

Comparisons of Liquidity and Transactions Costs of Asia-Pacific Stock Index Futures

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Abstract

This paper examines the cost of trading and liquidity of ten leading stock index futures contracts in the Asia-Pacific region. These include SFE SPI 200™ futures, KOSPI 200 futures, Nikkei 225 futures (Tokyo), Nikkei 225 futures (Singapore), MSCI Taiwan futures, MSCI Singapore futures, Hang Seng Index futures, H-Share Index futures, TOPIX futures and TAIEX futures. The objective of this paper is to provide information which enables global institutions to assess whether the SPI 200™ is sufficiently liquid, and its price sufficiently volatile, to provide profitable trading opportunities. Yearly analysis of a sample of trades executed between 1 January 2003 and 30 June 2007 documents that the market impact costs associated with executing large trades of SPI 200™ futures are small in comparison to the most actively traded stock index futures in the Asia-Pacific region and are decreasing on a yearly basis. The market impact of transactions is driven by the width of the bid-ask spread and depth of the limit order book.

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Introduction

This paper compares trading opportunities offered by ten stock index futures contracts traded in the Asia-Pacific region. Several analyses are conducted to compare the price volatility and liquidity (including transaction costs) of the ten futures contracts examined. For each contract, we evaluate market impact costs, the bid-ask spread, depth and trade value, volatility and US Dollar notional turnover. The Appendix contains additional statistics and contract specifications for each of the contracts examined.

The analysis draws on data obtained from Reuters for the period 1 January 2003 to 30 June 2007 for daytime trading only. Any trades that meet the minimum requirement for off-market block transactions are excluded from the sample (see Appendix).

Transaction Costs

Transaction costs are an important consideration for global institutional investors. One important transaction cost is the on-market cost of trading (market impact), which is incurred through the execution of large trades. Market impact is a function of both the bid-ask spread and depth. The bid-ask spread represents the minimum cost of trading futures, and sufficient depth at the best quotes allows investors to trade large quantities with minimal price impact. It is well documented that wide spreads and low depth erode institutional profits from trading strategies¹. To compare transaction costs across contracts, we report the on-market cost of trading (market impact), bid-ask spread, depth at the best bid and ask, and average trade value for each contract.

1) Market Impact Cost

Market impact is an *on-market* cost of trading, and is defined as the extent to which a large trade adversely affects the futures price. That is, the extent to which a large buy trade moves the futures price upwards, and the extent to which a large sell trade moves the futures price downward.

¹ Knez, P.J. and M.J. Ready, 1996, "Estimating the Profits from Trading Strategies," *Review of Financial Studies*, 9, 1121-1163.

To measure market impact for each trade, we first select a benchmark price independent of the trade. The benchmark used in this paper is the price five trades prior to the trade². Market impact is measured as the percentage return from the price five trades prior to the trade to the trade price. If the trade price is greater than the benchmark price for purchases or less than the benchmark price for sales then the trade has incurred market impact costs. The level of market impact depends on the magnitude and direction of the price pressure exerted by the trade.

To compare market impact costs across contracts, the notional value of each trade is calculated in US dollars and trades are assigned to size-groups based on their US dollar value³. Trades in the SPI 200™ are ranked according to US dollar value and the largest 10 per cent of trades are sorted into four (approximately) equal groups. To ensure comparability across contracts, US dollar bounds for SPI 200™ size groupings are applied to each contract in the sample. An additional group is added to capture extremely large trades greater than USD 10 million in notional value.

Figure 1 reports average market impact costs incurred by transactions in the most active stock index futures contracts in the Asia-Pacific. As expected, market impact increases as the notional value of the trade increases. Average market impact costs for the largest trades (>USD 10 million notional value) in SPI 200™ futures are no greater than 0.012 per cent. Only the contracts traded in the Nikkei 225 (Singapore) and Hang Seng futures have lower average market impact costs than SPI 200™ futures for all trade sizes. The statistics presented in Figure 1 show that trading strategies using SPI 200™ futures incur low market impact costs when compared to stock index futures contracts in the Asia-Pacific region.

² This is consistent with Berkman, H., T. Brailsford and A. Frino, 2005, "A note on execution costs for stock index futures: Information versus liquidity effects," *Journal of Banking and Finance*, 29, 565-577.

³ The exchange rate used is the daily USD exchange rate provided by the US Federal Reserve.

Figure 1

AVERAGE MARKET IMPACT COSTS INCURRED BY DIFFERENT-SIZED TRADES OF STOCK INDEX FUTURES

1 January 2003 – 30 June 2007

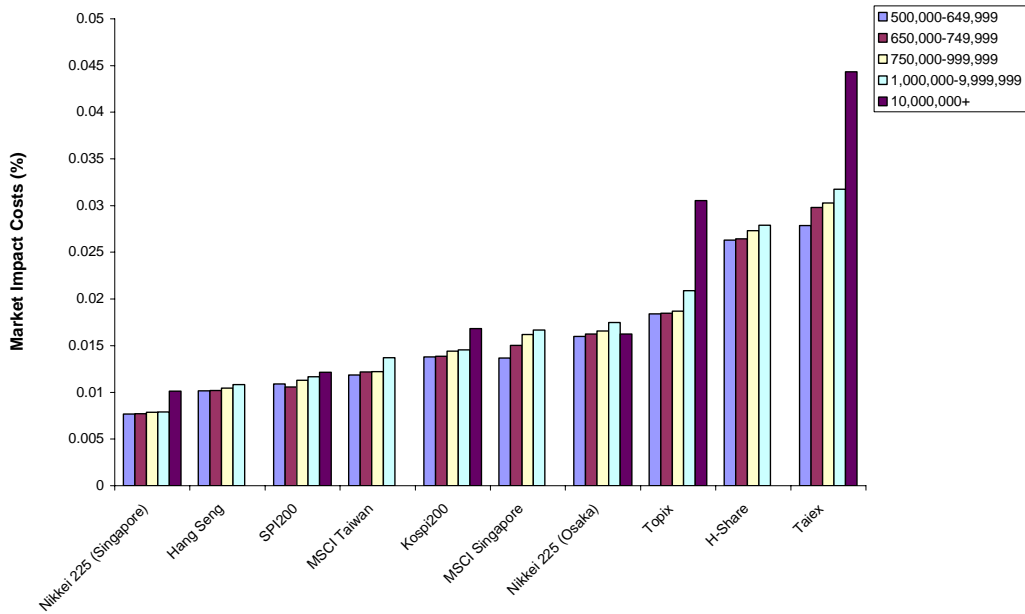


Figure 2

YEARLY COMPARISON OF AVERAGE MARKET IMPACT COSTS INCURRED BY DIFFERENT-SIZED TRADES IN THE SPI 200™ FUTURES

1 January 2003 – 30 June 2007

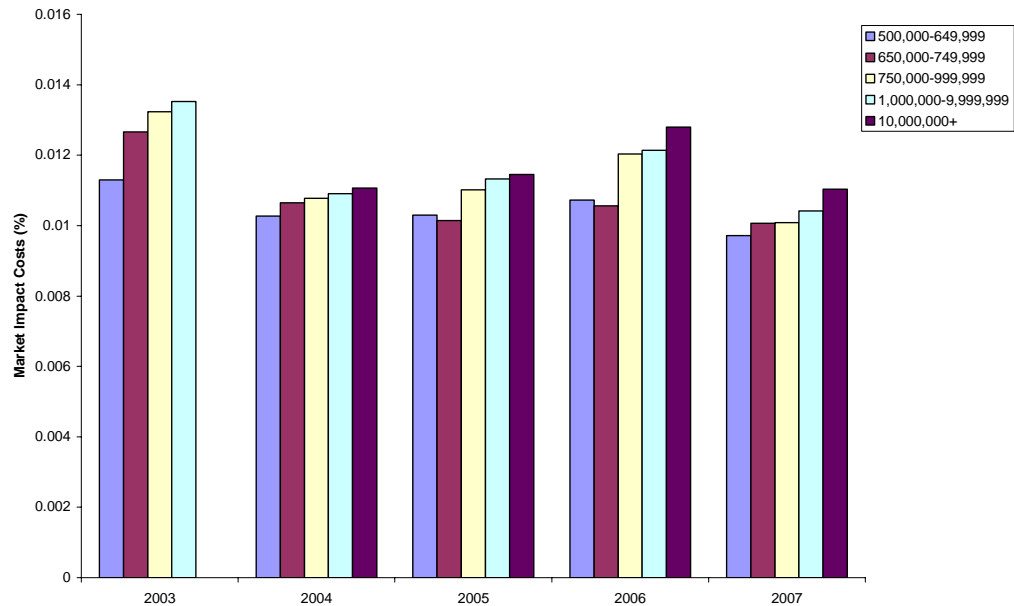


Figure 2 reports the yearly trend of market impact costs of large contracts traded in the SPI 200™ futures. Statistical evidence shows that market impact costs incurred in trading large SPI 200™ futures contracts are relatively stable, with slight decreases throughout the five-year period. This suggests that it is possible for global institutional investors to trade large contracts in the SPI 200™ futures on a consistent basis with minimum market impact costs.

2) Bid-Ask Spreads

The bid-ask spread measures the round-trip cost of a transaction. In order to assess the extent to which SPI 200™ futures are likely to present profitable trading opportunities to investors, we compare bid-ask spreads for stock index futures in the Asia-Pacific region.

Figure 3 reports average percentage bid-ask spreads⁴ for all contracts. Figure 3 documents that transactions in SPI 200™ futures incur an average round-trip cost of approximately 0.025 per cent. Hang Seng is the only contract with a lower round-trip transaction cost than the SPI 200™. The statistics presented in Figure 3 illustrate that trading strategies using SPI 200™ futures incur low transaction costs when compared to stock index futures contracts in the Asia-Pacific region.

⁴ The percentage spread is calculated as [(best ask – best bid) / midpoint]*100

Figure 3

BID-ASK SPREADS OF THE MOST ACTIVELY TRADED STOCK INDEX FUTURES IN THE ASIA-PACIFIC REGION

1 January 2003 – 30 June 2007

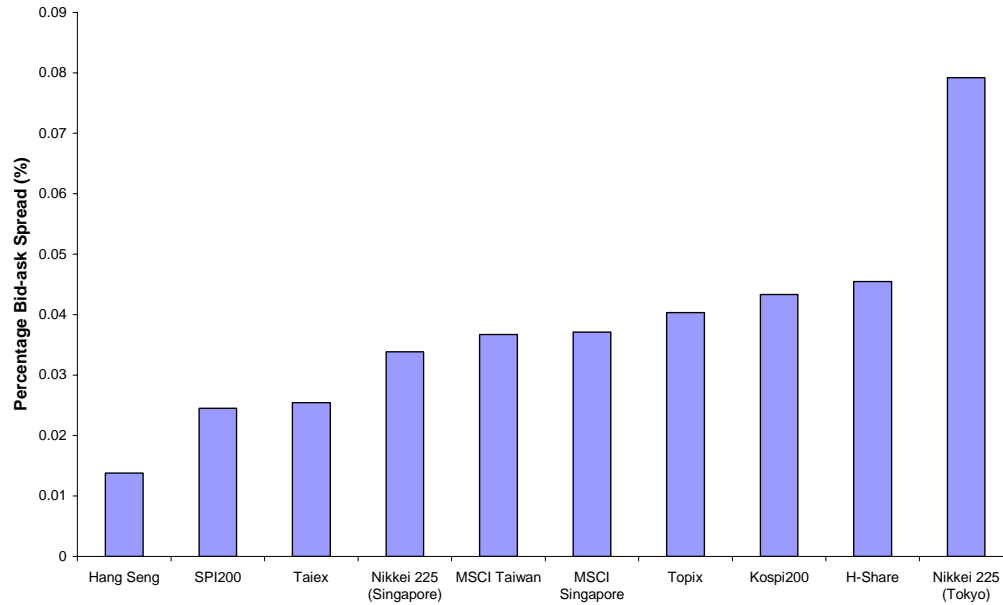
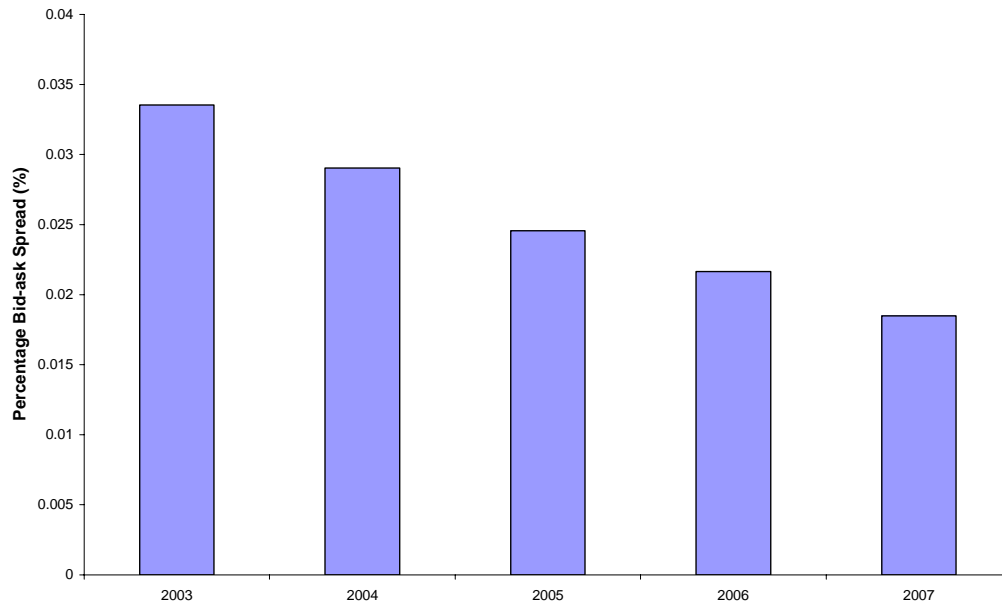


Figure 4 reports the yearly average percentage bid-ask spreads for the SPI 200TM futures. Figure 4 documents that transactions in SPI 200TM futures experienced on average, a decrease in bid-ask spreads of approximately 50% (or 0.015 per cent) from 1 January, 2003 to 30 June, 2007. The statistics presented in Figure 4 illustrate that investors are likely to incur increasingly lower trading costs in the SPI 200TM futures.

Figure 4
YEARLY COMPARISONS OF BID-ASK SPREAD IN THE SPI 200™ FUTURES
1 January 2003 – 30 June 2007



3) Depth and Trade Value

Depth and average trade value provide additional indicators of trading opportunities available to investors. To assess the extent to which the SPI 200™ presents profitable trading opportunities to investors, we compare average depth at the best quotes and average trade value for stock index futures in the Asia-Pacific region. We report depth and average trade value in US Dollars to compare across markets.

Figure 5 reports (in US Dollars) average depth at the best quotes and average trade value for all contracts. Contracts are ranked based on available depth. The average depth at the best quotes for SPI 200™ futures equals approximately USD 2.037 million, and the average trade value is approximately USD 222,787.

Cross-market comparisons in Figure 5 suggest that the SPI 200™ provides market depth greater than all contracts, apart from the Japanese stock index futures contracts and the KOSPI. This confirms that it is possible for investors to execute trading strategies using SPI 200™ futures with minimal price impact.

Figure 5
 DEPTH AND TRADE VALUE OF THE MOST ACTIVELY TRADED STOCK INDEX FUTURES IN THE ASIA-PACIFIC REGION
 1 January 2003 – 30 June 2007

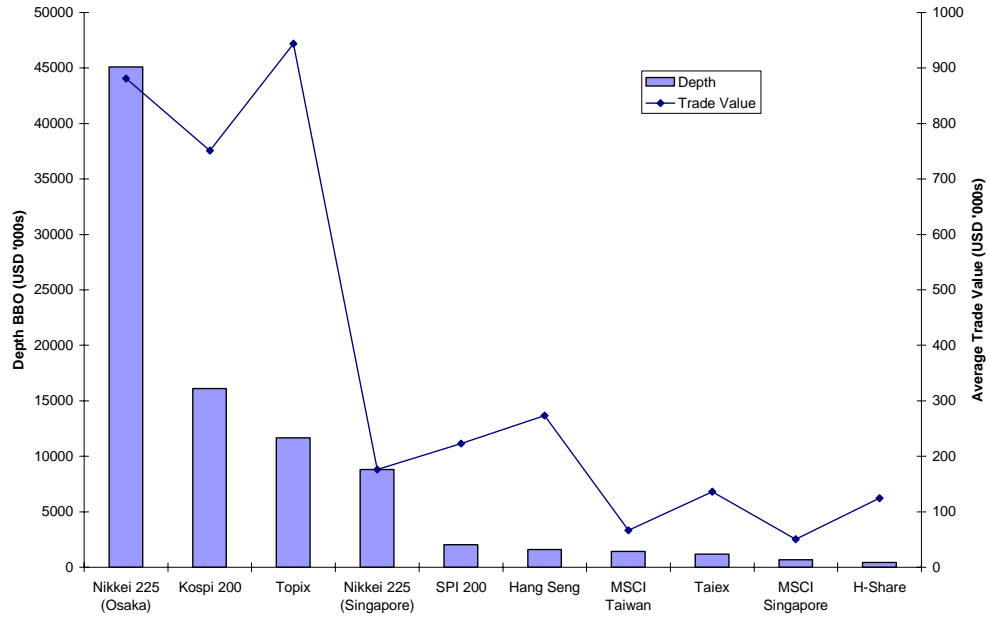
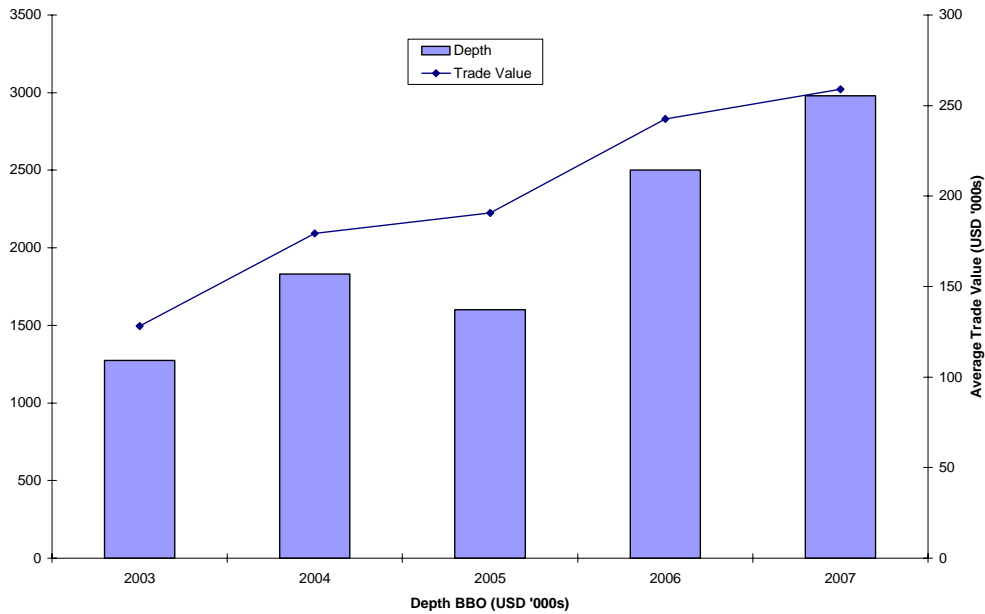


Figure 6 reports the yearly average depth for the SPI 200TM futures. Figure 6 documents that transactions in SPI 200TM futures experienced on average, an increase in depth of approximately USD 1.7 million from 1 January, 2003 to 30 June, 2007. These statistics show that there is increasing depth within the SPI 200TM futures to accommodate large trades.

Figure 6
 YEARLY COMPARISONS OF DEPTH IN THE SPI 200™ FUTURES
 1 January 2003 – 30 June 2007



Volatility

An additional consideration for investors is contract volatility. The expected profitability of a futures position increases when a contract is more volatile over the investors trading horizon. In order to assess the extent to which the SPI 200™ is likely to provide new and profitable trading opportunities in the Asia-Pacific, the price volatility of the SPI 200™ is compared with other stock index futures contracts in the region.

Figure 7 compares the average daily volatility (true range)⁵ for each contract in the sample and shows that the SPI 200™ has an average daily volatility of approximately 19.5 per cent over this period. Figure 8 shows the volatility of the SPI 200™ futures in the recent five year period and demonstrates increases of up to 20% from the base year (2003). Comparison of volatility using recent statistical evidence suggests that the profits which can be generated by trading SPI 200™ futures are of a similar order of magnitude to profits generated on other contracts in the region.

⁵ The 'true range' is calculated as the maximum of the $(|close_{t-1} - low_t|, |high_t - close_{t-1}|, |high_t - low_t|)$. This has been converted into currency values and divided by the margin for each contract.

Figure 7
 PRICE VOLATILITY EXHIBITED BY THE MOST ACTIVELY TRADED STOCK INDEX FUTURES IN THE ASIA-PACIFIC REGION
 1 January 2003 – 30 June 2007

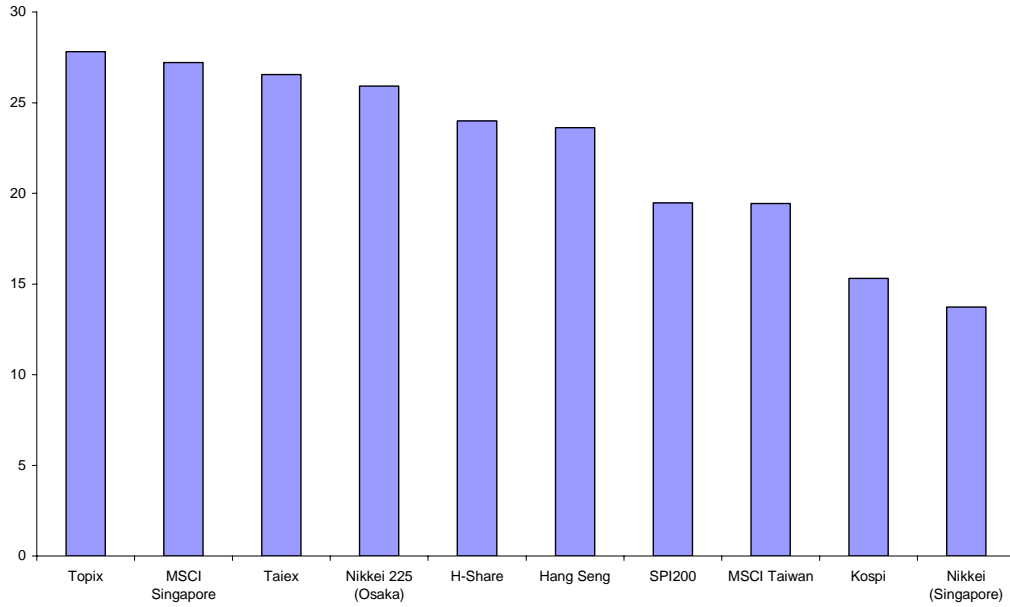
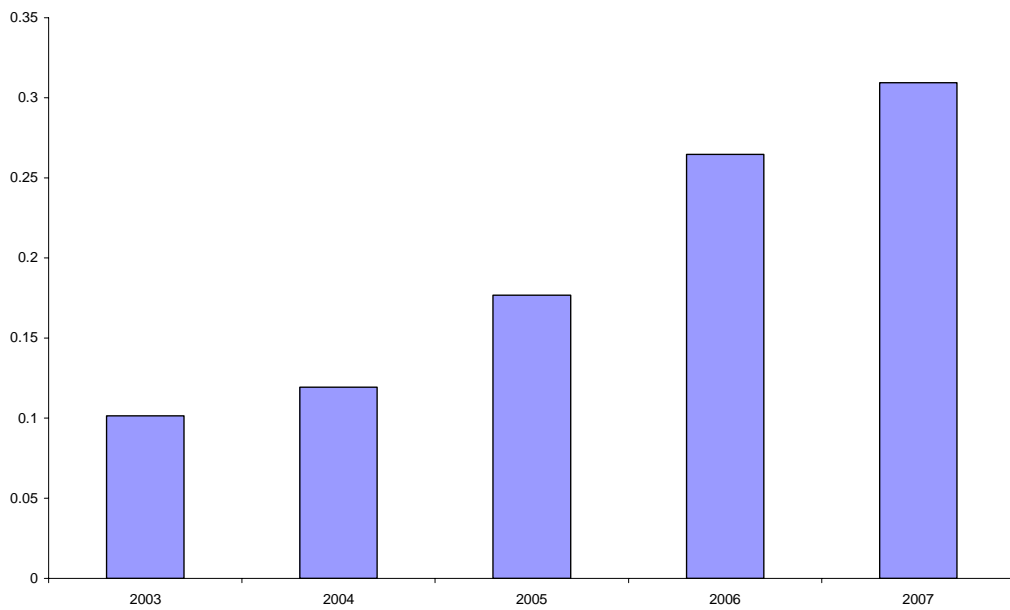


Figure 8
 YEARLY COMPARISON OF PRICE VOLATILITY EXHIBITED BY SPI 200™ FUTURES
 1 January 2003 – 30 June 2007



US Dollar Notional Turnover

When comparing trading opportunities offered by stock index futures, another consideration for global institutions is liquidity. The liquidity of a contract is related to the cost of trading, and directly affects the profitability of a futures trade. Two indicators of contract liquidity are average daily contract volume and average daily USD notional turnover⁶.

All stock index futures contracts examined are ranked in Table 1 according to average daily notional turnover in US Dollars. Based on statistics in Table 1, the SPI 200™ is the 7th most actively traded stock index futures contract in the Asia-Pacific region. From 2001 to mid-2006, the SPI 200™ had an average daily volume of 8,969 contracts, and an average daily notional turnover of approximately USD 412 million. These statistics are indicative of the liquidity of the SPI 200™ relative to stock index futures contracts in the Asia-Pacific region.

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⁶ Notional turnover is the product of the index multiplier and trading volume, and is converted to US Dollars based on the exchange rate for that day provided by the US Federal Reserve. Index multipliers were obtained from The COMPAQ Handbook of World Stock Derivative and Commodity Exchanges and various websites.

Table 1

US DOLLAR NOTIONAL TURNOVER (EXCLUDING OFF-MARKET BLOCK TRANSACTIONS)

1 January 2001 - 30 June 2006

	Exchange	Average daily volume*	Average daily notional turnover* (USD)
1. KOSPI 200	KSE	179,066.40	6,725,894,179.13
2. Nikkei 225	OSE	35,129.59	4,106,068,145.32
3. Hang Seng	HKE	17,067.86	1,186,422,468.50
4. TOPIX	TSE	10,034.91	1,013,092,280.28
5. TAIEX	TFE	22,667.01	806,845,961.48
6. Nikkei 225	SGX	51,809.70	935,642,422.59
7. SPI 200	SFE	9,345.20	646,784,615.63
8. MSCI Taiwan	SGX	19,039.61	495,790,290.05
9. H-Share**	HKE	4,352.17	140,065,959.72
10. MSCI Singapore	SGX	1,710.72	41,697,388.89

* Excludes trades that meet the minimum threshold for off-market block transactions

** Began trading December 8, 2003

APPENDIX

Data used to calculate descriptive statistics and market impact

This paper uses data provided by Reuters and made available through SIRCA that contains date, price, time, volume, contract code, best ask price, best bid price, depth at best ask and depth at best bid fields for each trade executed between 1 January 2001 and 30 June 2006.

Any trades that meet the minimum threshold for off-market block transactions are deleted. Many exchanges have an off-market facility for trading large blocks. As these trades are negotiated off-market, they provide price and execution certainty for traders. These trades do not incur price impact as the price is negotiated outside of the market and the trade arrives to the market crossed. Further, execution is guaranteed and in some cases reporting is delayed. These trades are not included in any calculations.

Methodology used to calculate market impact

Size Groups

Before sorting trades into size groups, the notional value of each trade is calculated in US dollars. Notional value is calculated as:

$$\text{Notional Value} = \text{Price} * \text{Volume} * \text{Dollar Value} * \text{FX Rate}$$

where *price* is the trade price (i.e. the underlying index level), *volume* is the volume of the trade, *dollar value* is the *dollar value* of each index point in local currency and *fx rate* is the daily exchange rate to US dollars provided by the US Federal Reserve.

The largest 10 per cent of trades in the SPI 200™ are divided into four (approximately) equal groups based on their notional value and an additional group is created to capture trades with a notional value greater than USD 10 million; resulting in five groups. This study only examines the largest 10 per cent of single trades in the SPI 200™ as these trades are more likely to be executed by CTAs and hedge funds. To ensure comparability across contracts, the US dollar size groupings for the SPI 200™ are applied to each contract in the sample. Group 1 represents the smallest trades, and group 5 represents the largest trades.

Measuring Market Impact

Market impact for trade *i* on day *t* is calculated as

$$\text{Market Impact}_{i,t} = \frac{\text{Price}_t - \text{Price}_{t-5}}{\text{Price}_{t-5}}$$

where Price_t is the price of the trade and Price_{t-5} is the price 5 trades prior to the trade. Market impact is measured as a percentage return from a pre-trade benchmark to the trade price. The pre-trade benchmark used in this study is the trade price 5 trades prior to the trade. It represents an unperturbed price independent of the trade and is observed by all traders prior to execution. This measurement of market impact is consistent with current futures microstructure literature⁷.

⁷ Berkman, H., T. Brailsford and A. Frino, 2005, "A note on execution costs for stock index futures: Information versus liquidity effects," *Journal of Banking and Finance*, 29, 565-577.

Table A1
CONTRACT
SPECIFICATIONS
1 January 2001 – 30 June
2006

This Table reports contract specifications and trade characteristics for the day trading session(s) of each contract. Panel A contains contract specifications. Panel B reports trade characteristics including average trade volume (Trade Size), average trade value in US Dollars (Trade Value) and average daily number of trades (Daily no. of Trades).

	SPI 200	Nikkei 225 (Osaka)	Nikkei 225 (Singapore)	MSCI Taiwan	MSCI Singapore
Panel A					
Contract Specifications					
Exchange	SFE	OSE	SGX	SGX	SGX
Minimum tick	1 point	10 Points	5 points	0.1 point	0.1 point
Notional value per index point	Aud	JPY 1000	JPY 500	USD 100	SGD 200
Panel B					
Trade Characteristics					
Trade size (no. contracts)	3.45	8.12	6.00	2.75	1.55
Trade Value (USD)	222,787.36	881,179.66	175,834.89	66,404.59	50,472.06
Daily no. of trades	2,821.97	4,655.11	10,672.67	7,152.35	1,156.23
	Kospi 200	Hang Seng	H-Share	Topix	Taiex
Panel A					
Contract Specifications					
Exchange	KSE	HKE	HKE	TSE	TFE
Minimum tick	0.05 points	1 point	2 point	0.5 points	1 Point
Notional value per index point	KRW 500,000	HKD 50	HKD 50	JPY 10,000	TWD 200
Panel B					
Trade Characteristics					
Trade size (no. contracts)	14.08	3.26	3.40	8.18	4.00
Trade Value (USD)	751,459.01	273,359.95	124,298.02	943,821.10	135,778.31
Daily no. of trades	14,437.24	4,892.59	1,205.55	1,225.41	6,367.33

* Off-market block trades are not included in the calculation of these statistics.

** This only includes electronic trading. In the process of converting floor-traded SGX products to electronic trading, there was a period of simultaneous floor and electronic trading. Futures contracts transacted in the SGX are now traded electronically. Actual volumes may be underestimated as a result of only having access to the electronic data.