A Historical Perspective on the International Evidence for Long-Term Reversals. *

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Abstract

This paper reexamines the international long-term reversal evidence. Using a longer time horizon and a larger number of country indices, I show that the results for long-term reversals differ across methodology, start date, and time horizon. Due to the fact that the major international equity data sets start around the same time, a small period of years accounts for the strong long-term contrarian profits documented in the international literature. When conservative transaction costs are considered, the long-term contrarian anomaly disappears. A final implication of this research is that international tests based on data denominated in US dollars may not represent the margin investor.

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Abstract

This paper reexamines the international long-term reversal evidence. Using a longer time horizon and a larger number of country indices, I show that the results for long-term reversals differ across methodology, start date, and time horizon. Due to the fact that the major international equity data sets start around the same time, a small period of years accounts for the strong long-term contrarian profits documented in the international literature. When conservative transaction costs are considered, the long-term contrarian anomaly disappears. A final implication of this research is that international tests based on data denominated in US dollars may not represent the margin investor.

I INTRODUCTION

Contrarian trading strategies have long been utilized with the intent to beat the return available from a passive strategy of holding the market. Such claims rest on the empirical observation that extreme losers tend, on average, to outperform the market portfolio, while extreme winners tend to underperform the market. Motivated by the psychological literature, De Bondt and Thaler (1985), hereafter D&T, gave the contrarian ideology serious bite and advocated it as an important violation of efficiently operating markets. By forming a zero-investment strategy, a long position in losers financed by a short position in winners, D&T demonstrate large gains over a three-year horizon. If positive gains could be extracted with a zero-investment portfolio, the fundamental assumption of no arbitrage would be violated. Given the strategy is not risk free, as there are periods when the strategy experiences a loss, positive and significant average gains violate a weaker claim of market efficiency, that past public information is fully incorporated in current prices.

The ensuing discussion, utilizing US data, encompassed such topics as: robustness to other documented anomalies, for example, the January effect or the size effect; whether rational models could explain the phenomenon, for example, time-varying systematic risk or market frictions; and statistical/methodological considerations, for example, data snooping bias or distortions due to sorting. As each potential flaw was demonstrated, contrarian proponents retorted by either demonstrating robustness of the profits by adjusting for the claimed flaw or by demonstrating weaknesses in the opponent's argument. To date, there does not seem to be a strong consensus concerning the validity of long-term reversals. Figure 1 summarizes many of the points of debate suggested by the claim that past returns contain valuable information for long-term future returns.[1] Overall, each branch in the figure is balanced. Making general conclusions from the US literature is difficult.

Given the mixed picture arising from the US data, it is natural for the literature to gravitate toward out-of-sample tests. International long-term reversal tests have been made at both the firm-level for specific countries and at the index level across different countries. Many papers in this literature control for the various issues debated in the US literature. Figure 2 summarizes the international evidence for long-term reversals. In stark contrast to the US evidence given in Figure 1, each branch in Figure 2 is lopsided instead of balanced. All the critiques on long-term reversals, e.g., time-varying expected returns, cannot account for the return reversals found in international markets. Thus, the international evidence on long-term reversals strongly rejects market efficiency. Given the inconclusive nature of the US data, the international evidence looms large in the debate on the existence of long-term reversals.

One of the main goals of this paper is to reconcile the disparate results in the US and international literature. Using a new data set by Global Finance, I carefully study the claim that contrarian strategies work across international market indices. To my knowledge, this is the first paper to use the Global Finance data to address pricing anomalies. I use a long time-series of country total return indices from Global Finance, which allows me to add an additional 45 years of observations prior to previous studies. I am also able to add an additional 10 years of recent data as well. Thus, my data contains about 3 times the number of observations compared to previous tests. Having a much longer time span of data allows me to view the international long-term reversal evidence from a historical perspective. Also, having a longer data series allows me to do much more detailed subperiod analysis, which is necessary to investigate consistency of the trading strategy and to explore possible driving forces.

I perform a detailed subperiod analysis by forming a grid of potential data sets available to empiricists. On the left hand side, I vary the start year of the available data. Along the top of the grid, I vary the length of the data used in the long-term reversal tests. For example, the starting years run from 1924 to 1995 for tests that use 10 years of data, and the starting years run from 1924 to 1975 for tests that use 30 years of data. I run tests with data lengths ranging from 10 years to 70 years in length.

Working with indices across different countries not only provides an interesting out-of-sample test of the contrarian hypothesis, it also has some nice properties. First, indices are a portfolio of many stocks. This would minimize many of the firm specific critiques, such as market microstructure and noise effects. Second, looking across different economies, as opposed to across different firms, subjects the contrarian trading strategy to a macro test. Richards (1997) performs such a test utilizing 16 developed country indices using 26 years of data from

1969 to 1995. He finds strong evidence in favor of the contrarian claim. I utilize Richards' methodology, which is biased toward rejecting market efficiency. This gives the long-term reversal hypothesis its best possible chance.

My tests that use between ten and thirty years of data, similar to past empirical tests in the international literature, show there is a large and consistent contrarian profit starting in the late 1960s and continuing into the early 1980s. Thus, my results corroborate the findings of Richards (1997) whose data started in 1969. However, the more recent data does not possess contrarian profits. Looking prior to the late 1960s, contrarian profits are again the exception rather than the rule. There are some small pockets of anomalous profits in the earlier data. The first two periods occur just before and just after the Great Depression. The second period occurs near the end of World War II, while there are a few profitable years in the mid 1950s. With longer samples of data, the claim that long-term reversals exist is substantiated for tests on data denominated in US currency. Tests that use 60 and 70 years of data show consistent long-term contrarian profits. These results are not driven by outliers. The anomaly still exists even when the subsamples are winsorized at the 5% and 10% levels.

The long-term reversal phenomenon breaks down in two senses. First, the anomaly is not robust to small changes to: starting date, data characterization, and the amount of data used in the tests. Taking any specified length of data, for example 20 years, the conclusion to accept or reject market efficiency depends on the start year of the data. This is true even with tests that average over 40 or more years of data. The results of the test change depending on whether the data is characterized in US currency or local currency. If the data is denominated in local currency, longer test periods result in exactly the opposite conclusion, that is, long-term reversals do not exist. For many start dates, the acceptance of market efficiency depends on the amount of data available.

Another new and more important result of this paper is when conservative trade execution costs are considered, the long-term reversal anomaly disappears. I use the transaction costs estimated by Lesmond, Ogden, and Trzcinka (1999) for the 1924 to 1990 period. Lesmond et al. use the incidence of zero return days to calculate their estimates. These trading costs are most likely low as zero return days will be underrepresented in the data for several reasons.[2] I also utilize the trade execution costs of Keim and Madhaven (1998). They use a small sample of recent data from 1991 to 1993. These estimates are used for the 1991 to 2005 period in my tests. The trade costs used are comprehensive costs in that they consider both implicit and explicit costs. Adding transaction costs to the strategy eliminates the significance of the long-term trading profits.

A final result is that international long-term reversal profits are driven by a small subset of the total available years. The exceptional 1970s and early 1980s drive much of the observed anomaly, when the anomaly exists. For the 10- and 20-year tests, long-term reversals are the exception both before and after this specific period. That is, an unusually strong period of reversals drives much of the results and evidence for international long-term reversals.

An important consequence of the detailed subperiod analysis is that caution must be used when using international data as an out-of-sample test. This has broad implication for all researchers who use international data. The majority of international data sets start in the late 1960s to mid-1970s.[3] These dates coincide with what appear to be a period of very unusual market price dynamics. The market, at least from the perspective of a contrarian trading strategy, looks quite different in both the ensuing decade and in all prior decades. Since the available international data coincides with this unusual period, strong conclusions should not be drawn from international tests until observations from longer data sets are possible. Even 50 years of data is not enough data to draw generally valid conclusions. The 20-year test length is the most common in the international long-term reversal literature. All reject market efficiency. From a historical perspective, 20-year tests would have accepted market efficiency for 78.7% of the possible start dates.

The above warning is especially relevant for the recent literature on firm-level international long-term contrarian strategies. Baytas and Cakici (1999) use data from 1982 to 1991 (9 years) and find reversals in the UK, Canada, Japan, Germany, Italy, and France. Dissanaike (1997) finds that the UK market exhibits positive and significant long-term contrarian profits for the largest firms over the period of 1975 to 1991 (16 years). da Costa (1994), using data between 1970 and 1989 (19 years), demonstrates the profitability of long-term contrarian strategies in Brazil. Alonso and Rubio (1990) use data between 1967 and 1984 (17 years) and demonstrate the profitability of the strategy in Spanish markets. The lone exception is Kryzanowski and Zhang (1992). Using a data set from 1950 to 1988 (38 years), they find that Canada does not exhibit long-term overreaction.[4] What is interesting to note about all these studies is that the very short test length used combined with the data date range used fall within a unique period when compared to a longer history of data. The data in these tests rely heavily on the 1970s and early 1980s, the time span that is responsible for generating almost all of the long-term reversal results. Results dependent on a small set of unusual years, from a historical perspective, are not generalizable and need to be interpreted cautiously.

Another important result with broad implications for international research follows from the fact that long-term reversal effects exist for data denominated in US dollars, but not if the data is denominated in Japanese yen or local currency. US dollar denominated tests implicitly assume that the marginal trader has final consumption in US dollars. However, large multinational firms have cost structures across country boundaries and may not have to convert their profits to a single currency. If such multinationals are the marginal price setter, then local currency denominated tests are the correct test specification. Another possibility is that there are regulatory constraints. The US is not a foreign investment friendly regulatory environment. US citizens cannot invest in the vast majority of overseas funds. If regulatory constraints bind, then there is a hidden cost that is difficult to measure. I am the first to demonstrate that long-term reversals do not exist when returns are denominated in Japanese Yen, but the reversals exist for all other currency denominations. This indicates that Japan may have the most open regulatory environment toward international investments. This interpretation has further support in that momentum exists in most markets, but it does not exist in Japan. My results suggest that international researchers should consider tests with data denominated in local currencies and/or in currencies other than US dollars.

I subject my conclusions to a series of robustness checks. First, I utilize MSCI data and demonstrate similar results, although slightly stronger.[5] I then compare the use of value-weighted portfolios and equally-weighted portfolios. Results are similar under either methodology. This is important as the Global Finance indices do not provide market values. Next I add various country indices to the original set of 8 countries. I use the original 16 countries used in Richards (1997) and an alternate 16 that have a longer data sample. Then I categorically increase the number of indices, giving up the time span for which data is available, until I have increased the sample to 40 countries that include many smaller and emerging market countries. The main conclusions of this paper hold up to all such robustness checks, that is: (1) long-term contrarian profits are stronger for US currency denominated data than for local currency denominated data (if local-denominated data is used, then market efficiency is accepted), (2) earlier tests on international data seems to be driven by a small band of exceptional years from a historical perspective, and (3) long-term contrarian profits vanish when reasonable trading costs are accounted for.

The analysis presented in this paper implies that long-term reversals are not a robust phenomenon. The methodologies I use are biased toward rejection of market efficiency. Given that the observed long-term contrarian profits are driven by a small band of years and are not robust to transaction costs, it would be difficult to classify this as an anomaly that violates rational pricing.

The paper proceeds as follows. Section I discusses the data used in the various studies. Section II and III describe the data and methodologies used in the international country index studies. Section IV explores the existence of long-term contrarian profits for the 81 years of data available from Global Finance. The consistency of the results and the relationship between pre-war and post-war profits are discussed further. Section V investigates the sources of the long-term reversal gains observed. It is found that only a small subset of the data is responsible for all contrarian profits and that such profits are not robust to transaction costs. Section VI performs some robustness checks. Section VII concludes.

[Figure 1 about here.]

[Figure 2 about here.]

II DATA

I use monthly Global Finance total returns index (capital gains + dividends) data in both local currency and US dollars for 8, 16, 24, and 40 countries collected from the Global Financial Database. One of the most useful specialized features of the Global Finance Database is that it provides long-term data series. I utilize this to test the long-term reversal hypothesis on clean out-of-sample data. My first tests start on 12/1924, adding 45 years of new data to the power of the tests. I also add the 10 years of data to the original study by Richards for a total of 55 years of new data for testing the long-term reversal hypothesis out-of-sample. The new data more than triples the original range for the international long-term contrarian strategy studies which usually utilized 25 years of data or less. Thus my sample covers from 12/1924 to 12/2005 and consists of 81 years of monthly data.

I use the monthly Morgan Stanley Country Indices (MSCI) total returns index data in US dollars for 16 countries collected from DataStream. The countries include: Australia, Austria, Canada, Denmark, France, Germany, Hong Kong, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, UK, and USA. I obtained market value weights from Dr. Anthony Richards.[6] This data was collected to replicate Richards (1997) and for control purposes to ensure that the Global Finance data set yields similar results as the MSCI data set for the range of overlap. The range for the compatibility tests are the original dates utilized in Richards (1997), which are from 12/1969 to 12/1995.

The first 8 countries studied use the Global Finance indices and consist of Australia, France, Germany, Italy, Japan, Sweden, UK, and the USA. Data for these countries is available from 12/1924 to 12/2005. I then add an additional 8 countries, combined with the first 8, to make a group of 16 countries, referred to as 16A. These countries are: Austria, Canada, Denmark, Finland, Hong Kong, the Netherlands, Spain, and Switzerland. The tests start on 12/1969 and end on 12/2005. These countries are chosen to coincide with the original sample of countries utilized in Richards (1997). The one exception is that Finland is used instead of Norway. The reason for this substitution is the Norway total returns index in Global Finance stops in the year 2001. This minor substitution should not have a substantial effect on a robust and stable anomaly.[7] For the group of 24 countries, I add the following group of 8 countries to the 16A group: Belgium, Greece, Korea, Malaysia, Norway, South Africa, Singapore, and Thailand. Data for these 24 countries begins on 12/1976. The addition of this group serves two purposes. First, since there are more countries, the 4 years of missing data in Norway is not a serious concern. Robust results confirm that the original substitution of Finland for Norway was not substantial. Second, 4 Asian countries and 1 African country are added to the group. This gives a more robust result compared to tests that basically rely on European and US indices. The final group of 40 adds the following countries to the group of 24: Argentina, Brazil, Chile, Columbia, India, Indonesia, Ireland, Jordan, Luxembourg, Mexico, New Zealand, Pakistan, Philippines, Taiwan, Turkey, and Venezuela. This comprehensive set of countries has data from 12/1987. Its drawback is the very short time frame of available data. This last group provides another robustness check as it adds again countries from the whole spectrum of world markets and it adds a substantial representation of the smaller emerging market countries. As long-term reversals have been documented to have a size component, that is, smaller firms and countries have larger observed long-term reversal returns, this last test group provides the highest hurdle for market efficiency.

III METHODOLOGY

I utilize the methodology of Richards (1997). The 36-month buy-and-hold return must exist on the n^{th}-rank date in order for the asset to be included in the n^{th}-portfolio of winners or losers. At date n, stocks are sorted by their past 3-year buy-and-hold returns. The top 25% form the winner portfolio and the lowest 25% form the loser portfolio.[8] The winner portfolio is sold and the loser portfolio is bought to form the zero-investment portfolio. Three-year buy-and-hold returns are tested for long-term mean reversion. I obtain the significance tests as in Richards (1997), page 2131. The t-stat to test the significance of the zero-investment portfolio, which corrects for the moving-average error in overlapping data, is obtained from the Newey-West correction. As the methodology used does not adjust for previously documented biases, such as time-varying expected returns, the tests employed are biased toward rejecting market efficiency.

IV THE RETURNS OF LONG-TERM REVERSAL TRADING STRATEGIES

A Consistency of International Long-Term Reversal Profits - US Dollar Indices

The main results of this paper are derived by using a long time series, 81 years, of international indices from Global Finance. The monthly observations start from December 1924 and end on December 2005. The methodology of Richards (1997) is used. In order to get a view of the largest time frame possible, the tests are run with 10 years of data, with each run utilizing a different start date. Thus, I get 70 observations from 1924 to 1995. The test length is increased to 20 years and the tests are run for all possible start dates. This continues until a test length of 70 years is reached and a clear picture arises. This approach allows me to observe two phenomenon not studied previously. First, I can study how a random start date of the test may influence the end results and the ultimate conclusions drawn from those results. Second, I can study the resulting conclusion sets from the various test lengths. This allows me to comment on the minimum sample size necessary in order to have a consistent conclusion from all start years for this particular methodology. Finally, I am able to understand prior research within a historical framework.

Our first set of tests use country indices from Global Finance for eight countries: Australia, France, Germany, Italy, Japan, Sweden, UK, and the USA. These tests utilize data that is denominated in US currency. Table I shows the regions of long-term profits for a variety of test lengths and for the range of possible start dates. In these tests the full data set is utilized. Starting with the 10-year tests, there is a natural ebb and flow from positive to negative profitability. Profitable years are slightly more numerous than negative years. According to the critique of Fama (1998), in a truly random market, one-half of the observations should be insignificant to positively significant, while the other half should be insignificant to negatively significant. The 10-year test results are not supportive of the long-term contrarian thesis. Depending on the start date of the test, any conclusion concerning market efficiency is possible. For tests of 20 years, 30 years, or 40 years the results are also not encouraging. The ultimate conclusion of whether markets are efficient or not again depends on the year in which the test is begun. In these tests, long-term reversals are significant at the 5% level for only 21.3%, 33.3%, and 19.5% of the start dates, respectively. For US-denominated data, the longer data tests allows us to run tests that utilize 60 years and 70 years of data. At these longer time horizons, the conclusion is unanimously in support of rejecting the hypothesis of efficient markets. These results simply reflect the dangers of short data samples. Surprisingly, even for tests that use 50 years of data, the zero-investment test of market efficiency yield conclusions that are dependent on the specific subperiod chosen for the test. At the 5% level, the 40-year test length accept market efficiency for 80.5% of the possible start dates and the 50-year test length accept market efficiency for 62.3% of the possible start dates. At the 70-year test length, market efficiency is never accepted.

[Table I about here.]

I next check that these results are not being driven by the existence of a small set of extreme observations. A standard technique to control for abnormally large or small returns is to winsorize the data. Standard levels are at the 5% and 10% levels. For example, to winsorize the data at the 5% level, I rank returns and eliminate the 5% largest and the 5% smallest (most negative) returns. I then run the tests on this subset of data. I run tests on both a 5% and a 10% winsorized subsample. The results above remain. Shorter test lengths are mixed in their results, while tests that use longer time spans of data tend toward positively significant long-term contrarian returns. Thus, market efficiency is still rejected. Again, even tests using 40 to 50 years of data can vary substantially by the start date on whether market efficiency is accepted or not. Table II contains the 10% winsorized results. Both Tables I and II agree at the 60- and 70-year test horizons.

An interesting phenomenon is that the winsorized results are almost reversed from the full data results of Table I. At the 30-, 40-, and 50-year test lengths, in Table I, the rejection of market occurs mostly in the second half of start dates, while in Table II the rejection occurs in the first half. This indicates that the rejection of market efficiency in the 70s and 80s is due to unusual large positive returns. On the other hand, market efficiency is not rejected in the previous decades because of the existence of large negative realized returns.

[Tables II about here.]

Most international data sets begin in the late 1960s or early 1970s. The results presented here are consistent with those presented in these earlier papers. Richards uses MSCI country total return indices from December 1969 to December 1995 for 16 countries. The Newey-West t-statistics reported in Footnote 5 of Richards (1997) agree in both magnitude and significance level. Balvers, Wu, and Gilliland (2000) report tests for two different time periods, each with a different length of data. Their first test again utilizes the MSCI data from 1969 to 1996 for 16 countries. Their second test uses 11 countries and 46 years of data from 1949 to 1997. Again they reject market efficiency at the 1% significance level. Table I rejects for both start year and test length combinations. It is important to note that in either of these two papers, their conclusions could have been dramatically different if the start date of their data sets had differed by only a few years. My results for the longer term tests confirm these earlier results, since with the longer data set the 70-year tests are the same.

With the exception of one study, the literature concerning firm-level long-term contrarian profits for international countries, i.e., countries other than the USA, find that such strategies are profitable and significantly so. The start date and test length combinations used in each of these papers are also insignificant in my sample of data. An important example is the 20-year test length, which is the most common data time span in the international long-term reversal literature. All papers in this data length category reject market efficiency. From a historical perspective, 20-year tests would have accepted market efficiency for 78.7% of the possible start dates. The fact that all of the international data sets start around the same time forces this distortion since all these short tests use data from the same unusual period.[9]

Figure 3 summarizes and compares the existing international literature with my results.[10]

[Figure 3 about here.]

All these results seem to be explained by the small sample used, when viewed within the larger picture of Table I. Although confirming earlier findings, my results suggest that studies based on short unique data sets should be used with considerable care. Small variation in the start date of long-run reversal tests can affect the final conclusion drawn concerning market efficiency. The strong international evidence for long-term reversals seems to be driven by an unusually strong reversal period that is historically atypical.

B Pre-War vs. Post-War Profits

Two previous studies using US firm-level data conclude that the long-term contrarian anomaly is a post-war phenomenon (see Boynton and Oppenheimer (2006) and Chen and Sauer (1997)). In a related, but different, line of literature, Kim, Nelson, and Startz (1991) conclude that long-term mean reversion is strictly a pre-war phenomenon. The international results presented in this are not directly comparable to these studies. The international results serve as a robustness check to these contradictory conclusions. My results are not consistent with either view. Long-term contrarian profits are consistently significant across all years at the longer test horizons (e.g. see the 70-year results in Table I). In the intermediate test horizons, long-term reversals do not exist pre-war. They sometimes exist post-war (e.g. see the 30- and 40-year results in Table I). In the shortest test horizon of 10 years, the results oscillate between long-term reversals, long-term momentum, and efficiently operating markets. For all test lengths and start dates, when long-term contrarian profits do exist, they are driven by an unusually strong period of reversals starting in the late 1960s and ending in the early 1980s.

It is interesting to investigate the consistency of the long-term contrarian strategy in more detail. It is possible that the international results are driven by a subset of the available countries that exclude the US prior to or following the war. Thus, the contrasting conclusions between the US firm-level studies and the international studies may be reconcilable.

Table III Panel A categorizes the component countries of the winner-minus-loser portfolio utilized in this paper's studies. This table gives, by subperiod, the frequency of each country's occurrence in an extreme portfolio. That is, the numbers in this table give the proportion of the years for which a country is part of the winner-minus-loser long-term contrarian portfolio. If random, the expected value is 50% as there are 8 countries and 4 will qualify for an extreme portfolio in each period. The results indicate that the US has a prominent role in the pre-war subperiod, as it is consistently overrepresented in the zero-investment winner-minus-loser portfolio. In the post-war period, the US is represented as expected in the contrarian portfolio.

[Table III about here.]

Table III Panel B and Panel C investigate how the US participates in both the extreme winner and the extreme loser portfolios. If random, each country should participate in an extreme portfolio about 25% of the time, as there are 8 countries and 2 will qualify for the winner portfolio and 2 will qualify for the loser portfolio. A clear picture arises from these two panels. The US strongly participates in the loser portfolio in the period of the Great Depression and during the Vietnam War period. All other periods, the US is underrepresented in the loser portfolio, with an amazing zero percent rate in the 1950s. The winner portfolio stands in direct contrast to the loser results. The US is overrepresented in every subperiod except the 1970s. Even in the period following the Great Depression it is well represented in the winner portfolio. Both pre-war and post-war, the US is an integral part of the extreme return portfolios, mostly by participation in the extreme winner portfolio. Thus, the data does not support the hypothesis that the difference between the US and international long-term reversal studies is due to different pricing dynamics in the US and international indices.

V SOURCES OF LONG-TERM REVERSAL PROFITS

The section above explores the existence of long-term contrarian profits and finds that in the limit of long test lengths, such profits exist and the null of market efficiency is rejected. The results are most strong for an unusual time spanning from the late 1960s to the early 1980s. In this section, I explore the sources of the long-term reversal profits. I explore the effects on the long-term reversal results when trade execution costs are considered. I also study the effects of changing the characterization of the data. The last effect explored is the use of statistical packages that use a preset formula for the Newey-West lag length.

A Trade Execution Costs

Market efficiency is rejected when raw returns are used in the long-term contrarian tests. However, trade frictions exist that limit the effectiveness of arbitrage, even if markets are operating efficiently. With the existence of trade execution costs, prices can be mispriced within a range. A smart trader will not push prices to fundamental value if the cost of trading exceeds the expected profit from trading on the mispricing. Thus, I adjust the long-term contrarian profits for trading costs.

The strategy tested in this paper consists of trading in broad country indices. For most the years covered, index funds did not exist. Even when index funds do exist, it is not clear that investing in such funds is optimal. Studies show that management and other fees generally make such funds underperform a strategy of buying and holding the underlying stocks of the index. What is needed is a cost estimate for trading a portfolio consisting of a broad cross section of stocks in a specific country.

Lesmond, Ogden, and Trzcinka (1999)[11] in their Table III compute the average round trip transaction costs for NYSE and AMEX, labeled NYSE/AMEX, and for just the NYSE stocks, labeled NYSE-only. They use a limited dependent variable regression set up to estimate costs from the incidence of zero return days. Their methodology utilizes CRSP daily data. I use the NYSE/AMEX average as a proxy for the trade execution costs for trading a comprehensive portfolio for the 1963-1990 period, as the AMEX stock coverage exists during this period. I use the NYSE-only average as a proxy for the trade execution costs for trading a comprehensive portfolio for the 1924 to 1962 period, as only NYSE stock coverage exists during this period. Keim and Madhaven (1998) in their Table II estimate the one-way transaction costs for both a buyer-initiated trade and a seller-initiated trade for the 1991-1993 period. Their estimates are for large institutional traders and are based on the effective spread and commissions. I use the average of their estimates for the trade execution cost of trading a comprehensive portfolio for the 1991-2005 period. I average first over quintiles and then over buyer and loser average costs. By using an average of these size ranked costs, I obtain a proxy for the cost of trading in a broad based portfolio. These costs seem reasonable when compared to the costs estimated by Jones (2002) for the Dow Jones Index, which consists of 30 larger and more liquid stocks.

It is important to stress that the transaction costs used in these tests are likely to be lower than the actual costs that would have been incurred for at least six reasons. First, as explained in Lesmond, et al., microstructure effects lower the incidence of zero-return days, which in effect lowers the trading cost estimates. Second, liquidity has been increasing over time in the US market. Thus, the earlier markets from 1924 to 1963 probably were less liquid than the firm data used in Lesmond, et al.'s estimates. Third and somewhat related to the previous point, the average size of listed firms has been increasing over time in the US market. Given that smaller firms are more costly to trade and asymmetric information problems are more severe, the costs projected back for the 1924 to 1963 period are most likely low. Fourth, I use the US cost estimates as the estimates for all eight countries. However, during the cost estimation period, the US markets were some of the most liquid and least costly to trade. Fifth, I ignore FX transaction costs in the US dollar tests, as it is necessary to convert the local profits back to US dollars. Finally, I assume all short positions can be established. All these suggest that my tests are biased against accepting market efficiency. Any results that do not reject the null that markets are efficient after considering trading costs can be interpreted as strong results. Table IV summarizes the trade execution cost estimates.

[Table IV about here.]

For each long-term contrarian observation, there are 4 trades. When the extreme country index positions are entered into at the rank date, there is one purchase of the loser portfolio and one short sale of the winner portfolio. When the position is closed, another two offsetting trades must occur. I treat short and long trade costs equally. That is, I ignore the practical issue of whether short sales could have been implemented. The results of the trade-cost-adjusted tests are reported in Table V. For the longer test periods, greater than 40 years of data, the long-term contrarian profits disappear. Thus, for the longer period tests, markets are efficient within a trade-cost range. For the shorter test lengths, 20 to 30 years of data, the results vanish except for the period from 1967 to 1976. The unusual nature of this particular period, with respect to long-term reversal profits, is noted above. The shortest test, 10 years of data, remains oscillatory in appearance. Overall, with the exception for the unusual period of 1967 to 1976, the results are in strong support of a limited market efficiency, where inefficiency is contained within the bounds set by trade execution costs.

[Table V about here.]

B Local Currency Indices

Since the tests in Table I convert all profits to US dollars, they consider long-term reversals from the perspective of a US-based investor. A US-based investor may not be the marginal price setter across international markets. The tests in this section take the perspective of a multinational conglomerate that has costs in each of the local currencies and thus does not have to convert profits back to one specific national currency. If such a large multinational firm is the marginal price setter, then tests based on returns denominated in US dollars are misspecified. Thus, the results of local-currency-denominated tests may differ from tests denominated in US dollars.

The next set of tests use the same 8 country indices from Global Finance that were used in Table I. These tests utilize data that is denominated in local currency, rather than US dollars. Table VI shows the regions of long-term profits for a variety of test lengths and for the range of possible start dates. In these tests the full data set is utilized. Starting with the 10-year tests, again there is a natural ebb and flow from positive to negative profitability. Profitable years are about as numerous as negative years. This is not supportive of the long-term contrarian thesis. Depending on the start date of the test, any conclusion concerning market efficiency is possible. For tests of 20 years in length, the ultimate conclusion to reject or accept market efficiency varies. Again there are start dates that yield significantly negative long-term reversal profits, i.e., long-term momentum exists in the two years prior to the Great Depression. At the 30-year, 40-year, and 50-year horizon, the negative results disappear. Although these results are more encouraging, the ultimate conclusion of whether markets are efficient or not still depends on the year in which the test began. For local-denominated data, the longer data set allows me to make tests that utilize 60 years and 70 years of data. At these longer time horizons, the conclusion is unanimously in support of accepting the hypothesis of efficient markets. This is in direct contrast to the conclusion obtained when the tests are run with US-denominated data. The apparent danger of short data samples is even more pronounced in the local-denominated data. Surprisingly, even for tests that use 50 years of data, the zero-investment test of market efficiency yields conclusions that are dependent on the specific subperiod chosen for the test.

[**Table VI about here.**]

C The Lag Length

Some statistical software packages code in a set functional form for the lag length in the Newey-West tests used to adjust for autocorrelation in the data. Use of such programs may lead to a shorter lag length than is inherent in the data. Use of too small a lag length may lead to biases in the tests. If the lag length is known, as it is in many of the market efficiency tests that rank on past returns, then this known lag length should be used. Only if the lag length is not known should a functional form that grows with the length of available observations be used. I explore the effects of lag length misspecification, using the EViews functional form as the alternative. The tables are not shown to save space. As can be expected, the results show that using a shorter lag length than is intrinsic to the data would result in much stronger rejection of market efficiency.

D Foreign Exchange Possesses Long-term Reversals

It is possible that the FX component of the trade is mean reverting, but not enough to compensate for the transaction costs of engaging in the long-term reversal trade. There is evidence that interest rates are mean reverting and theoretical models of interest rates incorporate this behavior (see Cox, Ross, and Ingersoll (1984)). The FX mean reversion is plausible given that FX rates are related to interest rates by the covered interest rate parity law. This finding supports earlier research (see Okunev and White (2003) for a review of this literature). The following equation, whose proof is given in the appendix, demonstrates this possibility.

$$r_{w-\ell}^{US} = r_{w-\ell}^{Loc} + r_{w-\ell}^{FX} + \left(r^{Loc} \cdot r^{FX}\right)_{w-\ell} \tag{1}$$

This equation has a simple intuition. If long-term reversal profits are observed in US dollar denominated returns, but not in local currency returns, ignoring second order terms, then the observed reversals are due to reversals in the returns on the FX exposure of the portfolio.

E Binding Regulatory Constraints

Another potential explanation for the results is suggested by the fact that long-term reversals exist when denominated in US dollars, but they do not exist when denominated in local currency. This suggests that it may be possible for the various regulating environments to affect the investment opportunity set available to country-specific investors. If so, then the restricted investment space may allow for efficiency violations if a constraint binds. To investigate this hypothesis, I test the long-term reversal strategy for the 8 original country indices utilizing the perspective of an investor from a specific country. Global Finance provides the 8 country indices in terms of the following 6 currencies: Australian dollar, Canadian dollar, Japanese yen, Swedish crona, UK pound, and the US dollar. Thus, I test for regulatory binding constraints from the perspective of an investor from these 6 regulatory environments.[12] The results, reported in Table VII, demonstrate that the long-term reversal strategy is significantly profitable for all currencies with the exception of Japan where it is negative and insignificant. This would suggest that the Japanese marginal price setter constraints do not bind, while constraints bind on the marginal price setters in all other regulatory environments.

[Table VII about here.]

The result that a Japanese investor is the only efficient investor, from the perspective of long-term reversals, is interesting in light of the documented fact that Japan is the only country where momentum is not found. The possibility that regulatory constraints bind is an interesting alternative framework for interpreting the international results. Regulatory constraints for international trading strategies have received little attention and may be a fruitful opportunity for future studies.

VI ROBUSTNESS CHECKS

A Tests With a Larger Subset of Countries - US Dollar Data

In this section, tests are conducted with a larger subset of country indices. The trade off is a smaller time span of data is available. The advantage is tests on larger sets of indices allow us to confirm, at least over the overlapping time period, whether the results reported previously are unique to the sample of countries chosen. It is quite likely that large and established markets will have characteristics that systematically differ from smaller and less liquid markets.

I run the three-year buy-and-hold test on US-denominated data. I use total return indices from Global Finance. The first addition of countries is the set of countries utilized by Richards (1997). This allows for a comparison with the results reported in Richards with those reported here. These tests include the original 8 countries of Australia, France, Germany, Italy, Japan, Sweden, UK, and the USA. In addition, another 8 countries are added with the first 8 to make the group of 16A. These countries are: Austria, Canada, Denmark, Hong Kong, the Netherlands, Finland, Spain, and Switzerland. These tests utilize data from 12/1969 to 12/2005.

Consistent with prior results, Table VIII Panel A shows the shorter time horizons of 10 and 20 years vary in the conclusion concerning market efficiency depending on the year the test is started. Tests of 30 years in length, however, are consistent in rejecting the hypothesis. In the tests reported for the full data set of 81 years and using only 8 country indices, the 30-year results are inconsistent. It is obvious why the 30-year tests seem stronger for the 16-index sample, as these results for the 8-country tests are strong starting in 1955. Table VII Panel A shows the tail of the positive run reported in Table I. It leaves out the many years for which market efficiency would have been accepted. Again, this should serve as a warning about drawing too broad a conclusion from tests that utilize a short time horizon. Time-specific results can appear universal.

[Table VIII about here.]

Transaction costs are considered next. For the 1969-1990 subperiod, I use the average cost estimates for the NYSE/AMEX from Lesmond, Ogden, and Trzcinka (1999), as the AMEX market coverage by WRDS starts in 1963. For more recent trading costs, I use the average estimate from Keim and Madhaven (1998) for the 1991-2005 subperiod. As explained in Appendix A of Lesmond et al., their estimates should be lower than the true transaction execution costs. I ignore all concerns of short sales implementability. I assume that all countries experience a similar trading environment as the US. The results, reported in the 8-country set, show that the shorter time frames are inconsistent and trading costs reinstate market efficiency at the longer time horizons. The 16-country results, presented in Table VIII Panel B, are best understood within the context of the longer data sample results presented in Table V.

Next, I run 3-year buy-and-hold tests on local currency data drawn from the Global Finance total return indices. The results are contained in Table VIII Panel C. As before, the results are weaker than the results observed for US-denominated data. The conclusions of Table VIII Panel C vary depending on the start date and the amount of data used in the test. For the longest test length of 30 years, the null of market efficiency is always accepted. This is analogous to the relationship observed between the US-denominated and local-denominated data for the 8-country tests. Thus the results are robust to the addition of 8 additional countries and hold for the original set of countries utilized in Richards (1997).

I run similar tests for various different sets of countries that have data available for various lengths of time. A third subset of countries is used to run tests on 24 country indices. This larger set of countries has data that begins on 12/1976. The 24 countries studied consist of the previous 16 countries: Australia, France, Germany, Italy, Japan, Sweden, UK, the USA, Austria, Canada, Denmark, Hong Kong, the Netherlands, Finland, Spain, and Switzerland. In addition, another 8 countries are added to this first set of 16 to make the group of 24. These countries are: Belgium, Greece, Korea, Malaysia, Norway, South Africa, Singapore, and Thailand. For the US-denominated data, long-term reversal results are inconsistent for the shorter horizon tests and completely disappear for the 30-year time horizon. These results are reported in Table IX Panel A. Also shown in Table IX Panel B are the results that include transaction costs. The results are similar except now the 20-year long-term profits also vanish.

[Table IX about here.]

A final test is performed with a large cross section of 40 countries. The data for this subset starts in 12/1987. This subset contains many smaller, emerging market countries. As there has been a size effect reported in prior papers, these tests provide another robustness check to my conclusions. The weakness of these tests is the very short length of available data. Table X contains the results. For US-denominated currency, the results are not consistent in that the start year determines the ultimate conclusion to be drawn concerning market efficiency. For local-denominated data, the results are inconsistent with the existence of long-term reversals. In fact, some long-term momentum is observed. Transaction costs, as in previous tables, do not materially affect the 10-year test results. This, of course, is not surprising as the trouble years occur mainly in the 1970s which are excluded from this data sample. The small size effect for long-term reversals is evidenced here. Compared to the 8-country results that adjust for trading costs, the long-term momentum for the 10-year results are less severe for the 40-country sample of indices. Even with small emerging markets, the results obtained for US-dollar versus local-currency denomination remain robust. The US-denominated data has strong long-term reversal results, while the local-denominated data is inconsistent and at times exhibits long-term momentum.

[Table X about here.]

B Alternate Indices & Value-Weighted vs. Equally-Weighted

Prior research on country indices and long-term reversals has almost exclusively used MSCI (Morgan Stanley Country Indices), while Global Finance indices are used here. Both set of indices are total return indices. It is important to compare the two data sets in order to ensure that the results are robust across different index groups. The tables for the MSCI data include test lengths of 25 years, as Richards (1997) utilized tests of this length, in addition to 10, 20, and 30 years. I first compare equally weighted averages. Again, I utilize the 3-year buy-and-hold tests of Richards (1997). I apply these tests to the MSCI indices for the subset of 16-country indices utilized by Richards. The data starts on 12/1969. Table XI Panel A is for US-denominated data. Again the tests demonstrate that at shorter time horizons of 10 and 20 years, the result to reject or accept market efficiency depends on the year the test is started. For US-denominated data, the longer test horizons consistently reject market efficiency.

[Table XI about here.]

Next, transaction costs are added in Table XI Panel B. The results are not as uniform as with the Global Finance data. The MSCI data has slightly stronger long-term contrarian profits over the years 1969 to 2005, when compared to Global Finance. This may be another reason why the previous literature on international indices has concluded in favor of rejecting market efficiency. However, when compared to the longer time span results reported in Table V for the 8-country subset, the results take on a different interpretation. Again, it is the special period starting in the late 1960s and ending in the early 1980s that drive the results in the MSCI data. This is a weakness of this data set, from a historical perspective, as we do not know if this is unique to this specification of a market index or if we are only observing the effects of this unique period. Overall for the 1969-2005 subperiod, the results between the MSCI and Global Finance data are similar, with the MSCI data being slightly stronger in favor of rejecting market efficiency.

In Table XI Panel C, the results, denominated in local currency, utilize the same testing procedure as the above tests. The long-term reversal results are inconsistent, in that the ultimate result of rejecting or accepting market efficiency depends on the year the test begins. The exception is again the longest test length of 30 years where market efficiency is uniformly accepted. The results of the MSCI data echo those reported using the Global Finance data over many different subsamples of country indices. Thus, the results previously reported are not specific to the Global Finance data set.

As Richards (1997) utilized value-weighted averages in his original study, I next compare value-weighted average results with equally-weighted average results. I report the results here, but do not present the table to conserve space. The comparison is as expected. The equally-weighted results tend to give stronger long-term reversals than the value-weighted results, although for the shortest test lengths this sometimes is reversed. This reflects the emphasis that equal weighting puts on smaller countries. These results are consistent with the differences reported between the 8-country subset and the 40-country subset. The significance levels of either methodology, value- or equally-weighted, are similar to the other, again with the exception of the shortest time horizon of 10 years.

VII CONCLUSION

In this paper I investigate the international evidence for long-term contrarian profits in country total return indices. This evidence is important since the firm-level studies are inconclusive and the international index literature, although small in comparison, provides an important out-of-sample test of the firm-level data. Using a long-term series of indices from Global Finance, I am able to add over 50 years of data to the tests. This longer data set allows me to conduct a more detailed subperiod analysis. This approach provides a means to study two phenomenon not studied previously. First, I study how a random start date of the test may influence the end results and the ultimate conclusions drawn from those results. Second, I examine how the resulting conclusions change across various time horizons and gain insight on the minimum sample size necessary to overcome the limitations imposed by having only a specific subset of data to run tests for this particular methodology and strategy.

One of the main goals of this paper is to reconcile the weak US long-term reversal results with the strong international results. This divergence in results is driven by two properties of the international data. First, from a historical perspective, long-term reversals are not the norm. However, there do exist strong reversals in the period from the late 1960s to the early 1980s. The reversals during this unique period survive transaction cost and different characterizations of the data. The second property of the data leading to the uniform acceptance of long-term reversals in international markets is that all major international data start about the same time. These start dates cluster in the early 1970s, coincidently with the start of the strong and unique period of long-term reversals. For example, approximately 20-years of data is the most common test length in the international long-term reversal literature. All such tests reject market efficiency. From a historical perspective, 20-year tests would have accepted market efficiency for 78.7% of the possible start dates. This unusual result is directly due to the international data sets all starting around 1970.

Overall, there are three main conclusions of the paper. First, using all the data, long-term reversals exist. However, they do not exist after accounting for transaction costs. This limits the economic importance of the anomaly. Market efficiency seems to hold within transaction bounds. Second, the long-term reversals that do exist are driven by an unusually strong period of reversals, spanning less than two decades out of 81 years of data. This result brings to question the repeatability of the anomaly. Earning consistent profits from a long-term contrarian-trading rule may prove difficult. Finally, the particulars of the methodology affect the conclusion drawn from the tests. The results change depending on whether the returns are in US dollars or local currency. Different start dates and/or lengths of available data can change the results. A true market anomaly should be robust to small perturbation in methodology.

The main conclusions of this paper are robust to a wide variety of changes to methodology. Tests are conducted for a subset of 8, 16, 24, and 40 countries. The tests are conducted for various subsets of the available data from 10 years to 70 years. The tests are run over different market indices. Equally-weighted and value-weighted averaging are compared. All variations of the methodology or indices used yield consistent conclusions.

The analysis presented in this paper implies that long-term reversals are not a robust phenomenon. Given that the observed long-term contrarian profits, when they exist, are driven by a small span of years and are subsumed by transaction costs, it would be difficult to classify this as an anomaly that violates rational pricing.

My results suggest some interesting topics for future research. Why are long-term reversals more prevalent in the 1970's and 80's? Since long-term reversals do not occur regularly, does there exist a set of lagged variables that can predict when long-term reversals occur? What is the proper test design to capture the experience of the marginal price setter in international markets... is it a large multinational (local currency tests)... or is the Japanese regulatory environment least binding (Yen based tests)? If a regulatory constraint binds, what rules are the most binding and how should these rules be modified?

Appendix: Proof of Theorem 1

Theorem 1 *The Winner-Loser portfolio in US returns, $r^{US}_{w-\ell}$, can be decomposed into the Winner-Loser portfolio in local returns, $r^{Loc}_{w-\ell}$, and the Winner-Loser return in the pure foreign exchange return, $r^{FX}_{w-\ell}$, as follows:*

$$r^{US}_{w-\ell} = r^{Loc}_{w-\ell} + r^{FX}_{w-\ell} + \left(r^{Loc} \cdot r^{FX}\right)_{w-\ell} \tag{A1}$$

where

$$\left(r^{Loc} \cdot r^{FX}\right)_{w-\ell} = \left(\frac{1}{N}\sum_{w=1}^{N} r^{Loc}_{w} \cdot r^{FX}_{w} - \frac{1}{N}\sum_{\ell=1}^{N} r^{Loc}_{\ell} \cdot r^{FX}_{\ell}\right) \tag{A2}$$

Proof

As a first step I develop a relationship between the US, local and FX returns for a single index. The following relation, which suppresses the time index is an identity:

$$I^{US}_{t} = I^{Loc}_{t} \cdot FX_{t} \tag{A3}$$

Where I^{US}_{t} is the value of the US index at time-t, I^{Loc}_{t} is the value of the local index at time-t, and FX_t is the value of the foreign exchange rate giving the US dollar equivalent value in terms of 1 dollar of local currency at time-t. Calculating the return from the US index, we obtain:

$$r^{US}_{t} = \frac{I^{US}_{t} - I^{US}_{t-1}}{I^{US}_{t-1}} = \frac{I^{US}_{t}}{I^{US}_{t-1}} - 1 \tag{A4}$$

Substituting A3 into A4 leads to:

$$r^{US}_{t} = \frac{I^{Loc}_{t} \cdot FX_{t}}{I^{Loc}_{t-1} \cdot FX_{t-1}} - 1 = \left(\frac{I^{Loc}_{t}}{I^{Loc}_{t-1}}\right) \cdot \left(\frac{FX_{t}}{FX_{t-1}}\right) - 1 \tag{A5}$$

Performing some standard manipulations:

$$r_t^{US} = \left(\frac{I_t^{Loc}}{I_{t-1}^{Loc}} - 1 + 1\right) \cdot \left(\frac{FX_t}{FX_{t-1}} - 1 + 1\right) - 1 = \left(r_t^{Loc} + 1\right) \cdot \left(r_t^{FX} + 1\right) - 1 \tag{A6}$$

This leads to our first identity:

$$r_t^{US} = r_t^{Loc} + r_t^{FX} + r_t^{Loc} \cdot r_t^{FX} \tag{A7}$$

or equivalently:

$$r_t^{US} - r_t^{Loc} = r_t^{FX} + r_t^{Loc} \cdot r_t^{FX} \tag{A8}$$

Equation (A7) demonstrates that the return in US dollars can be decomposed into three terms. First is the return denominated in local currency. Second is the return to a US investor holding local dollars, where the currency is held in a cookie jar, that is, it is a pure foreign exchange return. Finally, there is the cross product. This term is similar to a compounding term between the real and inflation return components. It is a second order term. It represents the compounding that occurs between the local currency return and the foreign exchange return. That is, the return on the local investment also experiences the effects of foreign exchange changes.

Next I derive the relationship between the returns for the US dollar return for a winner-loser portfolio to that of the local dollar winner-loser portfolio return and that of a foreign exchange winner-loser portfolio return. As is standard in the literature I derive the formula for an equally weighted portfolio with both the winner and loser portfolios consisting of N indices. I suppress the time subscript and use the subscript instead to indicate if the return is for a winner-loser portfolio (denoted by $w - \ell$), a winner portfolio (denoted by w), or a loser portfolio (denoted by ℓ). As before, the superscript is used to denote either a US dollar return, a Loc dollar return, or an FX return. Thus, we have:

$$r_{w-\ell}^{US} = \frac{1}{N}\sum_{w=1}^{N} r_w^{US} - \frac{1}{N}\sum_{\ell=1}^{N} r_\ell^{US} \tag{A9}$$

Plugging Equation (A7) into Equation (A9) yields the following relationships:

$$r_{w-\ell}^{US} = \frac{1}{N}\sum_{w=1}^{N}\left(r_w^{Loc} + r_w^{FX} + r_w^{Loc}\cdot r_w^{FX}\right) - \frac{1}{N}\sum_{\ell=1}^{N}\left(r_\ell^{Loc} + r_\ell^{FX} + r_\ell^{Loc}\cdot r_\ell^{FX}\right) \tag{A10}$$

Rearranging, we get:

$$\begin{aligned} r_{w-\ell}^{US} = & \left(\tfrac{1}{N}\textstyle\sum_{w=1}^{N} r_w^{Loc} - \tfrac{1}{N}\sum_{\ell=1}^{N} r_\ell^{Loc}\right) \\ & + \left(\tfrac{1}{N}\textstyle\sum_{w=1}^{N} r_w^{FX} - \tfrac{1}{N}\sum_{\ell=1}^{N} r_\ell^{FX}\right) \\ & + \left(\tfrac{1}{N}\textstyle\sum_{w=1}^{N} r_w^{Loc}\cdot r_w^{FX} - \tfrac{1}{N}\sum_{\ell=1}^{N} r_\ell^{Loc}\cdot r_\ell^{FX}\right) \end{aligned} \tag{A11}$$

We thus obtain our final relationship for the winner-loser portfolio returns denominated in US currency, local currency, and foreign exchange returns:

$$r_{w-\ell}^{US} = r_{w-\ell}^{Loc} + r_{w-\ell}^{FX} + \left(r^{Loc}\cdot r^{FX}\right)_{w-\ell} \tag{A12}$$

This completes the proof.

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Table I: Long-Term Reversal Profits, Global Finance Data
All years, 8 Countries, US Currency, 3-yr B&H

$Lag = 35$**, Not Winsorized**

This table reports the 3-year B&H contrarian returns using the method of Richards (1997) as follows:

1. For each of the N-ranking dates, one for each ranking month n, calculate the n^{th} ranking-period buy-and-hold wealth relative, for each asset j, for the prior 36 months $n-35$ to n. $BH^{rank}_{j,n} = \frac{X_{j,n}}{X_{j,n-35}}$
2. For each of the N respective ranking dates, rank the $BH^{rank}_{j,n}$ from high to low across assets, that is over the variable j, holding the time variable n constant. This yields a set of N sorted returns. Label these sorted returns, $BH^{sort}_{s,n}$, where s represents the return's position within the sorted returns.
3. On each of the relevant N portfolio formation dates, which correspond with the ranking date, form the winner and loser portfolios as follows:

   Winners =25% highest buy-and hold wealth relatives. For example, for 16 country indices, the top 25% are the 4 highest returns and Winners = $BH^{sort}_{1,n}, ..., BH^{sort}_{4,n}$. I represent the subset of stocks in this winners portfolio with the subscript W.

   Losers = 4 lowest buy-and hold wealth relatives = $BH^{sort}_{J-3,n}, ..., BH^{sort}_{J,n}$. I represent the subset of stocks in this losers portfolio with the subscript L.

   Thus, each portfolio is formed conditional on the prior 36 months buy-and-hold return behavior occurring before the portfolio formation date. We now have N winner portfolios and N loser portfolios, one each for the N portfolio formation dates.
4. On each of the N ranking dates, for each asset j that belongs to either the winner or loser portfolio, compute the test-period buy-and-hold wealth relative for the subsequent 36 months period, i.e. from n to $n+36$ as: $BH^{test}_{j,n} = \frac{X_{j,n+36}}{X_{j,n}}$
5. For each of the N winner and loser portfolios, calculate the equally-weighted average buy-and-hold return of the portfolio. This gives N winner portfolio returns ($BH_{W,n}$) and N loser portfolio returns ($BH_{L,n}$).
6. The overreaction hypothesis predicts that:

   $$[\, BH_{L,n} - BH_{W,n} \,] > 0$$

   I obtain the significance tests as in Richards (1997), page 2131 using Newey-West t-stats. This t-stat tests the significance of the zero-investment portfolio and corrects for the moving-average error in overlapping data design. There is an autocorrelation that is induced in the data due to the test design. As monthly data is used, each 3-year buy-and-hold observation uses 36 months of data. Consecutive return observations thus share 35 months of data, leading to a lag length of $L_2 = 35$.

Data from 12/1924 to 12/2005 are used in the tests. The BegYr column gives the start date of the test. Tests are run for each year possible given the test length. The next columns appear in pairs. The first column of each pair, EstN, gives the 3-year B&H profit estimate for the test beginning in the specified year. The next column of the pair, SigN, gives the significance level using the Newey-West adjustment for autocorrelation. Results are reported for N = 10, 20, 30, 40, 50, 60, and 70 years as test lengths. The last row, %LTR, gives the percent of start dates for a given test length that demonstrate long-term reversals at the 5% level. The 8 countries are Australia, France, Germany, Italy, Japan, Sweden, UK, and the USA. Total Return data for these countries is available from Global Finance.

BegYr	Est10	sig10	Est20	sig20	Est30	sig30	Est40	sig40	Est50	sig50	Est60	sig60	Est70	sig70
1924	0.336	+++	0.284	++	0.276	+	0.188	+	0.139		0.195	++	0.214	+++
1925	0.373	+++	0.344	++	0.268	+	0.205	+	0.140		0.200	++	0.210	+++
1926	0.412	+++	0.342	++	0.253	+	0.197	+	0.131		0.221	++	0.206	++
1927	0.228		0.274	+	0.206		0.181		0.128		0.224	++	0.192	++
1928	-0.021		0.177		0.185		0.161		0.112		0.207	++	0.187	++
1929	-0.112		0.144		0.178		0.172		0.119		0.210	++	0.182	++
1930	-0.170	##	0.107		0.160		0.163		0.122		0.209	++	0.174	++
1931	0.116		0.197		0.164		0.169		0.147		0.222	++	0.181	++
1932	0.484	+	0.292		0.175		0.170		0.166	+	0.232	++	0.187	++
1933	0.560	+++	0.381	+	0.198		0.160		0.198	+	0.235	+++	0.193	++
1934	0.696	+++	0.388	+	0.217		0.145		0.213	++	0.231	++	0.191	++
1935	0.714	+++	0.320		0.209		0.124		0.201	+	0.213	++		
1936	0.452	+++	0.222		0.155		0.082		0.203	+	0.189	++		
1937	0.280		0.160		0.144		0.087		0.213	++	0.178	++		
1938	-0.038		0.130		0.118		0.068		0.194	+	0.173	++		
1939	-0.326	###	0.069		0.105		0.056		0.182	+	0.155	+		
1940	-0.410	###	0.050		0.101		0.065		0.185	+	0.149	+		
1941	-0.040		0.073		0.118		0.104		0.206	++	0.161	+		
1942	0.384		0.117		0.135		0.139		0.227	++	0.174	++		
1943	0.719	+++	0.163		0.124		0.184	+	0.233	++	0.183	++		
1944	0.814	+++	0.217		0.115		0.211	+	0.234	++	0.186	++		
1945	0.545	+	0.194		0.080		0.192	+	0.210	++				
1946	0.238		0.113		0.026		0.200	+	0.183	++				
1947	-0.215		0.025		-0.006		0.185	+	0.148	+				
1948	-0.206	##	0.013		-0.014		0.173		0.152	+				
1949	-0.163		0.064		0.012		0.188	+	0.153	+				
1950	-0.148		0.080		0.038		0.201	+	0.153	+				
1951	-0.023		0.122		0.102		0.234	++	0.172	++				
1952	-0.083	##	0.090		0.115		0.236	++	0.169	++				
1953	0.004		0.050		0.166		0.234	++	0.173	++				
1954	0.175		0.029		0.201		0.234	++	0.175	++				
1955	0.385	+++	0.053		0.223	+	0.236	++						
1956	0.366	+++	0.037		0.279	++	0.234	++						
1957	0.236		0.031		0.287	++	0.209	++						
1958	0.098		-0.009		0.254	+	0.203	++						
1959	0.089		-0.017		0.244	+	0.182	+						
1960	0.123		0.021		0.259	++	0.180	+						
1961	0.125		0.087		0.280	++	0.187	+						
1962	0.062		0.125		0.292	++	0.189	+						
1963	-0.213	##	0.174		0.267	++	0.179	+						
1964	-0.325	###	0.223		0.260	++	0.176	+						
1965	-0.267	###	0.253		0.260	++								
1966	-0.269	###	0.364	+	0.266	++								
1967	-0.060		0.443	+++	0.267	++								
1968	0.042		0.456	+++	0.300	+++								
1969	0.139		0.475	+++	0.291	++								
1970	0.313	+++	0.512	+++	0.294	++								
1971	0.432	+++	0.517	+++	0.286	++								
1972	0.567	+++	0.537	+++	0.289	++								
1973	0.761	+++	0.501	+++	0.278	++								
1974	0.829	+++	0.460	+++	0.257	++								
1975	0.705	+++	0.393	+++										
1976	0.900	+++	0.348	++										
1977	0.727	+++	0.223											
1978	0.490	++	0.198											
1979	0.511	++	0.170											
1980	0.246	+++	0.063											
1981	0.197	+	0.030											
1982	0.326	+++	0.052											
1983	0.229	+++	0.041											
1984	0.133		0.018											
1985	0.000													
1986	-0.096	###												
1987	-0.214	###												
1988	-0.087													
1989	-0.078													
1990	-0.098													
1991	0.051													
1992	-0.021													
1993	0.062													
1994	0.089	++												
%LTR		33.8		21.3		33.3		19.5		38.7		85.7		100.0

+++ Positively significant at the 1% level. ### Negatively significant at the 1% level.
++ Positively significant at the 5% level. ## Negatively significant at the 5% level.
+ Positively significant at the 10% level. # Negatively significant at the 10% level.

Table II: Long-Term Reversal Profits, Global Finance Data
All years, 8 Countries, US Currency, 3-yr B&H
$Lag = 35$, 10% Winsorized

This table reports the 3-year B&H contrarian returns using the method of Richards (1997) as follows:

1. For each of the N-ranking dates, one for each ranking month n, calculate the n^{th} ranking-period buy-and-hold wealth relative, for each asset j, for the prior 36 months $n-35$ to n. $BH_{j,n}^{rank} = \frac{X_{j,n}}{X_{j,n-35}}$
2. For each of the N respective ranking dates, rank the $BH_{j,n}^{rank}$ from high to low across assets, that is over the variable j, holding the time variable n constant. This yields a set of N sorted returns. Label these sorted returns, $BH_{s,n}^{sort}$, where s represents the return's position within the sorted returns.
3. On each of the relevant N portfolio formation dates, which correspond with the ranking date, form the winner and loser portfolios as follows:

   Winners =25% highest buy-and hold wealth relatives. For example, for 16 country indices, the top 25% are the 4 highest returns and Winners = $BH_{1,n}^{sort}, ..., BH_{4,n}^{sort}$. I represent the subset of stocks in this winners portfolio with the subscript W.

   Losers = 4 lowest buy-and hold wealth relatives = $BH_{J-3,n}^{sort}, ..., BH_{J,n}^{sort}$. I represent the subset of stocks in this losers portfolio with the subscript L.

   Thus, each portfolio is formed conditional on the prior 36 months buy-and-hold return behavior occurring before the portfolio formation date. We now have N winner portfolios and N loser portfolios, one each for the N portfolio formation dates.
4. On each of the N ranking dates, for each asset j that belongs to either the winner or loser portfolio, compute the test-period buy-and-hold wealth relative for the subsequent 36 months period, i.e. from n to $n+36$ as: $BH_{j,n}^{test} = \frac{X_{j,n+36}}{X_{j,n}}$
5. For each of the N winner and loser portfolios, calculate the equally-weighted average buy-and-hold return of the portfolio. This gives N winner portfolio returns ($BH_{W,n}$) and N loser portfolio returns ($BH_{L,n}$).
6. The overreaction hypothesis predicts that:

   $$[\,BH_{L,n} - BH_{W,n}\,] > 0$$

   I obtain the significance tests as in Richards (1997), page 2131 using Newey-West t-stats. This t-stat tests the significance of the zero-investment portfolio and corrects for the moving-average error in overlapping data design. There is an autocorrelation that is induced in the data due to the test design. As monthly data is used, each 3-year buy-and-hold observation uses 36 months of data. Consecutive return observations thus share 35 months of data, leading to a lag length of $L_2 = 35$.

Data from 12/1924 to 12/2005 are used in the tests. The BegYr column gives the start date of the test. Tests are run for each year possible given the test length. The next columns appear in pairs. The first column of each pair, EstN, gives the 3-year B&H profit estimate for the test beginning in the specified year. The next column of the pair, SigN, gives the significance level using the Newey-West adjustment for autocorrelation. Results are reported for N = 10, 20, 30, 40, 50, 60, and 70 years as test lengths. The last row, %LTR, gives the percent of start dates for a given test length that demonstrate long-term reversals at the 5% level. The 8 countries are Australia, France, Germany, Italy, Japan, Sweden, UK, and the USA. Total Return data for these countries is available from Global Finance. The returns are winsorized at the 10% level before running the tests.

BegYr	Est10	sig10	Est20	sig20	Est30	sig30	Est40	sig40	Est50	sig50	Est60	sig60	Est70	sig70
1924	0.213	+++	0.137	+	0.164	+	0.204	+++	0.135	++	0.143	+++	0.149	+++
1925	0.303	+++	0.218	+	0.199	++	0.225	+++	0.130	++	0.146	+++	0.150	+++
1926	0.303	+++	0.251	++	0.223	+++	0.212	+++	0.129	++	0.150	+++	0.137	+++
1927	0.242	+++	0.252	++	0.209	++	0.206	+++	0.123	++	0.136	+++	0.125	+++
1928	0.115	++	0.185		0.194	++	0.184	+++	0.116	++	0.136	+++	0.122	+++
1929	0.073	+++	0.059		0.181	++	0.168	+++	0.106	++	0.145	+++	0.117	+++
1930	-0.006		-0.016		0.191	++	0.164	+++	0.107	++	0.147	+++	0.107	++
1931	0.046	+++	0.045		0.224	+++	0.164	+++	0.114	++	0.153	+++	0.109	++
1932	-0.006		0.138		0.214	+++	0.150	+++	0.123	++	0.154	+++	0.114	+++
1933	0.132	+	0.174		0.228	+++	0.140	++	0.133	++	0.152	+++	0.115	++
1934	0.200		0.209	+	0.238	+++	0.125	++	0.138	++	0.143	+++	0.112	++
1935	0.351	++	0.241	++	0.249	+++	0.121	+	0.140	+++	0.135	+++		
1936	0.512	+++	0.257	+	0.247	+++	0.130	++	0.145	+++	0.135	+++		
1937	0.244		0.199		0.220	+++	0.116	+	0.144	++	0.121	++		
1938	-0.090		0.167		0.203	+++	0.102	+	0.138	++	0.115	++		
1939	-0.380	###	0.150	+	0.167	+++	0.091	+	0.123	++	0.101	++		
1940	-0.367	###	0.164	+	0.141	++	0.081		0.120	++	0.087	++		
1941	-0.273	###	0.141		0.130	++	0.083		0.121	++	0.086	++		
1942	0.115		0.145		0.124	++	0.103	++	0.117	++	0.085	+		
1943	0.307	+++	0.125		0.103	++	0.112	++	0.107	++	0.083	+		
1944	0.377	+++	0.112		0.076		0.108	++	0.093	++	0.074	+		
1945	0.176	+	0.106		0.046		0.097	++	0.078	+				
1946	-0.004		0.085		0.036		0.077		0.064					
1947	-0.208		0.069		0.030		0.044		0.046					
1948	-0.153	#	0.062		0.040		0.051		0.051					
1949	-0.018		0.054		0.039		0.063		0.053					
1950	0.024		0.090	+	0.051		0.084	+	0.057					
1951	0.048		0.107	+	0.073		0.106	++	0.065					
1952	0.014		0.100	+	0.077		0.106	++	0.065					
1953	-0.007		0.068		0.087	+	0.092	++	0.064					
1954	0.131	++	0.026		0.077		0.082	+	0.055					
1955	0.205	+++	0.039		0.075		0.076	+						
1956	0.164	+	0.044		0.071		0.070							
1957	0.108		0.018		0.071		0.057							
1958	0.025		0.023		0.073		0.052							
1959	-0.058	###	-0.007		0.086		0.048							
1960	-0.020		-0.014		0.098		0.037							
1961	-0.061	##	-0.001		0.099		0.040							
1962	-0.049	#	0.029		0.108	+	0.053							
1963	-0.010		0.048		0.111	+	0.051							
1964	-0.089		0.065		0.104		0.047							
1965	-0.168	###	0.088		0.101									
1966	-0.061		0.089		0.091									
1967	-0.003		0.130		0.075									
1968	0.031		0.227	+++	0.104	+								
1969	0.018		0.258	+++	0.112	+								
1970	0.086		0.232	+++	0.087									
1971	0.156	+++	0.210	+++	0.090									
1972	0.206	++	0.201	+++	0.104	+								
1973	0.322	+++	0.220	+++	0.113	+								
1974	0.374	+++	0.191	++	0.102									
1975	0.297	+++	0.139	++										
1976	0.259	+	0.070											
1977	0.232	+	0.043											
1978	0.450	+++	0.060											
1979	0.397	++	0.055											
1980	0.121	++	0.029											
1981	0.248	+++	0.003											
1982	0.154	++	-0.008											
1983	0.164	+++	-0.031											
1984	0.082		-0.043											
1985	-0.033													
1986	-0.110	###												
1987	-0.104	###												
1988	-0.110	##												
1989	-0.104	#												
1990	-0.120	##												
1991	-0.049													
1992	-0.123													
1993	0.105													
1994	0.135	+++												
%LTR		35.2		18.0		37.3		46.3		67.7		85.7		100.0

+++ Positively significant at the 1% level. ### Negatively significant at the 1% level.
++ Positively significant at the 5% level. ## Negatively significant at the 5% level.
+ Positively significant at the 10% level. # Negatively significant at the 10% level.

Table III: Pre-War vs. Post-War

This table gives, by subperiod, the frequency of each country's occurrence in a long-term contrarian portfolio.

Panel A is the occurrence of each country in the Winner - Loser Portfolio. That is, the numbers in this panel give the proportion of the years for which a country is part of the winner minus loser zero-investment portfolio. The expected value is 50% as there are 8 countries and 4 will qualify for an extreme portfolio in each period.

Panel B gives, by subperiod, the frequency of each country's occurrence in the extreme loser portfolio. That is, the numbers in this table give the proportion of the years for which a country is part of the loser portfolio formed from ranking past 3 year buy and hold returns. The expected value is 25% as there are 8 countries and 2 will qualify for the extreme loser portfolio in each period.

Panel C gives, by subperiod, the frequency of each country's occurrence in an extreme winner portfolio. That is, the numbers in this table give the proportion of the years for which a country is part of the winner portfolio formed from ranking past 3-year buy-and-hold returns. The expected value is 25% as there are 8 countries and 2 will qualify for the extreme winner portfolio in each period.

Panel A: Winner - Loser Portfolio

	US	UK	Fra	Swe	Jap	Ita	Ger	Aus
1930s	0.789	0.174	0.771	0.505	0.633	0.183	0.560	0.385
1940s	0.517	0.492	0.708	0.158	0.258	0.825	0.625	0.417
1950s	0.325	0.308	0.525	0.392	0.775	0.275	0.550	0.850
1960s	0.717	0.183	0.742	0.417	0.425	0.658	0.567	0.292
1970s	0.417	0.533	0.325	0.525	0.650	0.675	0.383	0.492
1980s	0.475	0.275	0.550	0.692	0.325	0.708	0.417	0.558
1990s	0.525	0.183	0.333	0.608	0.792	0.792	0.317	0.450
2000s	0.466	0.110	0.247	0.521	0.781	0.781	0.274	0.822
Pre-War	0.641	0.304	0.823	0.331	0.436	0.442	0.552	0.470
Post-War	0.501	0.290	0.465	0.510	0.602	0.650	0.449	0.533
1st half	0.570	0.302	0.672	0.348	0.528	0.488	0.585	0.508
2nd half	0.489	0.285	0.398	0.600	0.611	0.727	0.356	0.534
All Data	0.529	0.293	0.537	0.475	0.569	0.609	0.470	0.520

Panel B: Loser Portfolio

	US	UK	Fra	Swe	Jap	Ita	Ger	Aus
1930s	0.413	0.174	0.339	0.321	0.367	0.101	0.165	0.119
1940s	0.192	0.300	0.383	0.042	0.192	0.408	0.300	0.183
1950s	0.000	0.250	0.175	0.258	0.450	0.108	0.250	0.508
1960s	0.383	0.175	0.583	0.233	0.008	0.350	0.200	0.067
1970s	0.358	0.308	0.267	0.167	0.008	0.633	0.108	0.150
1980s	0.242	0.025	0.317	0.392	0.017	0.417	0.250	0.342
1990s	0.192	0.000	0.142	0.100	0.492	0.667	0.192	0.217
2000s	0.014	0.110	0.014	0.151	0.671	0.219	0.274	0.548
Pre-War	0.343	0.304	0.442	0.221	0.232	0.177	0.099	0.182
Post-War	0.205	0.137	0.252	0.207	0.259	0.423	0.244	0.272
1st half	0.253	0.235	0.346	0.217	0.262	0.231	0.226	0.231
2nd half	0.213	0.106	0.235	0.202	0.246	0.517	0.204	0.277
All Data	0.233	0.171	0.290	0.210	0.254	0.374	0.215	0.254

Panel C: Winner Portfolio

	US	UK	Fra	Swe	Jap	Ita	Ger	Aus
1930s	0.376	0.000	0.431	0.183	0.266	0.083	0.394	0.266
1940s	0.325	0.192	0.325	0.117	0.067	0.417	0.325	0.233
1950s	0.325	0.058	0.350	0.133	0.325	0.167	0.300	0.342
1960s	0.333	0.008	0.158	0.183	0.417	0.308	0.367	0.225
1970s	0.058	0.225	0.058	0.358	0.642	0.042	0.275	0.342
1980s	0.233	0.250	0.233	0.300	0.308	0.292	0.167	0.217
1990s	0.333	0.183	0.192	0.508	0.300	0.125	0.125	0.233
2000s	0.452	0.000	0.233	0.370	0.110	0.562	0.000	0.274
Pre-War	0.298	0.000	0.381	0.110	0.204	0.265	0.453	0.287
Post-War	0.295	0.153	0.212	0.304	0.343	0.227	0.205	0.261
1st half	0.317	0.067	0.326	0.131	0.266	0.257	0.359	0.277
2nd half	0.275	0.177	0.166	0.399	0.364	0.213	0.151	0.255
All Data	0.296	0.122	0.246	0.265	0.315	0.235	0.255	0.266

Table IV: Trade Cost Estimates

This table gives trade estimates used to adjust the long-term reversal trading strategy for the existence of trade commissions and other trade execution frictions. The trade costs used are total costs in that they include both explicit and implicit costs. The unit of measurement is percent invested.

Lesmond, Ogden, & Trzcinka (1999) in Table 3 compute the average round trip transaction costs for NYSE and AMEX, labeled NYSE/AMEX, and for just the NYSE stocks, labeled NYSE-only. They use a limited dependent variable regression set up to estimate costs from the incidence of zero return days. Their methodology utilizes CRSP daily data. I use the NYSE/AMEX average as a proxy for the trade execution costs for trading a comprehensive portfolio for the 1963 to 1990 period, as the AMEX stocks exist during this period. I use the NYSE only average as a proxy for the trade execution costs for trading a comprehensive portfolio for the 1924 to 1962 period, as only NYSE stocks exist during this period.

Keim & Madhaven (1998) in Table 2 estimate the one-way transaction costs for both a buyer-initiated trade and a seller-initiated trade for the 1991-1993 period. Their estimates are for large institutional traders and are based on the effective spread and commissions. I use the average of their estimates for the trade execution cost of trading a comprehensive portfolio for the 1991-2005 period. I average first over quintiles and then over buyer and loser average costs.

Panel A

Lesmond, Ogden, & Trzcinka (1999) Table 3 estimates for 1963-1990

NYSE/AMEX size break deciles			NYSE size break deciles	
	NYSE/AMEX			NYSE only
	10.35			6.97
	7.09			4.12
	5.59			3.45
	4.49			3.02
	3.83			2.69
	3.19			2.43
	2.76			2.15
	2.28			1.91
	1.84			1.70
	1.23			1.46
Ave round trip	4.265		Ave round trip	2.990
Ave 1 way	2.133		Ave 1 way	1.495

Panel B

Keim & Madhaven (1998) Table 2 estimates for 1991-1993

	Buyer	Seller	All
mv1-mv2	1.78	2.07	1.925
mv3-mv4	1.00	1.33	1.165
mv5-mv6	0.64	1.02	0.830
mv7-mv8	0.43	0.63	0.530
mv9-mv10	0.31	0.26	0.285
Ave 1 way	0.832	1.062	0.947

Table V: Long-Term Reversal Profits, Global Finance Data
All years, 8 Countries, US Currency, 3-yr B&H
$Lag = 35$, Not Winsorized, Trading Costs

This table reports the 3-year B&H contrarian returns using the method of Richards (1997) as follows:

1. For each of the N-ranking dates, one for each ranking month n, calculate the n^{th} ranking-period buy-and-hold wealth relative, for each asset j, for the prior 36 months $n-35$ to n. $BH^{rank}_{j,n} = \frac{X_{j,n}}{X_{j,n-35}}$
2. For each of the N respective ranking dates, rank the $BH^{rank}_{j,n}$ from high to low across assets, that is over the variable j, holding the time variable n constant. This yields a set of N sorted returns. Label these sorted returns, $BH^{sort}_{s,n}$, where s represents the return's position within the sorted returns.
3. On each of the relevant N portfolio formation dates, which correspond with the ranking date, form the winner and loser portfolios as follows:

   Winners =25% highest buy-and hold wealth relatives. For example, for 16 country indices, the top 25% are the 4 highest returns and Winners $= BH^{sort}_{1,n}, ..., BH^{sort}_{4,n}$. I represent the subset of stocks in this winners portfolio with the subscript W.

   Losers = 4 lowest buy-and hold wealth relatives $= BH^{sort}_{J-3,n}, ..., BH^{sort}_{J,n}$. I represent the subset of stocks in this losers portfolio with the subscript L.

   Thus, each portfolio is formed conditional on the prior 36 months buy-and-hold return behavior occurring before the portfolio formation date. We now have N winner portfolios and N loser portfolios, one each for the N portfolio formation dates.
4. On each of the N ranking dates, for each asset j that belongs to either the winner or loser portfolio, compute the test-period buy-and-hold wealth relative for the subsequent 36 months period, i.e. from n to $n+36$ as: $BH^{test}_{j,n} = \frac{X_{j,n+36}}{X_{j,n}}$
5. For each of the N winner and loser portfolios, calculate the equally-weighted average buy-and-hold return of the portfolio. This gives N winner portfolio returns ($BH_{W,n}$) and N loser portfolio returns ($BH_{L,n}$).
6. The overreaction hypothesis predicts that:

   $$[\, BH_{L,n} - BH_{W,n} \,] > 0$$

   I obtain the significance tests as in Richards (1997), page 2131 using Newey-West t-stats. This t-stat tests the significance of the zero-investment portfolio and corrects for the moving-average error in overlapping data design. There is an autocorrelation that is induced in the data due to the test design. As monthly data is used, each 3-year buy-and-hold observation uses 36 months of data. Consecutive return observations thus share 35 months of data, leading to a lag length of $L_2 = 35$.

Data from 12/1924 to 12/2005 are used in the tests. The BegYr column gives the start date of the test. Tests are run for each year possible given the test length. The next columns appear in pairs. The first column of each pair, EstN, gives the 3-year B&H profit estimate for the test beginning in the specified year. The next column of the pair, SigN, gives the significance level using the Newey-West adjustment for autocorrelation. Results are reported for N = 10, 20, 30, 40, 50, 60, and 70 years as test lengths. The last row, %LTR, gives the percent of start dates for a given test length that demonstrate long-term reversals at the 5% level. The 8 countries are Australia, France, Germany, Italy, Japan, Sweden, UK, and the USA. Total Return data for these countries is available from Global Finance. The trade costs estimates of Lesmond, Ogden, and Trzcinka (1999) and Keim and Madhaven (1998) are used to adjust the long-term reversal strategy for transaction costs.

BegYr	Est10	sig10	Est20	sig20	Est30	sig30	Est40	sig40	Est50	sig50	Est60	sig60	Est70	sig70
1924	0.276	++	0.224		0.216		0.128		0.073		0.126		0.143	+
1925	0.313	+++	0.284	+	0.208		0.144		0.074		0.130		0.141	+
1926	0.352	+++	0.282	+	0.194		0.136		0.064		0.151		0.137	+
1927	0.168		0.214		0.146		0.119		0.061		0.153		0.123	
1928	-0.081		0.117		0.126		0.097		0.044		0.135		0.118	
1929	-0.172	#	0.084		0.119		0.108		0.050		0.138		0.114	
1930	-0.230	###	0.047		0.100		0.099		0.052		0.136		0.106	
1931	0.056		0.137		0.104		0.103		0.077		0.149		0.114	
1932	0.425		0.232		0.115		0.104		0.095		0.160	+	0.120	
1933	0.500	+++	0.321		0.137		0.093		0.127		0.163	+	0.126	
1934	0.636	+++	0.328		0.157		0.077		0.141		0.159	+	0.124	
1935	0.654	+++	0.260		0.147		0.056		0.128		0.142		0.109	
1936	0.392	+++	0.162		0.093		0.012		0.131		0.118			
1937	0.221		0.100		0.080		0.017		0.140		0.107			
1938	-0.098		0.071		0.053		-0.003		0.120		0.103			
1939	-0.386	###	0.009		0.039		-0.015		0.108		0.085			
1940	-0.470	###	-0.010		0.034		-0.007		0.110		0.079			
1941	-0.100		0.013		0.050		0.032		0.131		0.092			
1942	0.324		0.058		0.066		0.066		0.152		0.106			
1943	0.659	++	0.103		0.054		0.110		0.157	+	0.115			
1944	0.754	+++	0.156		0.044		0.136		0.159	+	0.118			
1945	0.486	+	0.132		0.008		0.116		0.135		0.098			
1946	0.178		0.048		-0.047		0.123		0.110					
1947	-0.275	#	-0.041		-0.080		0.108		0.075					
1948	-0.266	###	-0.055		-0.089		0.095		0.079					
1949	-0.223	#	-0.006		-0.064		0.109		0.081					
1950	-0.208	#	0.008		-0.039		0.121		0.081					
1951	-0.083		0.049		0.023		0.154		0.101					
1952	-0.143	###	0.014		0.035		0.156		0.098					
1953	-0.059		-0.027		0.086		0.154		0.103					
1954	0.108		-0.050		0.120		0.155		0.105					
1955	0.315	++	-0.028		0.140		0.158		0.107					
1956	0.291	+++	-0.046		0.195		0.156							
1957	0.157		-0.052		0.203		0.132							
1958	0.016		-0.093		0.169		0.127							
1959	0.004		-0.103		0.159		0.107							
1960	0.038		-0.064		0.173		0.106							
1961	0.039		0.002		0.196		0.115							
1962	-0.023		0.040		0.209		0.119							
1963	-0.298	###	0.089		0.185		0.110							
1964	-0.411	###	0.138		0.180		0.108							
1965	-0.352	###	0.168		0.181		0.109							
1966	-0.354	###	0.279		0.189									
1967	-0.145		0.358	++	0.193									
1968	-0.044		0.371	+++	0.228	++								
1969	0.054		0.390	+++	0.221	++								
1970	0.227	+++	0.426	+++	0.225	++								
1971	0.346	++	0.433	+++	0.219	+								
1972	0.482	+++	0.455	+++	0.225	++								
1973	0.675	+++	0.421	+++	0.216	+								
1974	0.744	+++	0.383	+++	0.196	+								
1975	0.620	+++	0.320	++	0.160									
1976	0.814	+++	0.278	+										
1977	0.642	+++	0.156											
1978	0.405	++	0.135											
1979	0.426	+	0.110											
1980	0.161	++	0.006											
1981	0.118		-0.024											
1982	0.252	+++	0.002											
1983	0.162	++	-0.005											
1984	0.077		-0.025											
1985	-0.049		-0.060											
1986	-0.140	###												
1987	-0.252	###												
1988	-0.125													
1989	-0.116													
1990	-0.136	#												
1991	0.013													
1992	-0.059													
1993	0.025													
1994	0.051													
1995	-0.010													
%LTR		32.4		14.8		7.8		0.0		0.0		0.0		0.0

+++ Positively significant at the 1% level. ### Negatively significant at the 1% level.
++ Positively significant at the 5% level. ## Negatively significant at the 5% level.
+ Positively significant at the 10% level. # Negatively significant at the 10% level.

Table VI: Long-Term Reversal Profits, Global Finance Data All Years, 8 Countries, Local Currency, 3-yr B&H $Lag = 35$, Not Winsorized

This table report the 3-year B&H contrarian returns using the method of Richards (1997) as follows:

1. For each of the N-ranking dates, one for each ranking month n, calculate the n^{th} ranking-period buy-and-hold wealth relative, for each asset j, for the prior 36 months $n-35$ to n. $BH_{j,n}^{rank} = \frac{X_{j,n}}{X_{j,n-35}}$
2. For each of the N respective ranking dates, rank the $BH_{j,n}^{rank}$ from high to low across assets, that is over the variable j, holding the time variable n constant. This yields a set of N sorted returns. Label these sorted returns, $BH_{s,n}^{sort}$, where s represents the return's position within the sorted returns.
3. On each of the relevant N portfolio formation dates, which correspond with the ranking date, form the winner and loser portfolios as follows:

   Winners =25% highest buy-and hold wealth relatives. For example, for 16 country indices, the top 25% are the 4 highest returns and Winners = $BH_{1,n}^{sort}, ..., BH_{4,n}^{sort}$. I represent the subset of stocks in this winners portfolio with the subscript W.

   Losers = 4 lowest buy-and hold wealth relatives = $BH_{J-3,n}^{sort}, ..., BH_{J,n}^{sort}$. I represent the subset of stocks in this losers portfolio with the subscript L.

   Thus, each portfolio is formed conditional on the prior 36 months buy-and-hold return behavior occurring before the portfolio formation date. We now have N winner portfolios and N loser portfolios, one each for the N portfolio formation dates.
4. On each of the N ranking dates, for each asset j that belongs to either the winner or loser portfolio, compute the test-period buy-and-hold wealth relative for the subsequent 36 months period, i.e. from n to $n+36$ as: $BH_{j,n}^{test} = \frac{X_{j,n+36}}{X_{j,n}}$
5. For each of the N winner and loser portfolios, calculate the equally-weighted average buy-and-hold return of the portfolio. This gives N winner portfolio returns ($BH_{W,n}$) and N loser portfolio returns ($BH_{L,n}$).
6. The overreaction hypothesis predicts that:

$$[\,BH_{L,n} - BH_{W,n}\,] > 0$$

   I obtain the significance tests as in Richards (1997), page 2131 using Newey-West t-stats. This t-stat tests the significance of the zero-investment portfolio and corrects for the moving-average error in overlapping data design.

Data from 12/1924 to 12/2005 are used in the tests. The BegYr column gives the start date of the test. Tests are run for each year possible given the test length. The next columns appear in pairs. The first column of each pair, EstN, gives the 3-year B&H profit estimate for the test beginning in the specified year. The next column of the pair, SigN, gives the significance level using the Newey-West adjustment for autocorrelation. Results are reported for N = 10, 20, 30, 40, 50, 60, and 70 years as test lengths. The last row, %LTR, gives the percent of start dates for a given test length that demonstrate long-term reversals at the 5% level. The 8 countries are Australia, France, Germany, Italy, Japan, Sweden, UK, and the USA. Total Return data denominated in local currency for these countries is available from Global Finance.

BegYr	Est10	sig10	Est20	sig20	Est30	sig30	Est40	sig40	Est50	sig50	Est60	sig60	Est70	sig70
1924	0.345	+++	-0.190		-0.114		-0.084		-0.061		0.060		0.090	
1925	0.361	+++	-0.215		-0.117		-0.065		-0.059		0.059		0.088	
1926	0.258		-0.287		-0.148		-0.080		-0.069		0.058		0.076	
1927	0.060		-0.460	#	-0.217		-0.110		-0.071		0.059		0.053	
1928	0.014		-0.469	##	-0.219		-0.114		-0.065		0.061		0.042	
1929	0.092		-0.340		-0.217		-0.097		-0.059		0.069		0.034	
1930	0.112	+++	-0.259		-0.218		-0.095		-0.055		0.078		0.029	
1931	-0.052		-0.218		-0.218		-0.095		-0.036		0.081		0.027	
1932	-0.450		-0.193		-0.219		-0.099		-0.018		0.086		0.030	
1933	-0.807	###	-0.309		-0.216		-0.123		0.017		0.078		0.028	
1934	-1.125	###	-0.328		-0.195		-0.133		0.032		0.072		0.025	
1935	-1.079	###	-0.294		-0.146		-0.115		0.042		0.080			
1936	-0.822	###	-0.201		-0.083		-0.068		0.088		0.103			
1937	-0.938	###	-0.180		-0.044		-0.013		0.133		0.112			
1938	-0.633	###	-0.087		0.007		0.035		0.167		0.125			
1939	-0.074		-0.054		0.048		0.055		0.187		0.123			
1940	0.354		-0.012		0.076		0.077		0.210	+	0.128			
1941	0.906	+++	0.103		0.144		0.149		0.252	++	0.156			
1942	0.981	+++	0.097		0.136		0.172		0.256	++	0.158			
1943	0.199		-0.005		0.040		0.173		0.212	++	0.128			
1944	-0.127		-0.044		-0.019		0.161		0.181	+	0.105			
1945	-0.319	#	-0.048		-0.044		0.138		0.163					
1946	-0.479	##	-0.077		-0.058		0.140		0.147					
1947	-0.353	###	0.004		0.028		0.205	+	0.163	+				
1948	-0.282	###	0.018		0.053		0.218	++	0.155					
1949	-0.239	#	0.069		0.070		0.236	++	0.146					
1950	-0.161		0.097		0.090		0.258	++	0.147					
1951	0.051	+++	0.159	++	0.160	+	0.289	+++	0.164					
1952	0.011		0.138	+	0.188	++	0.293	+++	0.164					
1953	0.099		0.101		0.264	++	0.288	+++	0.167	+				
1954	0.244	+	0.081		0.295	++	0.281	+++	0.165	+				
1955	0.379	+++	0.080		0.287	++	0.275	+++						
1956	0.370	+++	0.083		0.305	++	0.266	++						
1957	0.229		0.109		0.326	++	0.236	++						
1958	0.088		0.098		0.314	++	0.204	+						
1959	0.088		0.077		0.308	++	0.171							
1960	0.130		0.094		0.331	++	0.165							
1961	0.188	++	0.169		0.349	+++	0.168							
1962	0.139		0.224		0.357	+++	0.172							
1963	-0.126		0.316		0.328	++	0.160							
1964	-0.216	##	0.362	+	0.315	++	0.155							
1965	-0.222	###	0.348	+	0.306	++								
1966	-0.182	#	0.388	++	0.297	++								
1967	0.126		0.487	+++	0.292	++								
1968	0.303	++	0.527	+++	0.283	+								
1969	0.366	+++	0.557	+++	0.259									
1970	0.409	+++	0.591	+++	0.247									
1971	0.440	+++	0.554	+++	0.213									
1972	0.532	+++	0.540	+++	0.201									
1973	0.924	+++	0.511	+++	0.197									
1974	1.069	+++	0.484	+++	0.186									
1975	0.815	+++	0.409	++										
1976	0.710	++	0.325	+										
1977	0.473	+++	0.149											
1978	0.360	++	0.061											
1979	0.507	+++	0.032											
1980	0.530	+++	-0.016											
1981	0.362	+++	-0.085											
1982	0.350	+++	-0.096											
1983	0.207	++	-0.115											
1984	0.034		-0.155											
1985	-0.069													
1986	-0.220	###												
1987	-0.342	###												
1988	-0.411	###												
1989	-0.501	###												
1990	-0.484	###												
1991	-0.347	###												
1992	-0.188													
1993	-0.008													
1994	0.043													
%LTR		35.2		18.0		31.4		24.4		9.7		0.0		0.0

+++ Positively significant at the 1% level. ### Negatively significant at the 1% level.
++ Positively significant at the 5% level. ## Negatively significant at the 5% level.
+ Positively significant at the 10% level. # Negatively significant at the 10% level.

Table VII: LTR Regulatory Constraint Tests, Global Finance Data All Years, 8 Countries, 6 currencies, 3-yr B&H $Lag = 35$, Not Winsorized

This table reports the 3-year B&H contrarian returns from the perspective of an investor from one of the following countries: Australia, Canada, Japan, Sweden, UK, and the USA. This tests if regulatory constraints bind. If regulation is a binding constraint on trading profits, long-term return profits may differ across different country regulatory environments. A constraint is one possible reason for a market to be inefficient. The tests use the method of Richards (1997):

1. For each of the N-ranking dates, one for each ranking month n, calculate the n^{th} ranking-period buy-and-hold wealth relative, for each asset j, for the prior 36 months $n-35$ to n. $BH^{rank}_{j,n} = \frac{X_{j,n}}{X_{j,n-35}}$
2. For each of the N respective ranking dates, rank the $BH^{rank}_{j,n}$ from high to low across assets, that is over the variable j, holding the time variable n constant. This yields a set of N sorted returns. Label these sorted returns, $BH^{sort}_{s,n}$, where s represents the return's position within the sorted returns.
3. On each of the relevant N portfolio formation dates, which correspond with the ranking date, form the winner and loser portfolios as follows:

   Winners =25% highest buy-and hold wealth relatives. For example, for 16 country indices, the top 25% are the 4 highest returns and Winners = $BH^{sort}_{1,n}, ..., BH^{sort}_{4,n}$. I represent the subset of stocks in this winners portfolio with the subscript W.

   Losers = 4 lowest buy-and hold wealth relatives = $BH^{sort}_{J-3,n}, ..., BH^{sort}_{J,n}$. I represent the subset of stocks in this losers portfolio with the subscript L.

   Thus, each portfolio is formed conditional on the prior 36 months buy-and-hold return behavior occurring before the portfolio formation date. We now have N winner portfolios and N loser portfolios, one each for the N portfolio formation dates.
4. On each of the N ranking dates, for each asset j that belongs to either the winner or loser portfolio, compute the test-period buy-and-hold wealth relative for the subsequent 36 months period, i.e. from n to $n+36$ as: $BH^{test}_{j,n} = \frac{X_{j,n+36}}{X_{j,n}}$
5. For each of the N winner and loser portfolios, calculate the equally-weighted average buy-and-hold return of the portfolio. This gives N winner portfolio returns ($BH_{W,n}$) and N loser portfolio returns ($BH_{L,n}$).
6. The overreaction hypothesis predicts that:

   $$[\, BH_{L,n} - BH_{W,n} \,] > 0$$

   I obtain the significance tests as in Richards (1997), page 2131 using Newey-West t-stats. This t-stat tests the significance of the zero-investment portfolio and corrects for the moving-average error in overlapping data design.

Data from 12/1924 to 12/2005 are used in the tests. The BegYr column gives the start date of the test. Tests are run for each year possible given the test length. The next columns appear in pairs. One pair for each currency that Global Finance provides the indices. The first column of each pair, Est70, gives the 3-year B&H profit estimate for the test beginning in the specified year that utilizes 70 years of data. The next column of the pair, Sig70, gives the significance level using the Newey-West adjustment for autocorrelation. Results are reported only for N = 70 years as test length given that prior results demonstrate this is the most reliable. The 6 currencies are Australian Dollar, Canadian Dollar, Japanese Yen, Swedish Krona, UK Pound, and the USA Dollar. Total Return data denominated in local currency for these countries is available from Global Finance.

	Australia		Canada		Japan		Sweden		UK		USA	
BegYr	Est70	sig70	Est70	sig70	Est70	sig70	Est70	sig70	Est70	sig70	Est70	sig70
1924	0.223112	++	0.195572	++	-0.4678		0.224702	++	0.244373	+++	0.213544	+++
1925	0.220823	++	0.193609	++	-0.4695		0.224279	++	0.240856	+++	0.210396	+++
1926	0.213933	++	0.187275	++	-0.47697		0.218653	++	0.236088	++	0.206302	++
1927	0.201656	++	0.176676	++	-0.49371		0.207165	++	0.221627	++	0.192302	++
1928	0.201241	++	0.17486	++	-0.50075		0.212426	++	0.217316	++	0.187109	++
1929	0.197032	++	0.170114	++	-0.50592		0.201733	++	0.213653	++	0.182216	++
1930	0.190287	++	0.163497	+	-0.51199		0.190197	++	0.207392	++	0.17444	++
1931	0.193563	++	0.166489	++	-0.50922		0.1993	++	0.214279	++	0.181239	++
1932	0.195613	++	0.168387	++	-0.50728		0.203625	++	0.220095	++	0.187065	++
1933	0.199619	++	0.172639	++	-0.50253		0.209876	++	0.225722	++	0.193117	++
1934	0.194011	++	0.167441	++	-0.5081		0.207893	++	0.223301	++	0.19063	++

+++ Positively significant at the 1% level. ### Negatively significant at the 1% level.
++ Positively significant at the 5% level. ## Negatively significant at the 5% level.
+ Positively significant at the 10% level. # Negatively significant at the 10% level.

Table VIII: Long-Term Reversal Profits, Global Finance Data
Richards (1997), 16 Countries, 3-yr B&H, $Lag = 35$, Not Winsorized

This table reports the 3-year B&H contrarian returns using the method of Richards (1997) as follows:

1. For each of the N-ranking dates, one for each ranking month n, calculate the n^{th} ranking-period buy-and-hold wealth relative, for each asset j, for the prior 36 months $n-35$ to n. $BH^{rank}_{j,n} = \frac{X_{j,n}}{X_{j,n-35}}$
2. For each of the N respective ranking dates, rank the $BH^{rank}_{j,n}$ from high to low across assets, that is over the variable j, holding the time variable n constant. This yields a set of N sorted returns. Label these sorted returns, $BH^{sort}_{s,n}$, where s represents the return's position within the sorted returns.
3. On each of the relevant N portfolio formation dates, which correspond with the ranking date, form the winner and loser portfolios as follows:

   Winners =25% highest buy-and hold wealth relatives. For example, for 16 country indices, the top 25% are the 4 highest returns and Winners = $BH^{sort}_{1,n}, ..., BH^{sort}_{4,n}$. I represent the subset of stocks in this winners portfolio with the subscript W.

   Losers = 4 lowest buy-and hold wealth relatives = $BH^{sort}_{J-3,n}, ..., BH^{sort}_{J,n}$. I represent the subset of stocks in this losers portfolio with the subscript L.

   Thus, each portfolio is formed conditional on the prior 36 months buy-and-hold return behavior occurring before the portfolio formation date. We now have N winner portfolios and N loser portfolios, one each for the N portfolio formation dates.
4. On each of the N ranking dates, for each asset j that belongs to either the winner or loser portfolio, compute the test-period buy-and-hold wealth relative for the subsequent 36 months period, i.e. from n to $n+36$ as: $BH^{test}_{j,n} = \frac{X_{j,n+36}}{X_{j,n}}$
5. For each of the N winner and loser portfolios, calculate the equally-weighted average buy-and-hold return of the portfolio. This gives N winner portfolio returns ($BH_{W,n}$) and N loser portfolio returns ($BH_{L,n}$).
6. The overreaction hypothesis predicts that:

   $$[\,BH_{L,n} - BH_{W,n}\,] > 0$$

   I obtain the significance tests as in Richards (1997), page 2131 using Newey-West t-stats. This t-stat tests the significance of the zero-investment portfolio and corrects for the moving-average error in overlapping data design.

Data from 12/1969 to 12/2005 are used in the tests. The BegYr column gives the start date of the test. Tests are run for each year possible given the test length. The next columns appear in pairs. The first column of each pair, EstN, gives the 3-year B&H profit estimate for the test beginning in the specified year. The next column of the pair, SigN, gives the significance level using the Newey-West adjustment for autocorrelation. Results are reported for N = 10, 20, and 30 years as test lengths. These tests include the original 8 countries of Australia, France, Germany, Italy, Japan, Sweden, UK, and the USA. In addition, another 8 countries are added with the first 8 to make the group of 16. These countries are: Austria, Canada, Denmark, Hong Kong, the Netherlands, Finland, Spain, Switzerland. Total Return data for these countries is available from Global Finance.

Panel A: Consists of tests that use all years of data, denominated in US Currency, and are not Winsorized. Other than for the 10-year tests, which depend on the start date, the long-term contrarian profits are consistently significant.

Panel B: Consists of tests that use all years of data, denominated in US Currency, and are not Winsorized. Trading Costs LOT99 are employed. The LOT99 trade cost estimates are from Lesmond, Ogden, and Trzcinka (1999) and Keim and Madhaven (1998) are used to adjust the long-term reversal strategy for transaction costs. The 10-year and 20-year tests depend on the start date. The long-term contrarian profits are not significant for the 30-year tests. These results are best interpreted within the longer data set.

Panel C: Consists of tests that use all years of data, denominated in Local Currency, and are not Winsorized. The 10-year tests depend on the start date. The long-term contrarian profits are of mixed significance for the 20-year tests and disappear for the 30-year tests. These results are best interpreted within the longer data set.

Panel A: All years of data, US Currency, Not Winsorized

BegYr	Est10	sig10	Est20	sig20	Est30	sig30
1969	0.238	+++	0.434	+++	0.269	++
1970	0.200		0.455	+++	0.249	+
1971	0.118	++	0.453	+++	0.230	+
1972	0.141	+	0.461	+++	0.220	+
1973	0.301	+	0.483	+++	0.232	+
1974	0.417	+++	0.478	+++	0.249	+
1975	0.450	+++	0.471	+++	0.220	
1976	0.698	+++	0.426	+++		
1977	0.836	+++	0.355	++		
1978	0.840	+++	0.330	+		
1979	0.809	+++	0.259			
1980	0.541	+++	0.127			
1981	0.352	+++	0.042			
1982	0.370	+++	0.023			
1983	0.411	+++	0.033			
1984	0.281	++	0.029			
1985	0.181	+	-0.042			
1986	0.020					
1987	-0.147	###				
1988	-0.102	##				
1989	-0.294	###				
1990	-0.350	###				
1991	-0.258	###				
1992	-0.237					
1993	0.020					
1994	0.198	+++				
1995	0.057					

+++ Positively significant at the 1% level. ### Negatively significant at the 1% level.
++ Positively significant at the 5% level. ## Negatively significant at the 5% level.
+ Positively significant at the 10% level. # Negatively significant at the 10% level.

Panel B: All years of data, US Currency, Not Winsorized, LOT99 Trading Costs

BegYr	Est10	sig10	Est20	sig20	Est30	sig30
1969	0.153	++	0.348	+++	0.198	+
1970	0.115		0.370	+++	0.181	
1971	0.033		0.370	+++	0.164	
1972	0.056		0.379	+++	0.156	
1973	0.215		0.403	+++	0.170	
1974	0.331	+++	0.401	+++	0.189	
1975	0.365	+++	0.398	+++	0.162	
1976	0.613	+++	0.356	++		
1977	0.750	+++	0.288	+		
1978	0.754	+++	0.267			
1979	0.724	++	0.199			
1980	0.455	++	0.070			
1981	0.273	+++	-0.011			
1982	0.297	+++	-0.027			
1983	0.343	+++	-0.013			
1984	0.226	+	-0.014			
1985	0.131		-0.083			
1986	-0.024					
1987	-0.185	###				
1988	-0.140	###				
1989	-0.332	###				
1990	-0.387	###				
1991	-0.296	###				
1992	-0.275					
1993	-0.018					
1994	0.160	+++				
1995	0.019					

+++ Positively significant at the 1% level. ### Negatively significant at the 1% level.
++ Positively significant at the 5% level. ## Negatively significant at the 5% level.
+ Positively significant at the 10% level. # Negatively significant at the 10% level.

Panel C: All years of data, Local Currency, Not Winsorized

BegYr	Est10	sig10	Est20	sig20	Est30	sig30
1969	0.343	+++	0.323	+++	0.172	
1970	0.246		0.344	+++	0.147	
1971	0.024		0.333	+++	0.112	
1972	-0.002		0.320	+++	0.092	
1973	0.199		0.334	+++	0.105	
1974	0.357	++	0.348	+++	0.119	
1975	0.422	+++	0.374	+++	0.111	
1976	0.445	+++	0.316	+++		
1977	0.431	+++	0.219	+		
1978	0.422	+++	0.163			
1979	0.473	+++	0.107			
1980	0.445	+++	0.036			
1981	0.404	+++	-0.025			
1982	0.410	+++	-0.045			
1983	0.383	+++	-0.044			
1984	0.260	+	-0.070			
1985	0.167	++	-0.135			
1986	-0.018					
1987	-0.205					
1988	-0.289	##				
1989	-0.511	###				
1990	-0.533	###				
1991	-0.423	###				
1992	-0.306	##				
1993	-0.057					
1994	0.074					
1995	0.017					

+++ Positively significant at the 1% level. ### Negatively significant at the 1% level.
++ Positively significant at the 5% level. ## Negatively significant at the 5% level.
+ Positively significant at the 10% level. # Negatively significant at the 10% level.

Table IX: Long-Term Reversal Profits, Global Finance Data
All Years & Trading Costs LOT99, 24 Countries, US Currency, 3-yr B&H
$Lag = 35$, Not Winsorized

This table reports the 3-year B&H contrarian returns using the method of Richards (1997). Data from 12/1976 to 12/2005 are used in the tests. The BegYr column gives the start date of the test. Tests are run for each year possible given the test length. The next columns appear in pairs. The first column of each pair, EstN, gives the 3-year B&H profit estimate for the test beginning in the specified year. The next column of the pair, SigN, gives the significance level using the Newey-West adjustment for autocorrelation. Results are reported for N = 10, 20, and 25 years as test lengths. 25-year tests are used instead of 30-year tests due to the length of the data set and the desire to have more than one observation. These tests include the original 16 countries of Richards (1997): Australia, Austria, Canada, Denmark, Finland, France, Germany, Hong Kong, Italy, Japan, the Netherlands, Spain, Sweden, Switzerland, UK, and the USA. In addition, another 8 countries are added to this first set of 16 to make the group of 24. These countries are: Belgium, Greece, Korea, Malaysia, Norway, South Africa, Singapore, and Thailand. Total Return data for these countries is available from Global Finance. Panel A uses all data and conducts tests on raw returns, i.e. returns are not adjusted for transaction costs. Panel B uses the trade cost estimates of Lesmond, Ogden, and Trzcinka (1999) and Keim and Madhaven (1998) to adjust the long-term reversal strategy for transaction costs. For both the raw tests and the transaction-cost-adjusted tests results depend on the start date for both 10-year tests, while the long-term contrarian profits are consistently not significant at the 25-year time horizon. These results are best interpreted within the longer data set.

Panel A

All Years, US Currency Results						
BegYr	Est10	sig10	Est20	sig20	Est25	sig25
1976	0.537	+++	0.349	+	0.259	
1977	0.694	+++	0.349	+	0.255	
1978	0.942	+++	0.379	++	0.264	
1979	1.103	+++	0.320	+	0.261	
1980	0.645	++	0.177		0.192	
1981	0.389		0.130			
1982	0.074		0.056			
1983	-0.114		0.018			
1984	0.012		0.086			
1985	0.067	+	0.081			
1986	0.052					
1987	0.069					
1988	0.288	++				
1989	0.134					
1990	-0.066					
1991	-0.071					
1992	-0.189					
1993	0.046					
1994	0.328	+++				
1995	0.216	++				

Panel B

Trading Costs LOT99, US Currency Results						
BegYr	Est10	sig10	Est20	sig20	Est25	sig25
1976	0.452	+++	0.279		0.197	
1977	0.608	+++	0.282		0.196	
1978	0.857	+++	0.316	+	0.208	
1979	1.017	+++	0.260		0.207	
1980	0.560	+	0.120		0.140	
1981	0.309		0.077			
1982	0.001		0.006			
1983	-0.181		-0.028			
1984	-0.044		0.043			
1985	0.017		0.040			
1986	0.008					
1987	0.031					
1988	0.250	+				
1989	0.096					
1990	-0.104					
1991	-0.109					
1992	-0.227					
1993	0.008					
1994	0.290	+++				
1995	0.178	+				

+++ Positively significant at the 1% level. ### Negatively significant at the 1% level.
++ Positively significant at the 5% level. ## Negatively significant at the 5% level.
+ Positively significant at the 10% level. # Negatively significant at the 10% level.

Table X: Long-Term Reversal Profits, Global Finance Data
All years, 40 Countries, US & Local Currency, 3-yr B&H
$Lag = 35$, Not Winsorized

This table reports the 3-year B&H contrarian returns using the method of Richards (1997). Data from 12/1987 to 12/2005 are used in the tests. Data is in US currency in all three panels. The BegYr column gives the start date of the test. Tests are run for each year possible given the test length. The next columns appear in pairs. The first column of each pair, EstN, gives the 3 year B&H profit estimate for the test beginning in the specified year. The next column of the pair, SigN, gives the significance level using the Newey-West adjustment for autocorrelation. Results are reported for N = 10 years as test lengths. These tests include the original 24 countries of Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Korea, Malaysia, the Netherlands, Norway, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, UK, and the USA. In addition, another 16 countries are added with the first 24 to make the group of 40. These countries are: Argentina, Brazil, Chile, Columbia, India, Indonesia, Ireland, Jordan, Luxembourg, Mexico, New Zealand, Pakistan, Philippines, Taiwan, Turkey, and Venezuela. This comprehensive set of countries has Total Return data denominated in both US dollars and local currency from 12/1987 and is available from Global Finance. Panel A uses all data denominated in US dollars and conducts tests on raw returns, i.e. returns are not adjusted for transaction costs. Panel B uses the trade costs estimates of Lesmond, Ogden, and Trzcinka (1999) and Keim and Madhaven (1998) to adjust the long-term reversal strategy for transaction costs. These tests also use data denominated in US currency. Panel C uses all data denominated in local currency and conducts tests on raw returns. Consistent with other 10-year tests, the results either vary on the year the data starts (US data), or the results are insignificant or significantly negative (local data). These results are best interpreted within the longer data set.

Panel A

All Years US Currency Results		
BegYr	Est10	sig10
1987	0.412275	+++
1988	0.484482	+++
1989	0.284908	+
1990	0.044152	
1991	-0.08812	
1992	-0.1333	
1993	0.119068	
1994	0.405169	+++
1995	0.2872	+

Panel B

Trading Costs LOT99 US Currency Results		
BegYr	Est10	sig10
1987	0.375598	+++
1988	0.454177	+++
1989	0.259132	
1990	0.017452	
1991	-0.11757	
1992	-0.17756	
1993	0.080065	
1994	0.368592	+++
1995	0.239888	

Panel C

All Years Local Currency Results		
BegYr	Est10	sig10
1987	-2.178	###
1988	-1.327	#
1989	-1.464	
1990	-0.255	#
1991	-0.211	
1992	-0.163	
1993	0.242	
1994	0.529	++
1995	0.198	

+++ Positively significant at the 1% level. ### Negatively significant at the 1% level.
++ Positively significant at the 5% level. ## Negatively significant at the 5% level.
+ Positively significant at the 10% level. # Negatively significant at the 10% level.

Table XI: Long-Term Reversal Profits, MSCI Data, Richards (1997)
16 Countries, 3-yr B&H, $Lag = 35$, Not Winsorized

This table reports the 3-year B&H contrarian returns using the method of Richards (1997) as follows:

1. For each of the N-ranking dates, one for each ranking month n, calculate the n^{th} ranking-period buy-and-hold wealth relative, for each asset j, for the prior 36 months $n-35$ to n. $BH_{j,n}^{rank} = \frac{X_{j,n}}{X_{j,n-35}}$
2. For each of the N respective ranking dates, rank the $BH_{j,n}^{rank}$ from high to low across assets, that is over the variable j, holding the time variable n constant. This yields a set of N sorted returns. Label these sorted returns, $BH_{s,n}^{sort}$, where s represents the return's position within the sorted returns.
3. On each of the relevant N portfolio formation dates, which correspond with the ranking date, form the winner and loser portfolios as follows:

   Winners =25% highest buy-and hold wealth relatives. For example, for 16 country indices, the top 25% are the 4 highest returns and Winners = $BH_{1,n}^{sort}, ..., BH_{4,n}^{sort}$. I represent the subset of stocks in this winners portfolio with the subscript W.

   Losers = 4 lowest buy-and hold wealth relatives = $BH_{J-3,n}^{sort}, ..., BH_{J,n}^{sort}$. I represent the subset of stocks in this losers portfolio with the subscript L.

   Thus, each portfolio is formed conditional on the prior 36 months buy-and-hold return behavior occurring before the portfolio formation date. We now have N winner portfolios and N loser portfolios, one each for the N portfolio formation dates.
4. On each of the N ranking dates, for each asset j that belongs to either the winner or loser portfolio, compute the test-period buy-and-hold wealth relative for the subsequent 36 months period, i.e. from n to $n+36$ as: $BH_{j,n}^{test} = \frac{X_{j,n+36}}{X_{j,n}}$
5. For each of the N winner and loser portfolios, calculate the equally-weighted average buy-and-hold return of the portfolio. This gives N winner portfolio returns ($BH_{W,n}$) and N loser portfolio returns ($BH_{L,n}$).
6. The overreaction hypothesis predicts that: $[\, BH_{L,n} - BH_{W,n}\,] > 0$. I obtain the significance tests as in Richards (1997), page 2131 using Newey-West t-stats. This t-stat tests the significance of the zero-investment portfolio and corrects for the moving-average error in overlapping data design.

Data from 12/1969 to 12/2005 are used in the tests. The BegYr column gives the start date of the test. Tests are run for each year possible given the test length. The next columns appear in pairs. The first column of each pair, EstN, gives the 3-year B&H profit estimate for the test beginning in the specified year. The next column of the pair, SigN, gives the significance level using the Newey-West adjustment for autocorrelation. Results are reported for N = 10, 20, 25, and 30 years as test lengths. These tests include the original 16 countries used in Richards (1997). They include: Australia, Austria, Canada, Denmark, France, Germany, Hong Kong, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, UK, and the USA. Total Return data for these countries starts 12/1969 and is available from the MSCI Country Indices on DataStream.

Panel A: Consists of tests that use all years of data, denominated in US currency, and are not winsorized. Results are mixed for the 10-year and 20-year tests, as a test's conclusion depends on the start date. The long-term contrarian profits are consistently significant for test lengths of 25 and 30 years. These results are best interpreted within the longer data set.

Panel B: Consists of tests that use all years of data, denominated in US currency, and are not winsorized. Trading costs of LOT99 are employed. The trade costs estimates of Lesmond, Ogden, and Trzcinka (1999) and Keim and Madhaven (1998) are used to adjust the long-term reversal strategy for transaction costs. Results are inconsistent for all test lengths, as a test's conclusion depends on the start date. The long-term contrarian profits are more consistently significant for tests of length 30 years, but the significance level drops. These results are best interpreted within the longer data set.

Panel C: Consists of tests that use all years of data, denominated in local currency, and are not winsorized. Results are inconsistent for the 10-year, 20-year, and 25-year tests, as a test's conclusion depends on the start date. The long-term contrarian profits are consistently insignificant for test lengths of 30 years.

Panel A: All years of data, US Currency, Not Winsorized

BegYr	Est10	sig10	Est20	sig20	Est25	sig25	Est30	sig30
1969	0.180	+++	0.407	+++	0.369	+++	0.278	+++
1970	0.173	++	0.424	+++	0.361	+++	0.253	++
1971	0.101	+++	0.426	+++	0.325	+++	0.244	++
1972	0.112	+++	0.435	+++	0.315	++	0.243	++
1973	0.282	++	0.463	+++	0.328	+++	0.257	++
1974	0.374	+++	0.445	+++	0.310	++	0.264	++
1975	0.478	+++	0.431	+++	0.277	+	0.256	++
1976	0.809	+++	0.394	++	0.275	+		
1977	0.892	+++	0.346	++	0.246	+		
1978	0.779	+++	0.334	++	0.243	+		
1979	0.722	++	0.275	+	0.226	+		
1980	0.413	+++	0.128		0.139			
1981	0.263	+++	0.068					
1982	0.352	+++	0.081					
1983	0.375	+++	0.085					
1984	0.245	++	0.077					
1985	0.119		0.037					
1986	-0.032							
1987	-0.129	###						
1988	-0.015							
1989	-0.070							
1990	-0.124							
1991	-0.081							
1992	-0.106							
1993	0.058							
1994	0.234	+++						
1995	0.164	++						

+++ Positively significant at the 1% level. ### Negatively significant at the 1% level.
++ Positively significant at the 5% level. ## Negatively significant at the 5% level.
+ Positively significant at the 10% level. # Negatively significant at the 10% level.

Panel B: All years of data, US Currency, Not Winsorized, LOT99 Trading Costs

BegYr	Est10	sig10	Est20	sig20	Est25	sig25	Est30	sig30
1969	0.095	++	0.322	++	0.290	+++	0.207	++
1970	0.087		0.339	++	0.284	+++	0.185	+
1971	0.016		0.343	++	0.251	++	0.178	
1972	0.026		0.354	+++	0.244	++	0.178	
1973	0.196	+	0.383	+++	0.259	++	0.195	+
1974	0.288	+++	0.368	+++	0.243	++	0.203	+
1975	0.393	+++	0.358	+++	0.213		0.197	+
1976	0.723	+++	0.324	++	0.213			
1977	0.807	+++	0.279	+	0.187			
1978	0.694	+++	0.271	+	0.187			
1979	0.636	++	0.215		0.172			
1980	0.328	++	0.072		0.087			
1981	0.183	++	0.015					
1982	0.278	+++	0.032					
1983	0.307	+++	0.039					
1984	0.190	+	0.034					
1985	0.069		-0.005					
1986	-0.076							
1987	-0.166	###						
1988	-0.053							
1989	-0.108							
1990	-0.161							
1991	-0.118							
1992	-0.144							
1993	0.020							
1994	0.196	+++						
1995	0.126	+						

+++ Positively significant at the 1% level. ### Negatively significant at the 1% level.
++ Positively significant at the 5% level. ## Negatively significant at the 5% level.
+ Positively significant at the 10% level. # Negatively significant at the 10% level.

Panel C: All years of data, Local Currency, Not Winsorized

BegYr	Est10	sig10	Est20	sig20	Est25	sig25	Est30	sig30
1969	0.395	+++	0.353	+++	0.322	+++	0.176	
1970	0.323	+	0.381	+++	0.302	+++	0.160	
1971	0.171	++	0.358	+++	0.239	+++	0.143	
1972	0.086	+	0.328	+++	0.187	+	0.122	
1973	0.280	++	0.330	+++	0.156		0.126	
1974	0.319	+++	0.331	+++	0.145		0.123	
1975	0.305	+++	0.322	+++	0.138		0.101	
1976	0.319	+++	0.277	++	0.145			
1977	0.406	++	0.195		0.111			
1978	0.471	+++	0.143		0.095			
1979	0.502	+++	0.097		0.051			
1980	0.587	+++	0.051		0.023			
1981	0.448	+++	-0.024					
1982	0.389	+++	-0.048					
1983	0.351	+++	-0.052					
1984	0.181		-0.089					
1985	0.038		-0.156					
1986	-0.085							
1987	-0.239	###						
1988	-0.368	###						
1989	-0.482	###						
1990	-0.498	###						
1991	-0.364	###						
1992	-0.197							
1993	-0.020							
1994	0.097	+++						
1995	-0.013							

+++ Positively significant at the 1% level. ### Negatively significant at the 1% level.
++ Positively significant at the 5% level. ## Negatively significant at the 5% level.
+ Positively significant at the 10% level. # Negatively significant at the 10% level.

Figure 1

Map of Long-Term Reversals Literature (US)

LTRs

Pro	Con
Boynton et al (06)	Ball & Kothari (89)
Chopra et al (92)	Ball, Kothari, & Shanken (95)
Cooper, Gutierrez, & Hameed (04)	Chan (88)
DeBondt & Thaler (85)	Chen & Sauer (97)
George & Hwang (04)	Conrad & Kaul (93)
Jegadeesh & Titman (01)	Reedman (06)
Lee (06)	Wu (02)
Lee & Swaminathan (00)	Zarowin (90)
Liang (00)	

Size Effect

Pro	Con
Ball, Kothari, & Shanken(95)	Chopra et al (92)
Zarowin (90)	

January Effect

Pro	Con
De Bondt & Thaler (85)	
Chopra et al (92)	
McLean (06)	

Overreaction Exist in Lab Experiments

Pro	Con
Offerman & Sonnemans (04)	Stevens & Williams (05)

Results Independent of Period & Start

Pro	Con
	Jordan (06)

Return Measurement Problems

Pro	Con
Barber & Lyon (97)	Jones & Yeoman (02)
Canina et al. (96)	Loughran & Ritter (00)
Kothari & Warner (97)	
Lyon, Barber, & Tsai (99)	

Asymmetric Reversals

Pro	Con
De Bondt & Thaler (85)	Dissanaike (96)

Measurement Error

Pro	Con
Conrad & Kaul (93)	Loughran & Ritter (96)
	Boynton et al (06)

Short Sales Constraints

Pro	Con
Alexander (00)	Hirschey (03)
	Lee (06)

Beta or Risk Shift

Pro	Con
Liang (00)	Chan (88)
Chopra et al (92)	Ball & Kothari (89)
Jones (93)	Chen & Sauer (97)

Pre-war Only

Pro	Con
Kim, Nelson & Startz (91)	Boynton et al (06)
Chen & Sauer (97)	Jones (93)

FF 3 factor model

Pro	Con
Fama & French (96)	McLean (06)
	Loughran & Ritter (00)

Figure 2

Map of Long-Term Reversals Literature (International)

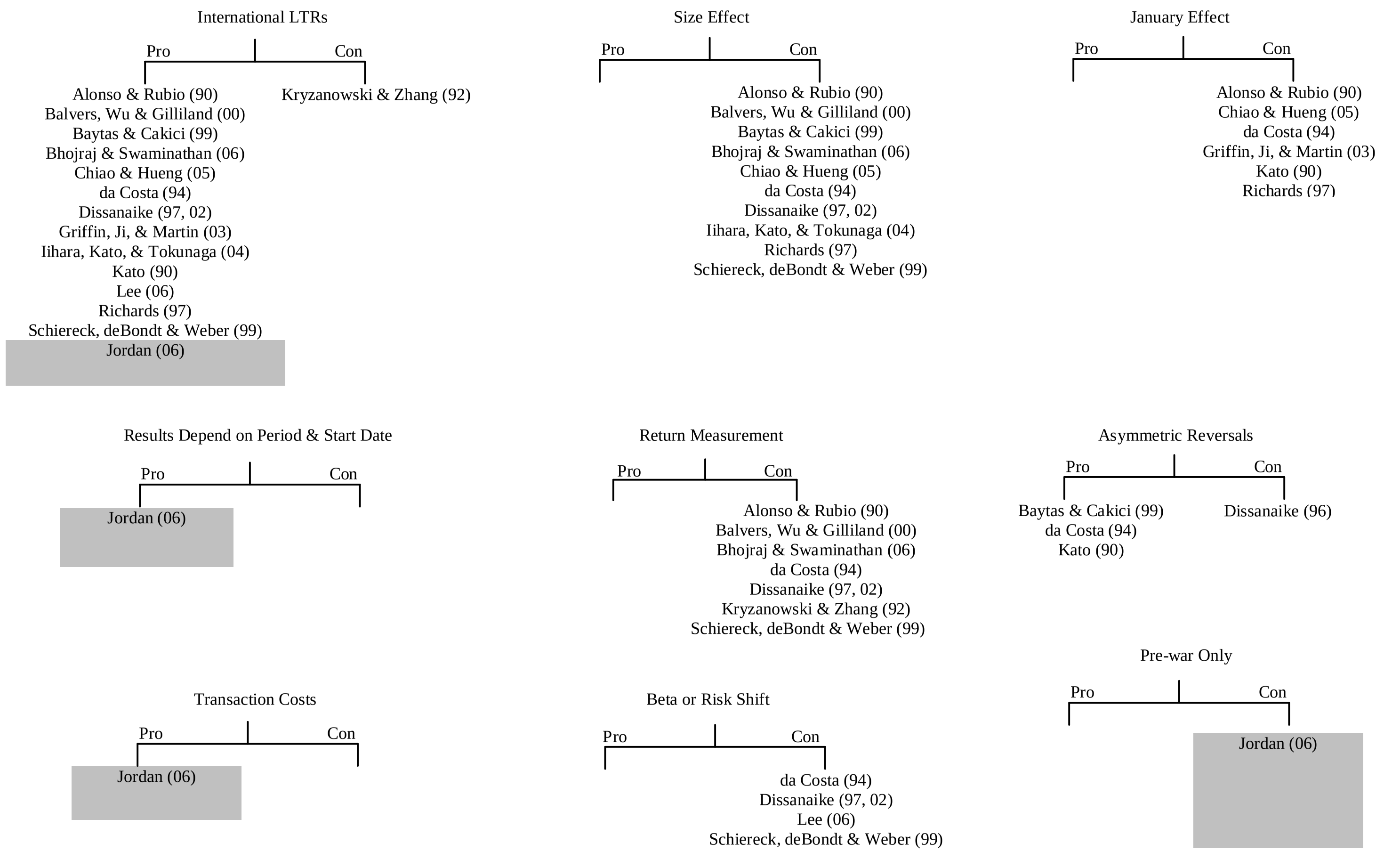

Figure 3

International Long-term Reversal Literature Start Dates and Number of Years Used in Tests.
Comparison of previous international results with the results derived in this paper.

Paper	Start Date	Number of Years	Their Results	My Results	Country
Alonso & Rubio (JB&F 90)	1965	20	LTR	X	SP (firm level)
Balvers, Wu & Gilliland (JF 00)	1) 1969 2) 1949	28 48	LTR LTR	1 % 10 %	18 countries 11 countries (MSCI & IFS indices)
Baytas & Cakici (JB&F 99)	1982	10	LTR	1 %	8 countries (firm level)
Bhojraj & Swaminathan (JB 06)	1970	20	LTR	1 %	38 countries (MSCI indices)
Chiao & Hueng (JWE 05)	1975	25	LTR	1-5 %	JP (firm level)
da Costa (JB&F 94)	1970	20	LTR	1 %	BR (firm level)
Dissanaike (JBFA 97, 02)	1975	17	LTR	1 %	UK (firm level)
Griffin, Ji, & Martin (JF 03)	1975	26	LTR	1 %	40 countries (firm level)
Iihara, Kato, & Tokunaga (JWE 04)	1975	23	LTR*	1 %	JP (firm level)
Kato (JPM 90)	1) 1973 2) 1973 3) 1980	15 7 8	LTR LTR X	1 % 1 % 5 %	JP (firm level)
Kryzanowski & Zhang (JFQA 92)	1950	39	X	X	CA (firm level)
Lee (JB 06)	1) 1920 2) 1946	79 53	LTR* LTR	1 % 5 %	US indices (DJIA, SP500)
Richards (JF 97)	1970	26	LTR	1-5 %	16 countries (MSCI indices)
Schiereck, deBondt & Weber (FAJ 99)	1961	31	LTR*	5 %	GE (firm level)