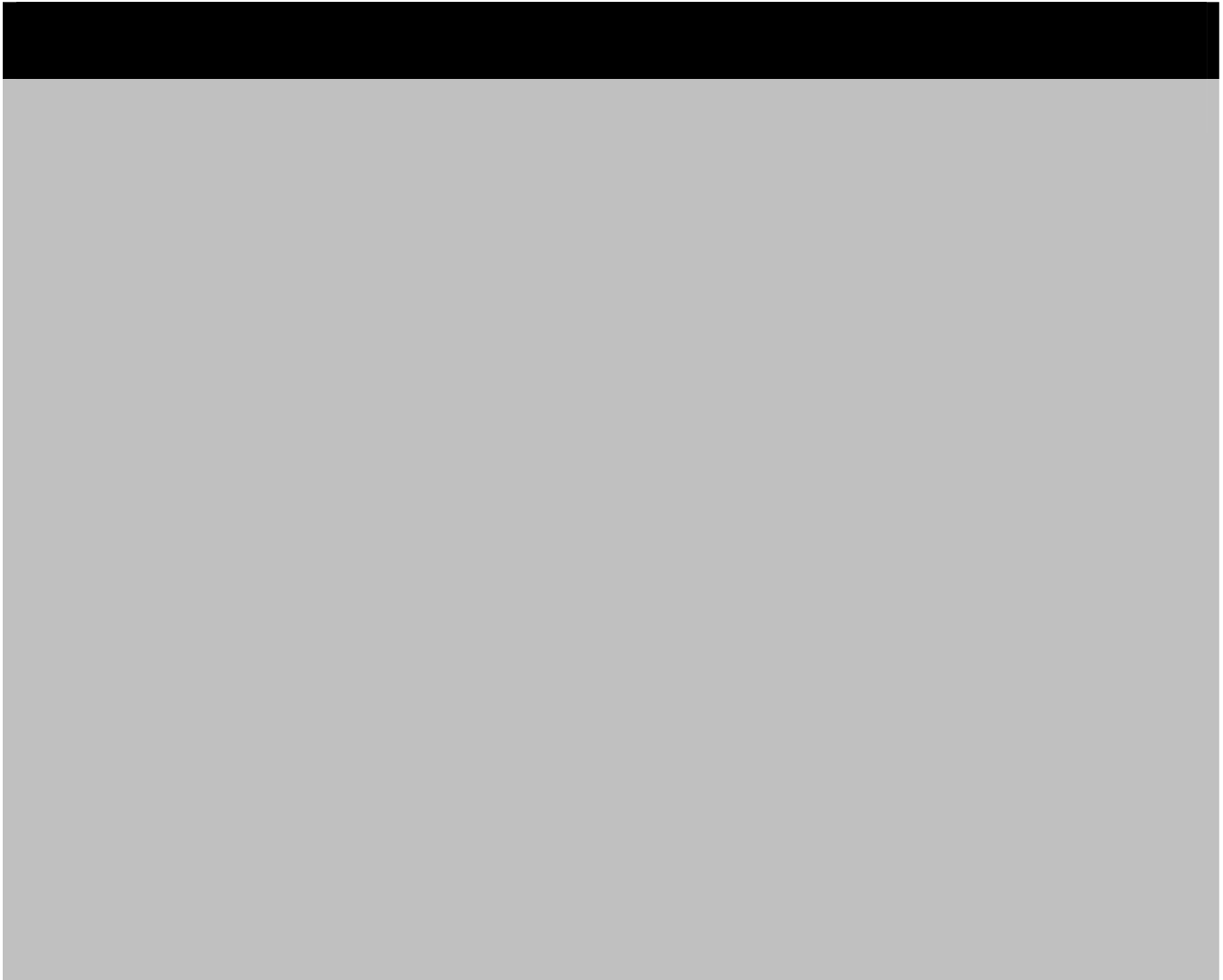




**An Analysis of the Trading Opportunities
between SGX MSCI Taiwan Index Futures
and TAIFEX TAIEX Futures**



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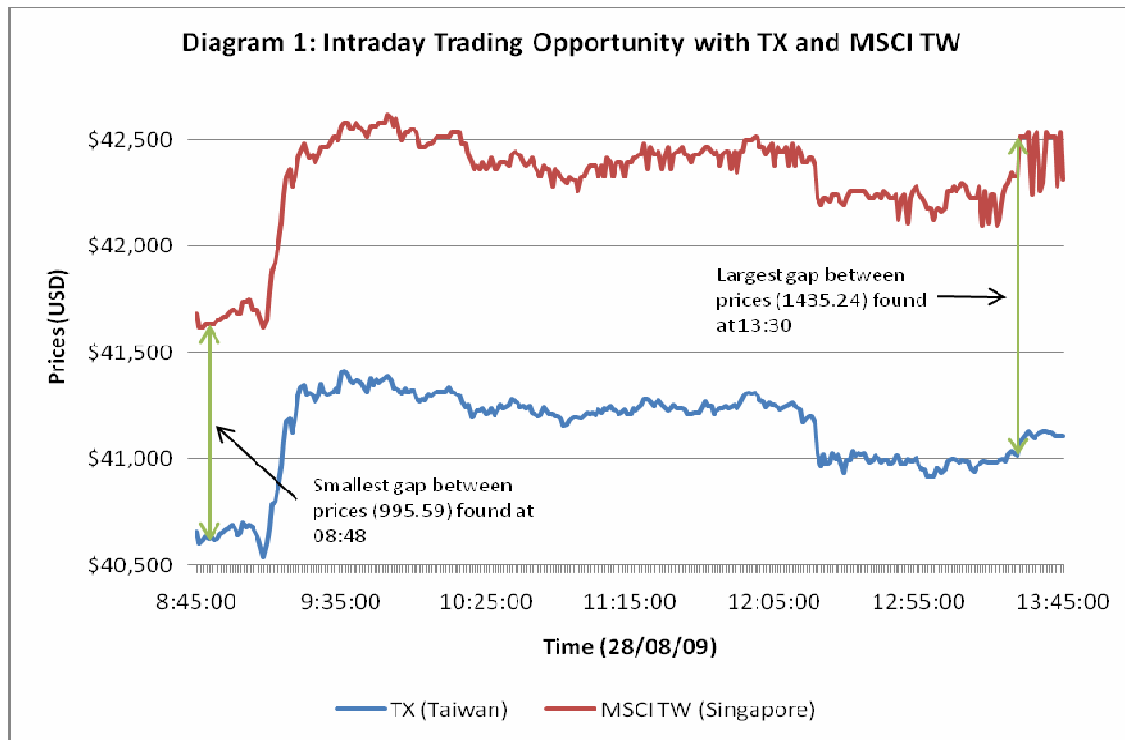
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An Analysis of the Trading Opportunities between SGX MSCI Taiwan Index Futures and TAIFEX TAIEX Futures

This paper aims to examine if there are arbitrage trading opportunities present between the SGX MSCI Taiwan Index futures (MSCI TW) and the TAIFEX TAIEX futures (TX). For arbitrage opportunities to exist, a mean reverting relationship between respective index futures prices have to be found.¹ In this case, the one year correlation (September'08 – September'09) between MSCI TW and TX is found to be at 0.9951. This analysis draws on intraday data of both index futures obtained from Bloomberg for the period 17th June 2009 to 15th September 2009.

This paper investigates the movements of intraday minute-by-minute closing prices of both index futures. It is observed that both index futures prices are found to be deviating from each other during different trading days. Thus, this suggests that there are potential trading opportunities to profit from the intraday movements of the respective index futures prices. As a result, a trading day (28/08/09) is chosen to demonstrate on how an investor might be able to profit from the intraday movements of the TX and MSCI TW index futures prices. Diagram 1 below, illustrates the movements of the prices for their respective index futures on 28/08/09.²



¹ For further details, please see Elliott, R.J., Van Der Hoek, J. & Malcolm, W.P., 'Pairs Trading' Quantitative Finance, 5, 271-276.

² Please see the Appendix for a detailed description on how both index futures prices are being calculated.

An investor can adopt a profitable trading strategy through selling the higher valued contract and buying the lower valued contract when the gap between the futures prices are found to be large while buying back the higher valued contract and selling the lower valued contract when the futures price gap is found to be small.³ From diagram 1, it is found that the smallest and largest price gaps are found at 08:48am and 13:30pm respectively. Table 1 below, explains how the investor is able to implement the strategy.⁴

Table 1: Description of the Trading Strategy Taken

Time	TX Price	MSCI TW Price	Actions Taken	Costs	Profits
08:48am (Entry)	US\$203.19 (NT\$6,676)	US\$244.90	Sell 3 TX and Buy 5 MSCI TW	-US\$614.94	US\$19.33
13:30pm (Exit)	US\$205.41 (NT\$6,749)	US\$250.10	Buy 3 TX and Sell 5 MSCI TW	US\$634.27	

At 08:48am, the investor will firstly sell three TX contract at NT\$6,676 and buy five MSCI TW contract at US\$244.90 Subsequently, at 13:30pm, the investor will then close out all positions when the price gap is found to have widen. Thus, he will then buy three TX contract at NT\$6,749 and sell five MSCI TW contract at US\$250.10. As a result, it can be observed that the investor is able to make a profit of US\$19.33 if he was to execute the trading strategy as describe above.

Alternatively, investors can also adopt this simple strategy at different periods within a trading day instead of profiting from the largest and smallest price gaps. From diagram 2, it can be observed that the index futures prices deviate from each other at certain periods in a trading day. Thus, this suggests that profitable trading opportunities might also exist. Diagram 2 and Table 2 illustrates the potential points of entries and exits that can lead to profits as a result of the deviating index futures prices within a trading day.⁵

Table 2 : Description of Multiple Trading Opportunities on 08/07/09

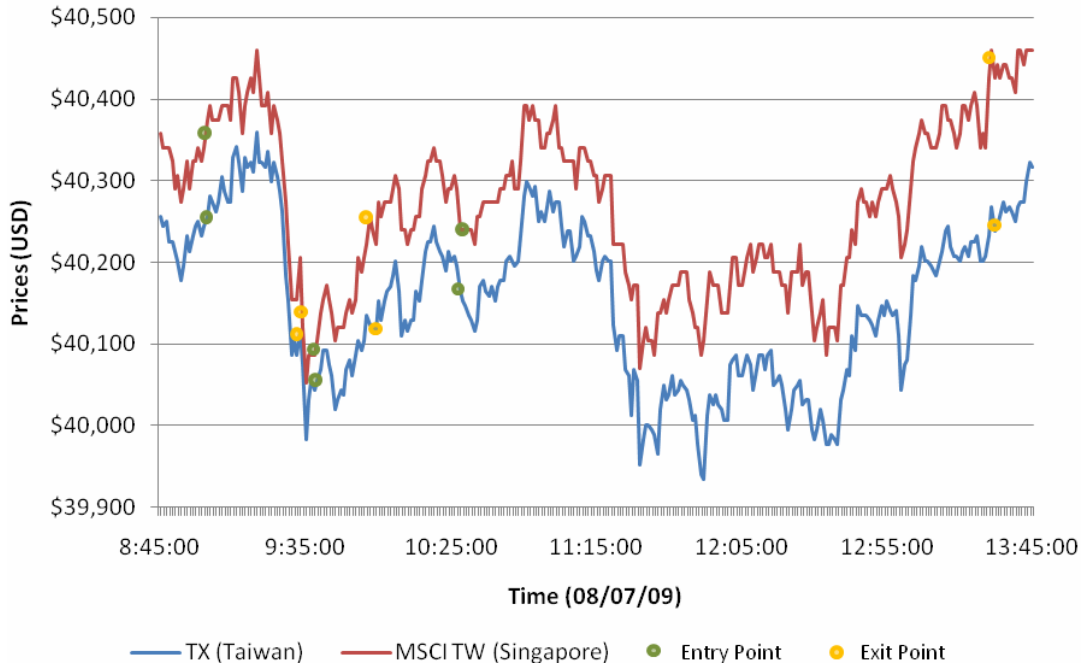
Time	TX Price	MSCI TW Price	Actions Taken	Costs	Profits
9:01am (Entry)	US\$201.28	US\$237.50	Buy 3 TX and Sell 5 MSCI TW	US\$583.66	US\$4.76
9:34am (Exit)	US\$200.37	US\$236.00	Sell 3 TX and Buy 5 MSCI TW	-US\$578.90	
9:37am (Entry)	US\$200.28	US\$235.80	Sell 3 TX and Buy 5 MSCI TW	-US\$578.17	US\$4.00
9:57am (Exit)	US\$200.61	US\$236.80	Buy 3 TX and Sell 5 MSCI TW	US\$582.17	
10:28am (Entry)	US\$200.82	US\$236.70	Sell 3 TX and Buy 5 MSCI TW	-US\$581.03	US\$4.81
1:33pm (Exit)	US\$201.22	US\$237.90	Buy 3 TX and Sell 5 MSCI TW	US\$585.84	

³ Elliott, R.J., Van Der Hoek, J. & Malcolm, W.P., 'Pairs Trading' Quantative Finance, 5, 271-276.

⁴ Please note that it is assumed that the trades are able to be executed at the best prices in that moment in time. In addition, the costs of transacting are not being factored in this analysis. The NT\$/US\$ monthly exchange rate is fixed at \$32.86 for the month of August 2009.

⁵ Please note that these illustrations only show that the price gaps between TX and MSCI TW index futures deviate sufficiently for profitable trading. Investors should determine their own entry and exit strategies. The NT\$/US\$ monthly exchange rate is fixed at \$32.87 for the month of July 2009.

Diagram 2: Multiple Intraday Trading Opportunities with TX and MSCI TW



In general, this paper investigates the movements of the SGX MSCI Taiwan Index futures prices and TAIEX futures prices across three months of intraday trading data. Subsequently, it is discovered that the spread between both index futures prices or price gaps are found to narrow and widen throughout different trading days. As a result, this paper shows that there are sufficient deviations between both index futures prices for potential trading opportunities in the intraday SGX MSCI Taiwan Index futures and TAIEX futures markets.

Appendix

Calculation of the Standardized MSCI TW Prices

$$\textit{Standardized MSCI TW Price}_{i,t} = \text{US\$100} * \textit{MSCI TW Price}_{i,t} * 1.7$$

Where *Standardized MSCI TW Price*_{*i,t*} is the MSCI TW price standardized at interval *i* on trading day *t*. US\$100 is the contract size multiplier as determined by SGX and *MSCI TW Price*_{*i,t*} is the traded MSCI TW price at interval *i* on trading day *t*. 1.7 is used as a factor to standardize the prices which is in accordance with the industry.

Calculation of the Standardized TX Prices

$$\textit{Standardized TX Price}_{i,t} = \text{NT\$200} * \textit{TX Price}_{i,t} * \frac{\text{US\$}}{\text{NT\$}} \textit{exchange rate}_t$$

Where *Standardized TX Price*_{*i,t*} is the TX price standardized at interval *i* on trading day *t*. NT\$200 is the contract size multiplier as determined by the TAIFEX and *TX Price*_{*i,t*} is the traded TX price at interval *i* on trading day *t*. The US\$/NT\$ *exchange rate*_{*t*} represents the US\$/NT\$ exchange rate at trading day *t* and is sourced from the US federal reserve.