

## MASTER'S THESIS

### Using session high/low time to test for intraday market efficiency in HSIF market

Hung, Cheung Wai

*Date of Award:*  
2012

[Link to publication](#)

#### **General rights**

Copyright and intellectual property rights for the publications made accessible in HKBU Scholars are retained by the authors and/or other copyright owners. In addition to the restrictions prescribed by the Copyright Ordinance of Hong Kong, all users and readers must also observe the following terms of use:

- Users may download and print one copy of any publication from HKBU Scholars for the purpose of private study or research
- Users cannot further distribute the material or use it for any profit-making activity or commercial gain
- To share publications in HKBU Scholars with others, users are welcome to freely distribute the permanent URL assigned to the publication

# **Using Session High/Low Time to Test for Intraday Market Efficiency in HSIF market**

**HUNG Cheung Wai**

**A thesis submitted in partial fulfilment of the requirements**

**for the degree of**

**Master of Philosophy**

**Principal Supervisor: Prof. LAM Kin**

**Hong Kong Baptist University**

**May 2011**

# ABSTRACT

The random walk hypothesis has two constituents i.e. (1) that the returns are independent and (2) that the returns are identically distributed. In Mok, Lam and Li (2000), their finding is that using data of HSIF for the period from July 1, 1994 to December 27, 1996, they reject the null hypothesis  $H_0$  and  $H_{00}$ . Nevertheless, they never touch on any trading rule to exploit the unearthed market in-efficiency. Also, they pay no attention on the lunch gap, which is the non-trading period from 12:30 to 2:30. In this dissertation, we would like to mend these holes in the previous study and in the same time find out more updated facts on the HSIF market for the period from January 3, 2005 to June 11, 2010. By separating the study into morning efficiency and afternoon efficiency, we can have more accurate tests of the hypotheses  $H_0$  and  $H_{00}$ . We also test  $H_{000}$  by testing the effectiveness of trading range break (TRB) trading rules that have more relevance to the test statistics of high-time and low-time. It is the first time that such trading rules are linked up with a test using market high-time and market-low time. It is discovered that the market inefficiency observed by Mok, Li and Lam(2000) still persists in HSIF market over a long period of time even it has been uncovered. In this particular example, it is particularly interesting because the market inefficiency does not come together with any trading rule.

# TABLE OF CONTENTS

DECLARATION .....	i
ABSTRACT.....	ii
ACKNOWLEDGEMENTS.....	iii
TABLE OF CONTENTS.....	iv
LIST OF TABLES .....	vii
<b>CHAPTER 1      INTRODUCTION .....</b>	<b>1</b>
1.1    RANDOM WALK MODELS IN THE FINANCIAL MARKET .....	1
1.2    FROM DAILY RETURNS TO INTRADAY RETURNS .....	3
1.3    HANG SENG INDEX FUTURES .....	5
1.4    TEST OF THE VARIOUS RANDOM WALK HYPOTHESES USING DAY-HIGH TIME AND DAY-LOW TIME .....	7
1.5    THESIS OBJECTIVES .....	9
1.6    THESIS CONTRIBUTION .....	10
1.7    ORGANIZATION OF THE STUDY .....	11
<b>CHAPTER 2      LITERATURE REVIEW .....</b>	<b>13</b>
2.1    MARKET EFFICIENCY AND TECHNICAL TRADING RULES .....	13
2.1.1 <i>Worldwide evidence</i> .....	13
2.1.2 <i>Evidence in Hong Kong stock market</i> .....	19
2.2    TESTING EFFICIENT MARKET HYPOTHESIS (EMH) WITH TRADING RANGE BREAKOUT RULES .....	20
2.2.1 <i>Worldwide evidence</i> .....	21
2.2.2 <i>Evidence in Hang Seng index futures market</i> .....	23
2.3    TESTING EFFICIENT MARKET HYPOTHESIS (EMH) WITH INTRADAY DATA .....	27
2.3.1 <i>Worldwide evidence</i> .....	27
2.3.2 <i>Evidence in Hang Seng index data</i> .....	31
2.4    TESTING EFFICIENT MARKET HYPOTHESIS (EMH) WITH DAILY HIGHS AND LOWS .....	39
2.4.1 <i>Worldwide evidence</i> .....	39
2.4.2 <i>Evidence in Hang Seng index futures data</i> .....	42
<b>CHAPTER 3      DATA.....</b>	<b>45</b>
3.1    INTRODUCTION.....	45

3.2	TIME FRAME OF STUDY .....	49
3.3	HANG SENG INDEX FUTURES (HSIF) .....	50
3.4	THE TRADING PERIOD FOR HSI AND HSIF MARKET .....	52
<b>CHAPTER 4</b>	<b>METHODOLOGY .....</b>	<b>54</b>
4.1	SESSION HIGH/LOW TIME IN THE HSIF MARKET .....	54
4.2	THEORETICAL DISTRIBUTION OF $T_H$ AND $T_L$ UNDER UNIFORM TRADING SPEED .....	55
4.3	THEORETICAL DISTRIBUTION OF $T_H$ AND $T_L$ UNDER TIME-VARYING TRADING SPEED .....	56
4.4	EMPIRICAL DISTRIBUTION OF $T_H$ AND $T_L$ .....	57
4.5	GOODNESS OF FIT TESTS .....	58
4.6	TRADING RANGE BREAKOUT (TRB) TRADING RULE.....	59
4.6.1	<i>Profits and t-statistics of the TRB trading rule .....</i>	<i>61</i>
<b>CHAPTER 5</b>	<b>RANDOM WALK HYPOTHESES IN THE MORNING TRADING</b>	
	<b>SESSIONS OF THE HSIF MARKET .....</b>	<b>62</b>
5.1	INTRODUCTION.....	62
5.2	EMPIRICAL DISTRIBUTION FOR $T_H$ AND $T_L$ .....	62
5.3	TEST UNDER UNIFORM TRADING SPEED .....	64
5.3.1	<i>Chi-square goodness of fit test.....</i>	<i>66</i>
5.3.2	<i>When the random walk assumption is violated.....</i>	<i>69</i>
5.4	TEST UNDER UNIFORM TIME-VARYING TRADING SPEED.....	70
5.4.1	<i>Chi-square goodness of fit test.....</i>	<i>74</i>
5.4.2	<i>When the random walk assumption is violated.....</i>	<i>77</i>
<b>CHAPTER 6</b>	<b>TESTING VARIOUS HYPOTHESES IN THE AFTERNOON TRADING</b>	
	<b>SESSIONS OF THE HSIF MARKET .....</b>	<b>79</b>
6.1	INTRODUCTION.....	79
6.2	EMPIRICAL DISTRIBUTION FOR $T_H$ AND $T_L$ .....	79
6.3	TEST UNDER UNIFORM TRADING SPEED .....	81
6.3.1	<i>Chi-square goodness of fit test.....</i>	<i>82</i>
6.3.2	<i>When the random walk assumption is violated.....</i>	<i>85</i>
6.4	TEST UNDER TIME-VARYING TRADING SPEED .....	86
6.4.1	<i>Chi-square goodness of fit test.....</i>	<i>88</i>
6.4.2	<i>When the random walk assumption is violated.....</i>	<i>91</i>
<b>CHAPTER 7</b>	<b>TRADING RANGE BREAK(TRB) TRADING RULES IN THE MORNING</b>	
	<b>SESSIONS OF THE HSIF MARKET .....</b>	<b>93</b>

7.1	WHY WE PROPOSE TO STUDY THE TRB TRADING RULE .....	93
7.2	TRB TRADING RULE FOR INTRADAY TRADING IN THE MORNING SESSIONS .....	95
7.3	FULL PERIOD TESTS AND SUB-PERIOD TESTS.....	98
7.4	EMPIRICAL RESULTS .....	99
<b>CHAPTER 8 TRADING RANGE BREAK(TRB) TRADING RULES IN THE</b>		
<b>AFTERNOON SESSIONS OF THE HSIF MARKET .....</b>		<b>131</b>
8.1	TRB TRADING RULE FOR INTRADAY TRADING IN THE AFTERNOON SESSIONS.....	131
8.2	FULL PERIOD TESTS AND SUB-PERIOD TESTS.....	132
8.3	EMPIRICAL RESULTS .....	133
<b>CHAPTER 9 CONCLUSION.....</b>		<b>156</b>
9.1	TESTING THE RANDOM WALK HYPOTHESES DURING AN INTRA-TRADING SESSION OF THE HSIF MARKET .....	156
9.2	TESTING FOR WEAK FORM OF MARKET EFFICIENCY OF INTRA-TRADING SESSIONS OF HSIF MARKET .....	157
9.3	EXTENSIONS FOR FUTURE STUDIES.....	162
<b>REFERENCES.....</b>		<b>164</b>
<b>CURRICULUM VITAE.....</b>		<b>172</b>