Strategies in International Equity Markets: The Long and the Short of It

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Abstract

This study investigates costless international momentum and reversal strategies for an extended interval (one of the longest in the published research) running from January 1970 to June 2008. Sixteen developed national equity market indexes, excluding the US market, are used in the investigation. Factor analysis reveals three common factors governing the returns of the sixteen markets. The research finds several interesting results. First, short-term momentum strategies are not profitable after 1997. Second, momentum strategies are not robust when executed with the indexes' residuals, perhaps because one of the factors generating the returns is itself a momentum factor. Third, long-term reversal strategies are more numerous than momentum strategies in all the periods and sub-periods considered and are also resilient when applied to indexes' residuals, possibly because of a long term reversal of returns to the mean.

Key Words: Equity Markets, Momentum Strategies

I.   Introduction

International investment is an important topic from both a theoretical and an empirical point of view. A massive worldwide trend towards privatization and financial liberalization has increased the global equity supply, cross border equity transfers, and global trading volume.

The theoretical benefits of international investment are well documented. Grubel (1968), Levy and Sarnat (1979) and Solnik (1995) showed benefits in a modern portfolio theory (MPT) setting. There are at least two major criticisms against the use of such a methodology for multi period investment strategies. Jorion (1985) suggested one criticism: estimation risk. Researchers (see Eun and Resnick (1988), for example) tried to get around this problem by constructing improved estimators and showed that ex-ante international strategies produce potential gains over domestic strategies. The other criticism arises in the context of the Intertemporal Capital Asset Pricing Model (ICAPM) of Merton (1973). The efficient frontier is not stationary and therefore the use of static models without hedging the shifts of the opportunity set is warranted only in the myopic case of an optimal growth with a log-utility function (for example see Ingersoll pg. 225, 1987). An exercise in multi period investment strategies in an international setting was performed by Grauer and Hakansson (1987). They use a discrete time portfolio choice model and found that international strategies yield remarkable gains over domestic strategies. Their approach was based on simplifying assumptions about the utility function of the investor, an approach subject to criticisms no less important than criticisms of strategies based on MPT. At the same time, such an approach does not avoid the estimation risk problem.

Apart from the above problems at least two other concerns arise when trying to construct an ex-ante international profitable strategy: (1) the choice of a benchmark and (2) currency risk. The first problem is usually neglected (see Black and Litterman (1992), for a good discussion) even though an incorrect choice can lead to wrong conclusions about the profitability of alternative strategies. The second problem is controversial. Eun and Resnick (1988) find that hedging

currency risk with forward contracts is beneficial. However, studying a longer period, Levy and Lim (1994) report no benefit from hedging.

Adding to the above problems are other frictions and violation of theoretical assumptions such as those of the efficient markets hypothesis (EMH.) One friction that has received controversial explanation is the home bias. French and Poterba (1991) report in a very early period that US investors had 94% of equity wealth invested domestically while Japanese investors had 98%. Tesar and Werner (1998) note that the share of international equity for domestic investors in a host of OECD increased after the 1987 crises.   Obstfeld and Rogoff (2000) reject some of the previous explanations for the home bias problem and explain it, as they do for other five puzzles in international macroeconomics, with trading costs. However, more recently Van Nieuwerburgh and Veldkamp (2009) review the issue of the home bias and conclude that most of the home bias can be explained by information asymmetry. They use a comparative advantage argument applied to learning about risk. Since a domestic investor has a comparative advantage in the home market more effort will be deployed to obtain information about the market. This would increase the information asymmetry and thus could explain the home bias.

When it comes to EMH the 800 pound gorilla in international investment are short-term momentum and long-term reversals that generate profitable contrarian strategies. This paper addresses a number of issues that extant research pointed out in a host of studies addressing explanations about the empirically observed deviation from efficiency. Firstly, we study momentum and contrarian (reversals) strategies for one of the longest periods in literature (1970-2008). Secondly, since results could be affected by financial crises that modify the pattern of integration between international markets (see for example, Tuluca and Zwick, 2001.) we investigate momentum and reversals in different sub-periods delimited by known important financial crises. Thirdly, we attempt, as previous papers suggested, to find out if momentum or reversals are caused by risk factors or by idiosyncratic components.

The paper continues with a discussion about the empirical evidence of momentum and reversal strategies in international equity markets. The third section presents data and methodology while the fourth presents the results. The last section concludes the paper.

II.   Contrarian and Momentum Strategies in Equity Markets
The contrarian investment strategy was suggested by DeBondt and Thaler (1985) along with the overreaction hypothesis (OH) applied to portfolios of losers and winners. Lo and MacKinley (1990) established that a contrarian strategy is a winner, based not on OH but on the cross-autocorrelations and lead-lag effects between portfolios of large and small capitalization stocks. The contrarian strategy was successful over long periods of time (3 to 5 years) both for the formation of portfolios and the holding period for the evaluation of portfolio performance. The existence of reversals between winners and losers that would lead to a successful contrarian strategy was documented by Jegadeesh and Titman (2001) for the US markets and by Richards (1997) for international equity markets among many others.

Initial research for the US market, done by Jegadeesh and Titman (1993) showed that for short periods of time (one to twelve months) gains can be obtained following a positive feedback strategy. Their research spawned numerous papers documenting in many ways the existence of a

momentum strategy, a new name for the positive feedback strategy. Positive feedback was defined by De Long, Shleifer, Summers and Waldmann (1990) as the strategy of buying when prices rise (winners) and selling when prices fall (losers). The model developed by De Long et all. (DSSW) demonstrates that informed investors have the incentive to act in such a manner as to accentuate the predictable correlation of returns. Given this model, rational investors will not abide by the classic contention that their role is to buck the trend and bring back prices to their fundamental value, but will act in a destabilizing way for the market. The existence of momentum in international markets was documented in many papers. In one early paper on the topic, Rouwenhorst (1998) shows that in portfolios of European stocks of winners and losers important momentum profits of about 1% per months are present. Chan et all. (2000) show that momentum is present in strategies involving individual equity markets indexes. They found that the volume of trading is a factor in the return continuation using weekly data. Patro and Wu (2004) study weekly and daily data and find that the daily international equity index strategies have important economic profits even after imposing reasonable transaction costs. In the US market the persistence of weekly momentum was discussed by Gutierrez and Kelley (2008).

The prevalence and importance of momentum was such that Carhart (1997) introduced it in an asset pricing model that extended the Fama and French (1993) three factor model. Very recently Fama and French (2012) analyzed the importance of the momentum in predicting international and local returns using both the three factor and the four factor models. While none can predict returns with authority the four factor model was found satisfactory in a number of situations.

Previous empirical work proved that both the momentum and the contrarian, or reversal, strategies could produce economic profit depending on the length of time used for the formation and holding periods. This research investigates the two strategies in an international setting as explained in detail in the next section.

III.   Data and Methodology

As in several of the papers discussed above data consist of the equity indexes of countries as reported by Morgan Stanley Capital International (MSCI). Each index consists of liquid stocks representing at least 60 percent of the aggregate market value listed on the associated stock exchange. The indexes are market value-weighted portfolios with values in $US at the exchange rate prevailing at the time returns are calculated. Monthly returns for the period January 1970 – June 2008 were computed as the $\ln(I_t/I_{t-1})$ of indexes obtained from Morgan Stanley. The countries are (in parenthesis are the symbols to be used from here on[1]):

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[1] The country code used is the three letter one standardized by ISO-3166.

Australia (AUS), Austria (AUT), Belgium (BEL), Denmark (DNK), France (FRA)
Germany (DEU), Hong Kong (HKG), Italy (ITA), Japan (JPN), Netherlands (NLD)
Norway (NOR), Singapore (SGP), Spain (ESP), Sweden (SWE), Switzerland (CHE)
United Kingdom (GRB)

We limited the study window to 2008 as the new crisis had long lasting effects and most equity markets had abnormal behaviors for longer periods than after the 1987 or 1997 crises which will represent breakpoints for our research. This study uses 12 European markets and 4 Pacific Rim prominent markets. The choice to leave United States out was made on account of the enormous size of the US market when compared to the rest. It is interesting to see the momentum from the perspective of a US investor (dollar denominated indexes were used) who will not be able to invest at all in the US market. This would negate the influence on the result of the US home country bias. Following the approach indicated by Lo and MacKinley (1990), a weighted relative strength strategy (WRSS) is employed to construct zero investment portfolios. The model is rooted in the earlier work of Levy (1967) and represents a fixture in of the research investigating momentum and contrarian strategies.

The strategy consists in buying/selling indexes that performed better/worse than a benchmark, B_j. The weight of each index is proportional to the difference between the index return and the selected benchmark. If $R_{i,t}$ is the return at time t of index i, and $B_{j,t}$ is a benchmark, $\omega_{i,t}$ the weight with which a country index enters in the portfolio, is given by:

$$\omega_{i,t} = \gamma(R_{i,t-k} - B_{j-p,t}) \quad i=1\ldots16, \ ; \ j \ benchmark \ selection \tag{1}$$

where k, p indicate the lag preceding t when the return of index i, and the return of the benchmark j are measured, and γ is a normalization factor. Therefore, the buy/sell decision at time t, is made based upon the returns at time $t-k$, compared with the benchmark at time $t-p$, where k is smaller or equal to p. When the benchmark is equal to the arithmetic mean of country indexes' returns and $p=k$, then γ is equal to unity and the total investment is zero. Whenever another benchmark or combinations of p,k are chosen, γ will be set at such a value as to make the net out of pocket investment null. Long and short positions will offset resulting in zero net investment. The profit, at $t+1$, where l is the forward lag of the holding period from the general strategy applied to n countries is:

$$P_{t+1} = \sum_{i=1}^{n} \omega_{i,t} R_{i,t+1} \tag{2}$$

Thus selected strategies open positions based on the performance of indexes p periods before the formation date, compared with the performance of the benchmark k periods before the formation date. The positions are held for a period of time ahead, after which they are liquidated at a loss or at a profit. A new position will be opened after liquidation, based on the same criterion of selection. Each strategy is repeated until the whole interval considered is covered. Since the initial position is costless the profit/loss cannot be reported as a percentage. Some previous papers reported a percentage computed as profit/loss divided by each period's long position as in (3) below, however, this research reports profits as an amount and not as a percentage.

$$I = 1/2 \sum_{i=1}^{n} |\omega_i| \qquad\qquad (3)$$

The results reported are for a benchmark that is an equally weighted index of all the indexes (EWII) considered. The equally weighted index received a lot of attention in empirical research because as Eun and Resnick (1988) note it can be interpreted either as a naive international diversification or as an attempt to eliminate the estimation risk by considering the mean of each index equal to the global (grand) mean. While we establish only momentum strategies, it is obvious that a loss as a momentum strategy can be transformed into a gain by a reversal strategy.

Another question that this research aims to address is to find possible explanations for the existence of profits in momentum or reversals strategies. More specifically we want to identify if the successful momentum/reversal strategies are the product of common risk factors in the equity markets considered, or of their idiosyncratic components. A modified approach of that pioneered by Roll and Ross (1980) for the arbitrage pricing theory (APT) is considered:

Step 1: a factor analysis to identify a set of common dimensions in the set of returns is performed and the factor scores are retained. The Kaiser criterion was used to identify the relevant factors. The Kaiser-Meyer-Olkin (KMO) was used to measure the appropriateness of the analysis.

Step 2: each index is regressed on the factor scores and the loadings are retained

Step 3: from the actual return of each period the factor scored multiplied by the loadings are subtracted and the residual, epsilon is retained

Step 4: the same strategies are replicated with the residual.

IV.   Results

We studied momentum and contrarian/reversal strategies for four different periods each with its table of results. Period one is the full period January 1970- June 2008, period two runs from January 1970 to October 1987, the date of the first major equity markets crisis. Period three runs from November 1987 to October 1997 the date that represents the Asian Crisis. Finally

period four runs from November 1997 to June 2008 that represents the start of the acceleration of the recent financial crisis and corresponds to the bankruptcy filing of IndyMac Bancorp[2].

To start with a general picture, a summary of the findings is presented in the **Table A** below where under Momentum we indicate the number of momentum strategies statistically significant at the 10% level with the whole index vs the number with the residual. Under Reversal the same numbers are presented for the reversal strategies.

Table A

Strategy	1970-2008	1970-1987	1987-1997	1997-2008
Momentum	19 vs. 5	17 vs. 6	20 vs. 11	3 vs. 0
Reversal	42 vs. 53	43 vs. 49	16 vs. 40	33 vs. 44

An inspection of this table reveals a number of interesting findings. First momentum strategies are not profitable after 1997. Second the momentum strategies are not robust when executed with the residuals. Thirdly, the reversal strategies are more numerous than the momentum strategies and are resilient when applied to residuals. As the detailed tables in the appendix would show, momentum strategies are usually short-term while the reversal strategies are long-term. Both results confirm in general lines the previous research and at the same time adds to the previous findings. All three summarized findings are new and not discussed in the previous research that we surveyed. We now turn to a more detailed analysis of the results.

Table 1 presents the results of many different variations of the strategy for the full period 1970 to 2008. We studied combinations of portfolio formation and holding period return estimation that range from one month to 60 months as indicated in the table. The numbers in each column represent the mean profit/loss of momentum strategies repeated the maximum possible number of times, given the data points available for each time period. The p-value associated with each profit/loss is indicated in the cell below. Considering the Central Limit Theorem and the quite large samples, the results have to be seen as robust[3], independent of the shape of return distributions.

Panel A shows that international momentum is not pervasive. The green cells indicate profit from a momentum strategy while the red cells indicate loss. However, as already mentioned a loss in a momentum strategy indicates a gain in the reversal strategy. In general the momentum strategies are profitable for periods of 12 months both in formation of the portfolio and in the holding period. The most consistently profitable momentum strategies are obtained for portfolio formation at 9 months and holding periods up to 12 months. However, the more important result is for the profitability of reversals. As the table shows formation periods of 36 or more months result in significant gains for reversal (loss for momentum.)   Both results

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[2] Paletta, Damian; Enrich, David (2008-07-12). "Crisis Deepens as Big Bank Fails: IndyMac Seized In Largest Bust In Two Decades". Wall Street Journal.

[3] The t-tests performed might not be independent. In this case the Bonferroni inequality suggests that the p-value should be multiplied by the number of tests for a reliable estimate. In our case the simultaneous number of tests is at most 7. The reader can verify that most of the significant results remain significant even after this rather stringent exercise.

confirm previous research that finds that momentum is short term profitable while contrarian strategies are profitable in the long run.

Of more interest is **Panel B** where we apply the same strategies to the residual after eliminating the risk factors. In all the cases studied the principal component analysis extracted three common risk factors. One can see that in the case of residuals the only strategies that continue to be consistently successful are the contrarian ones representing reversals. Very few momentum strategies survive. The results are more difficult to interpret, however, it appears that momentum might be due to the common risk factors while reversals could be due to idiosyncratic factors.

In **Table 2** both in **Panel A** and **Panel B** we repeat the strategies for January 1970-October 1987 period. The results are in line with those obtained for the full period. Again the contrarian strategies are consistently successful both in the full index and residual strategies with a pattern that mirrors the one for the full 1970-2008 period.

In **Table 3** where we repeat the strategies for the period November 1987- October 1997, the situation changes dramatically both in **Panel A** and in **Panel B**. Momentum strategies are profitable for much longer periods considering that portfolio formed based on the performance 24 months before time t, with a holding period of 12 months or portfolios with a formation period of 12 months before with a holding of 24 months are profitable. The number of reversal strategies that would be profitable is now confined to only very long periods of formation and holding.

For the residuals the results are less consistent with the full index. Momentum appears even for very long periods of formation and holding, reversals appear at short formation and holding periods. It appears that the national equity markets moved more together in this period. The elimination of risk factors (which are also the common generating factors in this analysis) led to an almost random pattern of profits from residuals. This might indicate that the possibility of gain was mainly due to idiosyncratic factors.

Table 4 presents the results for November 1997 to June 2008. The pattern in both the full index and the residual panel is consistent with the profitability of long term reversal strategies. There are just three momentum strategies profitable in the full index and none in the residuals while there are many possible reversal strategies profitable in both.

The lesson from the above analysis is that the period of analysis has an important effect on the results. Moreover, one or two sub-periods of consistent results could influence the result of a concatenation of periods.

V.   Conclusion
This study investigates costless international momentum and reversal strategies for a very long period of time that runs between January 1970 and June 2008. It uses 16 developed national equity markets and excludes the US market. Factor analysis reveals that there are three common factors governing the returns of the national markets considered. This could be consistent with the more recent research of Fama and French (2012) that found that a three or

four factor model might explain returns of national equity markets. We found a number of interesting results. First momentum strategies are not profitable after 1997. Second the momentum strategies are not robust when executed with the residuals. While this is not that easy to explain it might be due to the fact that one of the factors generating returns is a momentum factor. Thirdly, the reversal strategies are more numerous than the momentum strategies and are resilient when applied to residuals. This could be due to the fact that a momentum factor is not capturing the long term reversals. In addition robust reversal could be due to a reversal to the mean that would only confirm Poterba and Summers (1988) among others.

The absence of momentum profit after 1997 could be attributed to more financial liberalization that allowed more trading in various equity markets. This might have led to more efficient markets that did not allow positive feedback. The presence of momentum profit before 1997 could be due to severe market segmentation[4] stemming either from excessive regulation that does not allow foreign shareholders to own domestic equity, or from the unwillingness of domestic shareholders to own foreign equity. It could be seen as a reinforcement of Van Nieuwerburgh and Veldkamp (2009) who discussed the home bias as a comparative advantage in information seeking. As the equity markets became more global and the information easier and cheaper to obtain the short-term efficiency of equity markets improved. Finally as mentioned before, the pervasiveness of reversal strategies could be attributed to mean reversal. More documented explanations for the results of this research could be the object of further research.

References

Black, Fisher, and Robert Litterman. Global Portfolio Optimization. *Financial Analyst Journal* 48(1992): 28-43.

Chan, K. Hameed, A and Tong, W. Profitability of Momentum Strategies in International Equity Markets. *Journal of Financial and Quantitative Analysis* 35 (2000): 153-172

Carhart, M.M. On Persistence of Mutual Fund Performance, *Journal of Finance* 52(1997): 57-82.

De Long, Bradford J., Andrei Shleifer, Lawrence H. Summers, and Robert J. Waldmann.Positive Feedback Investment Strategies and Destabilizing Rational Speculation. *Journal of Finance* 45(1990): 379-395.

DeBondt, Werner F.M., and Richard M. Thaler.Does the Stock Market Overreact? *Journal of Finance* 40(1985): 793-805.

Eun, Cheol S., and Bruce G. Resnick.Exchange Rate Uncertainty, Forward Contracts, and International Portfolio Selection. *Journal of Finance* 43 (1988): 197-215.

Fama, E. and French, K.R.(1993) Common Risk Factors in the Returns on Stocks and Bonds *Journal of Financial Economics* 33: 3-56

Fama, E. and French, K.R.(2012) Size, Value, and Momentum in International Stock Returns. *Journal of Financial Economics* 105: 457-472

French, K., and Poterba J. (1991). Investor diversification and international equity markets. *American Economic Review* 81 : 222-226**.**

Grauer Robert R., and Nils H. Hakansson.Gains from International Diversification: 1968-85 Returns on Portfolios of Stocks and Bonds. *Journal of Finance* 42(1987): 721-741.

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[4] The same conclusion is supported by many studies, most notably by Grauer and Hakansson, (1987)

Grubel H. G.Internationally Diversified Portfolios, Welfare Gains and Capital Flows. *American Economic Review* 58(1968): 1299-1314.

Ingersoll, Jonathan E., Jr. *Theory of Financial Decision Making*. Rowman & Littlefield: Publishers, Inc., 1987.

Jegadeesh, Narasimhan, and Sheridan Titman.Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *Journal of Finance* 48(1993): 65-91.

Jegadeesh, Narasimhan, and Sheridan Titman.Profitability of Momentum Strategies; An Evaluation of Alternative Explanations. *Journal of Finance* 56 (2001): 699-720.

Jorion, Philippe.International Portfolio Diversification with Estimation Risk. *Journal of Business* 58(1985): 259-278.

Levy, Robert.Relative Strength as a Criterion for Investment Selection. *Journal of Finance* 22(1967): 595-610.

Levy, Haim and Marshall Sarnat.International Diversification of Investment Portfolios. *American Economic Review* 60(1970): 668-675.

_____ and Kok Chew Lim.Forward Exchange Bias, Heding and the Gains from International Diversification of Investment Portfolios. *Journal of International Money and Finance* 13(1994): 159-170.

Lo, Andrew W., and A. Craig MacKinlay.When Are Contrarian Profits Due to Stock Market Overreaction *The Review of Financial Studies* 3(1990): 175-205.

Merton, Robert.An Intertemporal Capital Asset Pricing Model. *Econometrica* 41(1973): 867-887.

Obstfield, M and Rogoff, K. The Six Major Puzzles in International Macroeconomics: Is There a Common Cause? in NBER Macroeconomics Annual 2000, Volume 15: 339-412.

Patro, D.K. and Wu, Y. Predictability of Short-Term Returns in International Equity Markets. *Journal of Empirical Finance* 11 (2004): 553-584.

Poterba, James M., and Summers, L.H. Mean reversion in stock prices: Evidence and implications. *Journal of Financial Economics* 22.1 (1988): 27-59.

Richards, A.J. Winner-Losers Reversals in National Stock Markets: Can They be Explained? *Journal of Finance*(1997): 2129-2144.

Roberto Gutierrez jr., and Eric K. Kelley. The Long-Lasting Momentum in Weekly Returns *Journal of Finance* 63, (2008) 415-447.

Roll, Richard, and Stephen A. Ross.An Empirical Investigation of the Arbitrage Pricing Theory. *Journal of Finance* 35(1980): 1073-1103.

Rouwenhorst, K.G.International Momentum Strategies. *Journal of Finance* 53 (1998):267-284

Solnik, Bruno.Why not Diversify Internationally Rather than Domestically? *Financial Analyst Journal* 20(1995): 48-54.

Tesar, L., and Werner, I. (1998). The internationalization of securities marketssince the 1987 crash. in *Brookings-Wharton Papers on Financial Services* Litan, R and Santomero A. (eds.). Washington: The Brookings Institution.

Tuluca, S.A. and Zwick, B. (2001) The Effects of the Asian Crisis on Global Equity Markets *The Financial Review*, 36: 125-142

Van Nieuwerburgh, S and Veldkamp, L. Information Immobility and the Home Bias Puzzle. *Journal of Finance* 64 (2009): 1187-1215

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Appendix A: Detailed Results

Table 1

Panel A in this table represents the profit from the WRSS applied to the 16 country indexes for the January 1970- June 2008 period. The columns indicate the formation period while the rows indicate the hold period. Panel B represents the WRSS for the same period applied to the "epsilon" of each index computed by eliminating the priced risk factors. Below the profit the significant at 10% level p-values are in green for momentum and in red for reversals.

Panel A (Formation Period)									Return Period	Panel B (Formation Period)								
1	3	6	9	12	24	36	48	60		1	3	6	9	12	24	36	48	60
0.00010	0.00009	0.00016	0.00038	0.00050	0.00004	-0.00033	-0.00037	-0.00030	1	0.00002	-0.00014	-0.00019	-0.00013	-0.00006	-0.00034	-0.00050	-0.00065	-0.00060
0.06772	0.35096	0.33457	0.07292	0.04609	0.90853	0.37006	0.27456	0.39871		0.6256	0.0158	0.0242	0.1775	0.5835	0.0299	0.0040	0.0000	0.0000
0.00009	0.00015	0.00059	0.00119	0.00104	-0.00015	-0.00147	-0.00119	-0.00113	3	-0.00008	-0.00022	-0.00028	0.00001	-0.00017	-0.00095	-0.00158	-0.00176	-0.00181
0.38292	0.45260	0.06430	0.00226	0.02708	0.82341	0.02747	0.05899	0.07881		0.19570	0.02678	0.05651	0.93871	0.41074	0.00019	0.00000	0.00000	0.00000
0.00017	0.00061	0.00166	0.00211	0.00149	-0.00063	-0.00297	-0.00256	-0.00267	6	-0.00001	-0.00008	0.00022	0.00042	-0.00005	-0.00154	-0.00287	-0.00314	-0.00358
0.20705	0.01552	0.00005	0.00001	0.01083	0.48089	0.00116	0.00432	0.00293		0.85956	0.51073	0.23905	0.04446	0.83723	0.00001	0.00000	0.00000	0.00000
0.00039	0.00123	0.00214	0.00212	0.00132	-0.00180	-0.00477	-0.00465	-0.00460	9	-0.00027	0.00027	0.00059	0.00061	0.00007	-0.00214	-0.00401	-0.00470	-0.00516
0.01542	0.00007	0.00000	0.00018	0.06213	0.10420	0.00003	0.00004	0.00005		0.33374	0.07270	0.00523	0.01422	0.83227	0.00000	0.00000	0.00000	0.00000
0.00052	0.00107	0.00152	0.00134	0.00022	-0.00393	-0.00719	-0.00703	-0.00716	12	0.00019	0.00025	0.00040	0.00044	-0.00008	-0.00301	-0.00525	-0.00635	-0.00694
0.00811	0.00200	0.00591	0.04723	0.78650	0.00291	0.00000	0.00000	0.00000		0.08159	0.16566	0.13756	0.16701	0.84108	0.00000	0.00000	0.00000	0.00000
0.00007	-0.00007	-0.00049	-0.00159	-0.00365	-0.01068	-0.01467	-0.01503	-0.01623	24	0.00005	0.00005	-0.00002	-0.00022	-0.00083	-0.00477	-0.00784	-0.01002	-0.01104
0.78158	0.87759	0.48966	0.06593	0.00104	0.00000	0.00000	0.00000	0.00000		0.73182	0.84944	0.95227	0.62813	0.12810	0.00000	0.00000	0.00000	0.00000
-0.00010	-0.00072	-0.00188	-0.00353	-0.00600	-0.01447	-0.01969	-0.02187	-0.02376	36	-0.00006	-0.00040	-0.00104	-0.00180	-0.00260	-0.00492	-0.00753	-0.00904	-0.01195
0.71474	0.15393	0.01745	0.00060	0.00000	0.00000	0.00000	0.00000	0.00000		0.71558	0.19485	0.01658	0.00129	0.00026	0.00000	0.00000	0.00000	0.00000
-0.00032	-0.00117	-0.00268	-0.00491	-0.00773	-0.01750	-0.02433	-0.02775	-0.02766	48	-0.00034	-0.00086	-0.00164	-0.00244	-0.00300	-0.00446	-0.00757	-0.00779	-0.00944
0.27365	0.03482	0.00147	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000		0.06439	0.01363	0.00072	0.00005	0.00007	0.00000	0.00000	0.00000	0.00000
-0.00033	-0.00141	-0.00334	-0.00567	-0.00902	-0.02011	-0.02851	-0.03068	-0.03232	60	-0.00049	-0.00080	-0.00151	-0.00204	-0.00283	-0.00501	-0.00917	-0.00701	-0.00799
0.32496	0.02939	0.00089	0.00002	0.00000	0.00000	0.00000	0.00000	0.00000		0.01145	0.02646	0.00134	0.00031	0.00014	0.00000	0.00000	0.00000	0.00000

Table 2

Panel A in this table represents the profit from the WRSS applied to the 16 country indexes for the January 1970- October 1987 period. The columns indicate the formation period while the rows indicate the hold period. Panel B represents the WRSS for the same period applied to the "epsilon" of each index computed by eliminating the priced risk factors. Below the profit the significant at 10% level p-values are in green for momentum and in red for reversals.

Panel A (Formation Period)									Return Period	Panel B (Formation Period)								
1	3	6	9	12	24	36	48	60		1	3	6	9	12	24	36	48	60
0.00020	0.00022	0.00034	0.00066	0.00084	-0.00006	-0.00066	-0.00066	-0.00053	1	0.00005	-0.00018	-0.00023	-0.00005	-0.00007	-0.00071	-0.00078	-0.00118	-0.00117
0.04353	0.25173	0.31200	0.10992	0.09097	0.93332	0.39014	0.30561	0.46114		0.4054	0.1098	0.1578	0.7783	0.7580	0.0188	0.0279	0.0000	0.0000
0.00022	0.00046	0.00103	0.00192	0.00157	-0.00063	-0.00278	-0.00207	-0.00202	3	-0.00009	-0.00026	-0.00023	0.00037	-0.00029	-0.00194	-0.00245	-0.00313	-0.00353
0.28214	0.23157	0.09700	0.01023	0.08152	0.63532	0.03258	0.06508	0.10116		0.48933	0.19148	0.44350	0.30344	0.49342	0.00008	0.00002	0.00000	0.00000
0.00035	0.00107	0.00257	0.00318	0.00212	-0.00161	-0.00578	-0.00437	-0.00442	6	0.00000	0.00007	0.00080	0.00109	-0.00012	-0.00294	-0.00452	-0.00555	-0.00692
0.17879	0.02008	0.00083	0.00030	0.04962	0.35011	0.00074	0.00623	0.01038		0.99891	0.75196	0.02850	0.00980	0.82057	0.00001	0.00000	0.00000	0.00000
0.00068	0.00202	0.00329	0.00324	0.00197	-0.00342	-0.00919	-0.00780	-0.00734	9	0.00022	0.00066	0.00131	0.00139	0.00006	-0.00394	-0.00637	-0.00849	-0.00985
0.02260	0.00024	0.00007	0.00108	0.10486	0.09762	0.00001	0.00009	0.00068		0.20964	0.01860	0.00177	0.00512	0.92552	0.00000	0.00000	0.00000	0.00000
0.00091	0.00179	0.00237	0.00214	0.00018	-0.00695	-0.01346	-0.01193	-0.01117	12	0.00033	0.00047	0.00087	0.00105	-0.00036	-0.00526	-0.00826	-0.01184	-0.01303
0.01639	0.00439	0.01806	0.06947	0.89856	0.00458	0.00000	0.00000	0.00001		0.12158	0.18035	0.10968	0.09747	0.63399	0.00000	0.00000	0.00000	0.00000
0.00012	-0.00021	-0.00111	-0.00288	-0.00631	-0.01917	-0.02631	-0.02480	-0.02589	24	0.00005	-0.00009	-0.00015	-0.00020	-0.00117	-0.00704	-0.01108	-0.01894	-0.02019
0.79673	0.81216	0.38903	0.05972	0.00151	0.00000	0.00000	0.00000	0.00000		0.85574	0.85588	0.83063	0.81534	0.27028	0.00000	0.00000	0.00000	0.00000
-0.00023	-0.00149	-0.00419	-0.00744	-0.01184	-0.02597	-0.03415	-0.03634	-0.03872	36	-0.00009	-0.00076	-0.00188	-0.00330	-0.00474	-0.00684	-0.01013	-0.01740	-0.02388
0.62362	0.09889	0.00276	0.00003	0.00000	0.00000	0.00000	0.00000	0.00000		0.77015	0.17043	0.01801	0.00189	0.00060	0.00000	0.00000	0.00000	0.00000
-0.00058	-0.00208	-0.00491	-0.00845	-0.01303	-0.02814	-0.03869	-0.04275	-0.04127	48	-0.00062	-0.00164	-0.00309	-0.00438	-0.00510	-0.00449	-0.00861	-0.01540	-0.02030
0.23612	0.02670	0.00054	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000		0.04777	0.00645	0.00032	0.00006	0.00027	0.00115	0.00000	0.00000	0.00000
-0.00046	-0.00207	-0.00519	-0.00869	-0.01353	-0.03058	-0.04242	-0.04425	-0.04390	60	-0.00085	-0.00161	-0.00276	-0.00342	-0.00425	-0.00415	-0.01104	-0.01444	-0.01728
0.40890	0.05085	0.00179	0.00006	0.00000	0.00000	0.00000	0.00000	0.00000		0.00559	0.00459	0.00022	0.00024	0.00081	0.00183	0.00000	0.00000	0.00000

Table 3

Panel A in this table represents the profit from the WRSS applied to the 16 country indexes for the November 1987 - October 1997period. The columns indicate the formation period while the rows indicate the hold period. Panel B represents the WRSS for the same period applied to the "epsilon" of each index computed by eliminating the priced risk factors. Below the profit the significant at 10% level p-values are in green for momentum and in red for reversals.

							Panel A										Panel B	
Formation Period										**Formation Period**								
1	3	6	9	12	24	36	48	60	Return Period	1	3	6	9	12	24	36	48	60
-0.00002	-0.00015	-0.00021	-0.00005	0.00028	0.00024	-0.00019	-0.00052	-0.00027	1	-0.00001	-0.00016	-0.00026	-0.00024	0.00003	0.00000	-0.00038	-0.00057	-0.00029
0.78215	0.28159	0.24448	0.82465	0.31455	0.48320	0.63796	0.26275	0.56238		0.9012	0.0350	0.0087	0.0318	0.8326	0.9872	0.1336	0.0441	0.2670
-0.00011	-0.00036	-0.00046	0.00039	0.00085	0.00074	-0.00067	-0.00117	-0.00069	3	-0.00017	-0.00035	-0.00069	-0.00033	0.00016	-0.00008	-0.00121	-0.00140	-0.00081
0.35073	0.07953	0.11248	0.28845	0.05199	0.21744	0.35959	0.18944	0.41673		0.01030	0.00320	0.00002	0.07292	0.54463	0.82990	0.00433	0.01107	0.09598
-0.00014	-0.00042	0.00032	0.00155	0.00178	0.00165	-0.00086	-0.00197	-0.00158	6	-0.00013	-0.00051	-0.00059	0.00006	0.00049	-0.00008	-0.00191	-0.00252	-0.00157
0.29841	0.11433	0.40363	0.00199	0.00385	0.04914	0.41577	0.08921	0.15184		0.07606	0.00091	0.00662	0.78214	0.16857	0.86888	0.00432	0.00111	0.02517
0.00011	0.00052	0.00159	0.00263	0.00309	0.00266	-0.00026	-0.00225	-0.00185	9	-0.00014	-0.00016	0.00008	0.00061	0.00113	0.00020	-0.00225	-0.00318	-0.00185
0.48773	0.11386	0.00045	0.00006	0.00009	0.01649	0.85223	0.11881	0.12561		0.11863	0.39223	0.71136	0.02168	0.00461	0.75290	0.01189	0.00076	0.03167
0.00032	0.00083	0.00187	0.00319	0.00384	0.00265	-0.00075	-0.00256	-0.00348	12	0.00003	0.00019	0.00039	0.00098	0.00167	-0.00013	-0.00316	-0.00373	-0.00255
0.10624	0.02175	0.00145	0.00006	0.00006	0.05926	0.67607	0.10817	0.02614		0.73818	0.32668	0.13379	0.00104	0.00022	0.87150	0.00760	0.00086	0.01405
0.00027	0.00086	0.00205	0.00302	0.00296	-0.00015	-0.00533	-0.00831	-0.01048	24	0.00007	0.00056	0.00097	0.00137	0.00127	-0.00126	-0.00579	-0.00464	-0.00417
0.26246	0.08829	0.00571	0.00103	0.00900	0.94106	0.02344	0.00014	0.00004		0.67301	0.08937	0.02109	0.00185	0.05135	0.34748	0.00254	0.00162	0.01275
0.00026	0.00076	0.00201	0.00332	0.00331	-0.00159	-0.00813	-0.01100	-0.01304	36	-0.00007	0.00033	0.00054	0.00130	0.00136	-0.00115	-0.00468	-0.00303	-0.00195
0.38823	0.16877	0.01208	0.00224	0.01361	0.46298	0.00189	0.00002	0.00001		0.75717	0.42415	0.23173	0.00495	0.02975	0.41134	0.00509	0.05414	0.27701
0.00026	0.00049	0.00101	0.00138	0.00110	-0.00429	-0.01056	-0.01346	-0.01439	48	-0.00005	0.00033	0.00052	0.00095	0.00094	-0.00181	-0.00467	-0.00052	0.00226
0.48551	0.44209	0.27771	0.27757	0.48436	0.10275	0.00078	0.00001	0.00002		0.83527	0.49494	0.34363	0.12399	0.23354	0.27094	0.02049	0.78357	0.29428
0.00014	-0.00002	0.00017	0.00076	0.00004	-0.00397	-0.01115	-0.01269	-0.01676	60	-0.00001	0.00057	0.00074	0.00131	0.00112	-0.00218	-0.00308	0.00402	0.00486
0.73232	0.98463	0.88561	0.61517	0.98481	0.11681	0.00024	0.00002	0.00000		0.98055	0.32324	0.29820	0.08744	0.25502	0.24555	0.12345	0.06605	0.01871

Table 4

Panel A in this table represents the profit from the WRSS applied to the 16 country indexes for the November 1997 - June 2008 period. The columns indicate the formation period while the rows indicate the hold period. Panel B represents the WRSS for the same period applied to the "epsilon" of each index computed by eliminating the priced risk factors. Below the profit the significant at 10% level p-values are in green for momentum and in red for reversals.

							Panel A										Panel B	
Formation Period										**Formation Period**								
1	3	6	9	12	24	36	48	60	Return Period	1	3	6	9	12	24	36	48	60
0.00004	0.00012	0.00024	0.00036	0.00019	-0.00003	-0.00003	0.00013	-0.00002	1	0.00000	-0.00004	-0.00003	-0.00011	-0.00015	-0.00015	-0.00025	-0.00009	-0.00020
0.58940	0.30322	0.26581	0.21413	0.57523	0.94352	0.95016	0.82397	0.96952		0.9141	0.5161	0.7051	0.2213	0.1507	0.3565	0.1648	0.6245	0.3075
0.00011	0.00013	0.00086	0.00075	0.00030	-0.00032	-0.00034	-0.00003	-0.00039	3	0.00001	-0.00004	-0.00002	-0.00025	-0.00034	-0.00040	-0.00076	-0.00031	-0.00065
0.37813	0.58881	0.06649	0.21229	0.68375	0.75271	0.75398	0.98285	0.73045		0.80093	0.70144	0.88872	0.08768	0.02813	0.15107	0.01122	0.34999	0.03581
0.00023	0.00085	0.00144	0.00082	0.00009	-0.00140	-0.00089	-0.00069	-0.00152	6	0.00009	0.00010	0.00000	-0.00038	-0.00054	-0.00090	-0.00145	-0.00052	-0.00139
0.18645	0.03289	0.02908	0.28647	0.92837	0.33632	0.57598	0.69094	0.34600		0.21814	0.38167	0.99863	0.03361	0.00461	0.02099	0.00045	0.27930	0.00081
0.00030	0.00065	0.00074	-0.00029	-0.00159	-0.00366	-0.00250	-0.00268	-0.00353	9	0.00010	0.00003	-0.00014	-0.00072	-0.00100	-0.00171	-0.00222	-0.00093	-0.00242
0.18783	0.22301	0.36743	0.78682	0.25425	0.05986	0.23646	0.23534	0.09678		0.30877	0.87083	0.48794	0.00205	0.00004	0.00138	0.00012	0.17418	0.00004
0.00010	0.00010	-0.00028	-0.00190	-0.00340	-0.00577	-0.00412	-0.00454	-0.00556	12	0.00011	0.00005	-0.00038	-0.00116	-0.00138	-0.00240	-0.00281	-0.00120	-0.00338
0.67902	0.86005	0.76528	0.13321	0.04211	0.01143	0.08169	0.07471	0.02123		0.31623	0.75800	0.14528	0.00007	0.00000	0.00018	0.00005	0.17178	0.00001
-0.00024	-0.00084	-0.00214	-0.00430	-0.00603	-0.00722	-0.00539	-0.00692	-0.00843	24	0.00004	-0.00025	-0.00087	-0.00203	-0.00253	-0.00460	-0.00467	-0.00195	-0.00539
0.36920	0.18795	0.05819	0.00579	0.00231	0.00317	0.03306	0.01012	0.00118		0.82560	0.32762	0.02991	0.00001	0.00000	0.00000	0.00003	0.11520	0.00000
-0.00023	-0.00085	-0.00172	-0.00367	-0.00520	-0.00717	-0.00663	-0.00955	-0.01243	36	-0.00001	-0.00054	-0.00119	-0.00244	-0.00299	-0.00551	-0.00607	-0.00159	-0.00486
0.49528	0.28487	0.19740	0.04481	0.02344	0.01907	0.02894	0.00297	0.00010		0.95356	0.18350	0.04545	0.00017	0.00000	0.00002	0.00001	0.23772	0.00001
-0.00024	-0.00103	-0.00239	-0.00516	-0.00750	-0.01160	-0.01254	-0.01739	-0.02075	48	-0.00004	-0.00059	-0.00114	-0.00246	-0.00349	-0.00792	-0.00932	-0.00237	-0.00565
0.56598	0.29875	0.15442	0.02566	0.01107	0.00351	0.00242	0.00008	0.00000		0.88599	0.18903	0.07559	0.00025	0.00000	0.00000	0.00000	0.10533	0.00003
-0.00035	-0.00135	-0.00375	-0.00763	-0.01124	-0.01859	-0.02205	-0.02842	-0.03252	60	-0.00018	-0.00066	-0.00172	-0.00349	-0.00519	-0.01160	-0.01460	-0.00754	-0.00893
0.48212	0.24840	0.06186	0.00504	0.00126	0.00008	0.00000	0.00000	0.00000		0.62129	0.27675	0.04844	0.00013	0.00000	0.00000	0.00000	0.00004	0.00000