Erasmus
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Economics

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ERASMUS SCHOOL OF ECONOMICS

Bachelor Thesis [Financial Economics]

Evidence of momentum returns across countries

Name Student: Bradley Gan

Student ID Number: 475301

Supervisor: Dr. Mayer, S.R.

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Abstract

Using the Fama-French methodology, this paper investigates the momentum effect in individual countries with different stock market capitalization across Asia. Six size-book to market ratio portfolios, as well as portfolios based on past returns with a one-year holding period to investigate the momentum effect, are formed to test for momentum profits. The results show that momentum profits are higher in countries with larger stock market capitalization. This finding implies that future research should take caution in studying the momentum effect across regions and ensure that countries that are grouped together have comparable stock market capitalization.

Keywords: Fama-French four-factor model, Momentum Effect

1. Introduction

There have been many authors who investigated how past returns explain stock returns. As a result, various investment strategies that utilize past returns to predict future returns have emerged. Some examples include momentum investing, technical analysis, and contrarian investing. This paper focuses on momentum investing. A momentum strategy is a usually executed by buying stocks that experienced relatively higher returns in the past (winners) and short selling stocks that had relatively lower returns (losers). Jegadeesh and Titman (1993) were one of the first few authors who documented momentum investing and found strong evidence for this strategy in the U.S. Since then, other authors have followed in their stead and found positive returns to momentum strategies in other countries like the UK, various European countries, and Asia with the exception of Japan. From there, momentum strategies have become one of the strongest empirical regularities in finance (Asness, 2011).

There have been several theories that have tried to explain the returns of momentum investing. The literature suggests three possible explanations for this consistent empirical irregularity, namely changes to price risk, pricing inefficiencies in the market, and data mining. Several other studies have also weighed in on the debate as to which factor best explains the abnormal returns to momentum investing. However, most of these studies focused on stock markets and countries with relatively large market capitalizations such as the US, UK, Europe, and Japan. In contrast to the other countries researched, Japan showed insignificant evidence of momentum (Griffin, Ji, and Martin, 2003; Asness, Moskowitz, and Pedersen, 2010; Fama and French, 2010; Asness, 2011). Asness (2011) concludes that the empirical failure of momentum in Japan does not the discount previous evidence of momentum. This is because there is a high chance that one strategy in one region has delivered poor results. Other studies in the world are robust and should not waiver due to the weak results in Japan. However, in Asness' (2011) sample, Japan stocks have on average relatively lower market capitalizations than that of US, UK, and Europe. This leads me to investigate the effects of momentum in different markets and in stocks of different size. Therefore, I formulate the research question of:

How do momentum investing returns vary across different countries in the Asia Pacific region compared to other regions from 2005 to 2019?

This paper examines whether the failure of momentum investing in Japan is also common to other Asian countries. Much of the literature that has investigated momentum profits focused on major stock markets such as those in the U.S., U.K., Europe, and Japan. To further expand the range of countries studied, this paper will include predominately smaller Asian countries of which momentum strategies have not been extensively researched yet. Fama and French (2012) tested momentum strategies across various regions such as the North America, Europe, Japan, and the Asia Pacific. Though they found momentum profits in every region except Japan, which is notably just one country, in contrast to the other regions in their sample. The ability to classify groups of countries together is based on the assumption of market integration. Fama and French (2012) suggested that their tests casts doubt on the validity of the market integration assumption in the Asia Pacific region. Therefore, in this paper, the relatively smaller and less developed smaller Asia Pacific countries are separated into individual countries. To investigate this, momentum returns across these countries will be compared. Furthermore, this paper uses a sample of relatively recent data which is important considering that the momentum effect could be a market inefficiency (or behavioral) phenomenon, which could correct itself over time.

In the rest of this paper, the theoretical framework, where the possible explanations to momentum investing, is first described. Next, the data and several initial tests on it are presented. After that, comes the methodology section in which the portfolio formation and holding periods are described. Next, the results of the momentum strategies of the various countries are presented. The results are then analyzed and interpreted in the discussion section. Finally, the main findings of this paper are summarized and some concluding remarks such as the limitations and recommendations for future studies are given.

2. Theoretical Framework

The previous literature suggests three possible explanations for the returns of momentum strategies: data mining, changes to price risk, and pricing inefficiencies in the market. There is still some contention with regard to which factor is the main determinant of the momentum effect. The recent inability of risk explanations to do has led to several authors pointing towards behavioral explanations. Jegadeesh and Titman (2011) argue that the magnitude and persistence of momentum returns are too strong to be explained by risk and a focus on behavioral models should be taken instead.

First, in terms of changes to price risk, momentum-based strategies, which consists of rebalancing portfolios based on going long in past winners and shorting losers, lead to higher returns as compensation for higher risk undertaken (Rouwenhorst, 1998). Cross-sectional dispersion in expected returns is one possible aspect that could give rise to momentum profits (Jegadeesh & Titman, 2011). Realized returns have a component correlated to expected returns. Thus, stocks that had higher returns in one period is expected to have higher average returns in the following period (Jegadeesh & Titman, 2011). In addition, positive serial correlation in factor returns could also lead to higher momentum profits. Stocks that had a high factor realization will be accompanied by relatively larger factor realizations in the following periods. Thus, momentum profits could be a result of higher systematic risks undertaken by investors. Rouwenhorst (1998) also found that international momentum returns are correlated with those of the US. This suggests that exposure to a common factor could be driving the returns of momentum strategies. In support of this proposition, Fama and French (1996) argue that there may by another undiscovered risk factor that could explain the large variation in momentum returns. Thus, the returns to momentum strategies are only a symptom of an underlying cause. However, a new risk factor has not yet been discovered. Some arguments against risk-based explanations for momentum profits include the fact that past studies, which have successfully found momentum results, still leave a large part of the variation in stock returns unexplained (Gilbert & Ward, 2009). The magnitude and persistence of momentum returns seem to be too strong to be explained by risk and this points to behavioral models for an answer (Jegadeesh & Titman, 2011).

Next, another potential source of momentum profits could be market inefficiency. Under the behavioral model, momentum profits arise due to a delayed reaction to information. For instance, if the efficient market hypothesis fails and stock prices do not fully react to positive news, the rise in price of this stock is not fully captured by the market and rises only partially as well. Buying this stock now would then take advantage of the delayed reaction and create momentum profits. On the other hand, one piece of evidence that suggests that momentum strategies are not explained by market inefficiency is its persistence over time. Under the efficient market hypothesis, investors will take advantage of any predictable pattern and exploit it until that advantage ceases to exist (Jegadeesh & Titman, 2011). However, momentum strategies have been well-researched since the 1990s and have

continued to generate excess profits in the following years. This implies that the momentum profits are not a result of some sort of market inefficiency, but rather because of a priced risk.

In addition, given how behavioral patterns can vary from country to country, the trading behavior of investors in different countries also impact the level of momentum profits. Nofsinger and Sias (1999) found that institutional herding is positively correlated with lag returns and possibly also with stock return momentum. Herding occurs when a group of investors trade in the same direction over time. This could be due to various reasons such as agency problems, security characteristics, fads, or information availability in the market (Nofsinger and Sias, 1999). Furthermore, institutional herding impacts prices more than herding by individual investors. Choi and Skiba (2015) find that institutional herding is more prevalent in countries with lower levels of information asymmetry. This refers to countries with better stock market development, readily available information, corporate transparency, implying that institutional herding is more pervasive in developed countries. With higher levels of institutional herding, the likelihood of momentum profits increases. Thus, different behavioral patterns in countries can influence momentum profits to different extents.

Third, the other possible explanation to momentum profits is data mining. There is always a chance that the empirical evidence of the success of momentum strategies happened by chance. However, this possibility can be gradually reduced with successful out-of-sample tests (Asness, 2011). And indeed, momentum strategies have successfully survived several out-of-sample tests across various countries with the exception of Japan (Griffin, Ji, & Martin, 2003). However, there is a high chance that one strategy in one region where momentum strategies failed and the empirical results of Japan leave the evidence from other parts of the world unscathed. Therefore, it is unlikely that the persistent and significant momentum profits occurred because of data mining.

Based on the main findings of the current literature, it still remains unclear whether momentum effects are due to a priced risk or behavioral explanations. To summarize, several studies that have examined risk, which although successfully obtained evidence of momentum profits, found that the current risk-based models are insufficient to explain momentum profits. The main two contenders are either behavioral patterns or an undiscovered risk factor since the possibility of data mining has been significantly reduced.

Using the insights from the aforementioned literature, two hypotheses are formulated to test the characteristics of momentum profits:

H_1: Momentum profits are lower in countries with lower stock market capitalization.

Countries with more developed and higher stock market capitalization have a higher degree of institutional herding. Since institutional herding affects momentum profits more than individual investors, momentum profits will differ depending on the investor profile. If momentum profits are lower in less developed stock markets, explanatory power could be assigned to behavioral patterns.

3. Data and Methodology

To study momentum profits, monthly closing stock prices from 2005 to 2019 are obtained from Datastream. Asness, Moskowitz, and Pedersen (2013) also used Datastream data for stocks outside of the U.S. For each country, firms listed in the stock market with the highest market capitalization are used as the sample from that country. The only exception is the US where firms from a mixture of multiple indices to ensure an accurate representation of the firms in the US. These stock prices are adjusted for dividends and stock splits. Furthermore, none of the stocks were delisted during the sample period. The countries examined are shown in Table 1. Some statistics of these countries are also included. Using the adjusted stock prices, monthly continuous returns are calculated. This is done by the following formula:

$$r_{monthly} = \ln\left(\frac{Price_t}{Price_{t\_1}}\right)$$

In addition to stock prices, the market capitalization and book-to-market ratio (BM) of each firm were also obtained from Worldscope. Firms that had missing data for either of this were eliminated. The market value is calculated by multiplying the share price by the number of ordinary shares outstanding. The BM value is obtained by dividing the book value per share by the share price. To create the market indices for each country, the value-weighted returns of all stocks in the respective portfolios are used. Some statistics of the market indices can also be found in Table 1. The one-month U.S. Treasury bill rate is used as the risk-free rate which was obtained from Federal Reserve Economic Data (FRED).

Table 1. List of countries.

Country	Number of stocks	Number of observations (months)	Average market capitalization in USD	Country-index mean returns	Standard deviation
US	494	154	31014.91	0.0814	0.1932
China	192	154	13828.93	0.1406	0.3941
Singapore	94	154	4570.39	0.0181	0.2693
Philippines	50	154	2958.21	0.1244	0.2834
Vietnam	92	131	923.85	-0.0007	0.2541
Indonesia	50	154	4246.33	0.1631	0.2662
Malaysia	88	154	2907.71	0.0901	0.1840
Thailand	48	154	5922.13	0.0999	0.2539
Taiwan	70	154	8035.79	0.0546	0.2061
South Korea	97	154	7794.39	0.0473	0.1855
India	100	154	7072.59	0.1367	0.2627
Hong Kong	97	154	18367.93	0.1023	0.3047

3.1 Portfolio Construction

To form the momentum portfolios, the stocks are first ranked into three deciles according to their cumulative returns for the holding period. The ranking periods ranged from 3- to 12-months. Furthermore, a one-month gap between the ranking period and formation date is used to avoid the short-term reversals (Daniel & Moskowitz, 2016). This is considered standard in the literature and aligned to the strategies that are used by other authors (Jegadeesh and Titman, 1993; Asness, 1994; Fama & French, 1996). Jegadeesh and Titman (1993) ranked stocks into three deciles. In contrast, the stocks in this paper are ranked only into three deciles due to the small number of stocks in some of the countries in our sample. Thus, the number of firms in one decile would be too few and vulnerable to outliers. Stocks with the highest returns were categorized into the "winner" portfolio while those with the lowest returns were put into the "loser" portfolio. Based on the rankings, momentum portfolios were formed by going long in the winner stocks and short selling the loser stocks. These portfolios were equally weighted. According to Jegadeesh and Titman (1993), the equally weighted decile portfolios provide relatively more information than the weighted relative strength strategy. Using an equally weighted portfolio is also simpler and more convenient to construct. However, the drawback is that it overstates the returns of smaller stocks and understate the returns of larger stocks. Descriptive statistics of the portfolios are presented in Table 2. In each month, the momentum strategy includes buying the "winner"

portfolio and short selling the "loser" portfolio. The position is then held on for *k* months, where *k* varies from 3- to 12-months, during which the portfolio is not rebalanced. In addition, to increase statistical power, overlapping portfolios are constructed (Du, 2007).

Table 2. Portfolios mean returns.

Country	small & low BM (S/L)	small & medium BM (S/M)	small and high BM (S/H)	big & low BM (B/L)	big & medium BM (B/M)	big & high BM (B/H)
US	0.0735	0.0577	0.0590	0.0981	0.1048	0.0830
	(0.2003)	(0.1752)	(0.2042)	(0.1492)	(0.1578)	(0.1809)
China	0.2133	0.2371	0.2030	0.0769	0.0501	0.0792
	(0.3411)	(0.3890)	(0.4079)	(0.3755)	(0.4608)	(0.4584)
Singapore	0.0653	-0.0318	0.0653	0.0030	0.0304	0.0283
	(0.3163)	(0.3673)	(0.3163)	(0.2205)	(0.2303)	(0.2927)
Philippines	0.1287	0.2085	0.1717	0.0331	0.1110	0.0836
	(0.2069)	(0.3843)	(0.3537)	(0.2209)	(0.2392)	(0.3528)
Vietnam	0.1081	0.0465	0.1472	0.0453	0.0111	0.0836
	(0.1792)	(0.2828)	(0.3227)	(0.2053)	(0.2392)	(0.3528)
Indonesia	0.1597	0.1827	0.2471	0.0823	0.1086	0.1137
	(0.2298)	(0.3103)	(0.3461)	(0.2157)	(0.2964)	(0.4319)
Malaysia	0.1233	0.1658	0.1303	0.0414	0.0299	0.0846
	(0.1764)	(0.2343)	(0.2479)	(0.1366)	(0.1929)	(0.2570)
Thailand	0.1712	0.1524	0.1372	0.0671	0.0190	0.0260
	(0.2923)	(0.3236)	(0.2879)	(0.2065)	(0.2453)	(0.3134)
Taiwan	0.0620	0.1215	0.0898	0.0100	0.0155	0.0065
	(0.2396)	(0.2464)	(0.2558)	(0.1892)	(0.1899)	(0.2055)
South Korea	0.0575	0.1217	0.0720	0.0127	0.0023	-0.0002
	(0.2162)	(0.1896)	(0.2356)	(0.2426)	(0.1956)	(0.2322)
India	0.1828	0.1705	0.2177	0.0989	0.0914	0.0654
	(0.2060)	(0.2981)	(0.3773)	(0.2101)	(0.2397)	(0.2908)
Hong Kong	0.1379	0.1274	0.2422	0.0317	0.0371	0.0336
	(0.4009)	(0.3472)	(0.4077)	(0.2980)	(0.2165)	(0.2861)

a. Standard deviations are in parentheses.

Next, a similar process is applied to investigate the size and value effects. Stocks are first independently ranked according to their market capitalization and BM ratio. After that, the stocks are also sorted into three deciles based on a ranking period. A ranking period for book information is needed to ensure that investors had sufficient time to incorporate information into their investment decisions. Stocks with the highest market capitalization are categorized as "big" and those with the smallest market capitalizations are "small". Likewise, stocks with the highest BM ratio are classified as "high" and those with the lowest BMs are "low". The variable small minus big (SMB) is calculated by taking the difference in equal-

weight average returns between the “small” and “big” stocks. This mimics a portfolio that is long in high market capitalization stocks and short in low market capitalization stocks. The variable high minus low (HML) is calculated by taking the difference in equal-weight average returns between “high” and “low” stocks. This is equivalent to a portfolio that is long in high BM stocks and short in low BM stocks. This process of calculating SMB and HML follows from the Fama and French (1993) procedure.

Some considerations that should be kept in mind are that the portfolios in this paper consists of local firms which generally eliminates firm-specific risk (Du, 2007). This contrasts behavioral models which are usually driven by firm-specific risk. However, the concept behind these behavioral models are still applicable due to country specific idiosyncratic risk where investor overreaction and underreaction still occurs. Furthermore, portfolio rebalancing is free from transaction costs. However, the firms in this sample are from stocks markets with the highest market capitalization in their respective countries. Thus, these are relatively large firms and the effects of small stocks that have high trading costs are mitigated (Du, 2007).

3.2 Multicollinearity

The correlations between each of the variables are checked to avoid multicollinearity issues. For conciseness, the large number of correlation matrices are displayed in the appendix. There is a relatively large correlation between excess returns of the six portfolios in each country and the excess returns of market indices of the respective countries. This is not unexpected as the portfolios were constructed based on accounting attributes, size and BM. Thus, portfolios returns will be affected by economic conditions and correlated with the market index. Furthermore, the excess return on market indices is just a control variable and not the main variable of interest. Thus, the high level of correlation between the dependent variable and control variable should not affect the interpretation of the results. For the rest of the variables, the absolute values of correlations between each other are low (< 0.3). Therefore, multicollinearity does not pose a threat to the analysis of momentum profits.

3.3 Model

The four-factor French and Fama (1993) model is used to model the returns of the momentum strategies. The momentum effect is studied under an existing factor model to ensure consistency with other studies in the literature.

$$RP_i(t) - Rf(t) = a + B_i[RM_i(t) - Rf(t)] + s_i[SMB(t)] + h_i[HML(t)] + w_i[WML(t)] + \mathcal{E}(t)$$

$RP_i(t)$ is the return on portfolio *i* at time *t*. $Rf(t)$ is the one-month Treasury bill rate at time *t* which represents the risk-free rate. $RM_i(t)$ is the market return for index *i* which is calculated as the value-weighted of the returns of all stocks in the respective portfolios at time *t*. SMB is the small stock premium as represented by the equal-weight average returns on "small" stocks minus that of "big" stocks. HML is the difference in the equal-weight average returns of "high" (BM) stocks and "low" (BM) stocks, which accounts for the performance of value stocks in excess of growth stocks (Fama & French, 1993). WML is the returns on momentum portfolios which is represented by the difference in equal-weight average returns of past winners and past losers with a holding period of 12-months.

3.4 Heteroskedasticity and Serial Correlation

The White test and Durbin-Watson test are used to test he residuals of excess portfolio returns for heteroskedasticity and serial correlation, respectively. The p-values of the White test and the Durbin-Watson statistics are shown in Table 4. Many countries showed significant heteroskedasticity and positive first-order serial correlation. The autocorrelation and partial autocorrelation plots also show signs of positive first-order serial correlation. Durbin-Watson statistics close to 0, 2, and 4, implies positive first-order serial correlation, no serial correlation, and negative first-order serial correlation, respectively. As seen in Table 4, almost all the Durbin-Watson statistics were below 0.5 which signals positive first-order serial correlation. To correct for heteroskedasticity and first-order serial correlation, White standard errors and generalized least squares method is applied. After applying the Prais-Winsten estimator, the Durbin-Watson statistics are much closer to 2 which indicates that first-order serial correlation is no longer present.

4. Results

Table 5 summarizes the main regression outputs which explains the excess returns on the six portfolios in the 11 countries. The main variable of interest of this paper, which investigates momentum profits, is *WML.* To analyze the results in a systematic and structured manner, the results will be compared across countries for the same portfolio and then across portfolios for the same country.

Firstly, the results of small market capitalization firms are analyzed. Though the US is not the focus of this analysis, it is included in this paper to function as a benchmark for the other countries. US portfolios with large market capitalizations and medium BM showed significant momentum profits as the 1% significance level. The level of momentum profits across the six US portfolios are less pervasive than some other countries with relatively lower average stock market capitalization. With regard to portfolios formed based on small market capitalization and low BM stocks, w_i was significant only for China at the 5% significance level. The WML coefficient for China was 0.074 with an R^2 of 0.93, which is also the highest among the sample countries. The R^2 ranged from 0.93 in China to 0.21 in Vietnam. The market capitalization of China relatively lower market capitalizations like Vietnam and Philippines, with average of 923.85 USD and 2958.21 USD respectively, had lower R^2 of 0.29 and 0.21, respectively. Holding a momentum portfolio in China has an average yearly return of

Next, for small market capitalization and medium BM portfolios, momentum profits can be found in South Korea. The coefficient of *WML* in South Korea was 0.185 which was significant at the 1% level. Interestingly, Hong Kong had a significant *WML* coefficient of -0.136 at the 5% level. This means that holding a momentum portfolio with yearly rebalancing in South Korea and Hong Kong produced momentum returns excess of the risk-free rate of 1.85% and -13.6%. The range of is smaller than small and low BM portfolios but larger than small and high BM portfolios

For small market capitalization and high BM portfolios, momentum profits were absent in all countries. The range of R^2 was greatest for big ad high BM portfolios which ranged from 0.44 to 0.94 while smallest for big and high BM portfolios which varied from 0.69

Table 4. Heteroskedasticity and serial correlation tests

Country	small & low BM (S/L)		small & medium BM (S/M)		small and high BM (S/H)		big & low BM (B/L)		big & medium BM (B/M)		big & high BM (B/H)	
	White test p-value	Durbin-Watson statistic	White test p-value	Durbin-Watson statistic	White test p-value	Durbin-Watson statistic	White test p-value	Durbin-Watson statistic	White test p-value	Durbin-Watson statistic	White test p-value	Durbin-Watson statistic
US	0.000	0.623	0.000	0.460	0.000	0.323	0.003	0.357	0.003	0.322	0.000	0.389
China	0.000	0.467	0.000	0.449	0.000	0.365	0.020	0.262	0.224	0.457	0.000	0.528
Singapore	0.000	0.372	0.000	0.478	0.000	0.345	0.062	0.431	0.481	0.567	0.000	0.366
Philippines	0.007	0.638	0.000	0.545	0.010	0.724	0.000	0.442	0.000	0.236	0.000	0.564
Vietnam	0.050	0.451	0.000	0.372	0.000	0.553	0.000	0.455	0.000	0.763	0.000	0.520
Indonesia	0.027	0.393	0.000	0.483	0.277	0.483	0.008	0.349	0.023	0.615	0.000	0.465
Malaysia	0.000	0.347	0.000	0.623	0.001	0.200	0.119	0.422	0.004	0.519	0.003	0.356
Thailand	0.001	0.408	0.000	0.475	0.000	0.636	0.151	0.746	0.000	0.384	0.036	0.456
Taiwan	0.000	0.319	0.060	0.402	0.060	0.558	0.000	0.320	0.188	0.367	0.000	0.444
South Korea	0.818	0.674	0.194	0.377	0.008	0.325	0.141	0.450	0.233	0.502	0.032	0.325
India	0.001	0.400	0.048	0.398	0.000	0.466	0.01	0.501	0.001	0.482	0.070	0.515
Hong Kong	0.062	0.408	0.014	0.962	0.018	0.361	0.001	0.219	0.000	0.303	0.000	0.514

Table 5. intercepts WML coefficients, and R^2 with White standard errors

Country	small & low BM (S/L)			small & medium BM (S/M)			small and high BM (S/H)			big & low BM (B/L)			big & medium BM (B/M)			big & high BM (B/H)		
	α	w_l	R^2	α	w_l	R^2	α	w_l	R^2	α	w_l	R^2	α	w_l	R^2	α	w_l	R^2
US	-0.022* (0.011)	0.006 (0.042)	0.93	-0.011 (0.008)	0.021 (0.032)	0.95	-0.022 (0.013)	-0.059 (0.029)	0.97	0.017 (0.014)	0.055 (0.029)	0.94	0.024 (0.014)	0.096** (0.034)	0.92	0.006 (0.009)	0.040 (0.029)	0.95
China	0.070** (0.0.15)	0.074* (0.030)	0.93	0.073** (0.018)	0.003 (0.045)	0.91	0.055* (0.237)	-0.064 (0.045)	0.89	-0.041 (0.043)	0.122* (0.051)	0.86	- 0.094** (0.015)	-0.040 (0.031)	0.95	- 0.043** (0.015)	-0.089 (0.049)	0.94
Singapore	0.033 (0.021)	-0.030 (0.075)	0.79	-0.022 (0.023)	0.143 (0.074)	0.86	0.081** (0.021)	-0.056 (0.045)	0.92	- 0.044** (0.009)	0.076* (0.031)	0.92	-0.007 (0.015)	- 0.090** (0.034)	0.91	-0.019 (0.018)	-0.073 (0.055)	0.87
Philippines	0.075* (0.036)	0.024 (0.089)	0.29	0.096* (0.040)	-0.110 (0.075)	0.53	0.028 (0.023)	0.047 (0.049)	0.82	-0.070* (0.031)	0.023 (0.043)	0.70	-0.036 (0.033)	-0.065* (0.029)	0.81	- 0.095** (0.030)	- 0.212* (0.083)	
Vietnam	0.092* (0.040)	0.075 (0.088)	0.21	0.001 (0.041)	0.034 (0.080)	0.59	0.127** (0.018)	-0.104 (0.071)	0.86	-0.020 (0.023)	-0.068 (0.044)	0.73	- 0.109** (0.021)	-0.083* (0.037)	0.69	-0.098* (0.046)	-0.169 (0.112)	0.60
Indonesia	0.053 (0.064)	0.198 (0.116)	0.22	0.021 (0.039)	-0.087 (0.072)	0.59	0.095** (0.032)	0.037 (0.036)	0.76	- 0.062** (0.022)	-0.014 (0.025)	0.81	- 0.090** (0.015)	-0.042 (0.037)	0.89	0.003 (0.143)	0.122 (0.115)	0.44
Malaysia	0.037 (0.031)	0.080 (0.042)	0.70	0.056* (0.023)	0.010 (0.069)	0.61	0.006 (0.025)	0.002 (0.031)	0.88	-0.019 (0.012)	0.048 (0.027)	0.76	- 0.046** (0.010)	- 0.080** (0.027)	0.89	-0.018 (0.038)	0.037 (0.079)	0.66
Thailand	0.051* (0.024)	0.046 (0.052)	0.81	0.051 (0.030)	0.010 (0.069)	0.76	0.032 (0.022)	0.051 (0.044)	0.83	-0.013 (0.014)	-0.066 (0.046)	0.78	- 0.078** 90.018)	0.010 (0.377)	0.85	- 0.072** (0.021)	- 0.085* (0.042)	0.86
Taiwan	0.020 (0.024)	0.028 (0.051)	0.75	0.0066* (0.032)	0.116 (0.059)	0.72	0.027 (0.022)	-0.016 (0.042)	0.87	-0.043* (0.019)	-0.021 (0.040)	0.80	- 0.042** (0.010)	-0.015 (0.029)	0.91	- 0.054** (0.017)	-0.033 (0.046)	0.79
South Korea	0.028 (0.028)	-0.014 (0.079)	0.49	0.078** (0.0247)	0.185** (0.053)	0.61	0.026 (0.024	-0.019 (0.044)	0.83	-0.045 (0.044)	0.162* (0.071)	0.62	- 0.056** (0.014)	-0.052 (0.033)	0.81	-0.043 (0.030)	- 0.084* (0.039)	0.83
India	0.081** (0.025)	0.078 (0.041)	0.79	0.028 (0.018)	0.032 (0.042)	0.88	0.046 (0.030)	- 0.0056 (0.047)	0.89	-0.018 (0.015)	0.069* (0.029)	0.86	-0.033* (0.016)	-0.059 (0.041)	0.89	- 0.096** (0.021)	- 0.080* (0.032)	0.91
Hong Kong	0.028 (0.045)	0.096 (0.049)	0.85	0.038** (0.011)	-0.136* (0.064)	0.91	0.122* (0.051)	0.033 (0.052)	0.84	-0.049 (0.049)	0.048 (0.037)	0.81	-0.043* (0.019)	- 0.105** (0.035)	0.85	- 0.085** (0.018)	- 0.073* (0.035)	0.90

a. Standard errors are in parentheses.

b. * indicates significance at the 5% level and ** at the 1% level.

to 0.95. The level of is R^2 of the four-factor models is expected and similar to results of other authors such as Fama and French (2012) and Nartea et al. (2009). In general, it seems that the ability of the four-factor model to explain portfolio returns increases with the market capitalization of the stock market. The spread of is R2 consistent with the findings of Nartea et al. (2009) who studied momentum effects in New Zealand. In my sample, Vietnam and Indonesia, with average market capitalizations of 923.85 USD and 4246.33 USD respectively, had relatively lower values of than countries with larger market capitalizations such as China with 13828.93 USD and Hong Kong with 18367.93 USD respectively. On the other hand, Indonesia and Vietnam had R^2 values of 0.21 and 0.22 respectively while China and Hong Kong had values of 0.93 and 0.85 respectively. Though the values of R^2 improved as the portfolios included larger stocks, the trend still holds.

When analyzing big market capitalization firms, momentum profits are more prevalent than small market capitalization firms. For big market capitalization and low BM portfolios, China, Singapore, South Korea, India all showed evidence of momentum profits with significant positive *WML* coefficients of 12.2%, 7.76%16.2%, and 6.9%. On the other hand, big market capitalization firms with medium and high BM did not show any evidence of momentum profits. The average R^2 values of big firms are relatively higher than that of small firms. In addition, they are also less dispersed. This implies that the four-factor model is more able to explain the portfolio returns when considering bigger firms. This can largely be attributed to the result that momentum profits are more prevalent in larger firms.

4. Concluding remarks

Previous research that studied momentum profits mostly grouped smaller explored regions, like Pacific Asia, instead of countries. Asness (2011) studied regions like the US, UK, Europe and it is interesting to note is that Japan was the only observation that was tested as a single country rather than a part of a region in his research. Asness (2011), amongst other researchers, claimed that the result in Japan does not come as a surprise since it is likely that just one country does not show momentum profits. However, the relatively smaller market capitalization of Japan may have been a factor that led to the absence of momentum profits in that country. Therefore, grouping smaller countries together, like in Asia Pacific, may result in misleading evidence of momentum profits since more developed countries compensate for the missing momentum return in less developed countries which leads to overall positive

profits in momentum portfolios. This paper investigates momentum profits across several countries in Asia with the hypothesis that momentum profits are lower in stock markets with smaller market capitalizations. Using the Fama-French (2012) four-factor model and country-specific data from various countries in Asia, the presence of momentum returns within six value and growth portfolios are tested. This paper finds that, unlike previous research, momentum profits cannot be characterized generally across Asia. When split up into individual countries, momentum profits are found mostly in countries with stock markets that have relatively higher market capitalization. This is further supported by the fact that portfolios with big firms resemble growth portfolios and have higher momentum profits. Therefore, the hypothesis that momentum profits are lower in countries with lower stock market capitalization Is not rejected.

The main finding of this paper is that momentum profits are higher in countries with higher market capitalizations. The literature explains momentum profits by either a priced risk or market inefficiencies, the higher momentum profits in countries with larger stock markets suggest that certain risk factors or market inefficiencies are higher in those countries. For instance, one type of market inefficiency could be that institutional herding which is more prevalent in countries with lower levels of information asymmetry, is also greater is countries with higher stock market cap and thus drives momentum profits. On the other hand, in term of changes to price risk, it could an undiscovered risk factor that is driving these momentum profits, as suggested by Fama & French (1996). Another possibility is that the absolute, and not just relative, market capitalization of stocks also drives momentum profits. In growth portfolios, relatively big stocks earn a premium over small stocks and this is captured by the variable SMB in Fama and French's (1993) four-factor model used in this paper. However, the effect of the absolute value of a stock market's capitalization on returns is not captured. Another indication of this is that the R^2 of the four-factor model is, in general, higher in countries with higher stock market capitalization. This can be seen in Table 5. The absolute value of stock market capitalization could also be a sign of certain market inefficiency because it reflects the stage of development of a stock market. As a stock market reaches a certain capitalization or as it increases, certain market inefficiencies, such as people's beliefs about certain stock characteristics, could become strong enough to drive momentum profits. Indications of this can also be seen in Table 5. The momentum profits in the US is actually less

pervasive than countries with lower stock market capitalization such as China, Singapore, and Malaysia. The correction of market inefficiencies over time could explain why the US has relatively higher stock market capitalization and lower momentum profits compared to these countries.

One limitation of this paper is that the sample ranges from 2007 to 2019 which not only is relatively short compared to other studies, but it also includes economic downturns such as the 2008 financial crisis. Including such a significant event in the sample might have skew the results. However, momentum profits as just as much about shorting as it is about going long. Furthermore, the extra costs of shorting are ignored in this research. Thus, the effect of drastic events like the 2008 financial crisis on the momentum effect is minimized. Furthermore,

The findings of this research have implications for future research. Firstly, the study of momentum profits should take extra caution in grouping countries together. Doing so might result in a momentum portfolio that selects stocks mostly in a particular country while the portfolio was technically built based on multiple countries. Future research examining momentum profits should therefore take into account country-specific factors. Next, though this paper finds that momentum profits differ across stock markets with different market capitalization, it does not identify the underlying reason for this phenomenon. Risk explanations have yet to be ruled out as an explanation to the momentum effect. However, alternate explanations like the behavioral models have also shown promise. Using country-specific factors, future research could make side-by-side comparisons of risk and behavioral models to investigate how well each model explain momentum profits.

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Appendix

Table 1A. Correlation matrix for US firms

	us_sl	Us_sm	Us_sh	Us_bl	Us_bm	Us_bh	Us_smb	Us_hml	Us_wml
Us_sl	1.000								
Us_sm	0.969	1.000							
Us_sh	0.977	0.980	1.000						
Us_bl	0.945	0.942	0.942	1.000					
Us_bm	0.937	0.938	0.928	0.966	1.000				
Us_bh	0.957	0.951	0.952	0.953	0.948	1.000			
Us_smb	0.467	0.510	0.498	0.303	0.355	0.317	1.000		
Us_hml	0.508	0.594	0.597	0.542	0.465	0.500	0.519	1.000	
Us_wml	-0.652	-0.684	-0.697	-0.624	-0.540	-0.654	-0.338	-0.565	1.000

s – small firm, b – big firm, l – low BM, m – medium BM, h – high BM

Table 2A. Correlation matrix for Chinese firms

	cn_sl	Cn_sm	Cn_sh	Cn_bl	Cn_bm	Cn_bh	Cn_smb	Cn_hml	Cn_wml
Cn_sl	1.000								
Cn_sm	0.938	1.000							
Cn_sh	0.873	0.900	1.000						
Cn_bl	0.840	0.890	0.901	1.000					
Cn_bm	0.866	0.909	0.970	0.925	1.000				
Cn_bh	0.807	0.861	0.961	0.910	0.970	1.000			
Cn_smb	-0.074	-0.170	-0.439	-0.439	-0.497	-0.582	1.000		
Cn_hml	-0.150	0.027	0.149	0.061	0.209	0.2592	-0.516	1.000	
Cn_wml	0.365	0.242	0.293	0.333	0.250	0.223	-0.094	-0.410	1.000

s – small firm, b – big firm, l – low BM, m – medium BM, h – high BM

Table 3A. Correlation matrix for Singaporean firms

	t_sl	t_sm	t_sh	t_bl	t_bm	t_bh	t_smb	t_hml	t_wml
t_sl	1.000								
t_sm	0.909	1.000							
t_sh	0.924	0.940	1.000						
t_bl	0.918	0.929	0.936	1.000					
t_bm	0.901	0.935	0.946	0.940	1.000				
t_bh	0.884	0.914	0.918	0.953	0.953	1.000			
t_smb	0.704	0.685	0.683	0.497	0.547	0.515	1.000		
t_hml	0.634	0.549	0.672	0.586	0.670	0.629	0.504	1.000	
t_wml	-0.019	0.064	0.005	-0.024	-0.161	-0.144	0.188	-0.253	1.000

s – small firm, b – big firm, l – low BM, m – medium BM, h – high BM

Table 4A. Correlation matrix for Filipino firms

	Ph_sl	Ph_sm	Ph_sh	Ph_bl	Ph_bm	Ph_bh	Ph_smb	Ph_hml	Ph_wml
Ph_sl	1.000								
Ph_sm	0.575	1.000							
Ph_sh	0.614	0.842	1.000						
Ph_bl	0.662	0.810	0.825	1.000					
Ph_bm	0.628	0.828	0.907	0.810	1.000				
Ph_bh	0.555	0.909	0.887	0.820	0.885	1.000			
Ph_smb	0.505	0.513	0.496	0.480	0.422	0.434	1.000		
Ph_hml	0.444	0.629	0.805	0.521	0.749	0.729	0.272	1.000	
Ph_wml	-0.278	-0.218	-0.010	-0.038	-0.103	-0.228	-0.305	-0.061	1.000

s – small firm, b – big firm, l – low BM, m – medium BM, h – high BM

Table 5A. Correlation matrix for Vietnamese firms

	Vt_sl	Vt_sm	Vt_sh	Vt_bl	Vt_bm	Vt_bh	Vt_smb	Vt_hml	Vt_wml
Vt_sl	1.000								
Vt_sm	0.384	1.000							
Vt_sh	0.482	0.746	1.000						
Vt_bl	0.502	0.732	0.720	1.000					
Vt_bm	0.294	0.650	0.725	0.654	1.000				
Vt_bh	0.401	0.504	0.661	0.669	0.698	1.000			
Vt_smb	0.189	0.417	0.668	0.131	0.145	0.165	1.000		
Vt_hml	0.044	0.234	0.560	0.182	0.561	0.616	0.403	1.000	
Vt_wml	-0.256	-0.163	-0.360	-0.295	-0.232	-0.334	-0.295	-0.2432	1.000

s – small firm, b – big firm, l – low BM, m – medium BM, h – high BM

Table 6A. Correlation matrix for Indonesian firms

	Id_sl	Id_sm	Id_sh	Id_bl	Id_bm	Id_bh	Id_smb	Id_hml	Id_wml
Id_sl	1.000								
Id_sm	0.522	1.000							
Id_sh	0.363	0.647	1.000						
Id_bl	0.514	0.815	0.676	1.000					
Id_bm	0.555	0.793	0.771	0.916	1.000				
Id_bh	0.308	0.704	0.703	0.825	0.834	1.000			
Id_smb	0.202	0.308	0.707	0.170	0.242	0.218	1.000		
Id_hml	0.083	0.243	0.653	0.285	0.402	0.548	0.4228	1.000	
Id_wml	0.259	0.048	-0.054	-0.036	-0.126	-0.176	0.028	-0.300	1.000

s – small firm, b – big firm, l – low BM, m – medium BM, h – high BM

Table 7A. Correlation matrix for Malaysian firms

	L_sl	L_sm	L_sh	L_bl	L_bm	L_bh	L_smb	L_hml	L_wml
L_sl	1.000								
L_sm	0.701	1.000							
L_sh	0.736	0.800	1.000						
L_bl	0.768	0.802	0.823	1.000					
L_bm	0.776	0.885	0.844	0.880	1.000				
L_bh	0.570	0.886	0.773	0.815	0.886	1.000			
L_smb	0.553	0.472	0.700	0.300	0.364	0.314	1.000		
L_hml	0.145	0.587	0.565	0.374	0.591	0.670	0.301	1.000	
L_wml	0.249	0.111	0.122	0.216	0.024	-0.032	0.099	-0.294	1.000

s – small firm, b – big firm, l – low BM, m – medium BM, h – high BM

Table 8A. Correlation matrix for Thai firms

	q_sl	q_sm	q_sh	q_bl	q_bm	q_bh	q_smb	q_hml	q_wml
q_sl	1.000								
q_sm	0.827	1.000							
q_sh	0.874	0.923	1.000						
q_bl	0.813	0.759	0.809	1.000					
q_bm	0.855	0.828	0.860	0.860	1.000				
q_bh	0.806	0.866	0.886	0.844	0.906	1.000			
q_smb	0.480	0..440	0.417	0.087	0.177	0.130	1.000		
q_hml	-0.139	0.208	0.193	-0.056	0.105	0.269	-0.317	1.000	
q_wml	-0.012	-0.137	0.004	-0.153	-0.189	-0.240	0.212	-0.144	1.000

s – small firm, b – big firm, l – low BM, m – medium BM, h – high BM

Table 9A. Correlation matrix for Taiwanese firms

	tw_sl	tw_sm	tw_sh	tw_bl	tw_bm	tw_bh	tw_smb	tw_hml	tw_wml
tw_sl	1.000								
tw_sm	0.756	1.000							
tw_sh	0.832	0.795	1.000						
tw_bl	0.779	0.843	0.904	1.000					
tw_bm	0.781	0.826	0.909	0.894	1.000				
tw_bh	0.816	0.789	0.914	0.817	0.923	1.000			
tw_smb	0.668	0.528	0.392	0.379	0.270	0.317	1.000		
tw_hml	-0.180	-0.277	0.078	-0.096	-0.068	0.022	-0.355	1.000	
tw_wml	-0.170	0.092	-0.303	-0.256	-0.214	-0.263	-0.152	-0.280	1.000

s – small firm, b – big firm, l – low BM, m – medium BM, h – high BM

Table 10A. Correlation matrix for South Korean firms

	ko_sl	ko_sm	ko_sh	ko_bl	ko_bm	ko_bh	ko_smb	ko_hml	ko_wml
ko_sl	1.000								
ko_sm	0.716	1.000							
ko_sh	0.749	0.733	1.000						
ko_bl	0.596	0.626	0.683	1.000					
ko_bm	0.696	0.753	0.825	0.665	1.000				
ko_bh	0.678	0.711	0.837	0.588	0.913	1.000			
ko_smb	0.078	-0.216	-0.023	-0.377	-0.310	-0.134	1.000		
ko_hml	-0.390	-0.335	-0.208	-0.524	-0.161	-0.083	0.249	1.000	
ko_wml	0.457	0.460	0.453	0.620	0.383	0.286	-0.282	-0.520	1.000

s – small firm, b – big firm, l – low BM, m – medium BM, h – high BM

Table 11A. Correlation matrix for Indian firms

	in_sl	in_sm	in_sh	in_bl	in_bm	in_bh	in_smb	in_hml	in_wml
in_sl	1.000								
in_sm	0.875	1.000							
in_sh	0.834	0.912	1.000						
in_bl	0.865	0.925	0.854	1.000					
in_bm	0.828	0.937	0.876	0.931	1.000				
in_bh	0.762	0.887	0.934	0.868	0.888	1.000			
in_smb	0.809	0.716	0.735	0.616	0.560	0.527	1.000		
in_hml	0.216	0.435	0.545	0.331	0.409	0.624	0.128	1.000	
in_wml	-0.274	-0.342	-0.334	-0.247	-0.342	-0.416	-0.188	-0.444	1.000

s – small firm, b – big firm, l – low BM, m – medium BM, h – high BM

Table 12A. Correlation matrix for Hong Kong firms

	k_sl	k_sm	k_sh	k_bl	k_bm	k_bh	k_smb	k_hml	k_wml
k_sl	1.000								
k_sm	0.940	1.000							
k_sh	0.808	0.882	1.000						
k_bl	0.703	0.794	0.739	1.000					
k_bm	0.815	0.876	0.893	0.792	1.000				
k_bh	0.801	0.883	0.894	0.817	0.925	1.000			
k_smb	0.872	0.821	0.746	0.418	0.627	0.585	1.000		
k_hml	-0.246	-0.187	0.007	-0.206	-0.100	0.007	-0.136	1.000	
k_wml	-0.150	-0.143	-0.031	0.113	-0.124	-0.085	-0.229	-0.313	1.000

s – small firm, b – big firm, l – low BM, m – medium BM, h – high BM