

International Momentum Strategies

K. GEERT ROUWENHORST*

ABSTRACT

International equity markets exhibit medium-term return continuation. Between 1980 and 1995 an internationally diversified portfolio of past medium-term Winners outperforms a portfolio of medium-term Losers after correcting for risk by more than 1 percent per month. Return continuation is present in all twelve sample countries and lasts on average for about one year. Return continuation is negatively related to firm size, but is not limited to small firms. The international momentum returns are correlated with those of the United States which suggests that exposure to a common factor may drive the profitability of momentum strategies.

MANY PAPERS HAVE DOCUMENTED that average stock returns are related to past performance. Jegadeesh and Titman (1993) document that over medium-term horizons performance persists: firms with high returns over the past three months to one year continue to outperform firms with low past returns over the same period. By contrast, DeBondt and Thaler (1985, 1987) document return reversals over longer horizons. Firms with poor three- to five-year past performance earn higher average returns than firms that performed well in the past. There has been an extensive literature on whether these return patterns reflect an improper response by markets to information, or whether they can be explained by market microstructure biases or by properly accounting for risk.¹ Fama and French (1996) show that long-term reversals can be consistent with a multifactor model of returns, but their model fails to explain medium-term performance continuation. Chan, Jegadeesh, and Lakonishok (1996) find that medium-term return continuation can be explained in part by underreaction to earnings information, but price momentum is not subsumed by earnings momentum.

Return reversal and continuation are only two of many patterns that empirical researchers have uncovered using substantially the same database of U.S. stocks. It can therefore not be ruled out that these apparent anomalies are simply the outcome of an elaborate data snooping process. This paper is

*The author is at the Yale School of Management. I thank Ray Ball, Jennifer Conrad, Eugene Fama, Narasimhan Jegadeesh, Ken French, N. Prabhala, Jake Thomas, Roberto Wessels, seminar participants at Erasmus Universiteit Rotterdam, Katholieke Universiteit Leuven, the University of North Carolina, the University of Pennsylvania, René Stulz (the editor), and an anonymous referee for their comments, and ARCAS-Wessels Roll Ross for kindly providing the data. I acknowledge support from a Fred Frank Grant.

¹ See for example Chan (1988), Ball and Kothari (1989), Ball, Kothari, and Shanken (1995), Conrad and Kaul (1993, 1996), Chan, Hamao, and Lakonishok (1991), Lakonishok, Schleifer, and Vishny (1994), and DeLong et al. (1990).

an attempt to address this concern by studying return patterns in an international context. Although Asness, Liew, and Stevens (1996) and Richards (1996) study return patterns across markets at the country index level, this paper primarily focuses on international return continuation within markets and across markets at the individual stock level using a sample of 2,190 stocks from 12 European countries in the period 1978 to 1995.² Because of the length of the sample period, the paper concentrates only on patterns in medium-term returns. The sample period partly overlaps with the United States samples of Jegadeesh and Titman (1993) and Fama and French (1996), and is thus not strictly independent because of common factors in international markets. However, return continuation in the United States does not seem to be related to common factors or conventional measures of risk. If return continuation is absent in international markets or, when present, can be rationalized using conventional measures of risk, this suggests that the U.S. experience may simply have been unusual. Return continuation that is common to many markets and cannot be accounted for by risk points either toward a more serious misspecification of commonly used asset pricing models or a general tendency of markets to underreact to information.

The main finding of the paper is that an internationally diversified relative strength portfolio that invests in medium-term Winners and sells past medium-term Losers earns approximately 1 percent per month. This momentum in returns is not limited to a particular market, but is present in all 12 markets in the sample. It holds across size deciles, although return continuation is stronger for small than large firms. The outperformance lasts for about one year, and cannot be attributed to conventional measures of risk. In fact, controlling for market risk or exposure to a size factor increases the abnormal performance of relative strength strategies. The paper, however, presents some evidence that European and U.S. momentum strategies have a common component, which suggests that exposure to a common factor may drive the profitability of momentum strategies.

The remainder of the paper is organized as follows. Section I describes the sample and documents the profitability of medium-term international momentum strategies. Section II shows that momentum is not restricted to stocks of a particular country or size category. Section III examines whether the returns to momentum strategies can be explained by conventional asset pricing models. Section IV provides conclusions.

I. Returns of Relative Strength Portfolios

The sample consists of monthly total returns in local currency for 2,190 firms from 12 European countries from 1978 through 1995: Austria (60 firms), Belgium (127), Denmark (60), France (427), Germany (228), Italy (223), The Netherlands (101), Norway (71), Spain (111), Sweden (134), Switzerland (154), and the United Kingdom (494). The sample covers 60 to 90 percent of each

² Foerster, Prihar, and Schmitz (1995) provide evidence on momentum strategies in the Canadian market.

country's market capitalization.³ All returns are converted to deutsche marks (DM) using exchange rate information taken from the *Financial Times*.

The relative strength portfolios are constructed as in Jegadeesh and Titman (1993). At the end of each month, all stocks with a return history of at least 12 months are ranked into deciles based on their past J -month return (J equals 3, 6, 9, or 12) and assigned to one of ten relative strength portfolios (1 equals lowest past performance, or "Loser", 10 equals highest past performance, or "Winner"). These portfolios are equally weighted at formation, and held for K subsequent months (K equals 3, 6, 9, or 12 months) during which time they are not rebalanced.⁴ The holding period exceeds the interval over which return information is available (monthly), which creates an overlap in the holding period returns. The paper follows Jegadeesh and Titman (1993) who report the monthly average return of K strategies, each starting one month apart. This is equivalent to a composite portfolio in which each month $1/K$ of the holdings are revised. For example, toward the end of month t the $J = 6$, $K = 3$ portfolio of Winners consists of three parts: a position carried over from an investment of one DM at the end of month $t - 3$ in the 10 percent of firms with highest prior six-month performance as of $t - 3$, and two similar positions resulting from a DM invested in the top-performing firms at the end of months $t - 2$ and $t - 1$. At the end of month t , the first of these holdings will be liquidated and replaced with a unit DM investment in the stocks with highest six-month performance as of time t .

Table I presents the average monthly returns on these composite portfolio strategies from 1980 to 1995.⁵ Panel A shows that an equally weighted portfolio formed from the stocks in the bottom decile of previous three-month performance returns 1.16 percent per month, 0.70 percent less than the top decile portfolio, which returns 1.87 percent. For the three-month holding period ($K = 3$), the excess return from buying Winners and selling Losers increases with the length of the return interval used for ranking (J). Irrespective of the interval used for ranking, average returns tend to fall for longer holding periods. For each of the ranking and holding periods, however, past Winners outperformed past Losers by about 1 percent per month. The returns range from 0.64 to 1.35 percent per month earned by portfolios based on 12-month ranked returns held for 12 and 3 months respectively. All excess returns in Panel A are significant at the 5 percent level.

The portfolios in Panel A are formed at the end of the performance ranking period. Because bid-ask bounce can attenuate the continuation effect, Panel B reports the average returns if the portfolio formation is delayed relative to

³ Although the sample is not comprehensive, and is biased to the larger firms in each market, there is no selection bias in the sense that the data are not backfilled.

⁴ An exception arises when a stock is delisted. In that case the liquidating proceeds are invested in the value-weighted Morgan Stanley Capital International (MSCI) index of the 12 countries in the sample. The conclusions of the paper are unchanged if the proceeds are re-invested in the remaining stocks in the same decile portfolio.

⁵ Return data are available from 1978, but two years are lost due to performance ranking: the $J = 12$, $K = 12$ strategy consists in part of positions taken 12 months ago based on prior 12-month performance.

Table I
Returns of Relative Strength Portfolios

At the end of each month all stocks are ranked in ascending order based on previous J -month performance. The stocks in the bottom decile (lowest previous performance) are assigned to the Loser portfolio, those in the top decile to the Winner portfolio. The portfolios are initially equally weighted and held for K months. The table gives the average monthly buy-and-hold returns on these portfolios for the period 1980 to 1995. In Panel A the portfolios are formed immediately after ranking, in Panel B the portfolio formation occurs one month after the ranking takes place. t -stat is the average return divided by its standard error.

Ranking Period (J)	Portfolio	Panel A					Panel B				
		Holding Period (K)					Holding Period (K)				
		3	6	9	12		3	6	9	12	
3	Loser	0.0116	0.0104	0.0108	0.0109		0.0077	0.0087	0.0094	0.0105	
	Winner	0.0187	0.0192	0.0190	0.0191		0.0185	0.0191	0.0190	0.0184	
	Winner - Loser	0.0070	0.0088	0.0082	0.0082		0.0109	0.0105	0.0095	0.0079	
	(t -stat)	(2.59)	(3.86)	(4.08)	(4.56)		(4.29)	(4.74)	(4.99)	(4.64)	
6	Loser	0.0095	0.0090	0.0092	0.0104		0.0072	0.0076	0.0088	0.0106	
	Winner	0.0208	0.0206	0.0204	0.0195		0.0204	0.0205	0.0200	0.0187	
	Winner - Loser	0.0113	0.0116	0.0112	0.0091		0.0131	0.0128	0.0112	0.0081	
	(t -stat)	(3.60)	(4.02)	(4.35)	(3.94)		(4.27)	(4.59)	(4.50)	(3.62)	
9	Loser	0.0088	0.0083	0.0097	0.0111		0.0064	0.0077	0.0095	0.0114	
	Winner	0.0212	0.0213	0.0204	0.0193		0.0209	0.0207	0.0197	0.0184	
	Winner - Loser	0.0124	0.0129	0.0107	0.0082		0.0145	0.0130	0.0102	0.0070	
	(t -stat)	(3.71)	(4.19)	(3.78)	(3.19)		(4.50)	(4.36)	(3.77)	(2.83)	
12	Loser	0.0084	0.0094	0.0108	0.0121		0.0077	0.0093	0.0110	0.0125	
	Winner	0.0219	0.0209	0.0197	0.0185		0.0208	0.0198	0.0188	0.0176	
	Winner - Loser	0.0135	0.0115	0.0089	0.0064		0.0131	0.0105	0.0078	0.0051	
	(t -stat)	(3.97)	(3.66)	(3.07)	(2.40)		(4.03)	(3.48)	(2.80)	(1.98)	

the ranking by one month. For the shorter ranking and holding intervals, delaying the portfolio formation indeed increases the payoff to buying Winners and selling Losers. This increase is primarily due to a lower return to the Loser portfolio.

Bid-ask bounce can also affect the measurement of the holding period returns. Blume and Stambaugh (1983) show that long-term performance measures, obtained by averaging short-term returns over time, will be biased upward due to measurement error in the returns and bid-ask bounce. This bias affects the apparent profitability of momentum strategies because Losers are on average smaller than Winners.⁶ In addition to the average monthly return on K -month strategies given in Table I, I also compute the average K -month holding period returns on the various strategies, and find the results to be very similar.

The remainder of the paper will concentrate on portfolios formed on the basis of six-month ranked returns, formed at the end of the ranking period and held for six months. Table II presents the summary statistics for the 10 decile portfolios of this strategy. The Average Return column shows that the average performance of the decile portfolios is monotonically increasing in previous six-month return. Higher past six-month return is on average associated with stronger future six-month performance. An F -test strongly rejects the equality of average returns of the relative strength portfolios. The next column of Table II shows that the standard deviation of the decile portfolios is u-shaped. The Winner and Loser portfolios have standard deviations that are 30 and 40 percent higher than the portfolios in the middle deciles. All else equal, stocks with higher standard deviations are more likely to show unusual performance, and past unusual performance is cross-sectionally correlated with volatility. The standard deviation of the excess return of Winners over Losers is about 4 percent per month, which is similar to the volatility of a long position in the middle decile portfolios. This indicates that an "unrestricted" international momentum portfolio may not be well-diversified. The MSCI β column shows that the excess return of Winners over Losers is unlikely to be explained by its covariance with the market. The sample average excess return on the market is about 0.6 percent per month. For market risk to explain a continuation effect of 1.2 percent per month would require, loosely speaking and ignoring standard errors, that the beta of Winners exceeds the beta of Losers by about two. Instead, both betas with respect to the value-weighted Morgan Stanley Capital International (MSCI) index are close to unity, and the beta of the excess return of Winners over Losers is insignificantly different from zero.⁷ The last column of Panel A reveals two interesting characteristics of the relative strength portfolios. First, the average size of the Losers is smaller than the average size

⁶ For example, Conrad and Kaul (1993) and Ball, Kothari, and Wasley (1995) show that this bias overstates the profitability of contrarian strategies.

⁷ Allowing for a delayed market response due to nonsynchronous trading does not change these conclusions.

Table II
Returns of Relative Strength Decile Portfolios

At the end of each month all stocks are ranked in ascending order based on previous six-month performance. The stocks in the bottom decile (lowest previous performance) are assigned to the Loser portfolio, those in the top decile to the Winner portfolio. The portfolios are initially equally weighted and held for six months. The table gives the average monthly buy-and-hold returns and standard deviations of the 10 portfolios for the period 1980 to 1995. The Morgan Stanley Capital International (MSCI) β is the beta of the decile portfolio computed relative to the value-weighted MSCI index of the 12 countries in the sample. The average size is the average natural logarithm of the market value of equity of the stocks in the portfolio, computed in deutsche marks. The F -statistic tests for equality of average returns of the 10 relative strength portfolios.

Prior Return Decile	Average Return	Standard Deviation	MSCI β	Average Size
Loser	0.0090	0.0564	1.00	5.55
2	0.0096	0.0459	0.89	6.01
3	0.0101	0.0420	0.85	6.19
4	0.0112	0.0402	0.83	6.29
5	0.0114	0.0398	0.84	6.36
6	0.0125	0.0403	0.86	6.40
7	0.0135	0.0414	0.89	6.44
8	0.0144	0.0431	0.91	6.43
9	0.0165	0.0450	0.93	6.41
Winner	0.0206	0.0527	1.02	6.22
Winner - Loser (t -stat)	0.0116 (4.02)	0.0397	0.02	
$F = 3.58$ (p -value < 0.001)				

of the Winners.⁸ Although Section III of the paper deals with risk-adjustment in more detail, the fact that average returns are negatively related to firm size suggests that size as a risk factor cannot explain the continuation effect. Second, both Winners and Losers are on average smaller than the average firm in the sample. This suggests that implementation of the Winners - Losers ($W - L$) strategy may be difficult because it predominantly requires positions in small stocks. The next section shows, however, that this is not the case.

II. Relative Strength Strategies That Control for Country and Size

The relative strength portfolios in the previous section combine stocks from 12 national markets, some of which are larger in size than others. More than half of the 2,190 stocks in the sample are from the United Kingdom (494), France

⁸ This size differential is in part a manifestation of the continuation effect, because the $J = 6$, $K = 6$ relative strength portfolios at time t contain positions taken at time $t - 6$. Of two firms that have equal size but different past performance at time $t - 6$, the firm with higher past returns will at time t on average be larger than the firm with lower past returns because performance persists.

(427), or Germany (228). The average market capitalization of these firms is larger than that of firms in the smaller European markets. This raises three questions about the source and the pervasiveness of the continuation effect. First, the continuation effect may be confined to only a subset of the 12 markets: either the three largest markets, which contribute the majority of sample firms, or alternatively the smaller European markets, which contain relatively many small and thinly traded issues. Second, no restrictions have been placed on the geographical composition of the relative strength portfolios and the country weights vary over time. The continuation effect may therefore in part be due to country momentum. It is interesting therefore to see to what extent the continuation effect holds in individual countries, and is present in relative strength portfolios that are country-neutral. Finally, because both the Winner and Loser portfolios in Table II are tilted toward small stocks, I will examine the influence of firm size on the returns to relative strength strategies. As pointed out before, country membership and firm size are not independent, and I also present results for portfolios that are both size- and country-neutral.

A. Relative Strength Portfolios by Country

Return decompositions by Heston and Rouwenhorst (1994) and Griffin and Karolyi (1996) show the presence of large country-specific factors in international stock returns. Large country-specific shocks can potentially lead to poor international diversification of the relative strength portfolios. For example, a strong performance of German stocks relative to other markets will subsequently cause the Winner portfolio to be overweighted in Germany relative to the European equally weighted index. Similarly, the Loser portfolio will be tilted toward stocks from markets with poor past performance. One possible explanation for return continuation is that country-specific market performance persists (Asness et al. (1996), Richards (1996)). However, if return continuation is primarily due to country momentum, controlling for the geographical composition of relative strength portfolios should significantly reduce the average payoffs to buying Winners and selling Losers. If on the other hand medium-term persistence reflects idiosyncratic firm performance, return continuation will remain present in country-neutral relative strength portfolios as well.

Country-neutral relative strength portfolios are formed by ranking stocks into deciles based on past performance relative only to stocks from the same local market. The 10 percent of stocks from each country with lowest past six-month return are assigned to the Loser portfolio, the top 10 percent to the Winner portfolio. Except for integer constraints, the resulting decile portfolios are well-diversified in the sense that they have the same country allocation, and are country-neutral relative to the equally weighted index of the 12 countries in the sample.⁹ Panel A of Table III shows that controlling for country composition only slightly reduces the average excess return of

⁹ This is only approximately true. The relative strength portfolios consist of K separate holdings, and each of these K positions is only country-neutral at origination. Because the positions are not rebalanced over time they lose their equal weighting in subsequent periods, due to performance differences and as securities are added to (or removed from) the sample.

Table III
Returns of Relative Strength Portfolios that Control
for Country and Size

At the end of each month all stocks are ranked in ascending order based on previous six-month performance, relative to other stocks in its country (Panel A), size decile (Panel B), or size-country group (Panel C). The bottom decile of stocks are assigned to the Loser (L) portfolio, the top decile to the Winner (W) portfolio. The portfolios are initially equally weighted and held for six months. Each panel gives the average monthly buy-and-hold return and standard deviation of an internationally diversified relative strength portfolio and its components for the period 1980 to 1995. The W - L excess returns for Austria, Denmark, and Norway in Panel A are based on Winner and Loser quintile portfolios due the small number of firms in the sample. The size assignments in Panel C correspond to the ranking of stocks in each country on size relative to other stocks in that country: small (bottom 30 percent), medium (middle 40 percent), and large (top 30 percent). $t(\text{mean})$ is the mean divided by its standard error.

Portfolio	Mean	Std. Dev.	$t(\text{mean})$
Panel A: Country-Neutral Momentum Strategies			
All stocks (country-neutral)	0.0093	0.0239	5.36
By country:			
Austria	0.0080	0.0498	2.23
Belgium	0.0110	0.0444	3.42
Denmark	0.0109	0.0478	3.16
France	0.0097	0.0496	2.72
Germany	0.0072	0.0395	2.52
Italy	0.0093	0.0508	2.53
Netherlands	0.0126	0.0497	3.51
Norway	0.0099	0.0658	2.09
Spain	0.0132	0.0801	2.28
Sweden	0.0016	0.0632	0.36
Switzerland	0.0064	0.0428	2.08
United Kingdom	0.0089	0.0408	3.02
Panel B: Size-Neutral Momentum Strategies			
All stocks (size-neutral)	0.0117	0.0376	4.30
By size decile:			
Smallest	0.0145	0.0588	3.42
2	0.0165	0.0542	4.21
3	0.0130	0.0495	3.64
4	0.0156	0.0455	4.75
5	0.0120	0.0409	4.04
6	0.0100	0.0453	3.04
7	0.0084	0.0463	2.51
8	0.0089	0.0451	2.73
9	0.0102	0.0479	2.96
Largest	0.0073	0.0473	2.13

Table III—Continued

Portfolio	Mean	Std. Dev.	<i>t</i> (mean)
Panel C: Size-Country-Neutral Momentum Strategies			
All stocks (size-country-neutral)	0.0085	0.0221	5.32
Size-neutral country portfolios:			
France	0.0099	0.0463	2.94
Germany	0.0065	0.0373	2.40
UK	0.0087	0.0363	3.31
Other	0.0087	0.0236	5.07
Country-neutral size portfolios:			
Small	0.0105	0.0304	4.79
Medium	0.0092	0.0249	5.09
Large	0.0055	0.0216	3.51

Winners over Losers ($W - L$) from 1.16 to 0.93 percent per month. This suggests that country momentum is relatively unimportant for explaining the continuation effect.¹⁰ The better diversification of the country-neutral relative strength portfolios lowers the standard deviations of both the Winner and Loser portfolios and increases their correlation from 0.74 to 0.88. As a result, the standard deviation of the excess return falls from 3.97 to 2.39 percent per month, and the significance of the average excess return increases ($t = 5.36$).

The remainder of Panel A gives the $W - L$ excess returns by country. Winners have outperformed Losers in all 12 countries. In 11 countries the $W - L$ excess return has a t -statistic exceeding two, including the largest markets of France, Germany, and the United Kingdom. Only in Sweden is the excess return insignificantly different from zero. The strongest continuation effect occurred in Spain, followed by The Netherlands, Belgium, and Denmark. The standard deviations of the individual country excess returns are about two to three times larger than the standard deviation of the internationally diversified momentum strategy. This implies that a large portion of the $W - L$ excess return variance is country-specific and can be diversified internationally. The conclusion from Panel A is that return continuation is not due to country momentum. It is pervasive, and not restricted to a few individual markets.¹¹

¹⁰ This is consistent with the relatively weak momentum in country index returns reported in Richards (1996), Bekaert et al. (1996), and Ferson and Harvey (1996).

¹¹ I also perform a similar analysis of sector momentum, by constructing sector-neutral portfolios based on assignments to 7 broad industry groups obtained from the *Financial Times*. The returns on sector-neutral relative strength strategies were all positive, and significantly different from zero for Basic Industries, Capital Goods, Consumer Goods, and Finance. For the Energy, Transportation, and Utilities sectors, which contain relatively few stocks and hence are poorly diversified, the equality of Winner and Loser returns could not be rejected.