Articles

Seasonal Effect for Explaining Price Momentum Failure in the Japanese Stock Market

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In our study we investigate the presence of calendar patterns on the high volatility of Japanese stock market and their influence on the medium-term price momentum effect as an anomaly in the stock pricing. We document that calendar effects are presented on the Japanese stock market and have a negative influence on the momentum profits, recorded over two months of consistently negative momentum profits. Momentum returns are substantially negative in January, which is in line with other studies (e.g. Jegadeesh and Titman, 1993), and in May. The price momentum strategy loses about 2-4% on average each January and 1.9%-4.2% in May across the 16 portfolios. The investor should consider fundamental characteristics of companies and the stage of the business cycle to increase the momentum profits.

Key words: seasonal effect, price momentum effect, Japanese stock market, cross section, long-short portfolios

JEL Classification: G11; G12; G14

1. Introduction

We are motivated by recent asset pricing literature that examines the effect of frictions on capital asset prices. Grinblatt et al. (1995) discovered that about 77% of the mutual funds in their sample use momentum strategies in their investment portfolios. Academic interest in the analysis of price momentum originated in the late 1980s/early 1990s due to the influence of explanatory power in the variation in stock returns and the failure of efficient market hypotheses. The first papers were written by De Bondt and Thaler (1985, 1987), and Jegadeesh and Titman (1993). Strategies that include buying winning stocks (stocks with high returns over the previous three months to one year) and selling losing stocks (stocks with low returns over the same period, the so-called ranking period), so-called zero cost strategy or long-short strategy, earn profits of about 1% per month for the following months within the year. In the 1980-90s, it was proposed that the underreaction of stock prices to information contained in past stock returns led to excess return momentum.

Stock price momentum investment strategies can be implemented on a single asset (trend-following strategy) or on a cross section of the same class of assets by creating long-short momentum portfolios[1] based on relative past stock's performance. The trend-following style uses

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different indicators (past average returns, moving average, ratios) to obtain signals to buy or sell the security by comparing with the current performance. The cross section momentum effect is observed among portfolios of the same class of assets (bonds, stocks) and based on their past relative performance (e.g. prior returns or measures of risk and return). An important element for the analysis of the cross section momentum effect is the method of portfolio formation. RSS (Relative Strength Strategies) and WRSS (Weighted Relative Strength Strategies) are used to form the momentum portfolios.

It is clear there is a need for additional research to understand stock pricing in various capital markets and its anomalies, the role of momentum strategies in markets with specific macroconditions and relatively closed stock markets, as well as the role of momentum strategies during financial crisis periods. We examine the failure of momentum effect in the Japanese stock market and the role of calendar effect.

Many researchers have checked the stock markets of different regions over different time periods using various methods of portfolio formation, and have consistently reported positive returns by implementing medium-term momentum strategies (3-12 months) and long-term (3-5 years) reversal strategies when investors buy losing stocks and sell winning stocks (stocks with relatively high returns). There is now substantial evidence that momentum strategies make profits in most developed stock markets and usually do not produce significant profits in emerging stock markets. However, the Japanese market is an exception (Rouwenhorst (1998); Liu and Lee (2001); Fama and French (2012); Asness, Moskowitz and Pedersen (2013)).

In our study we focus solely on the profitability and nature of medium-term momentum profits and cross section long-short momentum effects on the Japanese stock market – the world's second largest. The particular interest in studying the Japanese stock market is driven by its uniqueness of the Japanese economy, poor empirical studies of stock markets and the atypical behaviour of stock returns (in the rare investigations (Fama and French (2012), Asness et al. (2013)) into the Japanese stock market, it has been concluded that the momentum effect does not work). The aim of our paper is to examine the persistence of the momentum effect on the Japanese stock market and find an appropriate explanation for its existence or absence under the control of the fundamental factors of companies, state of economy and seasonal behavior of stock prices (calendar effects). We assume that the nature of the momentum effect can be explained not only by an underreaction of stock prices to new information, but also by the psychological characteristics of investors, and exposure to their optimism or pessimism in different periods of the economy and during different seasonal periods. Our hypothesis states that if we consider these particular country features, the momentum effect can be identified in the Japanese market.

2. Specificity of the Japanese economy and academic interest in asset pricing in the Japanese stock market

The Japanese stock market is the world's second largest. Japan's position is third in the world in terms of nominal GDP ($5,964 billion, IMF World Economic Outlook (WEO), April 2013), and industrial output after the U.S. and China. However, its macroeconomic conditions, companies' equity structure and sources of funding differ quite substantially from other countries.

For several decades after 1945, Japan demonstrated the highest growth rates

among industrialized countries: 12-13% per year. In 1990, the five largest banks in the world were Japanese; out of the world's six leading companies on market capitalization, four were Japanese. Until the 1980s, the issue of shares (and bonds) played a minor role in the financing of Japanese corporations. In the 1980s, the market value of shares of Japanese corporations increased until the end of 1989 by 20-30% per year. From 1990-1992 there was a rapid collapse of share prices on the Japanese stock exchanges and in real estate, which negatively affected the state of the Japanese financial system and its economy as a whole. In the 1980s, the average annual GDP growth rate was 4%, while in the 1990s it went down to a little over 1%. Japan has a unique record of falling stock prices: the most famous Japanese Nikkei 225 stock index in 2003 was about five times lower than the maximum reached in December 1989. Only in 2002-2003 did the Nikkei 225 index reach the level of the early 1980s. Dividend yield in all the years since the 1980s for listed companies on the TSE did not rise above 1.5% (up 1.5% in 2007).

The liquidity of the capital market (the ratio of turnover to capitalization) in Japan is traditionally lower than in the U.S. or British markets; free float is traditionally much lower than in Anglo-Saxon countries.

The official rate of the Bank of Japan since 1995 has been less than 1%. Japan has had a very low growth since the 1990s, decreasing savings rates, near-to-zero (nominal deposit) interest rates and low unemployment rate. The latter, however, is constantly increasing (over the 1970s-1980s the unemployment rate fluctuated within 2-2.8%, in the 1990s the figure slightly exceeded 3%, by 2012 it was 4.9%) and there has been chronic deflation since the end of the 1990s (1998-1999, 2008-2011). Japan's government debt is 1,016 quadrillion yen (about $10.9 trillion, 229% of GDP),

converting this to the 127 million population of the country it is the equivalent of 7.8 million Japanese yen (about $84,000 per person). Japan's economy since the end of 2012 has continued to experience a decline caused by both a decrease in exports and domestic consumption. In 2010, The Central Bank of Japan announced a program of quantitative easing (QE) to weaken the national currency and make the export of Japanese goods more profitable. The second attempt took place in August and October 2011, when the asset purchase program is expanded to 55 trillion yen. Facing projections for failure to reach 2 percent inflation target in about two years, and with the pressure from a higher sales tax, Bank of Japan several times increased its asset purchase program and monetary-stimulus program has been expanded to 80 trillion yen, boosting stocks and sending the yen tumbling.

The actuality of investigating the Japanese stock market is explained by the accumulated evidence which suggests that long-short momentum strategies generate positive profits in many markets and within different asset classes with one glaring exception – Japan. In particular, Liu and Lee (2001) found that the long-short momentum (from their analysis of winners minus losers (WML) portfolios) is not observed on the Japanese stock market. They document that over the period 1975-1997, momentum portfolios with J months (Formation Period) = 3-12 and K months (Holding Period) = 3-12, losing about 0.5% per month, indicating that stock prices in the Japanese stock market reverse rather than continue over a medium-term horizon. The most significant reversal pattern is observed in the first month of portfolio formation and is unique to small stocks. Even with the market risk and size factor controlled, the price reversal is still present in the Japanese market.

Chui, Titman and Wei (2000) examined eight Asian markets, i.e. Hong Kong,

Indonesia, Japan, Korea, Malaysia, Singapore, Taiwan and Thailand, with data from 1980 to 2000 (including a financial crisis period) and found that the Japanese market demonstrated the weakest momentum effect. Momentum strategies, which include buying past winners and selling past losers, are highly profitable when implemented on Asian stock markets outside Japan. The authors documented that the momentum effect is relatively stronger for firms with smaller market capitalizations, lower book-to-market ratios and higher turnover ratios. On the other hand, McInish et al. (2008) also analyzed trading strategies in Hong Kong, Japan, Korea, Malaysia, Singapore, Taiwan and Thailand from 1990 to 2000. Their research considered important factors such as trading activities and three-factor risk adjustment. Their results showed that contrarian profits are only significant in Japan and momentum profits only occurred in Japan and Hong Kong.

Fama and French (2012) more recently examined value, size and momentum anomalies in four regions: Asia Pacific, Europe, Japan and North America. They found the momentum effect to be observed everywhere except for the Japanese stock market. Perhaps it is due to the socio-cultural characteristics of the country. Hofstede (2010) found that people in Western countries tend to score higher in tests of "individualism" than people in Asia (see Appendix, Table 1). Japan recorded the highest index of Uncertainty Avoidance (UAI), much higher than for the US, UK and Germany (Tab 1 Appendix). The higher the UAI the more economic agents avoid uncertainty and the more conservatism in investment decisions (looking back at the past). Therefore, we can assume that the Japanese market, due to socio-cultural characteristics, would demonstrate the momentum effect. But this effect can be smoothed some features of reporting

standards, ownership structure and interests of different groups of investors (short or long, financial or not).

Another potentially important difference between Japan's economy and those of the Western economies (e.g. Germany, U.S.) is ownership structure and the importance of corporate groups. Unlike the U.S., Japanese corporations are prohibited from buying their own shares and they cannot create financial holdings. Therefore, to restore the position of the company they have resorted to cross-ownership. In Japan, major shareholders are corporations or banks, not individuals. The total share of financial institutions and corporations was more than 60% (TSE Fact Book, 2012).

Ownership in Japan often has non-financial goals – the establishment of sustainable partnerships between companies, some similarity to customer value management. So shareholders in Japan are not always interested in the financial results of investment (i.e. dividends as current benefits and increases in the share price as the long-term financial goal). Shareholdings in Japan are different from the U.S. Cross-shareholdings can count on friendly relations and operating privileges. Investor benefits are derived from the whole complex of relations connected with the status of shareholder. These non-financial targets of large blockholders can change the behaviour of small market investors on the stock exchange, or vice versa, generating price stability, insensitivity to new information, and underreaction.

Large portions of the public companies in Japan are affiliated with corporate groups (e.g. *keiretsu*) that are associated with either a bank or a powerful family. Six keiretsu account for about a quarter of all registered shares of Japanese companies, four of which are the of pre-war "zaibatsu" holdings (a large Japanese financial business conglomerate of family-controlled

vertical monopolies from the Meiji period until the end of World War II).

We assume that group affiliation can potentially affect momentum profits in two ways. On the one hand, membership in the group creates an internal capital market that do not require access to the bond market or attracting new equity. Group firms may be less transparent, and hence more difficult to evaluate than independent firms which can potentially make them more subject to investor overconfidence and momentum; investor protection in Japan is lower than in Australia, Britain, Canada, France, Germany, Italy, Switzerland and the U.S., (Investor Responsibility Research Center Institute Ranking). The continued presence of a group of companies smoothes response to incoming news and can produce the effect of investment commitment. On the other hand, corporate groups restrict the ownership of foreign investors that eliminating the effects of momentum. Recent research has documented that foreign investors tend to be momentum investors (Choe, Kho and Stulz (1999); Grinblatt and Keloharju (2000)), so corporate groups can reduce the momentum effect. In Japan the share of foreign investors has increased from 7.4% in 1995 and to 18.3% in 2002. The share of foreign investors in the 1990s did not exceed 18% (TSE Fact Book 2012). In 2007, the number of foreign investors to trade shares on the TSE was 45%, and the proportion of foreigners with equity in Japanese companies increased from 4% in the early 1990s to 10% in 1998 and 28% in 2007. But the role of foreign investors in influencing the stock market is not huge.

Most of the Japanese firms have their fiscal year-end in March and are required to report their annual financial statements no more than three months after their fiscal year-end, the financial information is provided every six months. We assume that this should be reflected in the profitability of the momentum effect. Consequently, March, April and May, October and November are the months with unknown financial results, when investors have great uncertainty. In the summer months, in December the information has been determined and investors, on the basis of this news, begin to change the portfolios so that the momentum effect has its maximum manifestation in September.

3. Literature overview

The idea of constructing portfolios based on the inclusion of assets in the light of their past investment belongs to De Bondt and Thaler (1985, 1987). These authors on U.S. stocks showed that long-term past losers tend to outperform long-term past winners over the subsequent three to five years. This style of investing is called contrarian strategy. Jegadeesh and Titman (1993) discovered a price momentum strategy for portfolios' returns on U.S. stocks during the period from 1965 to 1989. They documented that portfolios with stocks that have performed well in the past continue to earn relatively high returns over 3 to 12 months. The stocks that have performed badly over the 3 to 12 month period tend to earn low returns in the future.

The pioneering work of Jegadeesh and Titman (1993) inspired a vast number of academic papers devoted to the momentum effect, predominantly on the U.S. stock market. To prevent the possibility that the observed momentum phenomenon is simply a result of data snooping, researchers started to focus on international markets, examining different time periods. Numerous researchers have documented the momentum effect across different markets throughout the world (developed and emerging) during different time periods and in a number of asset classes.

The EMH postulates that market prices fully reflect all available information in

such a way that neither technical nor fundamental analysis can be exploited to identify securities that will earn abnormal returns. The momentum effect challenges the validity of the weak form of EMH. Advocates of the rational approach contend that abnormal momentum returns are primarily attributable to bearing higher risk for investors. However, it still seems difficult to explain why the momentum effect occurs. There are several possible explanations, both for and against momentum, that are broadly divided into rational and irrational reasons. Adherents to the rational financial theories try to relate the momentum effect to risk-based explanations (Conrad and Kaul, 1998; Fama and French, 1996), the result of data-mining or data snooping bias and the underestimation of transaction costs and short-selling constraints (Korajczyk and Sadka, 2004). Fama and French (1996) attempted to explain the momentum effect by traditional asset pricing models (CAPM and 3FF models) but had to admit that significant abnormal returns from the momentum strategy still existed even after controlling for size and value factors. Korajczyk and Sadka (2004) concluded that trading costs in the form of bid - ask spread and price impact cannot fully explain the momentum anomaly. The failure of the search for an appropriate model with a rational explanation for the momentum effect has induced researchers to incorporate psychological aspects in their models. The irrational explanation can be described in behavioural models that are based on the way people behave.

Overreaction and underreaction became extremely important concepts in behavioural finance. According to Chan, Jegadeesh and Lakonishok (1996), and Daniel, Hirschleifer and Subrahmanyam (1998), the conservatism and representativeness biases can explain the median-term (within one year) momentum effect. Conservatism

bias supposes that investors are too slow in changing their opinions and are opposed to new information. Such underreaction to new information causes the positive serial returns correlations or a momentum effect. Hong and Stein (1999) predict that stocks with slow information diffusion should exhibit stronger momentum. The authors propose a model describing the interaction between two types of investor: news watchers and noisy (momentum) traders. The former group makes forecasts based on fundamental analysis, ignoring the past price changes, whereas the latter condition their demand on past prices. Hong and Stein (1999) assume that fundamental information distributed gradually among news watchers results in an initial underreaction of the entire market, causing the momentum to begin. Momentum traders interpret this as a signal, pushing the price of past winners (losers) above (below) the fundamental value. The growing mispricing stimulates news watchers to take action in order to prevent it. Overreaction produces a long-term reserve on stock price. Therefore the Hong and Stein (1999) model explains both short-term continuation and long-term reversal.

In contrast to previous theories based on underreaction, Daniel et al. (1998) develop a theory which argues that price momentum results from delayed overreactions induced by investor overconfidence and biased self-attribution.

Irregularity in stock returns on different days of the week and months of the year has been featured on the U.S. market in the 1930s. Fred Kelly (1930) noticed that the worst day for buying stocks is at the beginning of the week, i.e. Monday is the day the price falls). Historically, the U.S. market has demonstrated that the maximum average market stock returns are recorded in December and January, zero returns in the summer months, and negative

in September-October. Another January effect, called the January Barometer, has shown that investment results in January have some predictive power for the following 11 months.

Grundy and Martin (2001) and Jegadeesh and Titman (1993, 2001), find an interesting seasonality in price momentum profits in the U.S. stock market. They document that the Winners outperform the Losers in all months except January, and the momentum portfolio earns significantly negative returns in January and significantly positive returns in months other than January. So, in the U.S. market, momentum strategies exhibit an interesting pattern of seasonality in January. The January effect refers to the most popular seasonal anomaly exhibited by stocks generating abnormal returns (predominantly for small-cap stocks). This pattern occurs in the last trading days in December and then continues to rally during the first weeks in January of the following year. The strategy based on the January effect implements buying small firms with negative annual returns in the prior period and selling them at the beginning of the year.

Jegadeesh and Titman (2001) examine the momentum effect in January and on an entire sample, except for January, of the U.S. market. The obtained results confirm the January seasonality: the average non-January return is 1.48% per month and -1.55% in January.

4. Data and our methodology for portfolio design

Our sample employs monthly stock returns of Japanese companies on the TSE, where market capitalization exceeds $300 million. Our data set consists of 1,125 traded common stocks. We use this selection criterion in order to exclude illiquid securities. Our subsample includes 580 common shares that form 90% of market capitalization (this technique corresponds to Asness (2011) study). This subsample is important for us to be able to test the significance of hypotheses about the impact of size on the momentum effect (significant momentum for large companies, about which investors have already formed a definite opinion, and new information which is often difficult to accept).

We assume that, for large companies, the momentum effect should appear brighter (more pronounced). Investors of the largest companies accept less risk, and market investors who invest in such shares are less confident, not willing to risk, so the stocks of such companies are more inert and on a sample of large companies the momentum effect is clear. The largest companies are often associated with the position of the industry in current macroconditions; the situation for them is less recognizable and distinguishable from the industry situation. As a result, market investors are not responsive to new information and do not share specifics with individual, large companies.

We test the size effect in two ways: by comparing the entire sample (1,125) and the subsample (580) of companies, and checking the significance of the coefficient of the variable premium for size in multifactor regression. We eliminate securities that represent cross listings, mutual funds, unit trusts, certificates, notes, rights, preferred stock, and other non-common equity.

The data cover the sample period from January 1997 to December 2013. The analyzed period comprises different phases of the business cycle (Asian crisis 1997 and financial crisis of 2008-2009). The analysis of expansionary as well as recessionary periods allows us to examine the profitability of momentum strategies in different phases of business cycles.

This investigation exploits monthly momentum portfolios returns. We form the momentum portfolios using methodology for

relative strength strategies from Jegadeesh and Titman (1993). The formation period (J) consisted of 3, 6, 9 and 12 months, and holding period (K) included 3, 6, 9 and 12 months. Each formation period tested data within each holding period, providing a total of 16 portfolios. At the end of each month t, all stocks are ranked in ascending order on the basis of their past J months' returns (J = 3, 6, 9, or 12 - formation periods). We use the methodology from Fung (1999) to sort the stocks from cumulative returns over the past J months' formation period. Based on these rankings, the stocks are assigned to one of ten decile portfolios. The top decile portfolio is called the "Winner" (abbreviated to Win in the tables), while the bottom decile is called the "Loser" (abbreviated to Los in the tables). These portfolios are equally weighted and held for K subsequent months (K = 3, 6, 9, or 12, K - holding period).

For testing the role of portfolio design, we consider two variants of holding periods: investment strategies including portfolios with overlapping holding periods are mentioned as partial rebalancing

the power of the test, so in the second step we implement trading strategies for overlapping holding periods on a monthly frequency. Therefore, in any given month t, the strategies hold a series of portfolios that are selected in the current month as well as in the previous K-1 months. This is equivalent to a composite portfolio in which 1/K of the holding is replaced each month. To avoid the potential "survival biases", we do not require all securities included in a particular strategy in the formation period to survive up to the end of the holding period.

Another feature in the construction of our portfolios is the exception of one month from consideration (a one month vacation for the analyzed investor). We do this to minimize the effect of bid-ask bounce and lead-lag effects. Our empirical methodology skips a month between the ranking periods and the holding periods. We follow Liu and Lee (2001), who document that there is a strong, short-term (one month) contrarian effect on the Japanese market.
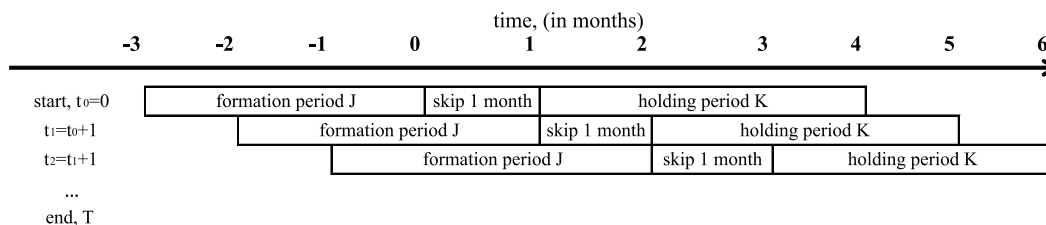
5. Empirical analysis

Fig. 1. Portfolio construction with overlapping holding periods and the month after portfolio formation for strategy 3/1/3

(1) and portfolios with full rebalancing (2). In the last case the portfolios are rebalanced at the beginning of each holding period whereas the first variant assumes monthly rebalancing. We have formation date T every month and repeat the process of ranking winner and loser portfolios every month throughout the sample period (Figure 1). The method of partial rebalancing needs us to minimize small-sample biases and to increase

5.1. Our two hypotheses and momentum profits without seasonal adjustment

H1. The seasonal effect is significant to build momentum strategies. Failures in momentum profits in previous studies on the Japanese stock market can be explained by ignoring the seasonal effect.

H2. Failures in momentum profits in previous studies on the Japanese stock

Method of testing portfolios	Sample period	Number of examined stocks	Momentum strategies with positive significant payoffs	Statistical significance
full rebalancing	1997-2013	1125 stocks	No	
		580 stocks	3/1/12	at the 5% level
			6/1/12	at the 5% level
	1997-2008	1125 stocks	3/1/3	at the 5% level
			3/1/9	at the 10% level
			3/1/12	at the 10% level
			6/1/3	at the 5% level
			6/1/12	at the 10% level
		580 stocks	3/1/12	at the 5% level
			6/1/12	at the 5% level
			9/1/9	at the 10% level
partial rebalancing	1997-2013	1125 stocks	No	
		580 stocks	No	
	1997-2008	1125 stocks	3/1/3	at the 10% level
			3/1/6	at the 10% level
			3/1/9	at the 10% level
			3/1/12	at the 10% level
			6/1/3	at the 10% level
			6/1/6	at the 10% level
			9/1/3	at the 10% level
		580 stocks	3/1/3	at the 10% level
			3/1/6	at the 10% level

Fig. 2. Summary of testing the profitability of momentum strategies

market can be explained by different portfolio design, control of market-state characteristics, company size and value effect.

Considering the total sample of shares (1,125) in the full time horizon (1997-2013) with J/1/K (when J and K are less than 1 year) portfolios, we find no momentum effect in the Japanese stock market with partial portfolio rebalancing (overlapping holding periods) and full rebalancing. None of the 32 long-short portfolios shows a statistically significant positive return (Figure 2).

In Figure 2 we document our results for the Japanese stock market for the total sample (1,125 traded stocks) and

subsample (the largest 580 companies) with different designs of portfolios (different formation and holding periods), full or partial rebalancing (overlapping holding periods) and during the whole period (1997-2013) and before August 2008.

The results of testing the pre-crisis (January 1997 - August 2008) period demonstrate the existence of a short-term momentum effect (three months) with 10% confidence level with different portfolio designs. The best result from the monthly returns (about 1.1%) is fixed for three months' holding periods (Table 1, portfolios 3/1/3, 6/1/3, 9/1/3). Crisis and post crisis periods do not show statistically significant positive long-short momentum returns with overlapping holding periods.

Table 1. Payoffs (raw returns) of momentum strategies for total sample (1,125 stocks) with overlapping periods during 1997-2008

Ranking period	Holding period	Winners	Losers	Winners Minus Losers	t-stat Winners Minus Losers	P-value	
3	3	0.018	0.007	0.011	1.88	0.06	*
	6	0.016	0.006	0.009	1.85	0.07	*
	9	0.014	0.007	0.007	1.72	0.09	*
	12	0.013	0.007	0.006	1.65	0.10	*
6	3	0.018	0.006	0.012	1.87	0.06	*
	6	0.016	0.007	0.010	1.67	0.10	*
	9	0.015	0.007	0.008	1.55	0.12	
	12	0.013	0.008	0.006	1.19	0.24	
9	3	0.018	0.007	0.011	1.64	0.10	*
	6	0.016	0.007	0.009	1.48	0.14	
	9	0.014	0.008	0.006	1.10	0.27	
	12	0.013	0.009	0.004	0.68	0.49	
12	3	0.018	0.008	0.010	1.45	0.15	
	6	0.015	0.008	0.007	1.09	0.28	
	9	0.013	0.010	0.003	0.61	0.54	
	12	0.011	0.011	0.001	0.17	0.87	

*Note: * shows significance at the 10% level*

To justify our choice of limiting the holding period to 12 months, we investigate momentum profits for 16 winner portfolios, 16 loser portfolios and zero cost portfolios (long-short) from Month 13 to Month 60

during the sample period from January 1997 to December 2013. Figure 3 demonstrates the cumulative returns of the Winner and Loser portfolios based on a 3-month ranking period over 60 months following the formation date T (sample of 580 companies).

In figure 4 we show the Winner minus Loser portfolio based on a 3-month ranking period over 60 months following the formation date T (sample of 580 companies). The average cumulative momentum return has steadily increased until the end of Month 12, when it reaches the maximum point of 8.8%. Afterwards the results reveal a reversal of returns from Month 13 to Month 44. A weak renaissance of momentum strategy can be observed which lasts for nearly six months but turns into reversal again. Momentum profits are negative on average from the second to the fifth years. The findings support that the momentum profits will reverse after the end of Month 12. We confirm the existence of a long-term contrarian effect.

A longer ranking period for portfolio construction accelerates the reversal effect (Figure 5). Positive profits from momentum strategy were observed over a longer period only with a short-term ranking period (3 month).

5.2. Seasonality in the Japanese market and our valuation of momentum profits

In our study we investigate the presence of calendar patterns and their influence on the stock market. We observe that the calendar effects are also presented on the Japanese stock market and have a negative influence on the momentum profits, recorded over two months of consistently negative momentum profits. Momentum returns are substantially negative in January, which is in line with other studies (e.g. Jegadeesh and Titman, 1993).
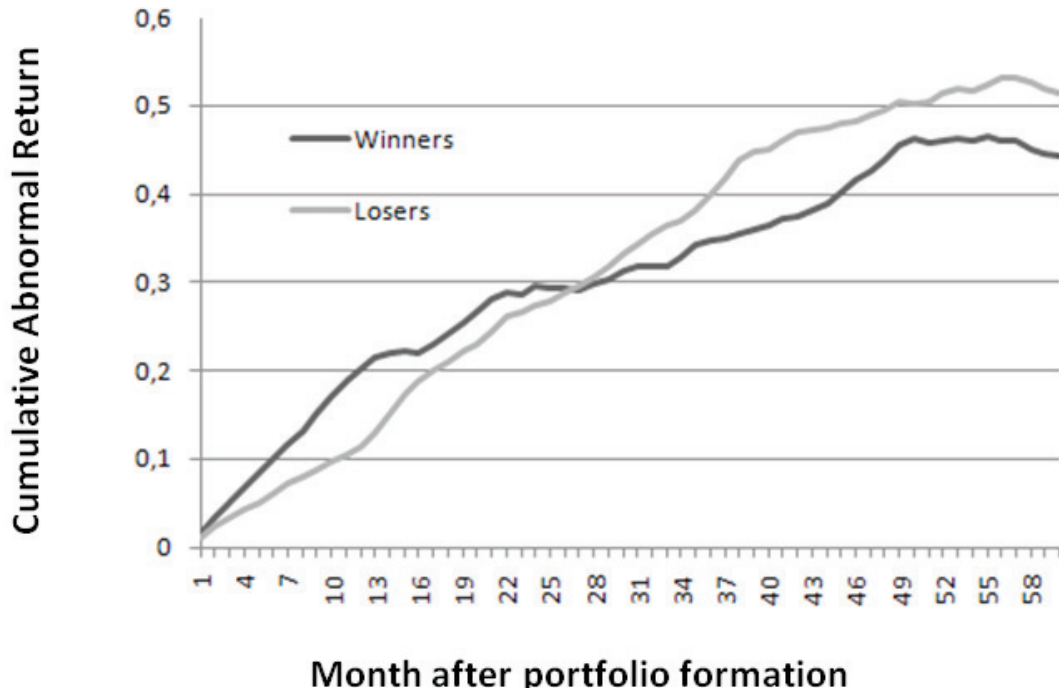
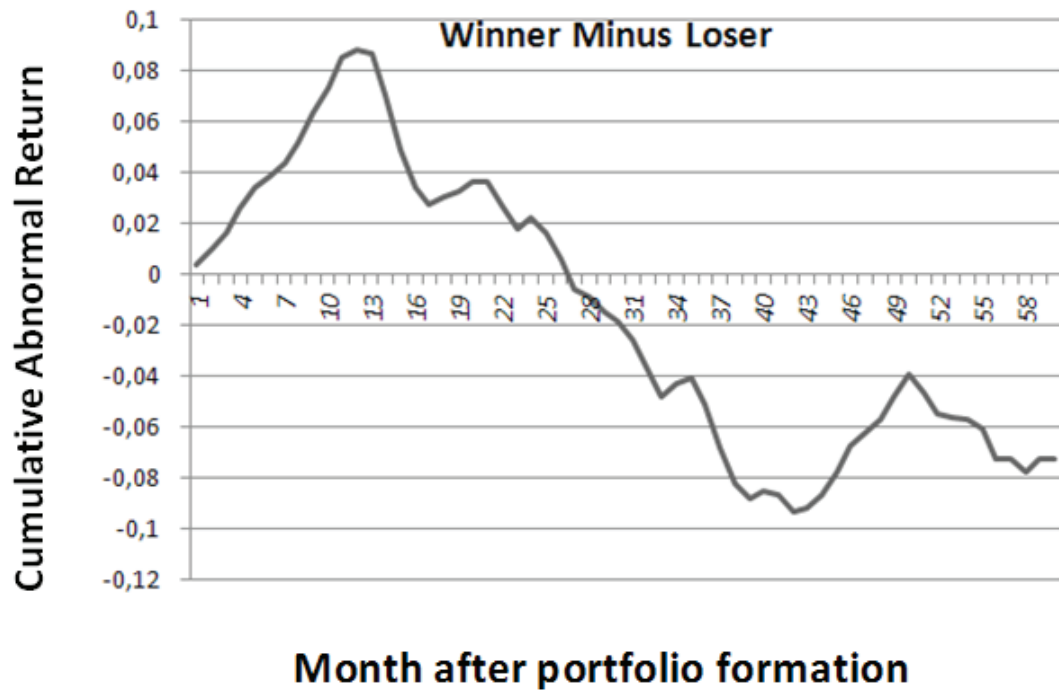Fig. 3. Average cumulative return for Winner and Loser portfolios (3/1/60)

Fig. 4. Average cumulative return for Winner and Loser portfolios (3/1/60), 1997-2013
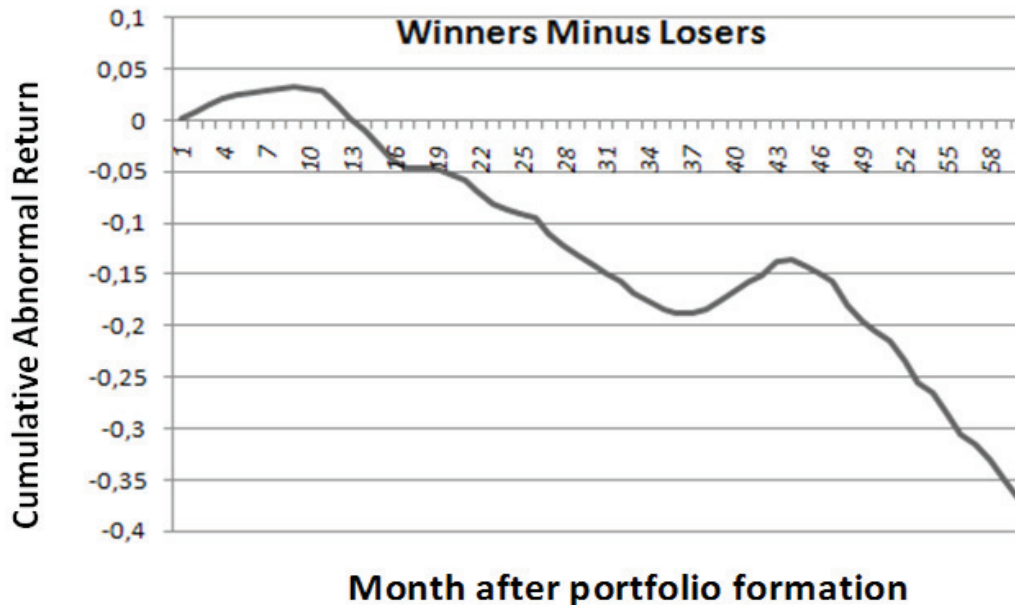
Fig. 5. Average cumulative return for Winner and Loser portfolios (12/1/60), 1997-2013

We have identified another important month for the investment decisions - May. The price momentum strategy loses about 2-4% on average in each January and 1.9%-4.2% in May across the 16 portfolios (Table 2).

The results shown in Table 2 suggest that there is also a seasonal pattern outside January. For instance, the returns are low in May, February and November and are predominantly high in July, September and December. The presence of the May effect we can relate to the well-known market-timing strategy "Sell in May and Go Away", i.e. an investor should close his positions on the stock market and return in November.

The findings in Table 3 present the proportion of positive returns of 16 price momentum portfolios by calendar month (full analysis period includes 17 years, i.e. 17 observations for each month in the year). We account for how many positive returns are observed in each month.

Our findings document that the cross section momentum strategy produces positive returns, in most cases, for September and December. The larger than average returns in December may in part be due to price pressure arising from portfolio managers selling their losers in these months for tax or window dressing reasons.

With the exclusion of the analyses of January and May, also with overlapping holding periods, the momentum effect became statistically significant (Table 4) in the Japanese stock market (excluding portfolios with long periods of holding and stock selection: 09/1/12, 12/1/06-12). We observe statistically significant profits for the total sample and for the large 580 companies (Table 5). Return on 11 zero cost portfolios (Win minus Los) is 1% per month with a 5% significance level. For the period 1997-2008, the results (Table 6) are even more impressive (for the 580 companies with a 1% significance level, the monthly return is in the range of 1%-2.3%). Maximum profits (2.3% monthly return) were observed for short-term three month holding periods.

Table 2. Returns on Price Momentum Portfolios by Calendar Month across the 16 investment strategies

	January	February	March	April	May	June	July	August	September	October	November	December
03/1/03	-4.00%	0.14%	0.07%	0.20%	-2.00%	2.09%	3.73%	1.08%	3.43%	0.12%	-2.12%	2.47%
03/1/06	-3.29%	-0.07%	0.14%	-0.15%	-2.25%	1.64%	3.08%	0.84%	3.10%	0.11%	-1.40%	2.02%
03/1/09	-3.29%	-0.07%	0.14%	-0.15%	-2.25%	1.64%	3.08%	0.84%	3.10%	0.11%	-1.40%	2.02%
03/1/12	-2.17%	-0.14%	0.34%	0.58%	-1.88%	0.50%	1.85%	1.05%	2.40%	-0.79%	0.01%	1.37%
06/1/03	-4.01%	-0.18%	0.39%	-0.25%	-3.51%	2.09%	4.11%	0.96%	4.15%	0.01%	-2.01%	2.73%
06/1/06	-3.19%	-0.43%	0.60%	0.01%	-3.43%	1.45%	2.95%	0.94%	3.60%	0.23%	-0.80%	2.52%
06/1/09	-2.55%	-0.46%	0.84%	0.60%	-2.84%	0.70%	2.30%	1.28%	3.20%	-0.11%	0.04%	2.06%
06/1/12	-2.26%	-0.71%	0.45%	0.72%	-2.40%	0.52%	1.86%	1.46%	2.73%	-0.79%	0.13%	1.41%
09/1/03	-3.82%	-0.68%	0.77%	0.21%	-4.22%	1.74%	3.25%	1.70%	4.50%	0.58%	-1.55%	2.80%
09/1/06	-3.10%	-0.61%	1.00%	0.65%	-3.52%	1.00%	2.68%	1.89%	4.11%	-0.02%	-0.62%	2.24%
09/1/09	-2.72%	-0.86%	0.60%	0.82%	-2.89%	0.48%	2.07%	1.98%	3.42%	-0.70%	-0.07%	1.52%
09/1/12	-2.36%	-1.13%	-0.04%	0.88%	-2.28%	0.28%	1.54%	1.74%	2.85%	-1.12%	-0.25%	1.00%
12/1/03	-3.38%	-0.79%	1.09%	0.91%	-3.89%	0.98%	2.74%	2.20%	4.40%	-0.26%	-1.42%	2.41%
12/1/06	-2.84%	-1.16%	0.57%	0.78%	-3.17%	0.65%	2.28%	2.11%	3.74%	-0.92%	-0.69%	1.42%
12/1/09	-2.51%	-1.43%	-0.19%	0.66%	-2.56%	0.23%	1.64%	1.86%	3.14%	-1.13%	-0.64%	0.95%
12/1/12	-2.02%	-1.53%	-0.66%	0.62%	-2.13%	-0.20%	1.20%	1.59%	2.46%	-1.45%	-0.63%	0.61%

Table 3. Proportion of Positive Returns of Price Momentum Portfolios by Calendar Month

	January	February	March	April	May	June	July	August	September	October	November	December
03/1/03	29%	41%	59%	59%	24%	35%	82%	53%	88%	41%	35%	76%
03/1/06	35%	41%	65%	65%	35%	41%	71%	53%	82%	53%	35%	76%
03/1/09	35%	41%	76%	71%	29%	53%	71%	59%	88%	53%	41%	76%
03/1/12	41%	35%	76%	76%	29%	35%	71%	65%	82%	65%	29%	71%
06/1/03	35%	41%	71%	71%	29%	53%	76%	65%	88%	47%	41%	76%
06/1/06	35%	41%	65%	65%	24%	59%	65%	47%	76%	53%	41%	76%
06/1/09	41%	35%	76%	65%	24%	53%	71%	65%	71%	65%	41%	71%
06/1/12	35%	35%	71%	71%	29%	41%	71%	59%	71%	59%	47%	71%
09/1/03	41%	41%	76%	65%	29%	59%	65%	59%	76%	53%	35%	76%
09/1/06	41%	41%	71%	71%	35%	53%	65%	65%	76%	65%	35%	71%
09/1/09	41%	35%	65%	71%	35%	47%	76%	65%	76%	59%	47%	71%
09/1/12	29%	35%	59%	65%	41%	59%	65%	65%	65%	53%	35%	65%
12/1/03	35%	29%	76%	71%	41%	41%	71%	65%	76%	59%	35%	71%
12/1/06	35%	35%	65%	71%	35%	41%	65%	59%	76%	59%	41%	65%
12/1/09	29%	41%	59%	65%	41%	47%	59%	59%	71%	53%	35%	59%
12/1/12	41%	29%	59%	59%	47%	53%	65%	65%	59%	59%	41%	59%

6. Other determinants of momentum profits

A possible explanation for the failure of momentum strategies in the Japanese market is the non-positive trend in stock market dynamics (Figure 6), high return volatility of the market compared to the U.S. (Table 6), significant value effect. We test the determinants of momentum effect through regression analysis of monthly returns for momentum portfolios on a number of market characteristics: prior market risk premium (as an indicator of investor sentiment), premiums for small size (Small minus Big) and premium for the Value factor.

Market risk premium, size (SMB) and book-to-market (HML) factors are widely used in examining abnormal returns in different markets. In our study we also focus on checking whether these determinants can explain return and excess momentum returns (profits of 16 momentum portfolios). The Kenneth R. French Data Library provides the Fama-French and market factor returns for the Japanese stock market. The portfolio of big stocks consists of the top 90% stocks and consequently the group of small cap companies contains the bottom 10%. The portfolio of value stocks contains securities with the highest book-to-price (B/P, BV/MV) ratios and the portfolio of growth stocks

Table 4. Payoffs of momentum strategies for total sample with overlapping except for January and May (1997-2013)

Ranking period	Holding period	Winners	Losers	Winners Minus Losers	t-stat Winners Minus Losers	P-value	
3	3	0.019	-0.001	0.020	3.27	0.00	**
	6	0.016	-0.001	0.017	3.43	0.00	**
	9	0.014	0.000	0.014	3.24	0.00	**
	12	0.012	0.000	0.012	3.01	0.00	**
6	3	0.020	-0.003	0.023	3.42	0.00	**
	6	0.017	-0.002	0.019	3.22	0.00	**
	9	0.015	-0.001	0.016	2.89	0.00	**
	12	0.013	0.001	0.012	2.48	0.01	**
9	3	0.020	-0.002	0.022	3.15	0.00	**
	6	0.017	-0.001	0.018	2.79	0.01	**
	9	0.014	0.001	0.014	2.28	0.02	**
	12	0.012	0.002	0.009	1.78	0.08	*
12	3	0.019	-0.001	0.019	2.71	0.01	**
	6	0.015	0.001	0.015	2.24	0.01	**
	9	0.013	0.003	0.010	1.65	0.10	*
	12	0.010	0.004	0.006	1.09	0.28	

*Note: ** shows significance at the 5% level, and * at the 10% level*

Table 5. Payoffs of momentum strategies for large companies with overlapping except for January and May (1997-2013)

Ranking period	Holding period	Winners Minus Losers	t-stat Winners Minus Losers	P-value	
3	3	0.011	2.27	0.02	**
	6	0.009	2.15	0.03	**
	9	0.009	2.36	0.02	**
	12	0.008	2.36	0.02	**
6	3	0.012	2.07	0.04	**
	6	0.011	2.15	0.03	**
	9	0.010	2.31	0.02	**
	12	0.008	1.94	0.05	**
9	3	0.013	2.25	0.03	**
	6	0.012	2.30	0.02	**
	9	0.009	1.91	0.06	*
	12	0.006	1.29	0.20	
12	3	0.012	2.04	0.04	**
	6	0.009	1.59	0.11	
	9	0.005	1.04	0.30	
	12	0.002	0.45	0.65	

*Note: ** shows significance at the 5% level, and * at the 10% level*

consequently comprises the lowest ratios. The B/P breakpoints for a region are the 30th and 70th percentiles of B/P for the big stocks of the region. Factors SMB and HML are constructed on the basis of six equity portfolios formed from the sorting of two size (market capitalization) and three B/P portfolios.

SMB is the difference between the average return on the two small portfolios and the average return on the two large portfolios:

SMB = 1/3 (Small Value + Small Neutral + Small Growth) – 1/3 (Big Value + Big Neutral + Big Growth)

Similarly, HML is the difference between the average return on the two portfolios with the highest B/P ratios and the average return on the two portfolios with the lowest B/P ratios:

HML = 1/2 (Small Value + Big Value) – 1/2 (Small Growth + Big Growth)

For the period 1997-2008, the market risk premium in Japan is significantly lower and more volatile than in the U.S. (Table 7). The Japanese market demonstrates bigger median and mode amount for value premium than the US market and positive size premium.

Table 6. Payoffs of momentum strategies for large companies with overlapping except for January and May (1997-2008)

Ranking period	Holding period	Winners	Losers	Winners Minus Losers	t-stat Winners Minus Losers	P-value	
3	3	0.021	0.001	0.020	2.93	0.00	**
	6	0.019	0.000	0.018	2.98	0.00	**
	9	0.017	0.001	0.015	3.14	0.00	**
	12	0.015	0.002	0.013	2.91	0.00	**
6	3	0.023	0.000	0.023	3.03	0.00	**
	6	0.020	0.000	0.020	3.05	0.00	**
	9	0.017	0.001	0.017	2.79	0.01	**
	12	0.015	0.003	0.013	2.34	0.02	**
9	3	0.023	0.000	0.023	3.09	0.00	**
	6	0.020	0.000	0.020	2.85	0.01	**
	9	0.017	0.002	0.015	2.30	0.02	**
	12	0.014	0.004	0.010	1.76	0.08	*
12	3	0.021	0.001	0.020	2.58	0.01	**
	6	0.018	0.002	0.016	2.17	0.03	**
	9	0.015	0.005	0.010	1.56	0.12	
	12	0.012	0.006	0.006	0.97	0.34	

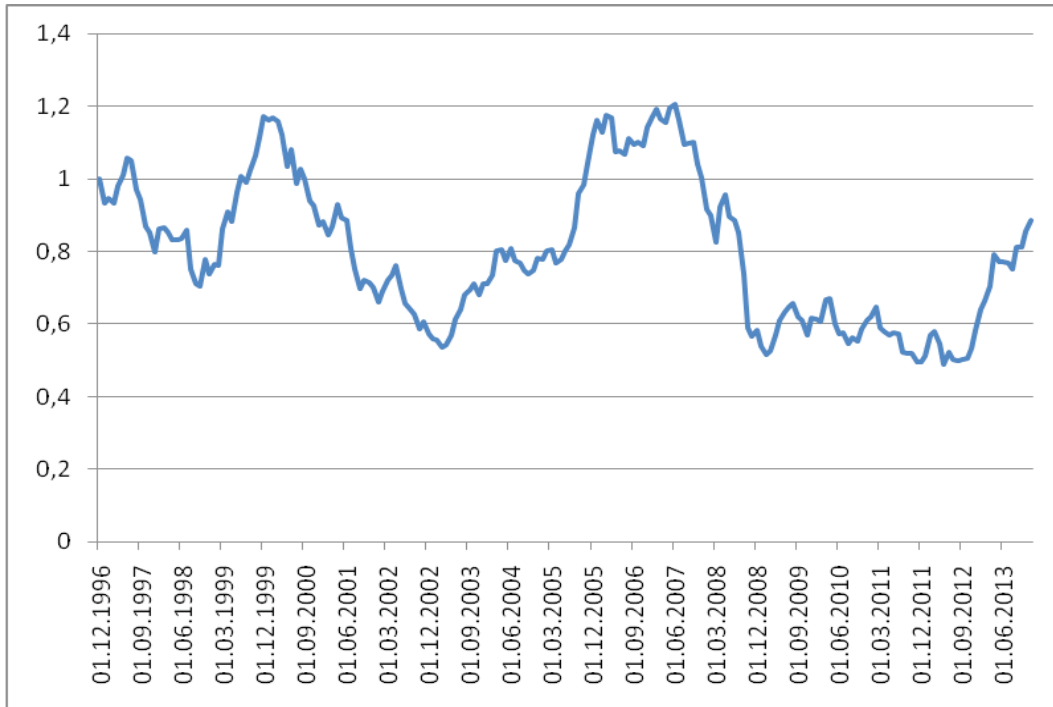*Note: ** shows significance at the 5% level, and * at the 10% level*

Fig. 6. Average cumulative return for Winner and Loser portfolios (12/1/60), 1997-2013

Momentum profits may depend on the prior market state and evolving expectations. In the conditions of a rising market, increasing investor optimism, past winners' and losers' portfolios are beginning to show a positive return (e.g. since 2003 in Japan). However, investors will not receive profit from opening short positions (by selling past losers' stocks). The growing market shows the highest payoff on investment strategies with the past winners. Our results document a statistically significant positive correlation on the monthly return of zero cost momentum strategy (3/1/3) with a change in the 3-month lag GDP and with the volatility of GDP growth by quarter of the year (Figure 7).

Sudden changes in quarterly GDP generate uncertainty in investors and make them more attentive to the selection of stocks for the portfolio. With changing economic conditions and the compression of some industries, investors are no longer willing to rely on past investment performance, become more

Table 7. Comparison of the risk premium, size and value premiums in the U.S. and Japanese markets

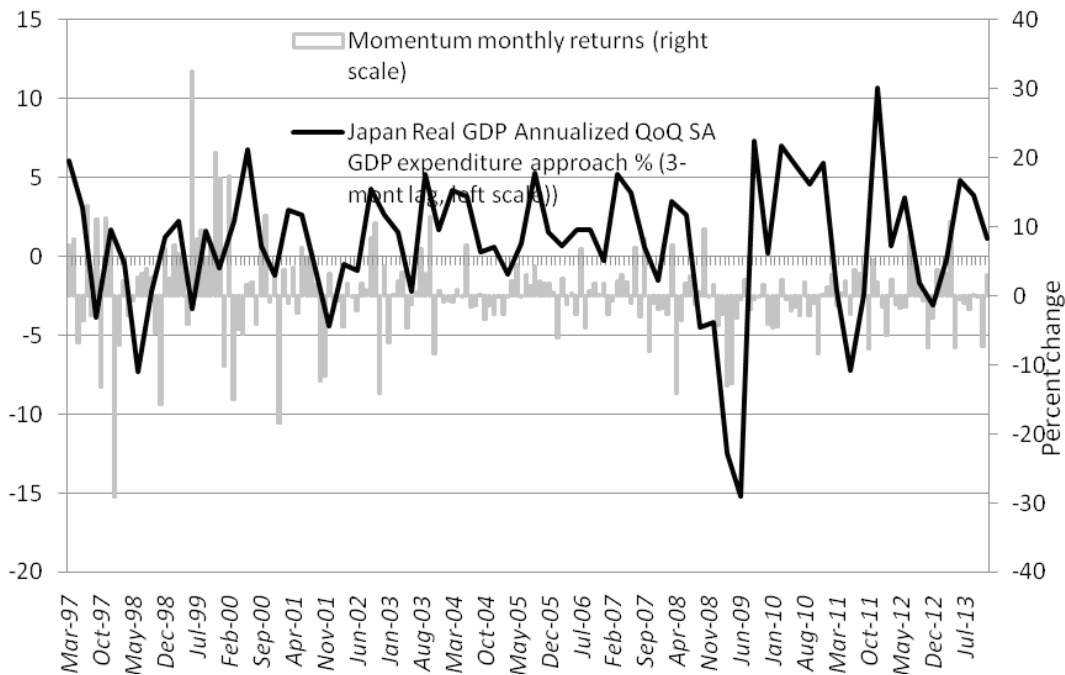| Countries	Japan			U.S.		
Statistical characteristics	MRP	SMB	HML	MRP	SMB	HML
Mean 1997-2013	0.09	0.021	0.465	0.544	-0.056	0.487
Mean 1997-Aug2008	-0.076	-0.136	0.59	0.356	-0.23	0.756
Median 1997-2013	0.36	0.19	0.54	1.3	-0.06	0.255
Standard Deviation	5.44	3.22	3.10	4.76	3.61	3.41
Mode 1997-2013	1.45	0.46	0.84	0.73	-0.26	0.48

Fig. 7. Momentum returns for portfolios with an overlapping holding period on the sample of 580 stocks and 3-month lag GDP (1997-2013)

susceptible to new information and thus the momentum effect disappears. This generates huge losses in momentum strategies. The Japanese market sustained maximum losses in momentum strategies in 1997-1998, 2001 and 2008-2009.

7. Conclusions

The two hypotheses are confirmed by the results for the timespan 1997-2013. The seasonal effect (January and May) is significant to build momentum strategies in Japanese stocks. We document that the calendar effects have a negative influence on the momentum profits. Momentum returns are substantially negative in January, which is in line with other studies (e.g. Jegadeesh and Titman, 1993) and in May. The price momentum strategy loses about 2% - 4% on average in every January and 1.9% - 4.2% in May across the 16 portfolios.

The existence and payoff of the momentum effect depend on seasonal adjustment and on

a method of portfolio construction (portfolio design), sample of stocks (fundamental characteristics of companies), state of the economy (growing and falling market, GDP growth) and past stock market volatility. Momentum strategies do not show a positive return during periods of financial and economic crisis, or after a period of high volatility. Momentum strategy in the Japanese stock market does not work when considering the total sample from 1997-2013 with a partial rebalancing of the portfolio (overlapping holding period). The momentum effect is observed only with a full portfolio rebalancing.

Reducing the sample to the largest companies (580), using the overlapping holding period and considering only the pre-crisis period from January 1997-August 2008, reveals a medium-term momentum effect with rather long investment window of 12 months (3/1/12, 6/1/12) with a payoff (long-short arbitrage portfolio) of 1% of monthly returns. Portfolios

constructed to mimic risk factors related to size and MV/BV show greater explanatory power compared to the market risk premium. The risk factor in returns related to HML is statistically significant at 5% level for all examined 16 strategies of the whole sample (1,125 stocks) and the largest one as well (580) with full and partial rebalancing portfolios during 1997-2013. In contrast, SMB factors do not work for explaining medium-term momentum on the sample of the largest stocks.

Appendix

Table A1. Table A1. Hofstede's Culture Dimensions, 4D country differences

Country	Power Distance	Uncertainty Avoidance	Individualism	Masculinity
Greece (GRE)	60	112	35	57
Portugal (POR)	63	104	27	31
Belgium (BEL)	65	94	75	54
Japan (JPN)	54	92	46	95
Peru (PER)	64	87	16	42
France (FRA)	68	86	71	43
Spain (SPA)	57	86	51	42
Argentina (ARG)	49	86	46	56
Chile (CHL)	63	86	23	28
Turkey (TUR)	66	85	37	45
South Korea (KOR)	60	85	18	39
Mexico (MEX)	81	82	30	69
Israel (ISR)	13	81	54	47
Columbia (COL)	67	80	13	64
Brazil (BRA)	69	76	38	49
Venezuela (VEN)	81	76	12	73
Italy (ITA)	50	75	76	70
Austria (AUT)	11	70	55	79
Pakistan (PAK)	55	70	14	50
Taiwan (TAI)	58	69	17	45
Arabic World (ARA)	80	68	38	52
Germany (FRG)	35	65	67	66
Thailand (THA)	64	64	20	34
Finland (FIN)	33	59	63	26
Switzerland (SWI)	34	58	68	70
Netherlands (NET)	38	53	80	14
Eastern Africa (EAF)	64	52	27	41
Australia (AUL)	36	51	90	61
Norway (NOR)	31	50	69	8
New Zealand (NZI)	22	49	79	58
South Africa (SAF)	49	49	65	63
Canada (CAN)	39	48	80	52
Indonesia (IDO)	78	48	14	46
United States (USA)	40	46	91	62
Philippines (PHI)	94	44	32	64
India (IND)	77	40	48	56
Malaysia (MAL)	104	36	26	50
Great Britain (GBR)	35	35	89	66
Ireland (IRE)	28	35	70	68
Sweden (SWE)	31	29	71	5
Hong Kong (HOK)	68	29	25	57
Denmark (DEN)	18	23	74	16
Singapore (SIN)	74	8	20	48
Sourses: Hofstede (2010)				

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