

Constructing Fair Value Adjusted Indexes

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For funds holding securities that trade on foreign exchanges that close before the US market, the usual method of computing Net Asset Value can result in stale fund prices. Some speculators profit from stale pricing to the detriment long-term shareholders. To solve the “mutual fund timing” problem and comply with SEC guidance, mutual fund companies are using fair value models to adjust the closing prices of foreign securities. Two challenges arise in implementation: (1) Fair value pricing creates tracking error relative to a benchmark index that uses stale foreign closing prices, and (2) Fund groups differ in their use of fair value models, distorting short-run peer comparisons. I argue that the implementation of fair value pricing across the financial industry would be expedited and simplified if public benchmark providers were to produce fair-value adjusted indexes. Such indexes are straightforward to produce and use, as demonstrated here, and would help coalesce pricing around a common industry standard.

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Mutual funds provide liquidity on a daily basis, allowing investors to transact in fund shares at the fund's Net Asset Value (NAV). For funds holding securities that trade on foreign exchanges that close before the US market, the usual method of computing NAV, at 4:00 p.m. Eastern Time using closing prices for the day, can result in stale fund prices. In the case of US mutual funds holding Japanese stocks, as much as 15 hours can elapse from the close in Tokyo at 1:00 a.m. ET (3:00 p.m. in Japan) to the US close at 4:00 p.m., as shown in the time line below. Although European stock prices are less stale, the same issues arise as European exchanges close between 11 a.m. and 12 noon, ET.

Time Line



Stale prices allow short-term speculators to trade on information signals observed after the close of the foreign market and before the US market closes, a practice known as mutual fund timing. Although risky, mutual fund timing can yield potentially large profits to speculators, profits that are at the expense of long-term shareholders. Funds concerned about mutual fund timing often use a variety of restrictions (such as limitations on the number of transactions and minimum holding periods) and fees, but these often have limited effectiveness and are unpopular with long-term fund holders.

Increasingly, some forward-looking mutual funds have implemented fair value pricing models to adjust fund NAVs based upon information flows after the close of the foreign market.¹ From a regulatory perspective, the United States Securities and Exchange Commission (“SEC”) has issued statements concerning fair value pricing for international equity securities.² In the view of the SEC, fair value pricing is a logical application of the Investment Company Act of 1940, which places a regulatory obligation on funds and their directors to make a good faith determination of the fair value of the funds’ portfolio securities when market quotations are not readily available.³ Fair value models thus allow international mutual funds to reduce losses to mutual fund timers and comply with their regulatory obligations.

However, despite the clear benefit to long term shareholders of using fair value pricing, implementation presents challenges. First, fair value pricing can introduce unintended tracking error for a fund relative to a public benchmark based on closing prices, simply because the benchmark or index is computed using stale closing foreign prices. Second, fair value pricing might generate “flips” in daily return rankings relative to peers, especially if other funds are not adjusting their NAVs using the same methodology, or worse yet, not adjusting them at all.

Nevertheless, we expect the clear benefits of fair value adjustments to lead to pressures to adopt fair value pricing models throughout the industry. I argue that this process can be greatly expedited and simplified if public benchmark providers were to produce fair-value adjusted indexes. Such indexes would be straightforward to produce and use, and help coalesce fund pricing around a common industry standard.

How Fair Value Models Work

A variety of different models exist that try to capture the underlying value of a foreign security that is not traded. Since there is no direct observation on the fair value price of a foreign stock at 4:00 p.m. ET, the next day’s opening price is commonly used as a proxy. Of course,

¹ For details, see Madhavan, A., “Implementing Fair Value Pricing,” ITG Inc., (2002). URL: http://www.itginc.com/research/workingpapers/madhavan/implementing_fvp.pdf. Estimates of mutual fund timing gains range widely, with recent evidence suggesting returns up to 20%. See also Goetzmann, W., Z. Ivkovich, and K. Rouwenhorst (2000), “Day Trading International Mutual Funds: Evidence and Policy Solutions,” *Journal of Financial and Quantitative Analysis*, vol. 36, 3 (September), 287-309.

² Scheidt, D. (2001), “Division of Investment Management: April 2001 Letter to the ICI Regarding Valuation Issues (April 30, 2001).” URL: <http://www.sec.gov/divisions/investment/guidance/tyl043001.htm>

³ The SEC staff has long permitted funds to adjust last-trade foreign equity prices to reflect more recent information, as long as the potential for doing so is disclosed in the fund prospectus.

events occurring between 4:00 p.m. ET and opening of a foreign market might change stock valuations, but are unlikely to introduce a systematic bias.

The logical starting point for a fair value model is a stock-specific multi-factor regression model, which models the return from the close of the stock in the foreign market to its open the next day as a linear combination of the returns of factors observed after the foreign close to 4pm ET. The factors are chosen to best capture the unobserved change in value, including intraday US market or sector movements, etc. The choice of factors might also vary from stock to stock, or might be selected on the basis of the statistical significance of the coefficient estimates. For example, for a thinly traded stock, the factors might be the US intraday market return (from the close of the foreign market to the US close at 4pm ET) and the corresponding returns to the stock's sector or industry. For an active stock, such as Vodafone Group PLC, an actively traded American Depository Receipt (ADR) exists, which might form an additional factor.

A correctly specified Fair Value Model ("FVM") should significantly decrease these arbitrage opportunities as measured out-of-sample. In this respect, factor based fair value models are successful at solving the mutual fund timing problem. For the fair value model developed by ITG Inc., for example, an extensive test showed there is 91.7% reduction in the simulated profits of market timers.

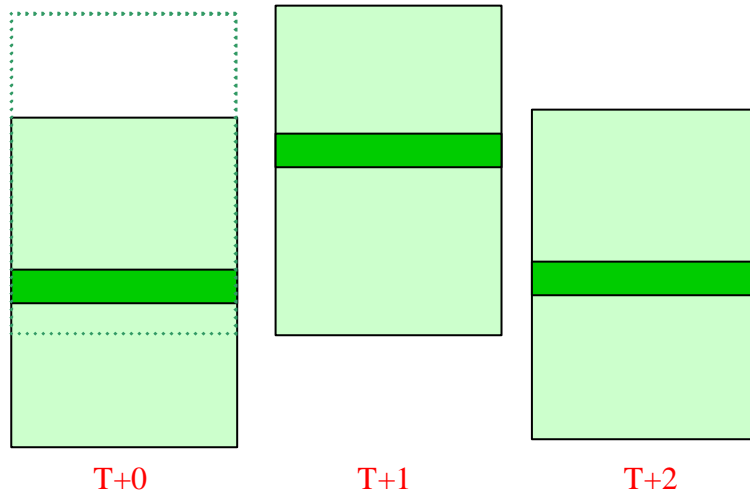
Implementation Issues

Two practical issues arise in the implementation of fair value models to compute mutual fund Net Asset Values. First, fair value pricing can introduce unintended tracking error for a fund relative to its benchmark. If a fund uses fair value adjustments, but the public benchmark is based on closing prices, then there will likely be greater performance dispersion simply because the benchmark is using stale foreign prices to calculate its index price. Over longer horizons, this tracking error is not a concern, but in the short-term, it might raise questions by investors and others.

Secondly, a similar but distinctly different problem is that short-term performance relative to a peer group of funds can be distorted if different fund complexes adopt different fair value methodologies, or worse yet make no fair value adjustments. These effects should reverse the next day, but fair value pricing nonetheless complicates the evaluation of fund performance relative to a universe of peers. This phenomenon is illustrated below. On day T+0, the rectangle

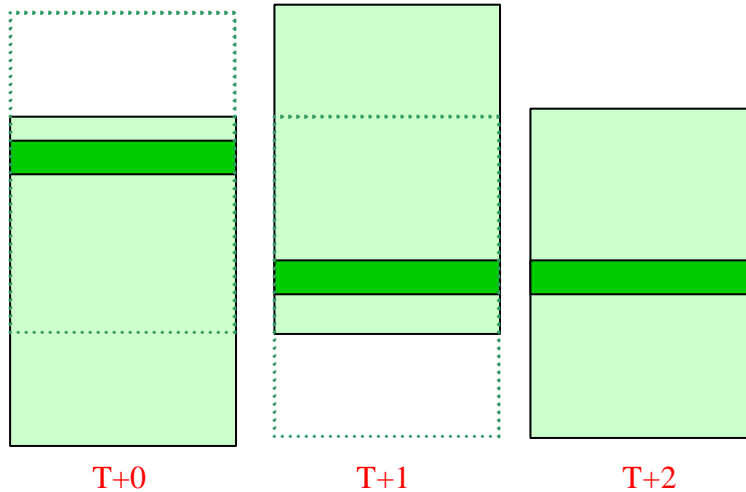
represents the a particular universe of international funds, with the dark bar representing the median fund. That day, suppose the return in the US market is positive (as shown by the dotted line on T+0), so the funds tend to rise in value on day T+1. On day T+2, the market falls in the US, bringing the funds back to the original level.

Relative Fund Rankings for Median Fund without Fair Value Adjustments



Now suppose the median fund uses a fair value adjustment, correctly adjusting upward its NAV on day T+0 to incorporate the intraday US market movement. As shown below, this puts the fund in the top tier of performance if others do not follow. The following day, the remaining funds play catch-up, and this fund is now in the bottom tier of performance. Finally, on T+2, the fund returns to its median status.

Fund Rankings When One Fund Makes Fair Value Adjustments



A Proposed Solution

One solution to the problems described above is for index providers to also compute fair value adjusted benchmarks. This requires some agreement on the form of the fair value model and its implementation. The implementation of fair value pricing across the financial industry would be expedited and simplified if public benchmark providers were to produce fair-value adjusted indexes. Such indexes are straightforward to produce and use, as demonstrated here, and would help coalesce pricing around a common industry standard.

How would a fair value adjusted index work? Consider, for example, the fair value model of ITG Inc., which currently has a universe of 16,000 foreign securities. Each day, the model suggests adjustment factors to each security (the model runs shortly after the close at 4 p.m. ET) in the universe on the basis of events since the close of the local foreign market where the security is traded and the US close. These adjustment factors would be applied to reported closing prices for the index constituent stocks, and the fair value adjusted index would be computed using the appropriate security weights. Given that the fair value adjustment results are readily available shortly after the close, there should be no practical problems in computing the index and reporting its value to mutual fund complexes.

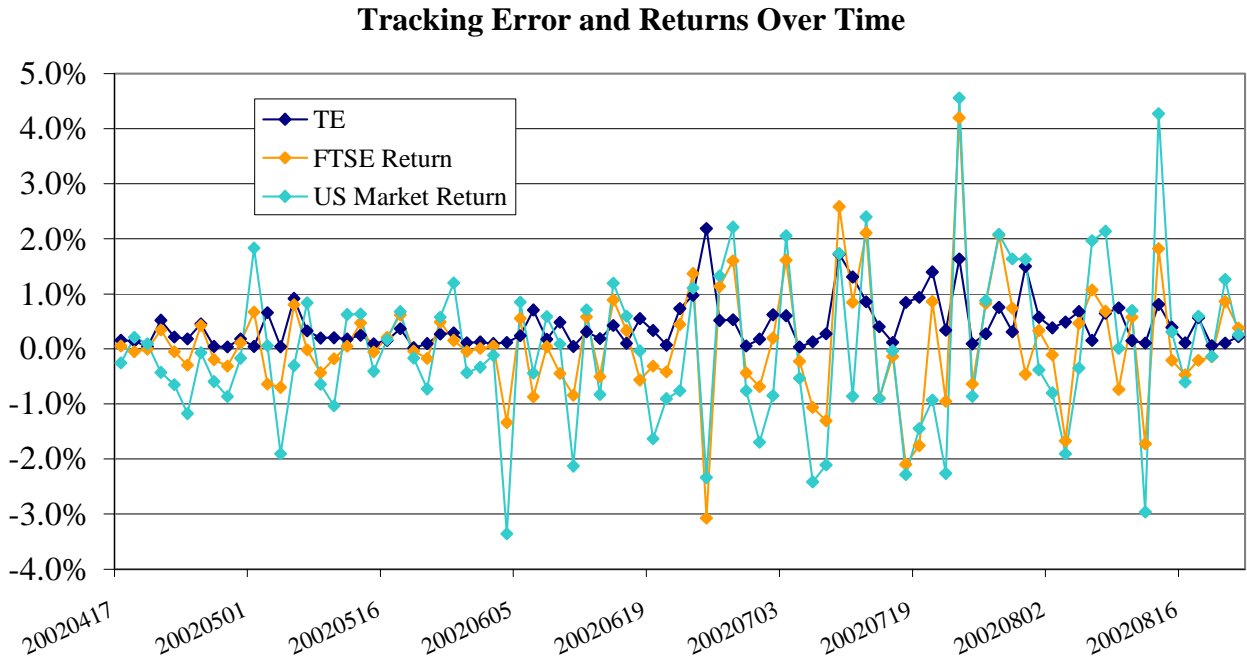
In reality, index providers might need to compute fair value indexes. To see why, first observe that applying a fair value model to all securities on a daily basis is complicated because most funds will want to review any suggested fair value changes. Accordingly, some funds use FV models *only* for securities whose *predicted* fair value prices depart from their closing price by more than a critical threshold level (this is also consistent with the SEC's statements that fair value pricing may be necessary in the context of "significant" events). So, if the threshold is, say, 2%, the model will be applied only to those stocks whose predicted (absolute) overnight return is greater than 2%. Applying a security-specific threshold is more appealing than using a market-based threshold because there might be events that are relevant only to certain countries or sectors. So, index providers might need to provide fair value adjusted indexes for a small number (e.g., 0, 1, 2, and 3%) of thresholds. This reduces the first problem, namely the unintended tracking error, but until a common standard is adopted for a threshold, leaves open the second problem, namely that of inter-fund comparison distortions. Nevertheless, since most of the distortions arise from not using a fair value models at all, the use of different thresholds across funds is unlikely to be the source of significant distortions.

A Real World Example

An illustration of how a fair value adjusted index might work is helpful in understanding the practical issues in implementing this idea. Consider a hypothetical index, which is comprised of a market capitalization weighted portfolio of the FTSE 100 stocks. Using data from 4/16-8/22, 2002, I first computed the close-to-open returns to this portfolio using the reported prices in the UK market. I then form a fair value adjusted index where the closing price of each stock on each day (there are 8,388 stock-day observations altogether) is adjusted using the ITG Fair Value Model, and then weight by market capitalization. To compare the two indexes, I calculate the absolute difference between the close-to-open returns of the fair value index relative to the notional index of market capitalization weighted FTSE 100 stocks. The results are surprising. Even though the FTSE 100 stocks are high capitalization stocks (and are less volatile than the typical international stock), and the window of time between the UK market close and the US market close is far smaller than for an Asian stock, the indexes differ considerably in their overnight tracking error. In particular, over the period in question, the mean daily tracking error

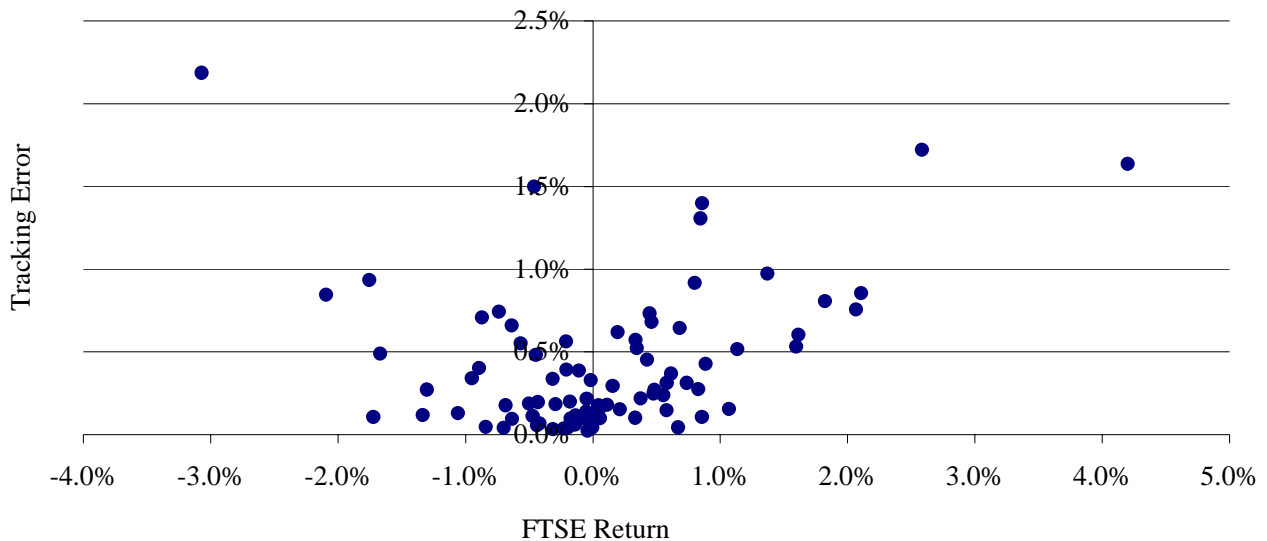
is 0.42%, suggesting that there is a considerable difference between the two return series. By way of comparison, the absolute overnight return to the unadjusted FTSE 100 portfolio is 0.72%.

The figure below shows the tracking error, FTSE portfolio return, and intraday US market return (computed using the 11:30 a.m. to 4:00 p.m., ET returns to a market capitalization weighted basket of the Russell 1000 stocks) over the period in question. Tracking error is relatively stable, but there are some days when it exceeds 1%, a significant difference.



The figure below plots the tracking error against the FTSE 100 portfolio return. It is clear that tracking error is higher on extreme movement days, both positive and negative.

Tracking Error vs. FTSE 100 Portfolio



Tracking error would be higher on a fair value adjusted index that is applied only on if the underlying index return exceeded a critical threshold. For example, in fact, if the analysis is run only on days when the FTSE 100 index exceeds 1% in absolute value, the tracking error is 0.72%, falling to 0.57% if a 0.5% threshold is used.

Conclusion

A rigorous, consistently applied, fair value model is a highly effective tool in reducing arbitrage profits and market timing, and simultaneously helps a fund complex comply with SEC guidance regarding fund pricing. Yet, despite the clear benefit to long term shareholders of using fair value pricing, implementation faces several challenges. In particular, fair value pricing potentially exaggerates the true tracking-error of a fund. Further, in the absence of a common or “market standard” model, fund groups differ in their choice fair value models, with many yet to adopt a systematic and consistent approach to fair value pricing. These factors can distort one-day returns between funds, complicating the task of comparing investment performance. One solution, advocated here, is for public benchmark providers to produce fair-value adjusted indexes. This is straightforward to implement, would speed the adoption of fair value pricing in the industry and coalesce agreement on common standards for fair value adjustments.