



RESEARCH NOTE

January 2010

Fair Value-Pricing The Implications for non-US Equity Index Funds

How did my non-US equity index fund underperform the benchmark by so much?

This note briefly explains the concept, rationale, and effects of fair value-pricing (FVP) as it applies to US-domiciled mutual funds, particularly those investing in non-US equities. The question driving this discussion is why numerous passively managed international index funds reported noticeable underperformance relative to their benchmarks in calendar year 2009. The table below sets the stage, showing how a sample of three Vanguard index funds failed to match their benchmark returns, not only in 2009 but over shorter and longer holding periods. We focus on the highlighted entries in the table headed “Due to FVP,” which were provided by Vanguard and show that much of the underperformance is explained by FVP.

Vanguard International Mutual Fund Returns as of 12/31/09				
	Q4-2009	1 year	3 years	5 years
Emerging Markets Fund (VEMIX)	8.31%	75.04%	4.80%	14.57%
MSCI EM Index	8.55%	78.51%	5.11%	14.89%
Excess Return	-0.24%	-3.47%	-0.31%	-0.32%
Due to FVP	-0.72%	-2.34%	-0.12%	-0.13%
Emerging Markets Fund (VERSX)	8.27%	74.95%	--	--
MSCI EM Index	8.55%	78.51%	--	--
Excess Return	-0.28%	-3.56%	--	--
Due to FVP	-0.77%	-2.41%	--	--
Developed Markets Fund (VDMIX)	1.67%	28.17%	-6.00%	3.50%
MSCI EAFE Index	2.18%	31.78%	-6.04%	3.54%
Excess Return	-0.51%	-3.61%	-0.04%	-0.04%
Due to FVP	-0.43%	-3.84%	-0.10%	-0.12%

As the table shows, FVP explains most of the reported underperformance and even more than all of it for some holding periods. Why does it not explain exactly 100% of the underperformance? Because index funds are not perfect replicas of their benchmark indexes, as exemplified by these Vanguard funds:

- The Vanguard Developed Market fund attempts to replicate “fully” the holdings in the EAFE, but may be unable to do this perfectly or without cost. Redemptions and new share purchases require the fund to trade rather than simply buy and hold. Changes in index constituency will also require the fund to trade. Given the randomness of security prices, it is likely some trading will occur at prices that differ from foreign local closing prices and result in slight return deviations (even in the absence of fair value-pricing effects). In addition, returns will differ from those of the index because the fund deducts the costs of trading, other expenses, and fees that do not affect the index.
- The Vanguard Emerging Market fund employs sampling techniques to select stocks from the index that will closely mimic the total index’s characteristics and exposures, and therefore its performance. The combination of different portfolio holdings (sampling technique), fees, expenses, and cash flow effects explains the residual amount of underperformance.

For index funds, deviations in returns relative to the benchmark are the result of FVP and the aforementioned non-FVP factors. Both FVP and non-FVP factors can either add to or detract from relative returns, depending on the period. Note that for the Emerging Market Funds (both share classes), non-FVP factors detracted from returns (more than FVP in some periods) for the longer holding periods but actually added to returns in Q4-2009. For the Developed Market Fund, FVP was the primary driver of underperformance; the non-FVP factors actually added to one-, three- and five-year returns. Our objective here, however, is not to evaluate the sampling methodology, portfolio construction, and intra-period trading but rather to discuss the impact of FVP.

What is fair value pricing?

The net asset value per share (NAV) is the price at which a mutual fund processes purchases, redemptions, and exchanges by its shareholders and is calculated as the market value of securities in the fund divided by the number of fund shares on a daily basis. The Investment Company Act of 1940 requires that fund boards determine fair value prices in good faith when market prices are not readily available for securities in the fund. The objective of fair value-pricing is to establish prices for securities in the fund—that is, NAV—that reflect the value a shareholder could expect to realize at the close of a trading day. For US-domiciled funds, this means at 4pm Eastern time when the New York Stock Exchange closes.

The SEC requires¹ that funds consider FVP in situations when 1) current market quotations are not available and/or 2) there is a “significant event.” The first of these may apply to funds which invest in US securities that trade thinly or experience trading halts, but will invariably apply to funds which invest in securities that trade in foreign markets which close before 4pm. The second includes such obvious situations as market closing events and disasters, but also market fluctuations.

If a US mutual fund invests in securities that trade on foreign exchanges which close before the NYSE, the fund is confronted with the issue of whether the foreign closing prices accurately reflect values when they calculate NAVs at 4pm Eastern time. International and emerging market index funds face FVP issues daily because European exchanges close at least four and a half hours before 4pm, and Tokyo and other Asian exchanges close 14 or 15 hours before. If the determination is that foreign local closing market prices are stale and do not reflect current values, the fund (through its Pricing Committee and Board) must consider adjusting prices.

¹ The SEC has increased its guidance on the subject of FVP since the Asian crisis of 1997, during which some US international funds used FVP and others did not. In 1998 the SEC firmed up requirements for fund disclosures about their FVP policies, largely in response to shareholder lawsuits against funds like Fidelity that used FVP. By using FVP, Fidelity surprised shareholders who thought they were buying at low Hong Kong closing prices on days when positive after-Hong Kong-hours news signaled higher next day Hong Kong prices. In 1999-2001 the SEC provided further guidance as to how funds should respond during unusual or emergency situations, highlighting that such situations include significant market fluctuations. In 2003, the SEC adopted Rule 38a-1, which outlines four obligations a fund has with respect to fair valuation:

- 1) Adopt written policies and procedures for monitoring and using FVP
- 2) Establish criteria for determining when market quotations are not reliable
- 3) Establish methodologies for determining current fair value
- 4) Regularly review methodologies for appropriateness and accuracy.

On a fundamental level, FVP attempts to establish an NAV that fairly values the fund for all shareholders—current and new—so that no shareholder gains or loses at the expense of another. This of course has implications for (and derivations from) market timing and arbitrage: if NAV is fairly valued, market timers and arbitrageurs will be discouraged or find fewer opportunities, especially in light of the early redemption fees charged by most funds.

In terms of a fund's investment strategy, FVP may or may not be a factor in managing the fund. In this note, we address passively managed international index funds, such as those offered by the Vanguard Group. These funds are managed to track an index and, once a given level of assets is invested, rarely trade (except for cash flows) unless there is a change in the index constituency. For these index funds, FVP is utilized in efforts to set fair prices for shareholder entry and exit, but does not impact portfolio management. Vanguard does not attempt to beat an index by using FVP information or to alter weightings relative to the benchmark. It attempts only to replicate an index (which does NOT and is not required to use FVP). However, since FVP affects the NAV at which investors buy or redeem on any given day, it affects the actual rate of return a shareholder realizes. Likewise, FVP affects the returns that funds regularly report on monthly, quarterly and calendar year bases.

Effect of fair value pricing on rates of return

Investors receive performance reports from their investment managers showing returns over various holding periods, which typically start and end at calendar quarters or years. Of course the actual entry and exit points of mutual fund investors are not limited to these conventional reporting dates, so their realized returns depend on the “end dates” of their specific investment periods. The point is that a rate of return calculation is simply the difference between ending value and beginning value divided by beginning value, with ending value including reinvested dividends or other cash flows. The NAVs at which the fund trades *during* the holding period (between the entry and exit points) are irrelevant to a holding period rate of return. This basic fact tells us that FVP only affects an investor's rate of return to the extent that it affects NAVs on the buy date and the sell date; any FVP within the holding period has no impact.

In order to isolate the effect of FVP, consider a perfectly replicated index fund and ignore management fees and expenses. At the close of any day, its NAV per share can be expressed as some proportion λ of its benchmark index price, denoted $Index_t$ on day t . If a market situation requires fair value pricing, the fund's pricing committee would adjust the NAV², effectively adjusting the Index closing price by some dollar amount denoted FVP_t , which could be either positive or negative. On day 1 of any holding or reporting period and day T , the last day of the period, the NAVs are given by equations (1) and (2):

$$(1) NAV_1 = \lambda(Index_1 + FVP_1)$$

$$(2) NAV_T = \lambda(Index_T + FVP_T)$$

Assuming that NAVs are adjusted to reflect the reinvestment of all dividends received during the T -day period (or that there are no dividends during the period), the rate of return for the period depends only on the beginning and ending NAVs as shown in equation (3):

$$(3) r_T = \frac{NAV_T - NAV_1}{NAV_1}$$

Substituting (1) and (2) into (3) and simplifying, the rate of return for the period is given by equation (3'):

$$(3') r_T = \frac{(Index_T - Index_1) - (FVP_1 - FVP_T)}{(Index_1 + FVP_1)}$$

Equation (3') shows the following:

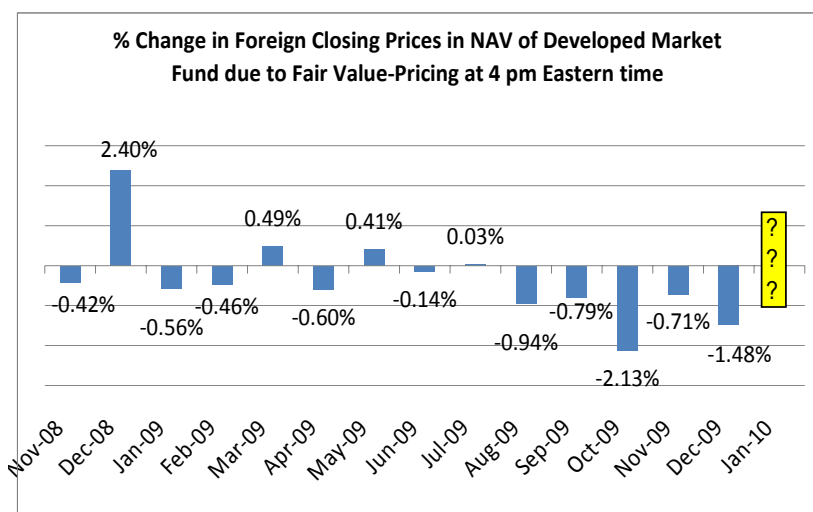
² Most mutual funds use the fair value pricing services of vendors such as Interactive Data Corporation, who use a variety of statistical valuation techniques to establish adjustments for millions of securities around the globe. These pricing services can automate much of the daily fair value-pricing task, but fund pricing committees still weigh in on adjustments and outlier events.

- In the absence of fair value-pricing adjustments (if $FVP_1 = FVP_T = 0$), perfectly replicated funds earn the index return. The fund's return will only differ from the index return if there is fair value pricing on the first and/or last day of the reporting period. FVP on other days during the period has no effect.
- Even if the total FVP dollar adjustments on days 1 and T offset each other ($FVP_1 = FVP_T$), the fund's return will still differ from the benchmark's because FVP_1 affects the beginning NAV (the denominator).
- If FVP occurs on the first and last days of the reporting period, the fund's return will equal the index return only if the ratio of the beginning and ending FVPs equals the ratio of the beginning and ending index levels. In other words, if the FVP price adjustments are the same percentage of the closing index prices (and in the same direction) on the first and last days of the holding period, the fund's return will match the benchmark's return.

Example: The Vanguard Developed Market Fund

If we know the dollar or percentage effect of FVP on a fund's daily prices, we can factor out its effect on period rates of return. The size of the NAV effect is not data generally published by funds or other investment managers. Prior to the recent periods of extreme market volatility, FVP return effects went almost unnoticed. Now, as index fund managers receive more inquiries about returns deviating from the index, they are providing additional information. Although Vanguard, for example, has not finalized the format of planned FVP data releases, the firm has provided end-of-month pricing effects on NAV for institutional class shares (VIDMX) in the Developed Markets Fund.³ We use that data to illustrate the previously discussed FVP return effects:

Effect of FVP on Daily NAV (prices):



Source: Vanguard webcast 1/22/10

As the graph shows, FVP affected NAVs on the last trading days of these thirteen months in both directions. Until 4pm Eastern time on the last trading day of January 2010, we cannot predict whether the FVP adjustment will be upward or downward.⁴

Effect of FVP on Return:

To isolate the effect of FVP, we can hold the EAFE index constant (assume its level was the same on the beginning and ending days of the holding period). To simplify, assume that the proportionality factor is 1

³ These data were presented in their webcast explaining fair value-pricing on January 22, 2010, which can be accessed at www.Vanguard.com. Note that FVP effects with differ slightly for different share classes (e.g., VDMIX versus VIDMX) due to different expenses, fees, etc.

⁴ The possibility of biases in statistical programs designed to make FVP adjustments exists but not the subject of this note.

(NAV simply equals the EAFE index price if there are no FVP adjustments). Then, if there are FVP adjustments, we can restate equation (3') as follows:

$$(4) \text{ Fund return} = \frac{\{EAFE (1 + \text{ending \%FVP effect}) - EAFE (1 + \text{beginning \%FVP effect})\}}{EAFE (1 + \text{beginning \%FVP effect})}$$

Example 1: Calculate the FVP effect on the one-year trailing return as of 11/30/09:

$$\begin{aligned} \text{Fund return} &= \frac{\{EAFE (1 - 0.71\%) - (EAFE (1 - 0.42\%))\}}{EAFE (1 - 0.42\%)} \\ &= \frac{\{(1 - 0.71\%) - (1 - 0.42\%)\}}{(1 - 0.42\%)} \\ &= -0.29\%. \end{aligned}$$

Fair value-pricing resulted in the Fund underperforming the EAFE by 0.291% over the year trailing 11/30/09.

Example 2: Calculate the FVP effect on the one-year trailing return as of 12/31/09:

$$\begin{aligned} \text{Fund return} &= \frac{\{EAFE (1 - 1.48\%) - (EAFE (1 + 2.40\%))\}}{EAFE (1 + 2.40\%)} \\ &= \frac{\{(1 - 1.48\%) - (1 + 2.40\%)\}}{(1 + 2.40\%)} \\ &= -3.79\% \end{aligned}$$

The Fund (VIDMX) underperformed the EAFE by approximately 3.79% in 2009 due to fair value-pricing. The difference between our -3.79% and Vanguard's -3.88% (from their webcast) is due to both calculations involving some degree of approximation in the interest of highlighting the effect of fair value-pricing.

Summary

Fair value pricing is a requirement for mutual funds. It is one of many regulations put into place to set fair prices at 4pm Eastern time and protect shareholders, but can impact their rates of return. When reviewing reported fund returns, shareholders must be aware that FVP adjustments at the beginning and/or end of any reporting period will affect the return. Because any single performance report uses the same quarter-end day to anchor calculations for short and long-term trailing returns, all returns in that report will be impacted. The Vanguard returns in the table (page one) all had ending values as of 12/31/09, a day that required FVP adjustments. If returns were reported for holding periods that had no FVP adjustments on the first and last days, they would match the index returns for those periods except for fees, expenses, and imperfect replication effects. For shareholders of international index funds buying or redeeming shares on a volatile market day, a slight return surprise may occur if FVP effects are large that day. Given the objective of FVP and assuming that funds adhere to it in good faith and execute reasonably well, shareholders should not be able to "game" the FVP process. Fair value-pricing is simply part of investing in mutual funds.

Pat Little, PhD

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