

Arbitrage Opportunities Do Not Exist in Liquid Markets

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A central tenet of modern finance is that arbitrage opportunities do not exist in liquid markets. So the fact that extreme arbitrage opportunities currently exist for mutual funds with international holdings shows that local market closing prices often are not the prices that would prevail in a liquid market at 4:00 p.m. Eastern Time (“ET”). In an April 2001 letter,¹ the staff of the Securities and Exchange Commission (“SEC”) states that when the closing price for a security would not be considered a readily available market quotation, the fund must value the security pursuant to a fair value pricing methodology. As you know, Interactive Data Pricing and Reference Data has designed a Fair Value Information Service to assist mutual funds in meeting their fair value obligations. This white paper reviews the underlying principle of Interactive Data Pricing and Reference Data’s Fair Value Information Service and the associated testing criteria for its output.

Background

The SEC letter was prompted in part by the growing awareness among arbitrageurs of predictable misvaluations of assets in daily net asset value (“NAV”) calculations. Such readily identifiable NAV variations create opportunities to earn profits at the expense of long-term shareholders. The most dramatic opportunity exists in international equity funds, where funds calculate their NAV using local closing prices and allow trading up until 4 p.m. ET. Arbitrageurs can use information available after the local close to earn annualized excess returns of over 50 percent.² Although short-term trading fees and monitoring can reduce arbitrage activity, they cannot eliminate it and they cannot be applied uniformly across channels. For example, many existing variable annuity contracts allow unlimited switching between funds. In addition, while short-term trading fees can be successful in diverting arbitrage activity to a competitor, at levels currently allowed by the SEC they will be insufficient to deter arbitrage once all funds have adopted them. Furthermore, there is the danger they will be selectively applied.³

The April 2001 letter may prompt mutual funds to undertake efforts:

1. To determine when a significant event has occurred such that local closing prices are not considered a readily available market quotation,
2. To determine fair value prices in these cases, and
3. To review the appropriateness of their fair value pricing methodologies and test the accuracy of their fair value prices.

¹ Letter to Craig S. Tyle, General Counsel, Investment Company Institute, from Douglas Scheidt, Associate Director and Chief Counsel, Division of Investment Management, SEC (April 30, 2001).

² The excess returns in 2000 from trading at maximum frequency in the average Asian, Japanese, and European fund were 72, 67, and 57 percent, respectively. These excess returns are expressed in log percentage points (i.e., un compounded), so an abnormal return of 70 percent implies a doubling. Returns from making only four roundtrips per year - the minimum allowed by the Department of Labor in 401(k) plans - are still quite high at about 20 percent of maximum frequency returns. Abnormal returns are calculated by Eric Zitzewitz, in his article “Daily NAV Predictability and the Associated Trading Profit Opportunity,” 2000 (hereinafter, Zitzewitz 2000).

³ For example, some management companies offer their own funds in their 401(k) plans. Even the perception that management company employees were benefiting from selective enforcement could be damaging.

How to go about this endeavor is not obvious. No single standard exists for determining fair value. Moreover, “different fund boards, or funds in the same complex with different boards, when fair value pricing identical securities, could reasonably arrive at prices that were not the same...”⁴ But saying that there are no right answers is not the same thing as saying that there are no wrong ones. In particular, doing nothing, or next to nothing, may be a dangerous strategy.

Finance 101: Easy Arbitrages Are Not Available in Liquid Markets

Although the efficient markets hypothesis is controversial among academics as well as practitioners, there is a weak form of market efficiency that is not controversial. This latter hypothesis states that market prices do not allow for arbitrage opportunities that are:

1. Widely known;
2. Can be applied at high (daily) frequency; and
3. Earn risk-adjusted profits after accounting for transactions costs.

Each of these qualifications is crucial. The best-known cases where market efficiency is weak, such as stock price momentum, reversals, and bubbles, occur over a much longer period of time than daily frequencies. Known high-frequency arbitrages (such as index arbitrage) can be profitably undertaken only by specialist firms or market makers who have especially low transaction costs. Trading on the basis of private information is also clearly not a “widely known” arbitrage. This weak form of market efficiency yields an insight that is central to fair value pricing and is also confirmed by market data:

Foreign securities trading at 4:00 p.m. ET have values that are within transaction costs of the statistical expectation of the next day’s opening or closing price, given all public information available at 4:00 p.m. ET (the best example of such a security is the Nikkei future).

This insight provides guidance on one means of meeting fair value requirements. Given the statement above, a reasonable approach for valuing foreign securities that do not trade at 4:00 p.m. ET might be to value them at the statistical expectation of the next day’s local opening price. When predictions of local opening prices are sufficiently different from local closing prices, it is reasonable to conclude that the local closing prices are not plausible market prices and thus that market quotations for the securities in question are not “readily available.” This insight also implies a testing criterion: funds can test their fair value prices by measuring the next-day excess return of various arbitrage strategies against the next day local opening prices. If correct predictions of next day local opening prices are used, the excess return should not be statistically different from zero.

This approach allows for some variation in fair values of international securities, since funds may make different decisions about how to calculate predictions of local opening prices based on:

1. Which market indicators best capture publicly available information;
2. How to estimate the historical relationships between these indicators and an individual security’s value; and
3. How to incorporate news announcements not reflected in other market prices.

But it also firmly rules out valuing a security at a price that has easily known predictive elements and will not be within transaction costs of the next day’s predicted local opening price, since such a price would not be a plausible price in a liquid market at 4:00 p.m. ET.

⁴ See letter to Craig S. Tyle, General Counsel, Investment Company Institute, from Douglas Scheidt, Associate Director and Chief Counsel, Division of Investment Management, SEC (December 8, 1999).

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For instance, an alternative ruled out by this criterion would be linking a security to the price of a thinly traded ADR, since high trading costs cause ADR prices to under-react to post local-close changes in world markets. This in turn causes ADR prices to be predictably different from the next day's predicted local opening price and thus from prices that could prevail at 4:00 p.m. ET in the more liquid local market.⁵

The above insight also suggests a basis for testing whether fair value methodologies are working. Although funds may choose different fair value pricing methodologies, the difference between the next day's local opening price and the previous day's fair value price should have at most a very small component that is predictable using information available at 4:00 p.m. ET. To ensure that fair value prices are approximations of current market prices, this difference should be smaller than transaction costs, although funds may choose to set higher standards for themselves in order to further reduce arbitrage opportunities.

Notice that this testing criterion is different from "directional correctness," i.e., testing whether the direction of the change (positive or negative) between the next day's opening price and the local closing price is the same as the direction of the change between the fair value price and the local closing price. In tests on days after the S&P 500 Index changed by 0.75%, our Fair Value Information Service evaluations were directionally correct 66% of the time; and, on days after the S&P 500 Index changed by 1.50% they were directionally correct 73% of the time⁶. Although these results are satisfactory, it is important to keep in mind that this is a necessary but not a sufficient test of the propriety of a fair value price. For instance, a directionally correct solution may "undercorrect," i.e., not move the right magnitude, thereby still allowing significant arbitrage opportunity. As mentioned above, ADR prices are an example of undercorrection; they often move in the correct direction of the next day's price but not in sufficient magnitude.

Conclusion

Any "right" fair value price should satisfy weak-form market efficiency as defined above. Interactive Data Pricing and Reference Data used this insight in creating its Fair Value Information Service methodology. Weak-form market efficiency also gives us criteria with which to test both Interactive Data Pricing and Reference Data's Fair Value Information Service methodology and alternative approaches. A future white paper will present the testing criteria in more detail with an analysis of test results.

⁵ For evidence that prices of ADRs, iShares, and closed-end funds do not fully reflect same-day global market movements, see Zitzewitz (2000), Table XI. We have found that linking to an ADR removes only about 50% of the predictability of next-day price changes.

⁶ Although we use the S&P 500 Index in this discussion, each fund should choose the index best correlated with its portfolio and the correct trigger level for that index. These choices should be revisited regularly, especially when the portfolio's composition is changing.

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