

Liquidity and Trading Cost Segmentation in Asia Pacific Equity Markets

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Working Paper
May 11, 2009

Abstract

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JEL Classification: G14

Keywords: Asia-Pacific Exchanges; Emerging Financial Markets; Liquidity ; Market microstructure

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1 Introduction

Asia Pacific equity markets continue to experience continuous strong growth in trading value in recent years at a compounded annual rate of 33% between 2004 to 2007. This growth rate has been achieved even though the exchanges in this region tended to develop independently of one another unlike the paths of consolidation chosen by the European markets under the Euronext (ENXT) and OMX Nordic. While it may be optimal to allow market structures to vary depending on the uniqueness of securities traded and on the clientele composition as O'Hara (2001) observes, it is quite clear that such spectacular growth rates in new listings and trading value is not equally shared in the markets of this region.

This study examines the market microstructures of ten Asia Pacific equity markets and compares cross-country liquidity and transaction costs using daily and intraday data in 2007. The ten markets account for 90% of trading value in Asia Pacific and are divided into five developed markets; Australia (Australian Securities Exchange, ASX), Hong Kong, (Hong Kong Stock Exchange, HKSE), Japan (Tokyo Stock Exchange, TSE), New Zealand (New Zealand Exchange, NZX), and Singapore (Singapore Exchange, SGX), and five emerging markets; China (Shanghai Stock Exchange, SSE), Korea (Korea Stock Exchange, KRX), Malaysia (Bursa Malaysia, KLSE), Thailand (Stock Exchange of Thailand, SET), and Taiwan (Taiwan Stock Exchange, TSEC).¹

Comerton-Forde and Ryde (2006) discuss the market microstructure designs of Asia Pacific exchanges and identify the challenges that the regional exchanges must address. To remain competitive, the authors argue that Asia Pacific exchanges may have to review certain institutional design and consider regional consolidation. Our study focuses on how the tiered structure of these markets in terms of the level of development and in price trading range within each market explains differential liquidity and transaction costs. Issues of tiered structures across markets and within the same market have thus

¹A market is classified as emerging if it is part of the S&P, IFC emerging market index in 2007.

far received less attention. Previous studies either address the issues of liquidity and transaction costs in the context of developed markets (Lesmond et al. (1999) and Stoll (2000)) or a comparison of emerging markets (Lesmond (2005)). Our review of existing market microstructure in the Asia Pacific indicates that exchanges in this region have a number of design commonality. All are limit order markets with absence of official market makers. Virtually all exchanges have been demutualized with the exception of Thailand's SET and China's SSE. There is a trend towards greater transparency and liberalized commissions. But going forward, markets must understand the different needs of its clientele. In this regard, we find that one interesting aspect that sets developed markets and emerging markets in our sample apart is the clientele compositions which are predominantly institutional in the developed group and largely retail in emerging markets.² Such differences in clientele structure is bound to effect the interrelationship among trading variables within each market as small and large investors have heterogeneous preferences about trading (Seppi (1997))

We find a wide variation in the degree of liquidity and transaction costs. Within the developed group, Australia's ASX has the highest median average percentage bid-ask spread, amounting to 3% whereas Japan's TSE has the lowest spread of only 0.44%. Among emerging markets, Malaysia's KLSE has the highest median average spread of 1.43% compared to China's SSE of 0.17%. We find that below median price stocks exhibit lower liquidity performance traits and higher volatility. However, after controlling for spread, volatility, and size, stocks that trade below median market price tend to have higher turnover levels in the emerging market sample. In addition, the study finds stocks with below median price have higher liquidity costs suggesting that retail investors are paying a price for liquidity. Our findings highlights the importance of segmenting the market in order to make more accurate inferences among relationships between price trading range with transaction costs and liquidity and provide evidence to suggest markets with strong retail participation should take steps to bring down the cost of trades

²This is based on responses from our market surveys on clientele composition.

in stocks with below median market prices.

The paper is organized as follows. Section 2 reviews literature on the significance of liquidity and transaction costs. Section 3 describes market backgrounds and data. Section 4 discusses the various liquidity measures used in this paper and summarizes the empirical results followed by a cross country comparison of liquidity of transaction costs in section 5. Finally section 6 concludes the paper.

2 The role of liquidity and transaction costs

Liquidity and transactions are related issues and are both important building blocks in ensuring market success. The higher the transaction costs, the more costly it is for investors to trade and hence the lower level of investor participation and trading. There are numerous aspects of liquidity. Ubiquitous measures like trading volume and turnover captures the trading quantity aspect. Alternatively, liquidity can be measured in terms of transaction costs, explicit (taxes, commissions, and settlement costs) and implicit costs such as bid-ask spreads (Amihud and Mendelson (1986)), and price reaction to trading volume (Amihud (2002)). Lesmond et al. (1999) and Liu (2006) propose new liquidity measures that captures multiple dimension of liquidity such as trading speed, quantity, and costs.

Cross-country studies indicate that interaction between transaction costs, liquidity, and volatility (Domowitz et al. (2000)) and that market design explains liquidity differences. Jain (2003) investigates 51 stock exchanges and find that spreads are lower and trading volume is higher when exchanges use consolidated limit order book, automation, and market makers. In addition, relative tick size and order flow fragmentation adversely affect trading costs. Similarly, Swan et al. (2004) examine three models of trading design; hybrid markets with dealers, electronic limit order book markets and, hybrid markets with limit order book and designated dealers in less liquid stocks, in 38 major exchanges on their trading costs and volatility. Dealer markets are shown to attract highest trading activity but with highest volatility. Swan et al. (2004) also concurs

with Comerton-Forde and Rydge (2006) that market consolidation should help reduce costs.

Other authors find that countries' institutional environments affects market liquidity. Lesmond (2005) uses a number of liquidity measures to show evidence that emerging markets with weak political and legal institutions tend to have higher liquidity costs. Hearn (2009) compares liquidity and trading costs of emerging African markets to two European markets, London and Paris and report considerable variation in trading costs within the African markets and with the two European markets. He notes that uncompetitive equity markets is a consequence of a strong bank-based and internal finance from family networks.

3 Market background and data description

3.1 Overview of Asia Pacific exchanges

Asia Pacific exchanges has experienced phenomenal growth between 2004-2007 with market capitalization and trading value growing at a compounded annual growth rate of 26% and 33% respectively. Table 1 shows that as of 2007, Asia Pacific exchanges account for 32% of total world market share and 21% of total world trading value. Yet in terms of trading value to market capitalization ratio, the Asia Pacific region consistently have the lowest ratio while having the highest number of listed firms (see Figures 1a and 1b). This suggest that listings in Asia Pacific tend to be firms with low capitalization which may be the cause of lower liquidity. The ten equity markets in our sample include Australia (ASX), Hong Kong (HKSE), Japan (TSE), New Zealand (NZX), Singapore (SGX), China (SSE), Korea (KRX), Malaysia (KSLE), Taiwan (TSEC) and Thailand (SET). We classify the first five markets as developed and the final five as emerging based on the IFC and S&P inclusion in their developed and emerging market indices as of 2007.

All exchanges in our sample are order-driven. Most exchanges use call auctions in

pre-opening sessions followed by a continuous auction. Apart from China and Japan, which has more than one market location, all other exchanges have one concentrated trading platform. There are some fragmentation issues as some foreign investors' trading are separated from local investors on a separate trading board (SET) or different share class (SSE). Except for China's SSE that impose uniform decimalization on tick size for all listed shares, all other exchanges implement a multiple tick rule that is an increasing function of price. The appendix of this paper provides a summary of selected current market structure from exchange websites and responses from market surveys that we have sent.

Using the return and standard deviation information in Table 2 we find that on average emerging markets performance in terms of reward to risk (1.25) is superior than that of the developed group (0.48) for 2007. We also find that all developed markets except for New Zealand have fairly high market capitalization to GDP ratios with Hong Kong leading at 8.9 times. Of the ten countries, Japan has the highest market capitalization of USD 4,331 billion followed by China with USD 3,694 billion. Despite the small equity market relative to GDP, three of the emerging markets in our sample (China, Korea, and Taiwan) have higher trading value to market capitalization than the developed group average.³

3.2 Data description

The study utilizes daily and intraday data from Datastream and the Securities Industry Research of Asia-Pacific (SIRCA) as of 2007. The statistics are computed after removing daily outliers outside the 5 and 95 percentiles. For each market, we maintain all equity listings in the year 2007 and apply the screening rule suggested by Ince and Porter (2006) to discard recording errors by Datastream. Table 3 reports price distributions and trading concentration based on price grouping by country. Panel A of Table 3 shows

³These numbers include trading on main and parallel markets in each country reported by the World Federation of Exchanges.

that price distribution is highly right skewed with TSE and KRX having the highest mean (USD 220, USD42) and median average (USD 8, USD 13).⁴ Most interesting is that the median trading prices in most of the markets, except TSE, NZX , SSE, and KRX are below USD 1 and that over half of the shares in each markets are trading at less than USD 1. There is clear evidence of a high correlation between trading price and market capitalization and between trading price and trading value. Panel B of Table 3 compares trading concentration of stocks below median price to stocks above median price. It shows that on the ASX and SSE, stocks trading above and below median price have fairly equal importance in terms of market capitalization and trading values as the ratios of combined market capitalization and trading value of those below median to those above median are close to 1.0. For TSE, stocks in the lower median price segment account for only 10% of the trading value of those in the upper median price range. Despite their relatively small market capitalization relative of the lower median price stocks in KRX, KLSE, and SET, these segments account for quite a sizable trading value of between 21%-37% of the high price segment, suggesting that there is interest in the trading of stocks with small price denominations.

4 Liquidity measures

4.1 Turnover

Daily turnover data is obtained from datastream from the ratio between daily number of shares traded to total number of shares outstanding. Daily outliers outside the 5 and 95 percentiles are trimmed. The turnover is a common measure of trading quantity. A higher turnover points to a high proportion of shares changing hands each day.

4.2 Bid-ask spreads

⁴Trading on the TSE is divided into three sections, for large, medium, and small caps, and hence the highly skewed price distribution.

The percentage quoted spread is computed from the average of the best standing bid-ask spreads every half an hour of continuous trading session as shown below,

$$\%BAS = (ASK - BID) / [(BID + ASK) / 2] \quad (1)$$

We eliminate spreads during the pre-opening and pre-closing sessions. Since all exchanges in our sample are limit order markets, most transactions occur at either the best outstanding bid or ask and so the percentage quoted spread is the key measure of trading costs. Although block trading facilities exist in many of these markets, the amount is quite small and some block trading is executed off-hours.

4.3 Daily Price impact

The annual average daily price impact measure, *ILLIQ* is based on Amihud (2002) and defined by,

$$ILLIQ_i = \frac{1}{D_i} \sum_{id=1}^{D_i} |R_{id}| / TVAL_{id} \quad (2)$$

where, D_i is the number of trading days in the sample, R_i is stock i return, and $TVAL_i$ is trading value of stock i in millions of USD. *ILLIQ* measures how much a dollar's worth of trading value causes absolute price change. This measure is multiplied by 10^6 for better representation.

4.4 Liu (2006) measure

Liu (2006) suggests a measurement that combines various aspects of liquidity, ie. trading speed, trading quantity, and trading costs into a standardized turnover adjusted number of zero daily trading volumes over the prior x months, LMx , that is,

$$LMx = \left[NZEROx + \frac{1/TURNx}{Deflator} \right] \times \frac{21x}{NTD} \quad (3)$$

where $NZERO$ is the number of zero trading daily volumes in prior 12 months, $TURNx$ is the sum of daily turnover in the past x months NTD is the total number of trading days in the market over the previous x months. The deflator is chosen such that, $0 < \frac{1/TURNx}{Deflator} < 1$ for all stocks in the sample. The deflator used to construct $LM12$ in this study is 1.5 million. The first term of the equation measures the number of zero trading days over the previous 12 months adjusted by a turnover adjustment in the second term. The ratio $\frac{21x}{NTD}$ standardizes the number of trading days in each month to 21 so that the LMx measure is comparable across countries.

5 Cross country comparisons of liquidity and transaction costs

In Table 4 we group stocks in each market to those below and above median price and contrast their liquidity performance. At the market level, stocks that are below market median price have relatively higher turnover than those trading above market median price even though BAS , and $ILLIQ$, point to higher transaction costs from higher spreads and larger price response to trading value. The $LM12$ measures which combines various aspect of liquidity shows mixed results with small differences between stocks that trade below or above median prices in most countries except for SET where the median $LM12$ of stocks the lower median price range is about half the $LM12$ of those in the upper median price range. Among developed markets, ASX has the highest BAS and $ILLIQ$ of 3.04% and 0.028 respectively. Within the emerging market group, SSE has the lowest median average BAS and $ILLIQ$ of only 0.17% and 0.0003 where as KLSE has the highest median average BAS and $ILLIQ$ of 1.43% and 0.02. When stocks are classified into developed and emerging, we find that stocks in the lower median price range is less liquid in all aspect, whereas stocks in the lower median price range in emerging markets

tend to have relatively active turnover despite higher trading costs. Figures 2a and 2b illustrates cross country differences in spreads and turnover.

Next we run multivariate regressions to better understand the determinants of cross-sectional differences between spreads, turnover, and volatility and report the results in Table 5. The 2SLS method is used to account for endogeneity between spread and turnover and between turnover and volatility. The set of regressions are described below.

$$\%BAS_i = a_0 + a_1 \cdot \%RTICK_i + a_2 \cdot STD_i + a_3 \cdot \ln TURN_i + a_4 \cdot S_i + \varepsilon_i \quad (4)$$

$$\ln TURN_i = b_0 + b_1 \cdot BAS_i + b_2 \cdot STD_i + b_3 \cdot \ln MV_i + b_4 \cdot S_i + \varepsilon_i \quad (5)$$

$$STD_i = c_0 + c_1 \cdot \ln TURN_i + c_2 \cdot \ln MV_i + c_3 \cdot S_i + \varepsilon_i \quad (6)$$

where:

$\%BAS_i$ = the average posted percentage bid ask spread

$\%RTICK_i$ = the relative tick computed from tick size divided by
average transaction price

STD_i = the percentage of the square root of daily squared returns
of each stock

$\ln TURN_i$ = the natural log of daily average number of shares traded
divided by total number of shares outstanding

$\ln MV_i$ = the natural log of average market capitalization in millions
of USD.

S_i = a dummy that takes a value of 1.0 if the stock is below
median market price

The endogeneity among the variables BAS, trading activities has been addressed in Harris (1994) and similar forms of estimation are used in Ahn et al. (2002). The residuals in each equation are derived from regressions of the dependent variables on the fitted values of endogenous variables and other variables. In equation (4), the percentage spread is determined by relative tick size since tick size forms the lower bound for spreads. The next variable, standard deviation measures idiosyncratic risk and the degree of asymmetric information is expected to move together with spread whereas turnover should have an inverse relationship as higher trading interest should close the bid-ask price difference. In equation (5) turnover is endogeneously determined by spread. At the same time return volatility and market capitalization are control variables for or firm size and trading activities. Finally, equation (6), measures the linear relationship between turnover and firm size.

The first set of regressions and second set of regressions in Table 5 separates emerging market and developed markets sample from each other as we expect each group may feature different clientele concentration which may impact relations between bid-ask spreads, turnover, and volatility differently. We then combine the two samples together in the third set but adding a dummy for emerging market, DEM , and an interaction dummy between below market median price stocks and emerging markets ($DEM * S$). In the fourth set of regressions we combine all markets except Japan's TSE since the size of its sample is largest and may affect generalization between developed markets and emerging markets.

The 2SLS regressions indicates that spreads are positively related to return volatility and inversely related to turnover in all samples (emerging, developed, combined, and all ex-Japan). The notable differences between emerging and developed market is that stocks below market median price tends to have higher turnover controlling for tick size, volatility, and turnover. This is confirmed by the positive coefficients on the dummy variable S in the first set of regression and in the coefficients on the interaction dummies $DEM * S$. Using the developed market sample alone and the combined sample the

loading on dummy variable S is negative and significant. In the second equation, we find a strong negative relationship between spread and turnover such that a 1% reduction in spreads leads to approximately 2% increase in turnover in both emerging and developed markets. A 1% increase in volatility also enhances turnover levels 0.56% and 0.96% in emerging and developed markets respectively. In regressions using separate emerging and developed markets, stocks below market median price tend to have higher turnover. Furthermore, it becomes most clear in the last combined sample excluding TSE that stocks below market median in emerging markets tend to have higher turnover velocity. In the volatility regressions, we find that price volatility is increasing in turnover for all samples. However, we find that volatility is decreasing (increasing) in firm size and stock price for emerging (developed) markets.

6 Conclusion

In conducting cross-country comparisons of liquidity and trading costs in Asia Pacific exchanges, markets are divided into developed and emerging markets and into groups with trading prices below market median and those above market median to explore how the stages of market development or trading range have a role in determining differences in liquidity and transaction costs. When aggregating all country data, our study finds that small stocks tend to be less liquid, most costly to trade, and have higher volatility. These are generalized set of traits usually made about small stocks in existing literature.

By separating Asia Pacific stocks developed and emerging group, we find that the usual generalization regarding emerging markets about having higher transaction costs and volatility may not hold true as emerging markets in Asia Pacific are fairly well developed. In addition, we find that developed and emerging markets in Asia Pacific differ notably in their clientele base, the former being institutional dominant while the latter has strong retail trading base. In the emerging markets of Asia Pacific, stocks in the lower median market price have high turnover albeit their relatively higher trading costs in the form of bid-ask spreads. Our findings underlines the necessity to carefully segment

market in studies on microstructure design as packaging markets into groups that are too generalized may result in less than accurate inferences among the characteristics of market variables. The study also highlight how retail investors who are likely the key traders in stocks in the lower trading range are providing liquidity to these stocks, but at a higher liquidity costs.

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Figure 1a : Trading value to market capitalization ratio by region as of 2007.

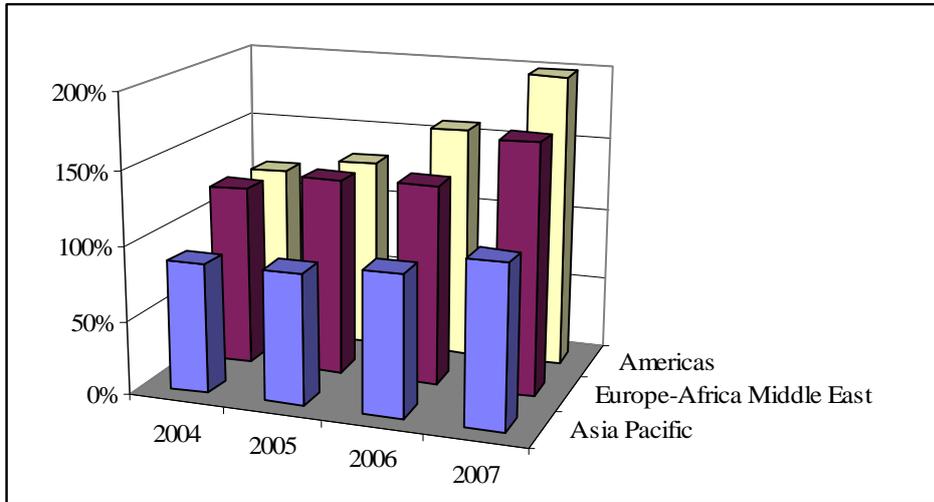


Figure 1b Number of listed firms by region

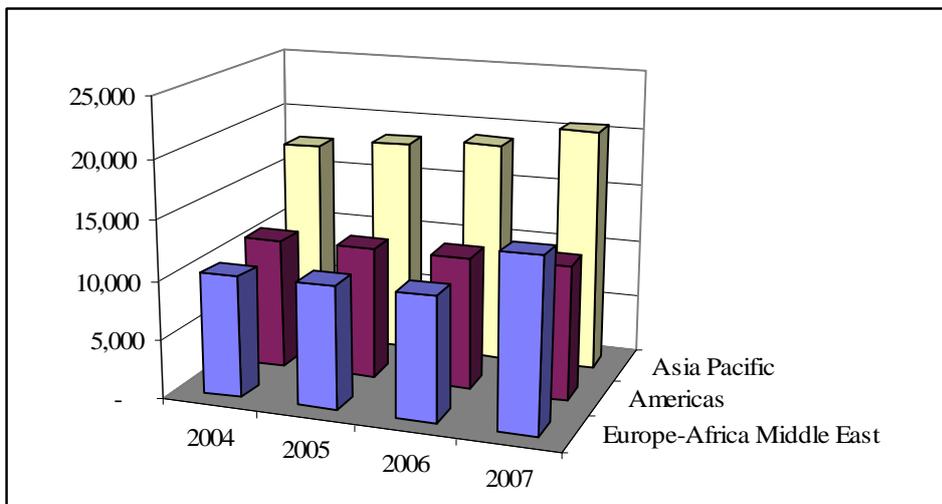


Figure 2a: Bid ask spreads by country

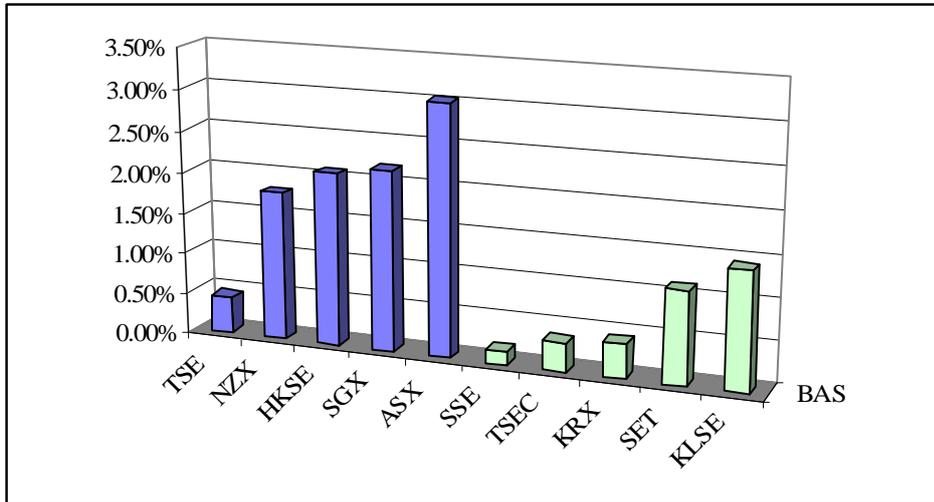


Figure 2b: Quoted bid-ask spreads and turnover by market type

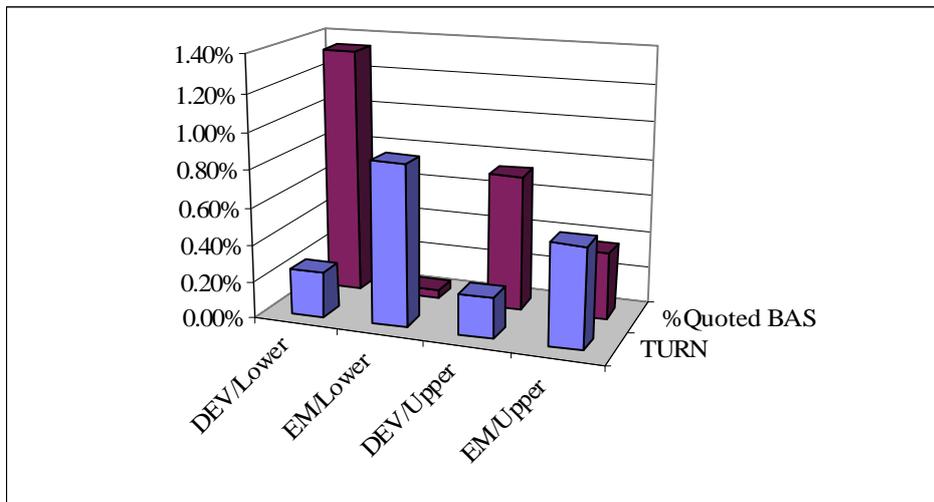


Table 1: Market capitalization and trading value by region in billions of USD as of 2007.

The numbers include trading in main and parallel markets. Data combined from World Federation of Exchanges.

	2004		2005		2006		2007	
	Market cap	Trading val						
Americas	18,206	21,797	19,894	25,981	22,653	35,909	24,320	48,363
Asia Pacific	7,888	6,890	10,018	8,813	12,793	12,081	19,792	21,460
Europe-Africa Middle East	11,133	13,580	12,206	16,240	16,145	21,839	18,593	31,366
Total	37,227	42,266	42,119	51,034	51,591	69,830	62,705	101,189
% share of total								
Americas	49%	52%	47%	51%	44%	51%	39%	48%
Asia Pacific	21%	16%	24%	17%	25%	17%	32%	21%
Europe-Africa Middle East	30%	32%	29%	32%	31%	31%	30%	31%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Table 2: Trading statistics by country

Return and standard deviation are comes from Datastream, authors' computations. Other market data comes from World Federation of Exchanges and World Bank. Market capitalization, trading value and number of listings includes main and parallel trading boards. All data is as of year 2007. A market is classified as emerging if it is part of the S&P, IFC emerging market index in 2007.

Market	Annualized daily return	Annualized return std	Reward to risk ratio	Mkt		Trading value to mkt cap
				capitalization USD billions	Mkt cap to GDP	
Developed						
Australia (ASX)	12.9%	16.5%	0.78	1,298	1.66	1,372
Hong Kong (HKSE)	33.0%	24.3%	1.36	2,654	8.86	2,137
Japan (TSE)	-13.0%	19.1%	-0.68	4,331	0.99	6,476
New Zealand (NZX)	-5.0%	10.0%	-0.50	48	0.41	24
Singapore (SGX)	15.8%	20.5%	0.77	539	2.27	381
<i>Average</i>	8.7%	18.1%	0.48	1,774	2.84	2,078
Emerging						
China (SSE)	67.6%	35.0%	1.93	3,694	0.52	4,069
Korea (KRX)	28.0%	22.8%	1.23	1,123	0.94	2,006
Malaysia (KLSE)	27.6%	16.5%	1.67	325	0.88	170
Taiwan (TSEC)	8.4%	20.9%	0.40	664	0.95	1,010
Thailand (SET)	23.3%	19.3%	1.21	197	0.37	118
<i>Average</i>	31%	22.9%	1.25	1,201	0.73	1,475
						110.6%

Table 3: Price distributions and trading concentration by country:

The table below shows the mean of means and mean of medians in parentheses. Panel A provides the price, market capitalization, and trading values by country and by group of those below and above market median market prices. Panel B reports trading concentration statistics by country and by group of those below and above market median market prices.

Panel A Price distributions, size, and trading value of firms below median and above median market price						
Market	Below	Above	Below med	Above med	Below med	Above med price
	Med Price	Med Price	price mkt cap (USD mn.)	price Mkt cap (USD mn.)	price Trading value (USD mn)	Trading value (USD mn)
Developed						
Australia (ASX)	0.16 [0.16]	4.59 [1.34]	293.33 [30.31]	436.36 [55.56]	1,030.58 [81.88]	1,545.47 [102.36]
Hong Kong (HKSE)	0.07 [0.06]	1.45 [0.44]	126.45 [58.31]	3,208.85 [364.68]	1,213.38 [347.30]	8,626.23 [864.95]
Japan (TSE)	4.01 [3.74]	403.02 [18.4]	698.96 [167.04]	3,184.33 [671.99]	39,928.18 [345.95]	127,309.91 [2087.96]
New Zealand (NZX)	0.45 [0.43]	2.91 [2.5]	54.58 [19.99]	620.64 [176.84]	367.35 [30.36]	1,274.90 [60.73]
Singapore (SGX)	0.16 [0.16]	1.57 [0.83]	82.33 [55.60]	1,931.21 [319.21]	564.49 [208.72]	4,235.90 [912.02]
Emerging						
China (SSE)	1.08 [1.09]	2.67 [2.13]	1,639.61 [435.61]	1,660.43 [575.06]	19,085.53 [10,636.63]	19,550.23 [12,862.45]
Korea (KRX)	5.42	78.49	141.24	1,837.13	2,473.06	12,021.45

	[4.49]	[36.8]	[74.51]	[338.33]	[761.90]	[1,422.59]
Malaysia (KLSE)	0.20 [0.21]	1.11 [0.79]	58.40 [33.28]	854.18 [225.42]	307.77 [86.38]	1,478.80 [285.48]
Taiwan (TSEC)	0.43 [0.42]	1.74 [1.18]	348.23 [104.38]	1,617.83 [342.79]	2,364.02 [917.43]	9,658.60 [4,109.60]
Thailand (SET)	0.10 [0.09]	1.40 [0.73]	129.55 [41.59]	714.50 [107.07]	583.00 [178.84]	1,581.41 [43.60]
Developed Avg	1.92 [0.30]	181.46 [5.86]	431.78 [86.46]	2,251.20 [309.44]	18,858.22 [192.86]	59,038.71 [591.81]
Emerging Avg	1.47 [0.53]	16.63 [1.72]	549.00 [98.41]	1,394.97 [341.25]	5,986.26 [872.13]	9,909.91 [2774.84]
Wilcoxon p value	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Developed vs EM diff:						
Total Avg	1.74 [0.42]	115.46 [2.36]	478.13 [90.32]	1,908.39 [325.76]	13,771.06 [343.34]	39,368.60 [1066.22]
Wilcoxon p value	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Below vs Above diff						

Table 3: Price distributions and trading concentration by country (continued):

Panel B Trading concentration of firms below and above median market price by country

Market	% Mkt cap of lower to total market cap	Ratio of lower to upper market cap	% Trading value of lower to total market cap	Ratio of lower to upper trading value	Proportion of firms with price < USD 1	No. of firms in sample
Developed						
Australia (ASX)	47.67%	0.91	54.06%	1.18	69%	1325
Hong Kong (HKSE)	3.80%	0.04	12.36%	0.14	87%	785
Japan (TSE)	7.16%	0.08	9.48%	0.10	2%	2170
New Zealand (NZX)	8.08%	0.09	22.37%	0.29	48%	106
Singapore (SGX)	4.09%	0.04	11.76%	0.13	79%	286
Emerging						
China (SSE)	49.62%	0.99	49.33%	0.97	18%	758
Korea (KRX)	7.16%	0.08	17.11%	0.21	2%	573
Malaysia (KLSE)	6.40%	0.07	17.23%	0.21	82%	586
Taiwan (TSEC)	18.08%	0.22	19.96%	0.25	65%	661
Thailand (SET)	15.45%	0.18	27.03%	0.37	79%	413

Table 4: Liquidity and transaction costs by country

The table below shows the mean of means and mean of medians in parentheses of various liquidity measures, turnover (TURN), quoted bid-ask spreads (BAS), the daily price impact (LLIQ), and the Liu (2006) adjusted turnover measure (LM12).

Market	Below median		Above median		Below % Quoted BAS	Above % Quoted BAS	Below ILLIQ	Above ILLIQ	Below LM12	Above LM12						
	TURN	median	TURN	median												
Developed																
Australia (ASX)	0.33%	[0.23%]	0.30%	[0.20%]	4.85%	[3.36%]	4.77%	[2.72%]	0.1418	[0.0395]	0.0073	[0.0163]	48.90	[17.93]	48.54	[16.93]
Hong Kong (HKSE)	1.22%	[0.48%]	0.32%	[0.21%]	5.31%	[3.13%]	2.18%	[1.06%]	0.0355	[0.0094]	0.0094	[0.0024]	45.03	[30.73]	32.73	[18.44]
Japan (TSE)	2.77%	[0.14%]	22.34%	[0.28%]	0.92%	[0.57%]	0.53%	[0.32%]	0.1696	[0.0039]	0.0291	[0.0072]	27.78	[16.45]	27.96	[16.46]
New Zealand (NZX)	0.64%	[0.07%]	25.99%	[0.09%]	3.60%	[1.95%]	3.83%	[1.65%]	0.1165	[0.0385]	0.1079	[0.0137]	66.76	[41.16]	63.95	[25.09]
Singapore (SGX)	0.59%	[0.36%]	0.40%	[0.25%]	3.48%	[2.06%]	4.18%	[2.30%]	0.0294	[0.0118]	0.0063	[0.0017]	36.58	[19.15]	21.55	[12.09]
Emerging																
China (SSE)	5.74%	[2.76%]	4.09%	[2.34%]	0.17%	[0.17%]	0.16%	[0.16%]	0.0003	[0.0003]	0.0003	[0.0002]	34.08	[23.95]	33.15	[23.95]
Korea (KRX)	2.51%	[1.23%]	0.65%	[0.45%]	0.51%	[0.45%]	0.46%	[0.38%]	0.0049	[0.0026]	0.0046	[0.0014]	19.52	[15.36]	19.13	[15.37]
Malaysia (KLSE)	0.50%	[0.22%]	0.24%	[0.14%]	2.79%	[1.98%]	1.23%	[0.88%]	0.0779	[0.0230]	0.0145	[0.0044]	26.74	[15.24]	20.73	[14.23]
Taiwan (TSEC)	0.93%	[0.68%]	1.22%	[0.99%]	0.76%	[0.44%]	0.33%	[0.26%]	0.0373	[0.0018]	0.0027	[0.0004]	21.35	[18.59]	19.61	[18.59]
Thailand (SET)	10.81%	[0.55%]	1.36%	[0.04%]	3.69%	[1.13%]	3.55%	[1.11%]	0.0091	[0.0086]	0.1357	[0.0173]	41.55	[16.46]	79.91	[33.94]

Developed Avg	1.62% [0.24%]	10.75% [0.22%]	3.02% [1.34%]	2.36% [0.73%]	0.1290 [0.0108]	0.0389 [0.0026]	38.19 [16.46]	35.21 [16.45]
Emerging Avg	3.74% [0.87%]	1.67% [0.54%]	1.37% [0.50%]	0.94% [0.36%]	0.0373 [0.0022]	0.0232 [0.0007]	28.09 [18.59]	31.55 [18.95]
Wilcoxon p value	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.278	< 0.001
Developed vs EM diff:								
Total Avg	2.46% [0.38%]	7.12% [0.29%]	2.36% [0.87%]	1.79% [0.55%]	0.0925 [0.0056]	0.0326 [0.0015]	34.20 [18.43]	33.74 [16.46]
Wilcoxon p value	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Lower vs Upper diff								

Table 5: Two-stage least square regressions

The table represents estimates from 2SLS regressions for 10 markets using annual average variables. The dependent variables are percentage bid-ask spreads (BAS), natural log of turnover (lnTURN), and daily standard deviation of return (STD). Independent variables include relative tick size (RTICK), natural log of market capitalization in millions of USD (lnMV), dummy variable S and DEM take value of 1 for below median price stocks and for emerging markets. The term DEM*S is the interaction dummy.

	Emerging only		Developed only		Combined		Combined ex-Japan	
Dependent var								
BAS	Estimate	t value	Estimate	t value	Estimate	t value	Estimate	t value
RTICK	-0.030	-0.13	2.315	1.32	-0.241	-0.26	-0.531	-0.94
STD	1.413***	14.75	1.237***	7.77	2.518***	12.88	1.712***	15.27
lnTURN	-2.508***	-23.8	-7.734***	-13.42	-9.803***	-17.62	-7.182***	-22.99
S	1.280***	7.48	-1.561**	-2.05	-4.632***	-5.42	-0.639	-1.27
DEM	0.168				2.532***	3.7	3.220***	6.46
DEMS					9.986***	8.32	4.809***	7.14
Adj rsq	0.168		0.060		0.054		0.106	
Dependent var								
lnTURN	Estimate	t value	Estimate	t value	Estimate	t value	Estimate	t value
BAS	-1.850***	-17.86	-2.167***	-9.81	-2.023***	-17.55	-1.471***	-17.97
STD	0.556***	7.46	0.958***	6.97	0.815***	10.93	0.574***	10.5
lnMV	-0.003	-0.05	-0.018	-0.17	-0.016	-0.25	-0.008	-0.15
S	1.140***	6.08	1.698***	3.02	1.811***	4.68	0.279	0.98
DEM					-3.138***	-8.88	-3.268***	-10.08
DEMS					0.747*	1.6	0.681**	1.94
Adj rsq	0.131		0.040		0.052		0.068	
Dependent var								
STD	Estimate	t value	Estimate	t value	Estimate	t value	Estimate	t value
Inturn	1.335***	24.88	1.845***	13.05	2.443***	21.24	3.241***	20.79
lnmv	-0.594***	-16.7	0.184***	3.49	-0.088**	-2.46	-0.842***	-15.53
S	-0.995***	-9.48	2.047***	12.58	1.868***	11.26	0.331	1.46
DEM					-1.212***	-6.42	-2.154***	-10.09
DEMS					-2.989***	-11.06	-2.819***	-10.46
Adj rsq	0.181		0.042		0.070		0.113	

***, **, * denotes significance at 1%, 5%, and 10% respectively.

Appendix 1: Stock market ownership profile

Country	Stock exchange name	Acronym	Current Ownership	Since
Australia	Australian Stock Exchange	ASX	Publicly listed exchanges	1998
China	Shanghai Stock Exchange	SSE	Associations or mutuals	-
Hong Kong	Hong Kong Exchanges and Clearing Limited	HKEx	Publicly listed exchanges	2000
Japan	Tokyo Stock Exchange Group, Inc	TSE	Demutualized	2001
Korea	Korea Exchange	KRX	Demutualized	2005
Malaysia	Bursa Malaysia	KLSE	Publicly listed exchanges	2005
New Zealand	New Zealand Stock Exchange	NZX	Publicly listed exchanges	2003
Singapore	Singapore Exchange Limited	SGX	Publicly listed exchanges	2000
Taiwan	Taiwan Stock Exchange Corporation	TWSE	Demutualized	1961
Thailand	Stock Exchange of Thailand	SET	Associations or mutuals	-

Appendix 2: Tick size

Exchange	Currency	Stock price	Minimum Tick Size
ASX	AUD	Below \$0.10	\$0.001
		\$0.10 to below \$0.50	\$0.005
		\$0.50 to \$998.99	\$0.01
		\$999 or greater	\$1.00
HKEx	HKD	0.25 or less	0.001
		Greater than 0.25 to 0,5	0.005
		Greater than 0.5 to 2	0.01
		Greater than 2 to 5	0.025
		Greater than 5 to 30	0.05
		Greater than 30 to 50	0.1
		Greater than 50 to 100	0.25
		Greater than 100 to 200	0.5
		Greater than 200 to 1000	1
		Greater than 1000 to 9,995	2.5
KLSE	MYR	Below RM1.00	1/2 sen
		RM1.00 up to RM2.99	1 sen
		RM3.00 up to RM4.98	2 sen
		RM5.00 up to RM9.95	5 sen
		RM10.00 up to RM24.90	10 sen
		RM25.00 up to RM99.75	25 sen
		RM100.00 and above	50 sen
KRX	KRW	Less than 5000	5
		5000 to less thab 10000	10
		10000 to less thab 50000	50
		50000 to less than 100000	100
		100000 to less than 500000	500
		500000 or greater	1000
NZX	NZD	Less than 20 cents	0.1 cent
		Above 20 cents	1 cent

SET	THB	2 or less	0.01
		Greater than 2 to 5	0.02
		Greater than 5 to 10	0.05
		Greater than 10 to 25	0.10
		Greater than 25 to 50	0.25
		Greater than 50 to 100	0.50
		Greater than 100 to 200	1.00
		Greater than 200 to 400	2.00
		Greater than 400 to 800	4.00
		Greater than 800	6.00
SGX	SGD	Below \$1	0.005
		\$1 - 9.99	0.01
		\$10 and above	0.02
SSE	RMB	A-shares, bond trading, and bond buyout repo trading	0.01
		Mutual Funds and Warrants	0.001
		B-shares	USD 0.001
TSE	JPY	2000 or less	1
		Greater than 2000 to 3000	5
		Greater than 3000 to 30000	10
		Greater than 30000 to 50000	50
		Greater than 50000 to 300000	100
		Greater than 300000 to 3m	1000
		Greater than 3m to 20m	10000
		Greater than 20m to 30m	50000
		Greater than 30 m	100000
TWSE	TWD	10 or less	0.01
		10 to 50	0.05
		50 to 100	0.10
		100 to 500	0.50
		500 to 1000	1.00
		Greater than 1000	5.00

Appendix 3: Clientele composition

Exchange	Institutions	Retail	Others
ASX	80%	20%	
HKSE	65%	35%	
KLSE	63%	36%	1%
KRX	43%	57%	
NZX			
SET	47%	53%	
SGX	50%	43%	7%
SSE	46%	54%	
TSE	74%	15%	11%
TSEC	33%	67%	

Appendix 3: Clientele composition

Exchange	Capital Gain tax	Other tax	Commission fees
ASX	Exempt	Dividend tax : 15-30%	Brokerage fee : 0.5 - 2.5% or negotiable but Minimum is between AUD 30-120 Stamp Duty : 0.15% of transaction value
HKSE	Exempt	Dividend tax is regarded as having been paid out of taxed profit and are not subject to further taxation.	Brokerage fee : fully negotiable Clearing fee : 0.011% paid by both buyer and seller Stamp Duty : 0.1% of transaction value
KLSE	Exempt	Dividend tax : individual is exempt and 28% for Corporate.	Brokerage fee : negotiable but maximum is 0.7% Clearing fee : 0.03% Stamp Duty : RM 1 for 1000 RM
KRX	The lesser amount between 25% of the gain and 10% of the gross proceeds realised from the sale is taxed unless reduced rates are available under a double-taxation treaty	Dividend tax : Standard rate of 27.5% which includes a withholding tax of 25% plus a 10% resident	Brokerage fee : negotiable but usually around 0.2% but maximum is 0.6%. Stamp Duty : 30 bp (sell only)
NZX	N/A	Dividend tax : N/A	Brokerage fee : Fully negotiable but usually 0.5% to 2.5%
SET	Individual : tax exempt Juristic : Corporate income tax but no withholding tax	Dividend tax : 10% for individual. Juristic is 10% if it isn't a listed company , exempt if it is a listed company and hold the stock at least 3 months	Brokerage fee : 0.5% and minimum is THB 50 Stamp Duty : THB 1 for THB 1000
SGX	Exempt	Dividend tax : Exempt (After 2007)	Brokerage fee : fully negotiable Clearing fee : 0.04% but maximum is S\$ 600 Stampy Duty : 0.2% stamp duty on market value based on the previous day's SGX closing price
SSE	Exempt	Dividend tax : 20%	Transaction cost : 0.4% for domestic share and 0.6% for foreign share Stamp Duty : 0.3% per each transaction

TSE	<p>Individual : 20% separate taxation on statement comprising of 15% income tax and 5% inhabitant tax</p> <p>Corporate : Capital gains are taxable. Capital losses are deductible from taxable income.</p>	<p>Dividend tax :</p> <p>Individual : 20% tax withheld at source comprising of 15% income tax and 5% inhabitant tax</p> <p>Corporate : 50% of the total amount of dividend received is not taxable</p>	<p>Brokerage fee : 0.1 - 1.15%; negotiable on trades over 1 billion Yen. Minimum 2,500 Yen</p>
TSEC	<p>Minimum =10% for local individual and institution</p>	<p>Dividend tax : 20%</p>	<p>Brokerage fee : maximum = 0.1425% . of trading value paid by both buyer and seller.</p> <p>Transaction tax on equities : 0.3% of sale value, paid by the seller</p>