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On the determinants of pairs trading profitability[☆]

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ABSTRACT

We perform a large-scale empirical analysis of pairs trading, a popular relative-value arbitrage approach. We start with a cross-country study of 34 international stock markets and uncover that abnormal returns are a persistent phenomenon. We then construct a comprehensive U.S. data set to explore the sources behind the puzzling profitability in more depth. Our findings indicate that the type of news leading to pair divergence, the dynamics of investor attention as well as the dynamics of limits to arbitrage are important drivers of the strategy's time-varying performance.

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1. Introduction

The apparent profitability of pairs trading, which bets on the future relative performance of two assets with very similar past performance, constitutes an intriguing anomaly. It seems to violate even the weak form of market efficiency, and it is very popular among sophisticated practitioners, but it has largely been neglected in the academic literature so far. As a consequence, it is still an open question when, where, and why pairs trading is particularly successful. Our large-scale empirical analysis aims to shed new light on these questions.

The idea behind pairs trading is “disarmingly simple” (Gatev, Goetzmann, and Rouwenhorst, 2006, p. 797). It uses statistical methods to identify economically related firms, and then tries to exploit potential short-term relative mispricings between the constituents of a pair. More precisely, for each month and all possible pair combinations, one first computes the historical distance between normalized daily return paths. One then selects the pairs with minimum distance for trading, thereby building on the assumption that these stocks represent to some extent economic substitutes. Whenever the cumulative daily returns of any of these top pairs diverge by more than what would be expected based on historical price patterns, one shorts the relatively overpriced winner and buys the relatively underpriced loser. If the future resembles the past, prices are likely to finally converge again, thereby generating positive returns on zero-cost portfolios.

As a relative-value arbitrage approach, pairs trading is widely used by hedge funds and investment banks. For instance, in a practitioner's book, Vidyamurthy (2004, p. 74) concludes that pairs trading has “increased in popularity and has become a common trading strategy.” Andrade, di Pietro, and Seasholes (2005, p. 2) estimate the realized profit from pairs trading for sophisticated investors at “hundreds of millions of dollars.”

In the academic literature, pairs trading has nevertheless attracted much less attention, in particular when compared to the few other anomalies seemingly contradicting the weak form of the efficient markets (most notably momentum). Our contribution is twofold.

Little is known about pairs trading in international markets, even though only few trading strategies have survived the test of time and independent scrutiny. We first address this gap in the literature. To our knowledge, our paper provides the first cross-country study of pairs trading. By relying on more than 200 million stock pairs from 34 countries, we first establish that abnormal returns generated from pairs trading are a persistent phenomenon. For the average country and measured over the period from 2000 to 2013, both the annualized one-month event-time return and the annualized calendar-time Fama and French (1993) three-factor alpha are in the area of 8–9%.

Our large cross-section also allows us to determine in which country groups trading is particularly profitable. We find that abnormal returns are most pronounced in emerging markets on the one hand and in markets with a large number of eligible pairs on the other hand. Further analysis indicates that these patterns may be related to limits to arbitrage in the case of emerging markets and information overload in the case of large markets. For instance, abnormal returns to pairs trading are larger in countries with higher average idiosyncratic volatility, as well as in countries with large stock markets relative to their economic size.

Second, and in light of these results, we construct a comprehensive U.S. data set based on daily data over a 47-year period to explore the potential drivers of pairs trading profitability in more depth. Our insights are based on more than 100,000 round-trip trades of the monthly top 100 pairs constructed from large and liquid stocks only. Again, the findings show that pairs trading has generated average annualized excess returns of at least 12%. Nevertheless, there is also surprisingly large time-variation in the profitability, even within each single year of the sample period. Our three key insights are that the type of news on the day of the pair divergence, the dynamics of investor attention, and the dynamics of market-wide limits to arbitrage appear to be major forces behind these return patterns.

Broadly speaking, abnormal long-short profits can arise from two general sources. On the one hand, investors might overreact to firm-specific shocks. On the other hand, due to investor underreaction, shocks that affect both stocks of the pair to a similar degree might be impounded at differential speed. The small empirical literature on pairs trading lends more support to the idea of differential responses to common news shocks (e.g., Engelberg, Gao, and Jagannathan, 2009; Chen, Chen, and Li, 2013; Deaves, Liu, and Miu, 2013). Our analysis supports this view. We find that pairs which diverge on days with public

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