1

### Quotes from Various Lead Exchange Websites

*New York Stock Exchange* – [www.nyse.com](http://www.nyse.com)

“To help reassure investors and support customers, the Exchange further reduced trading costs and increased **operating efficiencies**, strengthened regulatory and governance standards, and introduced new ways for customers to access the market.”

“Providing the highest possible market quality was our top priority, along with ensuring the **liquidity** and **transparency** that market participants have come to expect.”

*NASDAQ Market* – [www.nasdaq.com](http://www.nasdaq.com)

“NASDAQ is among the world’s most regulated stock markets, employing sophisticated surveillance systems...to protect investors and provide a **fair and competitive** trading environment.”

“Offering growth and **liquidity**, fostering innovative technologies...NASDAQ continues to build the most **efficient** trading environment...to the benefit of all market participants and investors.”

*London Stock Exchange*- [www.londonstockexchange.com](http://www.londonstockexchange.com)

“The FSA summarises its job as “To maintain **efficient, orderly and clean** financial markets and help retail investors achieve a **fair** deal...”

*Euronext*- [www.euronext.com](http://www.euronext.com)

“A business corporation that supervises listings on the exchange, ensures **efficient** trading, provides a guarantee of final settlement of transactions, disseminates market data in real time, and promotes securities markets in general.”

“Euronext aims to provide a **fair and orderly** market with built-in safeguards for the quality of price formation. Euronext is of the opinion that market participants should have a **level playing field**.”

*Toronto Stock Exchange*- <http://www.tse.com/en/aboutUs/tse/index.html>

“Toronto Stock Exchange provides an **efficient, liquid** market for senior equities”.

“Market Regulation Services Inc. is a national, not-for-profit, self-regulatory organization. It seeks to foster investor confidence in the Canadian securities market and to safeguard investors by maintaining **fair and orderly** marketplaces. It is jointly owned by the TSX and the Investment Dealers Association of Canada.”

*Australian Stock Exchange-* <http://www.asx.com.au>

“...the growing market capitalisation of the market have combined to increase **the depth and liquidity** of the market - two of the most crucial elements, along with **integrity** of a successful market;”

“The reputation of ASX's markets for **fairness and integrity** is very important to ASX. Maintaining this reputation involves constant and vigilant supervision.”

*Tokyo Stock Exchange-* <http://www.tse.or.jp>

“The management aims are stipulated in the Tokyo Stock Exchange's constitution as, "In order to contribute towards the protection of the public interest and investors, the trading of securities must be carried out in a **fair and efficient** manner.”

*Hong Kong Stock Exchange-* <http://www.hkex.com.hk>

“HKEx is committed to performing its public duty to ensure **orderly and fair markets** and that risks are managed prudently, consistent with the public interest and in particular, the interests of the investing public. “

“The powerful resources of its new integrated market structure will ensure that Hong Kong remains one of the most important centres for providing critical hedging and risk management facilities and for financing the development of China. At the same time, Hong Kong has the upward momentum to develop as a leading market with **maximum liquidity and minimum transaction costs.** “

*Taiwan Stock Exchange-* [http://www.tse.com.tw/docs/eng\\_home.htm](http://www.tse.com.tw/docs/eng_home.htm)

Mission statements:- “ To provide innovative, **efficient** and superior services.”

“ To maintain a **fair** open and safe trading market.”