CAN THE MAGIC FORMULA BEAT THE THAI AND JAPANESE MARKETS TOO?

YOSUKE KAKINUMA

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.....
Mr. Yosuke Kakinuma
Candidate

.....
Lect. Thanarerk Thanakijsombat, Ph.D.
Major advisor

.....
Lect. Lalita Hongratanawong, Ph.D.
Co-advisor

.....
Assoc. Prof. Sombat Thanawan, Ph.D.,
Acting Dean
Faculty of Graduate Studies
Mahidol University

.....
Lect. Dissatat Prasertsakul, D.B.A.
Program Director
Master of Business Administration
Program in Business Modeling and Analysis
International College
Mahidol University

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was submitted to the Faculty of Graduate Studies, Mahidol University
for the degree of Master of Business Administration (Business Modeling and Analysis)
on
March 29, 2014

.....
Mr. Yosuke Kakinuma
Candidate

.....
Mr. Treerapot Kongtoranin, Ph.D.
Chair

.....
Lect. Thanarerk Thanakijsombat, Ph.D.
Member

.....
Lect. Lalita Hongratanawong, Ph.D.
Member

.....
Assoc. Prof. Sombat Thanawan, Ph.D.,
Acting Dean
Faculty of Graduate Studies
Mahidol University

.....
Prof. Maleeya Kruatrachue, Ph.D.
Dean
International College
Mahidol University

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Yosuke Kakinuma

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YOSUKE KAKINUMA 5438834 ICMA/M

M.B.A. (BUSINESS MODELING AND ANALYSIS)

THEMATIC PAPER ADVISORY COMMITTEE: THANARERK THANAKIJSOMBAT, Ph.D., LALITA HONGRATANAWONG, Ph.D.

ABSTRACT

This research aimed to test the validity of Joel Greenblatt's Magic Formula on the Thai, the Japanese, and the US stock markets. The magic formula uses two ratios, return on capital and earning yield, to screen the stocks. The magic formula portfolio's return was compared to the return of the market benchmark, SET index for the Thai market, Nikkei 225 for the Japanese market, and S&P 500 for the US market. Sharpe ratio analysis was included to measure risk-adjusted return. The period covered in this study was from 1993 to 2012 for 20 years. The data was extracted from Thomson Reuters's Datastream.

The results of this study indicate that the magic formula beat all the three markets of Thailand, Japan, and the USA. The outperformance of the magic formula on the Thai market was particularly remarkable. Although the magic formula did not excel on the Japanese market, it managed to yield a higher annualized return than the market. The magic formula's higher return on the US market was partially from having higher risk. In conclusion, this study suggests that the magic formula is a solid investment model especially given its simplicity. The magic formula's two factors, return on capital and earning yield, are important indicators for securing "margin of safety."

KEY WORDS: VALUE INVESTING/MAGIC FORMULA/JOEL GREENBLATT

30 pages

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CHAPTER I
INTRODUCTION

1.1 Introduction---Value Investing

Value investing has been a fundamental investment principle for many investors. Benjamin Graham, the founder of value investing, emphasizes its importance in his classic investment analytic book "The Intelligent Investor (1949)." Graham asserts that margin of safety is a key for successful investment. In other words, the wider the gap between the purchasing price investors pay for a security and the firm's intrinsic value is, the better returns investors are likely to get. This "buy low, sell high" approach is a central investment concept for those who invest based on value investing principle such as world-famous investor Warren Buffett.

Although Graham's concept of the margin of safety is theoretically sound and understandable, actually finding a firm's intrinsic value is extremely difficult and it associates with great uncertainty even for professional investors such as mutual fund managers. Using a discounted cash flow method to find a firm's value is a prime notion in the school of Finance. Nonetheless, estimating a firm's future cash flows and setting an appropriate discount rate require significant understanding of the firm's business, its industry, and overall economic condition both domestically and internationally.

1.2 The Magic Formula

In "The Little Book That Still Beats the Market (2010)," Joel Greenblatt, a follower of Graham, introduces his "Magic Formula." The magic formula greatly simplifies a process of finding the margin of safety. Greenblatt proves that the annualized return from his portfolio using the magic formula beat the US market annualized return from 1988 to 2009. The magic formula employs the value investing concept for stock selection with the following two factors: 1) return on capital, and 2)

earning yield. The top 30 stocks that rank the highest in the both categories combined are included in the portfolio. In short, the magic formula looks for companies that have both a high return on capital and a high earnings yield. The more detailed criteria of the magic formula's stock selection are discussed in the Chapter 3 of this study.

The name of the this stock selecting system, "Magic Formula," is rather misleading because there is nothing magic about the formula. In fact, the two factors used in the formula, return on capital and earning yield, are fundamentally important measurements to analyze a security when making an investment decision. Another appealing component of this formula is its simplicity for implementation. No sophisticated programming is necessary to apply the formula. Therefore, any amateur investors are able to take advantage of the formula.

Greenblatt cautions that the magic formula works the best in a long term investment. In his book, he shows that, out of the years he analyzed the annual return from the magic formula against that of the market, there were some years that the return from the magic formula's portfolio was lower than that of the market. However, when he compares an annualized return over 22 years from 1988 to 2009, the annualized return from the magic formula (19.7%) is remarkably higher than that of the market (9.5%). Greenblatt suggests that investors follow the magic formula for at least 3 years with yearly portfolio rebalancing to gain a return higher than the market.

1.3 Objective of Study

In this research, I applied the magic formula to test if it also works on the SET (Stock Exchange of Thailand) in Thailand and the TSE (Tokyo Stock Exchange) in Japan. I also included the US market in the research to reconfirm Greenblatt's finding. The returns from the portfolio using the magic formula were compared to the returns from benchmark index in the respective markets, SET index in Thailand, Nikkei 225 in Japan, and S&P500 in the USA. I included Sharpe ratio analysis as well to examine risk-adjusted return. Thus, my research aimed to test validity of the magic formula across the markets.

1.4 Significance of Study

This study contributes to general investors' knowledge. It will be especially beneficial for amateur investors because of the simplicity of the magic formula's stock screening system. Amateur investors often need to invest through mutual funds due to their lack of knowledge. However, a lot of mutual funds underperform the market from time to time. Mutual funds charge management fee regardless their performance. Therefore, those who invest through mutual funds sometimes end up with suffering both loss in the investment and management expense. With the magic formula, amateur investors will be able to select stocks, or find the "margin of safety" on their own.

This study is especially beneficial for value investors. Use of the magic formula simplifies a process of finding underpriced securities with good prospect. Value investors' principle is to purchase a stock whose intrinsic value is higher than market value. However, finding a firm's intrinsic value requires sophisticated skills and knowledge. Discounted Cash Flow method is one way to calculate intrinsic value, yet estimation of future cash flow and determination of appropriate discount rate associate with great uncertainty. Some may resort to technical analysis to find intrinsic value with complicated computer programs. On the other hand, the magic formula uses only two financial ratios, return on capital and earning yield, which are easily calculated. With financial data and spreadsheet, anyone can buy a stock which is undervalued at the time but has good potential that its price goes up in the future.

1.5 Limitation of Study

This research is limited by the availability of data. Because the Thai stock market is still new compared to other mature markets, sufficient data for the Thai market can be obtained for the period after the mid 1990s.

Survival bias also limits this research because this study involves back-testing of the data in the three different stock markets. For example, the constituents of today's S&P 500 and the ones 10 years ago are not the same because some corporations are dropped and others are added as their market capitalization (or market

cap) changes all the time. The companies dropped out of the index in the past are excluded in the data. Thus, the results from the back-testing tend to exaggerate the returns calculated from the past data.

CHAPTER II
LITERATURE REVIEW

2.1 Empirical Studies on the Magic Formula

Probably because of the popularity of Greenblatt's bestseller book, his magic formula has been academically analyzed and examined in several markets.

One example is a recent research by Sign and Kaur (2013). Sign and Kaur calculated the magic formula's risk-adjusted return using Sharpe ratio in the Indian stock market, the Bombay Stock Exchange. They calculated the monthly returns and standard deviations of the magic formula portfolio, then annualized them to obtain yearly return and Sharpe ratio. BSE-SENTEX (Bombay Stock Exchange Sensitive Index), also called BSE 30, was used to calculate the market's return. The data was extracted from PROWLESS, an electric database of Monitoring Indian Economy. In order to avoid look-ahead bias, their portfolios were formed at the end of every June to ensure that there was ample time for investors to get the latest financial information. In India, a financial year usually ends at the end of March. They found that, from 1996 to 2010, the portfolio of the magic formula was able to produce a higher risk-adjusted return in 10 years out of 15 years than the market index. Their magic formula portfolio astonishingly generated 65.6% of the annualized return for the period tested while the market produced 12.2% of the annualized return.

Persson and Selander (2009) tested validity of the magic formula in the Nordic region, namely, Denmark, Sweden, Norway, Iceland, and Finland. They collected their data monthly from January 1988 to December 2007, and built their magic formula portfolio by selecting 2 stocks form the 5 different markets every month to the maximum of 24 stocks. The 2 stocks selected in any months were kept in the portfolio for 12 consecutive months and then sold. If the same stock which was already in the portfolio was selected in any particular month, the next ranked stock was added. Datastream was used to collect the data and the market returns were calculated from MSCI Nordic. They too found that the magic formula portfolio

outperformed the market on compounded annual growth basis. The standard deviation was lower for the magic formula portfolio, which means it generated higher returns with lower risk. One interesting point of their study is that they took transaction cost into consideration too. As their portfolio involved 4 transactions every month (buy 2 stocks and sell 2 stocks), the transaction cost could be very large. However, even deducting the transaction cost from the returns, the magic formula portfolio still outperformed the market. They also remarked that there were quite a few 12-month rolling periods during the 10-year span that the magic formula portfolio lost money, which suggested that there was a chance of losing money in a short term.

In addition to the magic formula's two factors, return on capital and earning yield, Larkin (2009) added other two-factor ratio combinations such as B/M (book-to-market) and market cap, and earning yield and ROE (return on equity). This research was conducted on the US market. The portfolio was rebalanced every end of the year. Larkin concluded that the portfolio based on the combination of B/M and market cap had the highest annualized return from 1998 to 2006, 32%, which was well above the market return, 6.7%. Larkin's magic formula portfolio generated 19% of the annualized return and outperformed the market for the period but it was not the best strategy in his study. His study also found the magic formula was less likely to experience negative returns. Out of 73 3-year rolling periods, the magic formula had no periods with negative returns while the market faced negative returns 28 times. Out of 49 5-year rolling periods, the magic formula again did not generate negative returns whereas the market had 25 negative return periods.

Sareewiwatthana (2011) utilized a simplified version of the magic formula to test it on the Thai market. P/E (price-to-earning) and ROE were used for screening stocks in place of the original combination of earning yield and return on capital. 30 stocks were picked using a combined rank of P/E and ROE at the beginning of every year from 1996 to 2010. The each stock was equally weighted. The modified magic portfolio performed significantly better than the market from 1996 to 2010, generating 37% annualized return. On the other hand, the market produced only 2.4% annualized return in the same period. Nonetheless, when comparing single year return, the modified magic formula portfolio underperformed the market 3 years out of the total of 15 years.

The all studies' results are in line with Greenblatt's statement: the magic formula works for a long term investment. Greenblatt suggests that investors follow the magic formula strategy at least 3 years with yearly portfolio rebalancing.

2.2 Price to Earnings Ratio

One of the magic formula's components, earning yield, is a reciprocal of price to earnings (P/E) ratio. Plentiful academic journals have been published regarding P/E ratio being an indicator of intrinsic value of common stocks. Basu (1977) was the first who identified low P/E ratio as a predictor of a high future return. The study was conducted on the period from 1957 to 1971. Publically traded stocks were ranked on their P/E ratios, and then assigned to 5 portfolios according their P/E ratio rankings. The results were that the portfolio consisted of stocks with the lowest P/E ratios yielded the highest annualized return, 16%, whereas the portfolio with the highest P/E ratios generated the annualized return of 9%. Basu concluded that there was a better chance that stocks with low P/E ratio would result in a superior return than those with high P/E ratio; hence investors were better advised to look for stocks with low P/E ratio to secure the margin of safety. Trevino and Robertson (2002) and Truong (2009) drew the same conclusion from their analysis on P/E ratio among other academic researches.

2.3 Value Investing in Thailand

The following two researches using financial ratios similar to the magic formula's two factors have been conducted particularly on the Thai stock market. Sareewiwatatthana (2010) used price to earnings to growth (PEG) ratio for stock selection. The PEG ratio compares a stock price to profit, along with the growth rate of the profit, so it is a combination of value investing and growth investing. The research was conducted for the period of 1999 to 2010. Portfolios were formed according to PEG ratio and rebalanced at the end of every February. Sareewiwatatthana concluded that the portfolio consisted of stocks with low PEG ratios generated a significantly higher return than the SET index for the research

period. Shape ratio analysis was included in this study, and low PEG ratio portfolio outperformed the market on risk-adjusted basis too.

Another value investing study on the Thai stock market is by Panyagometh (2012). This study tested 3 different portfolio weighing theories; equally-weighted portfolio, market capitalization weighed portfolio, and Mean-Variance optimization portfolio. Panyagometh utilized P/E ratio and price to book (P/B) ratio to select stock. 10 stocks were included in the portfolio with yearly rebalancing. He found that the equally weighted portfolio with lowest P/E ratio and the lowest P/B ratio combined greatly outperformed the market during the period from 2002 to 2011 with 41.48% of 10-year holding period rate of return. The market's return was 21.27%. These studies clearly indicate that the Thai stock market is rather inefficient.

CHAPTER III
RESEARCH METHODOLOGY

3.1 The Magic Formula's Portfolio Construction

The following are the magic formula's steps to select stocks and construct a portfolio. This framework is quoted from Greenblatt's book.

Step 1: Screen by market capitalization.

The minimum market cap is set for the each market because of low liquidity and low trading volume of small-cap stocks. This is to screen out stocks whose financial fundamentals are solid but practically not purchasable on the market because of the size of the company.

Greenblatt suggests that the minimum market cap for the US market is USD 100 million, so I use this figure for this research.

For the Japanese market, I set the minimum market cap at JPY 10 billion. According to the Tokyo Stock Exchange's website (tse.or.jp), there are 1,744 stocks listed on the TSE as of October 2013. TOPIX 1000 is an index consisted of the largest 1,000 stocks on the TSE, and Arisawa Manufacturing was added to TOPIX 1000 in October 2013 with the market capitalization of approximately JPY20 billion. In a consideration of the stock price surge in 2013 thanks to the Japanese government's economic stimulus policy, "Abenomics," JPY 10 billion should be an appropriate minimum market cap to cut out small stocks for the period of this study.

I use THB 3 billion for the minimum market cap criteria for the Thai market. As of October 2013, one of the smallest stocks in SET100 is G Steel PCL with the market cap of approximately THB 4 billion. Thus, THB 3 billion should be a sufficient size to be considered non-small cap. According to the Stock Exchange of Thailand's website (set.or.th), FTSE SET Small Cap Index is consisted of the bottom 10% of the listed corporations by market capitalization. One of the constituents of FTSE SET Small Cap Index in October 2013 is Tata Steel (Thailand) PCL with the

market cap of THB 2 billion. Although the market capitalization of the stocks in FTSE SET Small Cap Index changes all the time, setting THB 3 billion as the minimum value should exclude small cap stocks for the period of this study. **Table 3.1** summarizes the minimum market cap criteria for the each market.

At the current exchange rate as of February 2004, the amounts in **Table 3.1**, THB 3 billion, JPY 10 billion, and USD 100 million, are almost equivalent values.

Table 3.1 Summary of the Minimum Market Capitalization Criteria

	Thailand	Japan	the USA
Minimum Market Capitalization	THB 3 billion	JPY 10 billion	USD 100 million

Also in this step, the financial and utilities stocks are omitted. The financial stocks are excluded because their accounting number does not represent the same economic meanings as non-financial stocks. Utilities stocks are also eliminated because their earnings are heavily depended upon the governmental regulations.

Step 2: Rank the stocks selected in the Step 1 by 1) Return on Capital, and 2) Earning Yield, which are calculated by the following formulas.

1) **Return on Capital = EBIT/(Net Working Capital* + Net Fixed Assets*)**
2) **Earning Yield =EBIT/Enterprise Value****

***Net Working Capital and Net Fixed Assets are an average of the beginning and ending value of a year.

**Enterprise value is a sum of market value of equity and net-interest bearing debt.

After placing the stocks in a descending order by 1) return on capital, and 2) earning yield, a combined rank is assigned to each stock. For example, a stock that ranks the 7th in return on capital and the 3rd in earning yield gets a combined rank of the 10th. Place the stocks in an ascending order according to the combined rank.

These ratios measure how efficient a company utilizes its invested capital and how reasonably a stock is priced compared to the underlying company's ability to earn. The formula finds undervalued stocks, or "bargain stocks" as Greenblatt calls them, of which the underling businesses are managed efficiently. According to Greenblatt, those bargain stocks should eventually see a rise in the price in the future.

Step 3: Pick the top 30 stocks among the list from the Step 2.

The 30 stocks included in the portfolio are held for one year then sold. The portfolio is rebalanced every year. This means that the 3 steps written above are repeated every year.

Greenblatt recommends that investors hold 30 stocks, or at least 20 stocks, for the magic formula portfolio. I agree with him that a portfolio with 30 stocks is an appropriate size for the following two reasons. The first is diversification effect. When investing in a stock, there are two risks, systematic risk and unsystematic risk. Systematic risk, also called market risk, is commonly measured by beta. It is a risk that affects virtually all listed stocks. Natural disaster is one example. In 2011, Thailand experienced a devastating flood and it had a negative impact on the entire economy. Unsystematic risk is firm-specific risk and this risk can be diversified away. Gupta and Khoon (2001) write that 30 stocks are enough to eliminate unsystematic risk, and there is no further significant diversification effect after adding 30 stocks in a portfolio. Although it varies, a number of researchers suggest that a well-diversified portfolio consist of 20 to 30 stocks. The second reason is transaction cost. Transaction cost such as commission and VAT can be a considerable amount if the portfolio size gets large. As there is no further benefit of diversification after 30 stocks, investors should save the transaction cost by not purchasing more stocks once their portfolio has as many as 30 stocks.

3.2 Methodology

I calculate and compare returns from the magic formula and the market for a period of 20 years from 1994 to 2013. Returns are calculated on prices. The portfolio is rebalanced yearly.

30 stocks in the portfolio are weighted equally. Greenblatt explains on his website (magicformulainvesting.com) that the magic formula is based on buying equal dollar amounts of each stock. This is beneficial for this study for its simplicity of stock allocation. Furthermore, Panyagometh's (2012) compared value stock portfolios with the same constituents from the Thai stock market but different weight allocations, which are equally-weighted, market capitalization weighted, and mean-variance optimization weighted. The study concluded that the equally weighted portfolio showed the best performance among the choices.

3.3 Portfolio Rebalancing Timing

The magic formula portfolio is rebalanced every year and the following is the timing of rebalancing for the each market.

For the Thai market, the price on the first working day in April is used to calculate returns. This is because, in Thailand, publicly listed corporations are required to submit their audited financial statements within 3 months from the end of a quarter and most Thai corporations' accounting year ends in December. Thus, the price in April should fully reflect the latest financial data available to investors. In Japan, public corporations must announce their quarterly earnings within 45 days after the end of every quarter and most Japanese companies' accounting year ends in March. Therefore, I take the price on the first working day in June. In the U.S.A., it is mandatory for public corporations to submit their quarterly financial statements within 45 days after the end of every quarter. Though it varies, most listed companies generally have an accounting year ending in December. Thus, I take the price on the first working day in March for the U.S. market.

Market returns are measured from market indices for the each country, which are SET for Thailand, Nikkei 225 for Japan, and S&P500 for the U.S.A. **Table 2** in the following page summarizes the portfolio rebalancing timing and market indices for the each country.

To measure risk-adjusted return, I will include Sharpe Ratio in the analysis. Use of Sharpe Ratio confirms that an excess return is not from an increased

risk. The higher Sharpe ratio means more efficient investment. Sharpe ratio is calculated by the following formula.

$$\textbf{Sharpe Ratio} = (Er_p - r_f)/Stdv_p$$

where r_p = portfolio's return

r_f = risk free rate

$Stdv_p$ = standard deviation of the portfolio's return

For the risk free rate, I use 3-month government bond rate for the each corresponding market. The Thai government bond is for the Thai market, the Japanese government bond is for the Japanese market, and the US government bond (T-Bill) is for the US market.

Standard deviation is calculated from monthly price change of the stocks. After selecting 30 stocks based on the magic formula, I obtain monthly price for the 30 stocks, from which I calculate the standard deviation of the portfolio. The rate is annualized then plugged in the Shape Ratio formula.

Table 3.2 Summary of the Portfolio Rebalancing Timings and Benchmark Indices for the Each Market

	Thailand	Japan	the USA
General Accounting Year	Jan-Dec	Apr-Mar	Jan-Dec
Audited Financial Statements Reporting Deadline After Each Quarter	Within 90 days	Within 45 days	Within 45 days
Stocks bought for the Magic Formula	The 1st working day in April	The 1st working day in June	The 1st working day in March
Benchmark Index	SET	Nikkei 225	S&P 500

3.3 Data Source

Historical data are extracted from Thomson Reuters's Datastream. The data span is 20 years from 1993 to 2012.

CHAPTER IV
DATA ANALYSIS AND RESULTS

The data extracted from Thomson Reuter's Datastream includes all the public corporations listed on the Thai and Japanese stock markets. For the US market, the extracted data includes the constituents of S&P 500. If any of the financial information necessary for the magic formula's calculation such as market cap, EBIT, or net working capital for a particular stock is not available, I omitted the stock from this analysis.

4.1 The Thai Market

The returns and Sharpe ratios of the magic formula portfolio and the market (SET index) on the Thai market are shown in **Table 4.1**.

The magic formula portfolio yielded the annualized return of 24.3% from 1993 to 2012, well outperforming the market, which generated 3.0% of the annualized return. An average return (arithmetic mean) for the magic formula portfolio was 34.1% while the one for the market was 9.6%. In 18 years out of the 20-year period of this study, the magic formula' return was higher than the market's. In 12 years out of the 20-year period, the magic formula's Shape ratio was higher than the market's. The most significantly, in 12 years out of the 20-year period, which is 60% of the time, both the magic formula's return and Sharpe ratio were higher than the market's, during which the magic formula produced a higher return with lower risk. **Table 4.2** summarizes the results on the Thai market.

Figure 4.1 exhibits a growth of hypothetical initial investment of THB1,000 from the begging of 1993 to the end of 2012, invested in the magic formula portfolio and the market index. As clearly shown in the chart, the magic formula's growth is remarkable. The initial investment grew to THB77,324 in 20 years whereas the market's growth was only to THB1,804.

With the results above, it is reasonable to conclude that the magic formula worked on the Thai market for the period of this research. Also, the magic formula's outperformance over the market suggests that the Thai market is rather inefficient.

Table 4.1. Magic Formula Results (Thai Market)

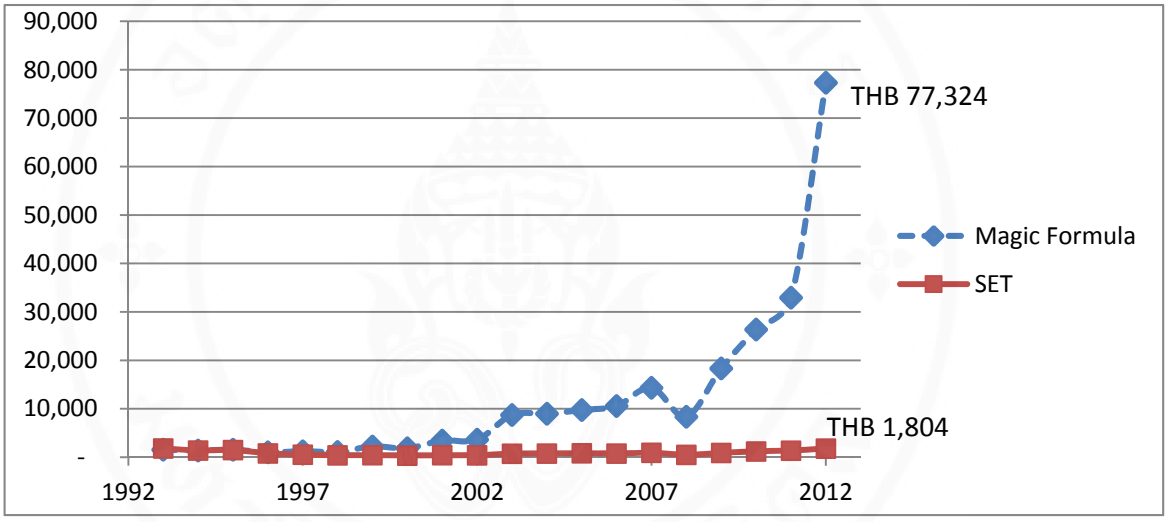
	Returns		Sharpe Ratios	
Year	Magic Formula	SET	Magic Formula	SET
1993	55.6%	83.1%	0.74	1.57
1994	-9.3%*	-23.2%	-0.35**	-0.66
1995	10.3%*	6.0%	0.22	0.35
1996	-33.6%*	-45.3%	-1.10**	-2.43
1997	19.7%*	-34.9%	0.35**	-0.43
1998	-10.1%*	-23.3%	-0.02**	-0.25
1999	100.3%*	13.7%	0.79**	0.48
2000	-15.9%*	-27.1%	-0.27**	-0.68
2001	83.8%*	28.1%	1.13**	0.98
2002	5.9%*	-2.5%	0.10**	-0.06
2003	139.9%*	77.6%	1.41	2.09
2004	2.8%	5.3%	0.07	2.09
2005	8.5%*	7.6%	0.28	0.40
2006	8.8%*	-8.1%	0.28**	-0.76
2007	35.4%*	21.3%	0.73	0.83
2008	-41.6%*	-47.2%	-1.03**	-1.62
2009	118.9%*	82.6%	2.31	2.92
2010	43.8%*	32.9%	1.12	1.83
2011	24.9%*	14.3%	0.76**	0.57
2012	134.6%*	30.4%	1.48**	-0.06
Geometric Mean	**24.3%**	**3.0%**		
Arithmetic Mean	**34.1%**	**9.6%**		

Note: * indicates that the magic formula's return is higher than the market's.
** indicates that the magic formula's Sharpe ratio is higher than the market's.

Table 4.2 Summary of the Magic Formula's Performance (Thai Market)

	Magic Formula's Outperformance	Total Years	Winning Rate
Annualized Returns	18	20	90%
Annualized Sharpe Ratios	12	20	60%
Both the Returns and Sharpe Ratios	12	20	60%

Figure 4.1 Growth of THB 1,000 from 1993 to 2012



4.2 The Japanese Market

The returns and Sharpe ratios of the magic formula portfolio and the market (Nikkei 225) on the Japanese market are shown in **Table 4.3**.

On an annualized basis, the magic formula beat the Japanese market. The magic formula portfolio yielded the annualized return of 5.1% from 1993 to 2012, which was higher than the market's return, -0.9%. The market produced negative annualized return in this period. An average return (arithmetic mean) for the magic formula portfolio was 9.3% while the one for the market was 1.7%. However, only in 10 years out of the 20-year period of this study, the magic formula' return was higher than the market's. In 12 years out of the 20-year period, the magic formula's Shape ratio was higher than the market's. Merely in 8 years out of the 20-year span, less than

a half of the research period, both the magic formula's return and Sharpe ratio were higher than the market's. In other words, there were more years that the magic formula produced a higher return than the market but with a higher risk, or simply the magic formula's return was lower than the market's. **Table 4.4** summarizes the magic formula's performance on the Japanese market.

Figure 4.2 exhibits a growth of hypothetical initial investment of JPY1,000 from the begging of 1993 to the end of 2012, invested in the magic formula portfolio and the market index. The initial investment in the magic formula grew to JPY2,724 while the investment in the market decreased to JPY830.

Although the reasons that the magic formula did not excel in the Japanese market are not known in this study, the following can be explanations. The first is the market efficiency. It can be said that Japanese market is rather transparent and information is readily available to investors, and more investors make decisions based on fundamental analysis. The second reason can be a prolonged recession that Japan experienced in the 1990s and 2000s, which falls into the most of this study's period. According to the data from OECD (Organization for Economic Co-operation and Development) and the World Bank, Japan's average yearly GDP growth from 1993 to 2012 was only 0.8% while Thailand's and the US's average GDP growth for the same period were 4.0% and 2.6% respectively. Yoshikawa (2007) explains that the unusually long recession was caused by uncertainty. Because of a credit crunch after the burst of real asset bubble in the early 90s, corporate investment significantly declined. This was the start of a vicious circle, which was lower consumer confidence, higher unemployment rate, and slumping stock market. Yoshikawa concluded that, under the gloomy circumstance, uncertainty kept dragging the economy down. The rather unimpressive results on the Japanese market may suggest that the magic formula is less effective under unfavorable economic conditions.

Table 4.3 Magic Formula Results (Japanese Market)

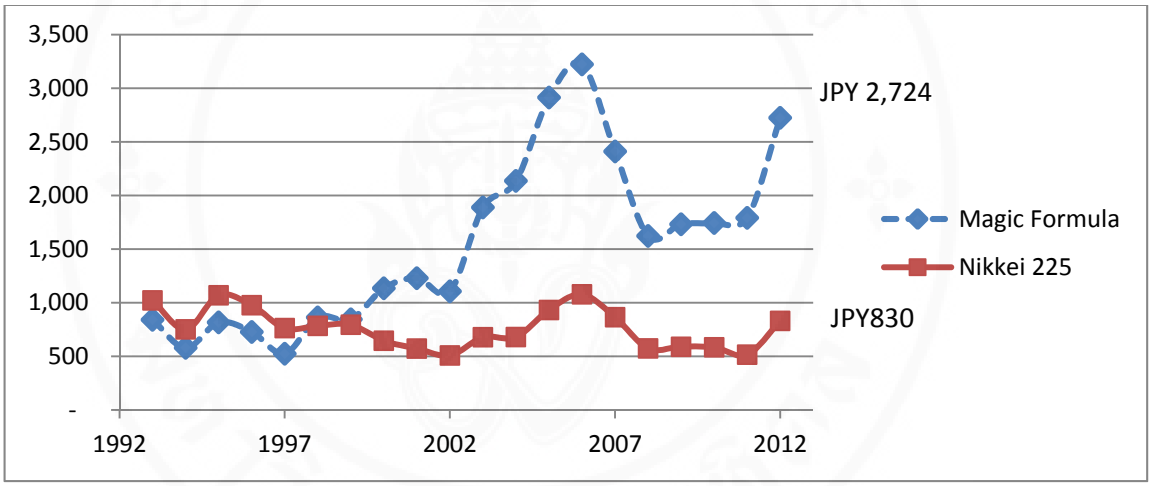
	Returns		Sharpe Ratios	
Year	Magic Formula	Nikkei 225	Magic Formula	Nikkei 225
1993	-15.9%	2.0%	-0.34	0.10
1994	-31.2%	-26.4%	-1.32**	-2.07
1995	41.1%	42.2%	1.32	1.80
1996	-11.0%	-8.6%	-0.69	-0.42
1997	-27.8%	-21.9%	-0.73**	-1.25
1998	64.3%*	2.8%	0.90**	0.20
1999	-2.0%	1.4%	0.06	0.15
2000	34.2%*	-18.8%	0.29**	-0.88
2001	8.4%*	-11.3%	0.16**	-0.49
2002	-10.1%*	-11.3%	-0.12**	-1.68
2003	70.8%*	33.4%	1.41	2.00
2004	13.1%*	0.4%	0.53	2.00
2005	36.5%	37.2%	1.02	1.84
2006	10.6%	15.6%	0.07	1.92
2007	-25.2%	-19.8%	-0.76**	-1.04
2008	-32.7%*	-33.6%	-0.67**	-1.06
2009	6.8%*	2.6%	0.26**	0.20
2010	0.6%*	-0.8%	0.07**	0.02
2011	2.7%*	-11.9%	0.25**	-0.51
2012	52.1%	61.2%	1.36**	0.25
Geometric Mean	**5.1%**	**-0.9%**		
Arithmetic Mean	**9.3%**	**1.7%**		

Note: * indicates that the magic formula's return is higher than the market's.
** indicates that the magic formula's Sharpe ratio is higher than the market's.

Table 4.4 Summary of the Magic Formula's Performance (Japanese Market)

	Magic Formula's Outperformance	Total Years	Winning Rate
Annualized Returns	10	20	50%
Annualized Sharpe Ratios	12	20	60%
Both the Returns and Sharpe Ratios	8	20	40%

Figure 4.2 Growth of JPY 1,000 from 1993 to 2012



4.3 The US Market

The returns and Sharpe ratios of the magic formula portfolio and the market (S&P500) on the US market are shown in **Table 4.5**.

The magic formula portfolio yielded the annualized return of 12.7% from 1993 to 2012, and outperformed the market, which generated 6.5% of the annualized return. An average return (arithmetic mean) for the magic formula portfolio was 15.5% while the one for the market was 8.8%. In 13 years out of the 20-year period of this study, the magic formula' return was higher than the market's. In 8 years out of the 20-year period, the magic formula's Shape ratio was higher than the market's. Only in 5 years out of the 20-year period, both the magic formula's return and Sharpe ratio were higher than the market's. This means that there were more years that the

magic formula produced a higher return than the market but with a higher risk, or simply the magic formula's return was lower than the market's.

The return figures in **Table 4.5** of the US market are different from Greenblatt's. This is because that my portfolio rebalancing timing, every March, is different from his, which is at the end of the year. Also while I obtained the data from Datastream, Greenblatt used Compustat. However, the results of this study draw the same conclusion: the magic formula can beat the market in a long run.

Although the magic formula's returns are generally higher than the market's, an analysis of Sharpe ratio raises a question of the magic formula's level of risk. Only in 8 years out of the 20-year period, or 40% of the time, the magic formula's Sharpe ratio is higher than the market's. This implies that the magic formula's higher return often comes from higher risk. In the US market, the magic formula is able to generate a higher return, yet the higher return is partly from taking a higher risk. **Table 4.6** summarizes the magic formula's performance.

Figure 4.3 exhibits a growth of hypothetical initial investment of USD1,000 from the begging of 1993 to the end of 2012, invested in the magic formula portfolio and the market index. It is clear to see that the magic formula's growth is superior to the market's. The initial investment grew to USD10,875 in 20 years whereas the market's growth is only to USD3,521.

With the results above, I reconfirm that Greenblatt's finding is positive. Nonetheless, the Sharpe ratio in this research indicates that the higher return is partly from higher risk.

Table 4.5 Magic Formula Results (US Market)

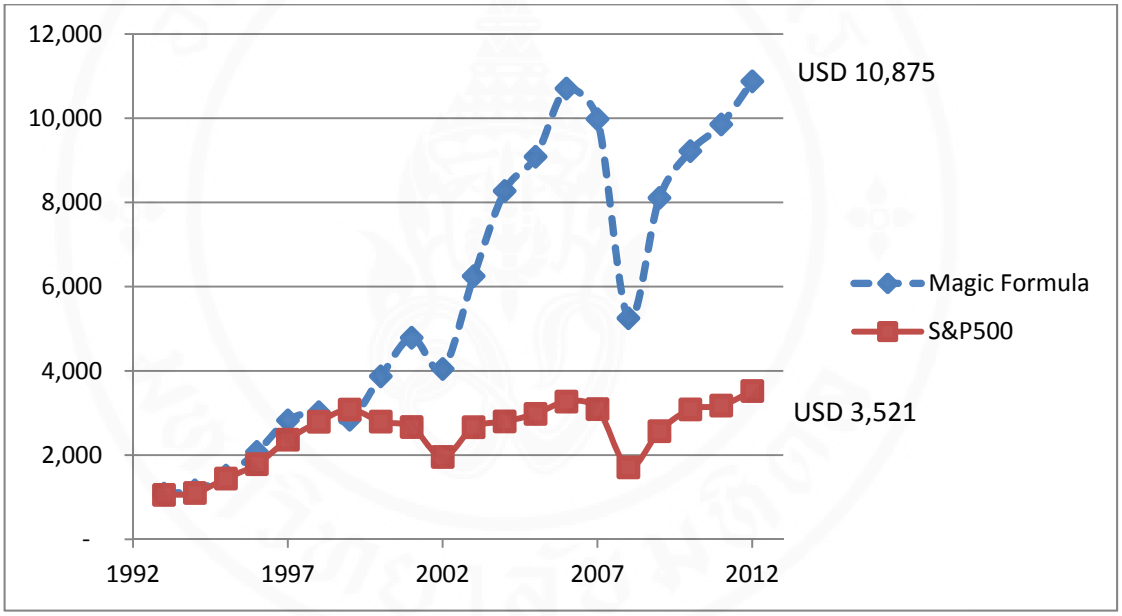
	Returns		Sharpe Ratios	
	Magic Formula	S&P 500	Magic Formula	S&P 500
1993	8.7%*	5.4%	0.14**	-0.14
1994	7.0%*	4.3%	0.10	0.15
1995	30.3%	31.4%	1.11	4.11
1996	37.2%*	23.5%	0.76	1.46
1997	35.9%*	32.7%	0.96	1.53
1998	6.9%	18.0%	0.08	0.64
1999	-5.9%	10.3%	-0.59	0.77
2000	36.1%*	-9.3%	0.72**	-0.71
2001	23.7%*	-4.6%	0.54**	-0.86
2002	-15.4%*	-26.7%	-0.45**	-1.31
2003	54.4%*	36.1%	1.78	3.29
2004	32.4%*	5.1%	0.86	3.31
2005	9.8%*	6.4%	0.32	0.87
2006	17.8%*	9.9%	0.70	1.12
2007	-6.8%	-5.4%	-0.75**	-0.93
2008	-47.4%	-44.8%	-1.37**	-1.56
2009	54.4%*	50.3%	1.80	2.73
2010	13.7%	20.2%	0.55	0.85
2011	6.9%*	2.9%	0.45**	0.22
2012	10.3%	10.9%	0.52**	0.07
Geometric Mean	**12.7%**	**6.5%**		
Arithmetic Mean	**15.5%**	**8.8%**		

Note: * indicates that the magic formula's return is higher than the market's.
** indicates that the magic formula's Sharpe ratio is higher than the market's.

Table 4.6 Summary of the Magic Formula's Performance (US Market)

	Magic Formula's Outperformance	Total Years	Winning Rate
Annualized Returns	13	20	65%
Annualized Sharpe Ratios	8	20	40%
Both the Returns and Sharpe Ratios	5	20	25%

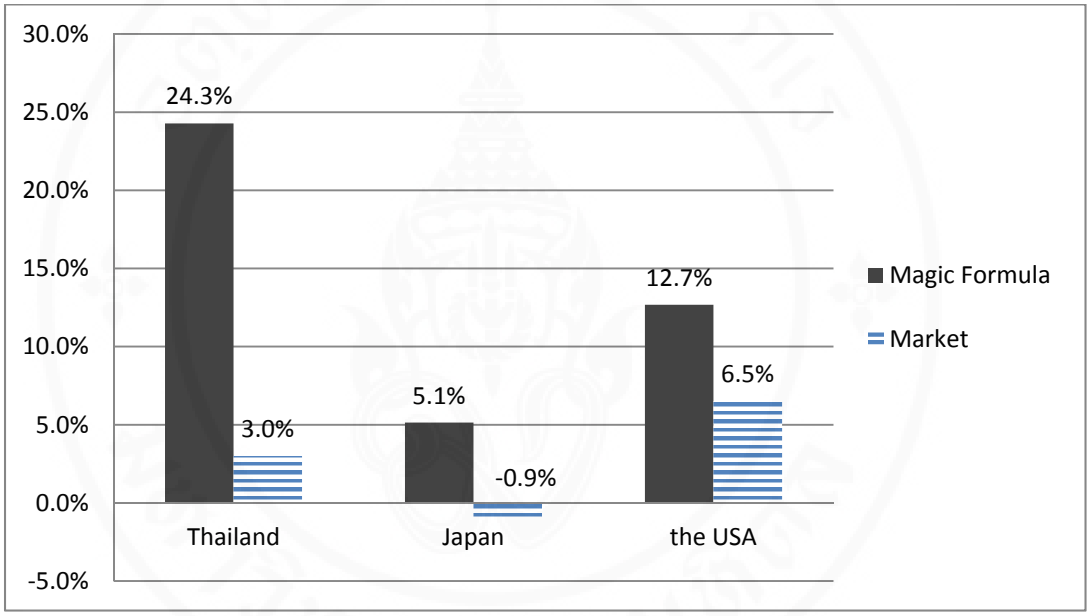
Figure 4.3 Growth of USD 1,000 from 1993 to 2012



4.4 Results Summary

Figure 4.4 displays the annualized returns from 1993 to 2012 on the Thai, Japanese, and the US markets. The magic formula outperformed the market in all the three markets in this study. It is noteworthy that the return on the Thai market is prominent.

Figure 4.4 Summary of the Annualized Returns on the Three Markets



One of the cautions I must mention is that, while the magic formula is able to beat the market, it does not always have positive returns. In this research, the magic formula beat the US market in 2002. The magic formula generated a return of -15.4% whereas the market produced that of -26.7%. Although the magic formula's return in 2002 was higher than the market's, the portfolio value decreased by -15.4%. In the same year, the 3-month US government bond yielded 1.76%, which means that investors could get a higher return without taking a risk if they bought the government bond instead of investing in the magic formula portfolio.

Another caution is that the magic formula's higher returns sometimes come from higher risk. In this study, there were some years that the magic formula generated higher returns than the market, but the magic formula's Shape ratio was

lower than the market. For example, my study on the Japanese market in 2003 shows that the magic formula produced a return of 70.8% when the Japanese market's return was only 33.4%. Nonetheless, the magic formula's Sharpe ratio, 1.41, was lower than the market, 2.00. Such years were found in all the three markets I researched in this study. This suggests that the magic formula may not be a suitable investment strategy for those who have little tolerance for risk.

CHAPTER V
CONCLUSION AND RECOMMENDATIONS

This study examines the validity of Joel Greenblatt's "Magic Formula," a simple stock selection model, across the Thai, Japanese, and the US markets. The study period covered in this study is from 1993 to 2012, for 20 years. The steps to screen out the stocks for the magic portfolio were quoted from Greenblatt's "The Little Book That Still Beats the Market," and the magic formula's returns were compared to the market's returns. The market returns were calculated from the benchmark indices for the each market, SET index for the Thai market, Nikkei 225 for the Japanese market, and S&P 500 for the US market. To measure risk-adjusted return, I conducted Sharpe ratio analysis in this research.

My study concludes that the magic formula beat the all three markets. The magic formula particularly worked well on the Thai market. The risk-adjusted returns were higher in the most years as well. This leads to implication of inefficiency of the Thai market. The magic formula managed to beat the Japanese market in terms of the annualized return although the results were not as convincing as the other markets. Market efficiency and the magic formula's non-endurance to lengthy recession may be reasons for the feeble effect of the magic formula on the Japanese market. On the US market, the magic formula outperformed the market, and thus I confirmed Greenblatt's discovery. Nevertheless, this study found that the magic formula's higher return in the US market was partially from higher risk.

Overall, this study suggests that the magic formula is a solid investment model especially given its simplicity. The magic formula's two factors, return on capital and earning yield, are important indicators for securing "margin of safety." The study also indicates that the magic formula may not benefit investors who have little risk tolerance.

Future research could focus on the following. The first is to test the magic formula on the other markets. This study as well as published literatures seems to

show that magic formula works universally on both the developed and emerging markets. Also, it would be interesting to find modified version of the magic formula. As Larkin (2009) tried other two-factor model such as B/M and market cap, the magic formula could be modified to generate better return or reduce risk. Because this research could not fully confirm the magic formula's validity on the Japanese market, seeking an adjusted version of the magic formula which also works on the Japanese market would be worthwhile. Finally among the others, the magic formula would be more convincing if researches are conducted for longer periods of time. Partly because the magic formula is rather a new model, published literatures on the magic formula focus on a more recent period, mostly dating back to only the mid 90s. As the data should be available especially for the developed market, examining the magic formula for a longer length would make the magic formula more persuasive.

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BIOGRAPHY

NAME	Yosuke Kakinuma
DATE OF BIRTH	15 June 1981
PLACE OF BIRTH	Sendai, Japan
INSTITUTION ATEENDED	San Diego State University, 2000-2002 Bachelor of Science (Finance) Mahidol University International School 2012-2014 Master of Business Administration (Business Modeling and Analysis)
HOME ADDRESS	The Corner 3302 366/1 Krungthoburi 6, Klongsan Bangkok 10660, Thailand
EMPLOYMENT ADDRESS	11th Fl, Nantawan Building 161 Ratchadmri Rd, Pathumwan Bangkok 10330, Thail