การลงทุนตามวัฏจักรกลุ่มอุตสาหกรรมด้วยกลยุทธ์การลงทุนแบบโมเมนตัม

INDUSTRY ROTATION USING MOMENTUM STRATEGY: EVIDENCE FROM THE STOCK EXCHANGE OF THAILAND

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บทคัดย่อ

การศึกษานี้มุ่งวิเคราะห์ผลงานของการลงทุนตามวัฏจักรกลุ่มอุตสาหกรรมด้วยกลยุทธ์การลงทุนแบบโมเมนตัมในตลาดหลักทรัพย์แห่งประเทศไทย ข้อมูลที่ใช้ในการศึกษาครั้งนี้ใช้ดัชนีผลตอบแทนรวมในระยะเวลา 141 เดือน ตั้งแต่เดือนมกราคม 2547 ถึงเดือนกันยายน 2558 โดยกลยุทธ์ที่ประสบผลสำเร็จมากที่สุดคือกลยุทธ์ที่ใช้ข้อมูลย้อนหลัง 6 เดือนในการเลือกหุ้นและลงทุนถือเป็นเวลา 1 เดือนก่อนจะทำการจัดพอร์ทใหม่ ซึ่งได้ผลตอบแทนการลงทุนสูงกว่ามาตรฐาน ดังนั้นจึงแสดงให้เห็นว่าการใช้กลยุทธ์โมเมนตัมโดยจัดพอร์ทใหม่ทุกเดือนจะทำให้ได้ผลตอบแทนที่ดีขึ้น ผลการศึกษาในครั้งนี้สามารถเป็นประโยชน์ต่อนักลงทุนสถาบันและนักลงทุนรายย่อยในการนำไปสร้างเป็นกลยุทธ์การลงทุนเพื่อให้ได้ผลตอบแทนสูงกว่าค่าเฉลี่ย นอกจากนี้ยังเสนอเทคนิคการลงทุนที่นักลงทุนรายย่อยสามารถนำไปใช้ได้ง่ายโดยมีต้นทุนการซื้อขายที่ไม่สูงมากนัก

คำสำคัญ: การลงทุนตามวัฏจักรกลุ่มอุตสาหกรรม การลงทุนแบบโมเมนตัม กลยุทธ์การลงทุน ตลาดหลักทรัพย์แห่งประเทศไทย การลงทุนแบบจับจังหวะตลาด

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Abstract

This paper examines the performance of industry rotation using momentum strategy evidenced from the Stock Exchange of Thailand. The data is based on the industry total return index during 141-month period starting from January 2004 to September 2015. The most successful strategy is the strategy with six-month formation period with one-month holding period that can generate the return significantly higher than a benchmark portfolio. This implies that determining the winner very frequently can improve the performance of the industry momentum strategy. Therefore, this paper has the contribution for both institutional investors and individual investors to exploit the knowledge in developing the investment strategy in order to earn above-average return. Moreover, the individual investors, by this technique then, can implement the strategy easily with relatively low transaction cost.

Keywords: Industry Rotation Momentum Strategy, Investment Strategy, Stock Exchange of Thailand, Marketing Timing

Introduction

The stock market and economic condition is expected to be closed related. Therefore, the economic fluctuation or business cycle can affect the fluctuation of stock market. However, each industry might be affected by the economic fluctuation differently. For example, Braun and Larrain (2005) have shown that the industries relying on external financing are affected more by recessions. Therefore, if investors can rotate among different industries properly by taking advantages from different impacts of business cycle on each industry, they can earn above-average return.

Many finance researches showed that the return of stock portfolio with high return for a specific period tends to be higher in the subsequent period. The phenomenon of performance persistence is known as the momentum effect. Although the momentum strategy has been well-documented in previous literature, the implementation of the strategy faces some limitations. The momentum strategy at individual stock level is based on the creation of portfolio representing winner and loser with respect to a full ranking of all individual stocks in such market. Moreover, the portfolio of stocks defined as winner or loser is much diversified and consists of many individual stocks like using top and bottom decile by Jegadeesh and Titman (1993) or using top 30% and bottom 30% by Fama and French (2012). The large diversified portfolio is difficult to be implemented especially by retail investors. Hussaini, Shafaee, and Garang (2016) have studied the existence of momentum in Thailand and found that there is a momentum return from investing in large-stock portfolio. Then, it is possible that this momentum effect may exist in the industry level in Thailand.

This paper provides the evidence for momentum strategy at the industry level or industry momentum strategy. Using the industry index published by the Stock Exchange, the

successful of the strategy can be implemented easily by any investor because the industry index is publicly available. The result shows that the industry rotation using momentum strategy can outperform the benchmark. The most successful strategy is the strategy using six-month formation period with one-month holding period generating significantly higher return than a benchmark portfolio. This implies that determining the winner very frequently can improve the performance of industry momentum strategy

In addition, the implementation of industry momentum can be exploited easily by retail investors, especially in the market that the mutual funds tracking industry index like exchange-traded funds (ETF) are widely available. Although the exchange-traded funds are not widely available, this paper suggests the simple rule of portfolio construction in order to exploit the industry momentum using the portfolio of a few stocks. Using this technique, the individual investors can implement this strategy easily and the transaction cost should be relatively lower. Furthermore, the abnormal performance of industry momentum strategy in this paper is still significant though the transaction cost is considered in performing rotation strategy month-by-month.

Literature Review

Jegadeesh and Titman (1993) has analysed the abnormal return from buying past winning stocks and selling past losing stocks. The result revealed that past winners can outperform past losers in the various investment horizon shorter than one year. This evidence implied that there is the momentum in stock return and the relative strength portfolio forming based on past return can generate abnormal return. Thereafter, momentum became popularity among financial researchers.

This momentum in stock return can be explained by the under-reaction stock market to new information like earnings announcement. Once there are positive or negative earnings surprise, this positive or negative effect will last for next two quarters on average (Chan, Jegadeesh, and Lakonishok, 1996). The similar evidence of positive stock price trend after the announced earnings is higher than expected earnings has been also documented by Jones and Litzenberger (1970). Chordia and Shivakumar (2002) have explained the return from momentum strategy using lagged macroeconomic variables. Once the stock return has been adjusted based on macroeconomics variables, the momentum return has disappeared.

Moskowitz and Grinblatt (1999) have adapted the momentum strategy at the industry level. The industry momentum is based on the industry portfolio from grouping stocks according to their industries. This industry momentum can contribute significantly to the return from momentum strategies on the portfolio of individual stocks.

Momentum also plays an important role in asset pricing model. Carhart (1997) has created the four-factor model by adding the momentum factors to the Fama-French three-factor model in order to the explain the mutual funds' returns. The four-factor model

including momentum can explain cross-sectional variation of mutual funds' returns better than CAPM and three-factor model. Thereafter, Fama and French (2012) have included momentum factor into their famous three-factor model to examine the international stock markets. They found that the momentum return is quite significant for all regions, except in Japanese stock market.

The momentum effect has been also found in various markets. Rouwenhorst (1998) found the momentum return of around 1% from the portfolio of stocks in twelve European countries. Liu, Liu and Ma (2011) have applied a 52-week momentum strategy proposed by George and Hwang (2004) to twenty major stock markets. They found that the momentum strategy is profitable for eighteen out of twenty markets. Not only from developed markets, Cakici, Fabozzi, and Tan (2013) have examined the value and momentum effect of eighteen emerging markets and found the momentum effect in almost all emerging markets except the markets in Eastern Europe region. Moreover, the momentum effect in emerging markets is mainly driven by small stocks. Asness, Moskowitz, and Pedersen (2013) have found the momentum effect in other asset classes beside stock like currency, government bond, and commodity futures.

Data and Methodology

This study examines the profitable from doing investment rotation for different industries using the momentum strategy. The return from investment in different industries is calculated from the industry index provided by the Stock Exchange of Thailand. The Stock Exchange of Thailand has classified stocks into 8 industries, which are Agro & Food (AGRO), Consumer Products (CONSUMP), Financials (FINCIAL), Industrials (INDUS), Property & Construction (PROPCON), Resources (RESOURC), Services (SERVICE), and Technology (TECH). The calculation of return is based on total return index that includes all three sources of income from investment in stocks, which are capital gain, rights offering, and dividends. The total return index for each industry is gathered from the Stock Exchange of Thailand during January 2004 - September 2015, which is totally 141 months. The return for each industry can be computed by the following equation.

$$R_{i,t} = ln(TRI_{i,t}) - ln(TRI_{i,t-1}), \quad (1)$$

where $R_{i,t}$ is the monthly return for industry i for month t and $TRI_{i,t}$ is the total return index of industry i for month t and $TRI_{i,t-1}$ is total return index of industry i for month t-1.

The momentum strategy is used as the signal in selecting the industry in order to conduct industry rotation investment. The winner based on m-month formation period is the industry with the highest m-month average return and the loser is the industry with the lowest m-month average return where m can be 1, 3, 6, and 12 in this study. Firstly, the industries

are ranked based on m-month average return to determine the winner and loser. Secondly, in the following n-month, the winning industry determined earlier will be invested where n can be 1, 3, and 6 months respectively. At the end of each n-month period, the process to determine the winner and loser will be repeated.

For example, in case of one-month formation period and one-month holding period (m=1, n=1), the winner is the industry with the highest previous month return. The winner will be bought and held for one month. After one month, the new winner will be determined. However, if it is the case of three-month formation period and six-month holding period (m=3, n=6), the winner is the industry with the highest historical three-month average return. The winner will be bought and held for consecutive six months. After six months, the new winner will be determined based on historical three-month average return. Then, the process will be repeated until the end of studying period.

Thereafter, the performance of each relative strength strategy for different holding periods will be compared to benchmark and buy-and-hold strategy in terms of mean return, standard deviation, Sharpe ratio, beta, and Jensen's Alpha. The Sharpe ratio is the ratio between portfolio excess return over risk-free and portfolio standard deviation. Jensen's Alpha is the portfolio's abnormal return over the expected return from the Capital Asset Pricing Model. Both measures show the performance of portfolio in term of risk and return trade-off.

The benchmark is based on total return index for the Stock Exchange of Thailand or SET TRI. The risk-free rate is from the average yield of one-month T-bill in Thailand during the same period, which is 2.468% per year.

Results and Discussion

The return for each industry is calculated as in equation 1. The period of data collection used in this study is during January 2004 to September 2015. The descriptive statistics of the return for each industry is reported in table 1.

Table 1 reports the descriptive statistics of monthly return for each industry. The Stock Exchange of Thailand has classified all stocks into 8 industries. The descriptive statistics of monthly return for overall market is also reported. The industry with the highest average return is Agro & Food Industry with the average return of 1.3845% per month or around 16.614% per year whereas the industry with the lowest average return is Industrials Industry with the average return of 0.3673% per month or around 4.4076% per year. Meanwhile the average overall market return is 0.7696% per month or around 9.2352% per year.

Table 1 Descriptive Statistics of Monthly Return for Industry

Industry	Mean (%)	S.D (%)	Minimum (%)	Maximum (%)
AGRO	1.3845	5.6050	-26.1154	14.6172
CONSUMP	0.7064	3.6974	-16.1623	10.7833
FINCIAL	0.6869	6.6373	-33.6073	18.6253
INDUS	0.3673	8.5779	-49.0763	23.7235
PROPCON	0.6450	7.1518	-37.3157	18.3675
RESOURC	0.6306	7.5245	-39.7054	17.4408
SERVICE	1.1955	5.9290	-38.0746	12.1072
TECH	1.0511	6.0275	-24.9348	13.9525
SET	**0.7969**	**6.1288**	**-35.8047**	**14.5725**

The interesting information is on the volatility. The volatility of Agro & Food Industry with the highest average return is only 5.6050%, which is lower than the average market volatility of 6.1288% implying that this industry provides high return with relatively low volatility during the studying period. This outstanding performance may be resulted from the industry-specific performance. However, the return from Agro & Food Industry is not always persistently higher than other industries. The maximum return of Agro & Food Industry during the analysis period is 14.6172%, which is clearly lower than Industrials Industry with the highest return up to 23.7235%. However, the return from Industrials Industry is quite volatile as the minimum return can be as worse as -49.0763% and the standard deviation of Industrials Industry is highest at 8.5779%.

Performance of Industry Rotation

The performance of industry rotation using momentum strategy for one-month formation with different holding periods has been shown in table 2.

Table 2 summarizes the performance of one-month formation period from industry rotation. The mean return and standard deviation as well as the Sharpe ratio are reported to compare the performance of different strategies with a benchmark. Using one-month formation period, the average monthly return for momentum strategy with one-month holding period is 1.0752% with the standard deviation of 6.0440% whereas the average monthly of overall market is only 0.7969% with the standard deviation of 6.1288%.

Table 2 Performance of industry rotation for one-month formation period

	One-month holding period	Three-month holding period	Six-month holding period	Benchmark
Mean Return (%)	1.0752	0.1166	0.3269	0.7969
S.D. (%)	6.0440	6.2705	6.9555	6.1288
Sharpe Ratio	0.1365	-0.0213	0.1151	0.0892
Mean Difference (%)	0.2783	-0.6803	-0.4699	
t-stat	0.6841	-2.0146	-1.4243	
Beta	0.6797	0.8150	0.8324	
Jensen's Alpha (%)	0.4677	-0.5709	-0.3708	

** indicates significant at 10% and ** indicates significant at 5%*

The result from one-month holding period shows that the momentum strategy can generate higher return than overall market. This higher return is not the result of taking higher risk because the momentum strategy has a slightly lower standard deviation than overall market. This reflects on the Sharpe ratio of 0.1365 for the momentum strategy, which is higher than the benchmark from overall market of 0.0892. The difference in average monthly return is 0.2783% per month or 3.3396% per year, which is economically significant. However, the result of t-test shows that this difference is not statistically significant.

Once the holding period of momentum strategy has been extended to three-month and six-month, the performance of momentum strategy is worse than one-month holding period and lower than the overall market. This means that extending the holding period will deteriorate the performance of momentum strategy. However, this result is not surprising based on previous studies about momentum, especially from the original work by Jegadeesh and Titman (1993). In their seminal paper, the most successful strategy is the strategy with the longest formation period but the shortest holding period within the horizon of one year. The result from one-month formation period shows that one-month holding period is the best performance strategy.

As mentioned earlier, the momentum strategy provides higher return but lower standard deviation than overall market. However, the standard deviation may not be a good measurement of risk because it is not totally priced by the popular asset pricing model as some portion of risk can be diversified in portfolio investment. The systematic risk measured by beta can be a better measurement of risk. However, the result is not different because the momentum strategy results in lower beta, which is only 0.6797 compared to the unit beta of overall market used as the benchmark. Under the context of capital asset pricing model, the abnormal return of momentum strategy using Jensen's Alpha is 0.4677% per month or 5.6124% per year, which is again marginally high.

The performance of industry rotation using momentum strategy based on other formation periods including three-month, six-month, and twelve-month are reported in table 3, table 4, and table 5, respectively.

Table 3 summarizes the performance of three-month formation period from industry rotation. The average monthly returns of momentum strategy with one-month holding period, three-month holding period and six-month holding period are 1.5560%, 1.1963%, and 1.3288%, respectively. The momentum strategies using three-month formation period are more successful than using one-month formation period in all holding periods. Moreover, the returns of momentum strategies have outperformed the benchmark from overall market. Evidently, the most successful strategy is one-month holding period, which is the shortest holding period used in various momentum strategies.

Table 3 Performance of industry rotation for three-month formation period

	One-month holding period	**Three-month holding period**	**Six-month holding period**	**Benchmark**
Mean Return (%)	1.5560	1.1963	1.3288	0.8679
S.D. (%)	6.5296	6.7103	6.6831	6.1161
Sharpe Ratio	0.2068	0.1476	0.1680	0.1083
Mean Difference (%)	0.6882	0.3285	0.3074	
t-stat	1.7986*	0.8937	0.7754	
Beta	0.7982	0.8515	1.0316	
Jensen's Alpha (%)	0.8218	0.4268	0.2864	

** indicates significant at 10% and ** indicates significant at 5%*

Although the standard deviation of the momentum strategy with one-month holding period is slightly higher than overall market, the return from the strategy is much higher than the average return of overall market. Therefore, this results in the Sharpe ratio for the momentum strategy of 0.2068, which is almost double from the benchmark Sharpe ratio of only 0.1083. The average return of momentum strategy with three-month formation period and one-month holding period is higher than the overall market by 0.6882% per month or 8.2584% per year, which is economically significant and statistically significant at 10% level. Similar to the result reported earlier, the momentum strategy has the beta of 0.7982, which is lower than the market beta. With the higher average return and lower systematic risk gauged by beta, the abnormal return based on Jensen's alpha is as high as 0.8218% per month or 9.8616% per year.

Table 4 summarizes the performance of six-month formation period from industry rotation. The result is similar to the performance of three-month formation period reported

in table 3. The momentum strategies have outperformed the benchmark for all holding periods. The best performance is one-month holding period with the average monthly return of 1.7528%. The benchmark portfolio has the average monthly return of 0.8991% and standard deviation of 6.1790%. The standard deviation of one-month holding period is 6.6149%, which is slightly higher than the benchmark. However, this higher standard deviation cannot be compared to the large difference in monthly return. The Sharpe ratio for one-month holding period is 0.2339, which is more than double of the benchmark Sharpe ratio of 0.1122.

Table 4 Performance of industry rotation for six-month formation period

	One-month holding period	**Three-month holding period**	**Six-month holding period**	**Benchmark**
Mean Return (%)	1.7528	1.4427	1.0736	0.8991
S.D. (%)	6.6149	6.4800	7.3964	6.1790
Sharpe Ratio	0.2339	0.1909	0.1173	0.1122
Mean Difference (%)	0.8538	0.5436	0.3060	
t-stat	2.0093**	1.3782	0.7824	
Beta	0.7444	0.7667	0.7611	
Jensen's Alpha (%)	1.0310	0.7054	0.4717	

** indicates significant at 10% and ** indicates significant at 5%*

The average return of momentum strategy with six-month formation period and one-month holding period is higher than the benchmark by 0.8538% per month or 10.2456% per year, which is economically significant and statistically significant at 5% level. Although the standard deviation of momentum strategy is higher than benchmark, the beta is clearly lower than the beta of overall market at 0.7444. The abnormal return based on Jensen's alpha is 1.0310% per month or 12.372% per year.

Table 5 summarizes the performance of twelve-month formation period from industry rotation. The most successful strategy using twelve-month formation period is the shortest holding period, which is one-month. The average monthly return is 1.1721%. However, only momentum strategies using one-month holding period and three-month holding period can generate return above the overall market. The return for six-month holding period is lower than the benchmark. Although the return of one-month holding period is higher than the benchmark, the standard deviation is evidently higher and this results in the Sharpe ratio of only 0.1329, which is slightly higher than the benchmark of 0.1034.

Table 5 Performance of industry rotation for twelve-month formation period

	One-month holding period	Three-month holding period	Six-month holding period	Benchmark
Mean Return (%)	1.1721	1.0292	0.5996	0.8562
S.D. (%)	7.2707	7.3732	6.8800	6.2897
Sharpe Ratio	0.1329	0.1117	0.0573	0.1034
Mean Difference (%)	0.3159	0.1730	-0.0748	
t-stat	0.7168	0.4012	-0.1840	
Beta	0.8269	0.8605	0.8232	
Jensen's Alpha (%)	0.4286	0.2638	0.0402	

** indicates significant at 10% and ** indicates significant at 5%*

The return of one-month holding period is higher than overall market for only 0.3159%, which is not statistically significant at any convention level. However, the betas of momentum strategies are still obviously lower than the overall market. This results in the Jensen's alpha of 0.4286% per month or 5.1432% per year.

Based on all momentum strategies mentioned earlier, it demonstrates that the shorter holding period has generated better performance. However, in terms of formation period, the intermediate range of formation periods like three-month or six-month can perform better than the shorter one like one-month and the longer one like twelve-month. The most successful strategies are the strategy using six-month formation period with one-month holding period and the strategy using three-month formation period with one-month holding period.

If the short-selling is not much restricted, investors implementing the momentum strategy can create the portfolio of taking long position of winner or buying winner and taking short position of loser or selling loser. This strategy will create the portfolio with zero investment. The way to create such portfolio is similar to what have been done earlier. However, instead of only buying the winner or the industry with highest past return during formation period, the zero-cost investment strategy will also short sell the loser or the industry with lowest past return during formation period. The winner and loser are determined at the end of each holding period.

The earlier results in this paper have shown that one-month holding period outperform other ranges of holding periods. The result of zero-investment portfolios using various formation period with one-month holding period is reported in table 6.

Table 6 summarizes the performance of zero-investment portfolio strategy for various combinations of formation periods and holding periods. The zero-investment portfolio should not generate any positive return significantly; otherwise the market efficiency becomes questionable. The t-statistics is from the statistic test of mean whether it is significantly

different from zero or not. The result of zero-investment portfolio strategy from table 6 is qualitatively similar to long-only strategy reported earlier. The best formation period used to determine winner and loser is six-month period, whereas the best holding period of the strategy is the shortest one, which is one-month period.

Table 6. **Performance of zero-cost portfolio with momentum strategy**

		One-month holding period	Three-month holding period	Six-month holding period
One-month	Mean Return	1.0508	-0.0148	-0.6644
Formation Period	t-statistic	1.8003*	-0.0296	-1.3556
Three-month	Mean Return	1.3288	0.3743	0.3594
Formation Period	t-statistic	2.3692**	0.6831	0.6103
Six-month	Mean Return	1.0736	0.7826	0.4969
Formation Period	t-statistic	1.7296*	1.3646	0.8399
Twelve-month	Mean Return	0.5996	0.2545	-0.0505
Formation Period	t-statistic	1.0386	0.4281	-0.0859

** indicates significant at 10% and ** indicates significant at 5%*

Jagedeesh and Titman (1993) have reported that the zero-investment momentum strategies can generate significantly positive return for almost all combinations of formation periods and holding periods ranging from three-month to twelve-month. However, the result of zero-investment momentum strategy at industry level can generate significant return for only one-month formation period with one-month holding period, three-month formation period with one-month holding period, and six-month formation period with one-month holding period.

Portfolio Construction for Industry Rotation

The previous section has shown that the momentum strategy is valuable for the implementation of the rotation strategy among different industries. The industry rotation strategy using six-month formation period in order to select winner and loser can generate superior performance. However, the implementation of such strategy is difficult because investors need to replicate the industry portfolio. In some developed markets, there are mutual funds and exchanged-traded funds (ETFs) replicating the return of each specific industry. Without such funds, it is not easy to create their own portfolio in order to replicate return of the whole industry, especially for retail investors

Therefore, this paper proposes the simple rule to construct the portfolio in order to exploit the industry rotation strategy. The industry index published by the Stock Exchange of Thailand has been calculated based on value-weighted, the stocks with larger market capitalization can influence the index number more. Therefore, we can construct the portfolio

with small number of stocks in that industry like three stocks or five stocks in order to get the return comparable to the whole industry.

As shown earlier, the best formation period is six-month period. The evidence in this section is provided for six-month formation period. The winner or loser is determined using the industry index but the investment has been done using the portfolio of small number of large-cap stock in that industry. Firstly, the industries are ranked based on six-month average return in order to determine the winner and loser. Secondly, in the following n-month, the portfolio of three or five largest capitalization stocks in the winning industry will be invested where n can be 1, 3, and 6 months, respectively. At the end of each n-month period, the process to determine the winner and loser will be repeated until the end of the studying period. The performance of portfolio construction based on six-month formation period for three-stock portfolio and five-stock portfolio has been reported in table 7 and table 8, respectively.

Table 7 summarizes the performance of three-stock portfolio construction using six-month formation period. The return of portfolio construction is slightly lower than using the return from industry index as reported in table 4. Looking on one-month holding period, the momentum strategies using industry portfolio can generate the average monthly return of 1.7528% with the Sharpe ratio of 0.2339 whereas the average monthly return of three-stock portfolio construction is only 1.5085% and the Sharpe ratio is 0.1823. The performance of three-stock portfolio is lower than using the whole industry portfolio.

Table 7 Performance of three-stock portfolio construction for six-month formation period

	One-month holding period	**Three-month holding period**	**Six-month holding period**	**Benchmark**
Mean Return (%)	1.5085	1.5967	1.0561	0.8991
S.D. (%)	6.9043	6.7940	6.7696	6.1790
Sharpe Ratio	0.1823	0.1982	0.1191	0.1122
Beta	0.6667	0.6782	0.6814	
Jensen's Alpha (%)	0.8406	0.9207	0.3779	

** indicates significant at 10% and ** indicates significant at 5%*

However, the performance of portfolio construction using six-month formation period is still better than benchmark for all holding period. Similarly, the betas of all momentum strategies range from 0.6667 to 0.6814, which is obviously lower than the market beta. The result also shows that the abnormal return for one-month holding period using Jensen's alpha is 0.8406% per month or 10.0872% per year.

Table 8 summarizes the performance of five-stock portfolio construction based on six-month formation period. The performance of five-stock portfolio construction is qualitatively similar to the preformation of three-stock portfolio construction reported in table 7. Although the performance is lower than using the return from industry index, the portfolio construction can generate higher return and Sharpe ratio than benchmark. Moreover, the portfolio betas from momentum strategies are obviously lower than benchmark but they can generate the abnormal return over the market benchmark.

Table 8 Performance of five-stock portfolio construction for six-month formation period

	One-month holding period	**Three-month holding period**	**Six-month holding period**	**Benchmark**
Mean Return (%)	1.1704	1.2926	0.9318	0.8991
S.D. (%)	5.8755	6.1103	6.2889	6.1790
Sharpe Ratio	0.1566	0.1706	0.1084	0.1122
Beta	0.6548	0.7358	0.7659	
Jensen's Alpha (%)	0.5697	0.6431	0.2642	

** indicates significant at 10% and ** indicates significant at 5%*

Further Discussion

Based on the earlier results, the momentum strategies are successful for implementing industry rotation. Investors can use the historical return of each industry to determine the past winner and invest in such industry for some specific holding period, then, reselecting the new industry for investing. The strategy can generate higher return than benchmark with slightly increase in standard deviation. Moreover, the momentum strategies have lower beta than the average, which can generate abnormal return measured by Jensen's alpha.

This section evaluates the performance of most successful momentum strategies reported earlier in this paper with the buy-and-hold strategy for one specific industry with the highest average return. The result is shown in table 9.

Table 9 summarizes the performance of two most successful momentum strategies and the performance of buy-and-hold strategy for specific industry. The first strategy is the momentum strategy with six-month formation period and one-month holding period. The second strategy is the momentum strategy with three-month formation period and one-month holding period. The buy-and-hold strategy for specific industry is based on the industry with highest average return during the period used in this study, which in fact cannot be determined in advance. This paper assumes that investors can select the highest return industry and investors will buy and hold in that industry portfolio for the whole period of this study. The

performance of such buy-and-hold strategy is shown for comparison purpose. The market portfolio is also as the benchmark.

Table 9. Performance Evaluation of Industry Momentum Strategies

	Momentum Strategies		Buy-and-Hold	
	Strategy 1	**Strategy 2**	**Industry**	**Market**
Panel A: Performance Summary				
Mean Return (%)	1.7528	1.5560	1.3845	0.8991
S.D. (%)	6.6149	6.5296	5.6050	6.1790
Semi S.D. (%)	4.7128	4.7640	4.3780	4.9970
Beta	0.7444	0.7982	0.7243	
Jensen's Alpha (%)	1.0310	0.8218	0.7815	
Panel B: Marketing Timing				
Constant	0.1345	-0.0611	0.9359	
	(0.2088)	(-0.1027)	(1.9361)	
x(t)	0.9747	1.2099	0.6839	
	(6.7394)**	(7.7678)**	(0.1078)	
y(t)	0.3736	0.3736	-0.0659	
	(1.7825)*	(1.9536)*	(-0.4216)	

Note: *The number in parenthesis is t-statistics*

** indicates significant at 10% and ** indicates significant at 5%*

Based on table 9 panel A, although both momentum strategies have higher standard deviation than the market, their semi-standard deviations are slightly lower. This means that the momentum strategies may face higher risk than the benchmark in terms of standard deviation; the semi-standard deviation shows that the downside risk of momentum strategies is slightly lower than the benchmark. However, if investors select the correct industry (though they cannot really do so) then buy that industry portfolio and hold until the end of period of study, they can earn the higher return than benchmark. the semi-standard deviation and beta of the industry portfolio are also lower than market and two momentum strategies. Anyway, the performance of that buy-and-hold portfolio is still lower than two momentum strategies.

One explanation of abnormal return from using momentum strategy in industry rotation is that the momentum strategy can reduce possible loss during the market downturn. This is usually known as market timing. The portfolio with market timing can adjust their components to reduce loss during down period but can capture the gain during up period. In the context of market model, the measurement of stock volatility with market or beta can represent how such stock moves against the market portfolio. If there is market timing, the beta should be lower during the market downturn because the portfolio return is less volatile

and does not go down as much as the market. Henriksson and Merton (1981) have proposed the model to measure this market timing using the following equation.

$$Z_p(t) - R_t = \beta_0 + \beta_1 x(t) + \beta_2 y(t) + \varepsilon \quad (2)$$

where $Z_p(t)$ is the portfolio return, $R(t)$ is the return on risk-free portfolio, $x(t)$ is market risk premium, and $y(t) = max[0,-x(t)]$. During the market upturn, the second term in equation 2 is zero and β_1 represents the portfolio beta during that period. However, during the market downturn, the second term will be activated and the portfolio beta is represented by ($\beta_1 - \beta_2$), which is lower than the portfolio beta during upturn by β_2. Therefore, the market timing of portfolio can be shown that the coefficient of $y(t)$ or β_2 should be positive and statistically significant at convention level.

Based on table 9 panel B, the result of strategy 1 or the momentum strategy using six-month formation period and one-month holding period, the coefficient of $y(t)$ or β_2 is 0.3736, which is statistically significant at 10% level representing the market timing in the strategy 1. During the market upturn, the portfolio beta is 0.9747, which is very close to one implying that the portfolio return will change similarly to the market. However, during the market downturn, the portfolio beta is just 0.6011 allowing the portfolio to face lower loss during such period. The result of strategy 2 or the momentum strategy using three-month formation period and one-month holding period yields qualitatively similar. The beta is 1.0299 during market upturn and is only 0.6546 during the market downturn.

However, the result from the industry portfolio is totally different. The coefficient of $y(t)$ or β_2 is not positive and not statistically significant at any level. This is not surprising because the industry portfolio is from the buy-and-hold of one industry with the highest average return. Although the return is relatively high, it does not arise from market timing as in the portfolio with industry rotation using momentum strategy.

Conclusion

This paper examines the industry rotation investment using momentum strategy. At the beginning of each holding period, the winner is determined from an industry with the highest historical m-month average return where m is the number of month for formation period. The winning industry will be invested for n-month holding period. At the end of each holding period, the winner will be selected and invested. The formation periods can be one-month, three-month, six-month, and twelve-month whereas the holding periods vary from one-month, three-month, and six-month.

The optimal formation period is the middle range like three-month and six-month period. Meanwhile, the best holding period is one-month period implying that determining the winner very frequently can improve the performance of industry momentum strategy. In

conclusion, the most successful strategy is the strategy with six-month formation period with one-month holding period. The average return for this strategy is higher than the benchmark market portfolio by 0.8538% per month or 10.2456% per year, which is both statistically and economically significant. Although the standard deviation of this strategy is slightly higher than the benchmark, the beta of the strategy is only 0.7444, which is below the average level. This results in the abnormal return or Jensen's alpha of 1.0310% per month or 12.372% per year.

The momentum strategy proposed in this paper can be implemented easier compared to the momentum strategy using the portfolio of individual stocks. In such case, the portfolio is much diversified and cannot be implemented easily, especially by retail investors. The industry momentum strategy used in this paper applies the total return industry index published by the Stock Exchange of Thailand that is widely available for all investors. The investment in a specific industry can be selected easily using the industry index fund or ETF. In case that such funds are not available, this paper also proposes the simple portfolio construction rule with only three or five stocks in the portfolio. The result shows that the performance of portfolio construction is slightly lower than the industry portfolio but is still higher than the benchmark.

The best strategy in this paper using one-month holding period requires the payment of transaction costs, which can reduce the return of industry rotation strategy. However, the round-trip commission fees in Thailand are about 0.3%. Thus, the most successful momentum strategy in this paper including the transaction cost yields the net return of 0.5538% per month or 6.6456% per year, which is still economically significant.

This paper has provided the evidence of momentum strategy in Thailand at the industry level. The future research can be conducted to examine the success from using momentum strategy together with other investment strategies to create a better performance for their investment portfolio.

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