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Multi-country event-study methods

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ABSTRACT

We provide the first simulation evidence of event-study test performance in multi-country non-US samples. The nonparametric rank and generalized sign tests are more powerful than two common parametric tests, especially in multi-day windows. The two nonparametric tests are mostly well specified, but neither is perfectly specified in all situations. The parametric standardized cross-sectional test can provide a useful robustness check but is less powerful than the nonparametric tests and rejects too often in single-market samples and when firm-specific events affect the market index. Local-currency market-model abnormal returns using national market indexes are sufficient.

1. Introduction

Researchers use event-study methods to gauge the effects of information arrival on stock prices. The hypothesis tested is that information affects the value of stocks, on average, across firms with similar information arrival. Conclusions regarding the performance of event-study tests that appear in the methodological literature are based on simulations using data from single markets, especially the US, but the application of event-study methods to multi-country samples is growing rapidly. The suitability of specific event-study methods when applied to multi-country non-US samples has not been established in the methodological literature. This paper provides simulation evidence of the performance of several methods in such samples.

Stock markets differ on many dimensions, e.g., size, liquidity, trading volume, market-making mechanisms, accounting standards, securities regulation, investor protection, ownership concentration, and corporate governance. Market characteristics can affect the statistical properties of stock returns (see Cole et al., 2008; Hutson et al., 2008 as examples). We find that return distributions in non-US multi-country samples are non-normal, even at the portfolio level, to a greater degree than US-based studies report. In multi-country samples, where a mixture of distributions is present, the applicability of existing simulation evidence is an unexplored empirical question.

Examining recent journal articles that report event studies on multi-country samples, we find that researchers tend to use simple methods for identifying a benchmark or "normal" return, primarily the single-index market model, with the market-adjusted return method also appearing repeatedly. For testing whether the average abnormal return differs from zero, the "crude dependence adjustment" (CDA) test by Brown and Warner (1980, 1985) is often used (see Bailey et al., 2006; Aktas et al., 2007 as examples). A parametric test based on standardized abnormal returns, introduced by Patell (1976) and Mikkelson and Partch (1986) and modified by Boehmer et al. (1991) is also common. Several papers report nonparametric tests such as the rank test (Corrado, 1989) and the generalized sign test (Cowan, 1992), especially in conjunction with a parametric test (as in Harvey et al. (2004) and Behr and Güttler (2008), among others). Nonparametric tests are naturally appealing for ill-behaved data, but in the absence of evidence cannot be assumed to be powerful and well specified. When a parametric and a nonparametric test are both reported in an article, they frequently lead to different inferences.

Using the simulation approach pioneered by Brown and Warner (1980, 1985), we investigate the accuracy and power of statistical tests applied to market-model abnormal returns. Overall, we find that the generalized sign test (Cowan, 1992) and rank test (Corrado, 1989) are more powerful in simulation than the two commonly used parametric tests. The parametric tests also are well specified but less powerful than the nonparametric tests. In the presence of a

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large return variance increase on the event date, the nonparametric tests tend to reject too often, but their specification is better under a more moderate variance increase. The standardized cross-sectional test is well specified under a variance increase and is more powerful than the CDA test.

We also examine test performance in samples that are potentially problematic for test specification or power. These include single-market samples, samples from the most concentrated national markets, and markets with the most non-normally distributed returns. The two nonparametric tests remain mostly well specified and powerful in these settings. The standardized cross-sectional test is less consistently well specified in single-market samples than in multi-country samples.

We also examine the ability of tests to detect abnormal returns when the affected securities are potential "market movers." This is when a stock can make up such a large fraction of its national market's capitalization that the individual price effects of firm-specific information arrivals exert a significant influence on the market index. Thus, abnormal return calculations that use the national market index would deduct the part of the information effect included in the index return from the total information effect in the stock return, potentially reducing power. When we simulate such effects, we find that the rank and generalized sign tests continue to exhibit correct specification and good power. The standardized cross-sectional test, which uses the index return in estimating a security's abnormal return variance, is not as reliably well specified in this situation.

Aspects of multi-country event-study design, other than the selection of a test statistic, are also potentially important. First, many markets are characterized by high frequencies of missing returns due to non-trading. Our results show that a corrective procedure proposed in the literature, treating missing returns as zero returns, sometimes called the "lumped returns" procedure, produces somewhat worse event-study test performance compared to the more standard "trade to trade" method. The latter involves omitting missing-price days from calculations while accounting for the corresponding market-index returns when the stock eventually trades. Second, our results indicate that the use of a national market index, without incorporating an international or US index, is sufficient to produce well-specified and powerful tests of average stock-price effects. Third, the results suggest that for the types of stock-price reaction tests that we investigate, there is no need to convert returns from different markets into a common currency.

2. Data and methods

2.1. Data

We use Datastream to obtain daily data for over 50,000 non-US stocks over 1988–2006. We download prices, dividends, and volume for active and delisted stock codes based on numerous lists compiled by Datastream. We limit the initial data set to equities that meet the following criteria:

- The beginning date of data on Datastream is not missing and is before July 1, 2004. This criterion limits the data set to equities that potentially have adequate data for the random selection and simulation procedures.
- There is a time series of prices available for a minimum of 300 consecutive trading days in 1988–2006. In making this determination, we do not exclude missing prices. However, the criterion requires some judgment because Datastream does not report an ending date for an individual security. We designate the last date of a reported non-missing price as the ending date for each security. If fewer than 300 trading days exist between the reported beginning date or the first trading day of 1988, whichever is later, and the inferred ending date, we exclude the security.
- The security name record on Datastream does not include one of the codes (listed in Appendix A) that indicate the security is not an ordinary share (common stock in US terms).
- The security is not traded in the US.

We also download the Datastream Global total market index that corresponds to each equity issue. This is a series of value-weighted national market indexes in local currency that is also called the "level one" Datastream Global series. Despite their labeling by Datastream as "total market" indexes, Datastream's online help indicates that the level one indexes "do not include all companies in a market" but consist of "the most important companies by market value."

Because different markets are characterized by different trading frequencies, excluding stocks from the simulations based on a moderate absolute number of non-missing returns, regardless of the market, could result in an overrepresentation of thickly traded stocks and stocks in more heavily traded markets. Therefore, we adopt a conservative approach to excluding stocks due to missing returns. First, in constructing the data set from which we draw simulation samples, we exclude stocks that are in the quartile of each market in each year having the lowest frequency of non-missing returns (in effect, the quartile of the market with the fewest trading days in that year). Second, we require each randomly selected security-event to have a minimum of 24 non-missing stock-return (and corresponding market-index return) observations in its 251-day estimation period (further described in Section 2.3) and to have a non-missing return on the designated day zero.

2.2. Return and abnormal return calculations

2.2.1. Returns

We calculate individual stock returns from prices and dividends to avoid the rounding problem with Datastream returns reported by Ince and Porter (2006). Each daily stock return is calculated from the previous day with a non-missing price to the current day, including dividends. We use Datastream price data type *P*, which the database delivers already adjusted for stock splits and other capital events.

To take into account different methods of handling the non-trading of stocks, we calculate both trade-to-trade and lumped daily returns (Maynes and Rumsey, 1993). Trade-to-trade returns are simply the calculated returns from non-missing price days; the return on a missing price day is missing. For a stock with a missing price, the corresponding market-index return is added to the next non-missing price day's index return for a trade-to-trade abnormal return calculation. Lumped returns consist of trade-to-trade returns on non-missing price days and zero on missing price days. The market-index return adjustment for missing trade-to-trade returns is not performed for lumped returns because the lumped return calculation produces no missing returns. Maynes and Rumsey suggest that lumped returns, by increasing the number of return observations, can improve the efficiency of estimators and test statistics used in event studies.

2.2.2. Abnormal returns

We use market-model abnormal returns for the simulations.[1] The abnormal return is:

$$u_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}), \quad (1)$$

[1] The conclusions are similar using market-adjusted returns (details not reported).