

WHITE PAPER

**THE RELATIONSHIP BETWEEN MSCI
EMERGING MARKETS INDEX,
mini MSCI EMERGING MARKETS INDEX
FUTURES AND THE iShares MSCI EMERGING
MARKETS ETF**

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Table of Contents

Executive Summary	1
What exactly is THE MSCI EMERGING MARKETS INDEX?	2
The EMERGING MARKETS ETF	3
mini MSCI EMERGING MARKETS Futures	3
Comparing EM Index with the EEM ETF	4
Tracking Error and Fair Value Adjustment	5
Comparing the EM index with EM Futures	6
Bibliography	6

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Executive Summary

This paper is the second in a series examining the relationship among certain international indices, and the futures and ETFs based on those indices. The first paper was authored by Mark Zurack and Linna Su of Columbia University, and considered MSCI EAFE, a broad global benchmark that tracks the performance on non-North American developed equity markets. In this paper, we extend that analysis to the most recognized benchmark for global emerging markets — MSCI Emerging Markets Index.

Both institutions and individuals invest in the MSCI Emerging Markets Index (EM) as a way to obtain global emerging market equity exposure. EM exposure is achieved in many ways:

- Directly purchasing a portfolio designed to track EM
- Investing in an Exchange Traded Fund designed to track EM
- Combining Fixed Income Securities and EM Futures to create a “synthetic EM index”
- Combining Fixed Income Securities and EM Equity Swaps to create a “synthetic EM index”

Many institutional investors are used to these choices when purchasing domestic indexes (like the S&P 500) and find on a day to day basis all four choices provide very similar returns. For EM index exposure, return differences are greater.

In this report we investigate why these differences are greater, specifically comparing the monthly total returns for the MSCI EM index, the iShares MSCI EM ETF, and a synthetic indexing strategy that combines short-term Fixed Income securities with mini MSCI futures that trade on ICE Futures US. We leave out purchasing a portfolio of stocks; for most investors that is too cumbersome a process. We also leave EM Index Swaps out of the comparison; swaps expose the investor to credit and liquidity risk and reliable historical prices are hard to find.

We found that over the four year period studied, the annual return of EM and the iShares ETF differed by 98 basis points (bps), and the synthetic index using mini MSCI EM futures underperformed the index by 116 bps. The standard deviation of return differences (tracking error) between EM and the Net Asset Value of the ETF was relatively low, with tracking error rising significantly when actual market prices of the ETF and Futures prices were considered. However, 50% of the incremental tracking error can be explained by timing mismatches between when EM is calculated and ETF and Futures prices recorded. We also found that the EM calendar spreads were overvalued during the period, explaining the great majority of the underperformance of the synthetic index strategy; but that the level of overvaluation declined significantly by the end of the period.

What exactly is the MSCI Emerging Markets Index?

The MSCI Emerging Markets Index is a free float-adjusted market capitalization index that is designed to measure the equity market performance of emerging markets. As of June 2013, the MSCI Emerging Markets Index consisted of the following 21 emerging market country indices: Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, Indonesia, India, Korea, Morocco, Mexico, Malaysia, Peru, Philippines, Poland, Russia, Thailand, Turkey, Taiwan, and South Africa.

Table 1 provides an estimate of what percentage of EM is priced at different times of the day:

Table 1: When EM is Priced*

TIME OF DAY		
(Eastern Standard Time)	Percent of EM	Comments
12:10 - 6:00 AM	60%	Asia
7:30 - 11:05 AM	18%	Europe, Middle East, Africa
2:00 - 4:00 PM**	22%	Latin America

* Based on country weights as of August 2013

** At certain times during the year, some countries may close later than 4:00 PM

To denominate EM in different base currencies, exchange rate information is captured at 4pm, London time, based on WM Reuter spot currency rates. Finally, MSCI measures total returns by reinvesting dividends paid by the constituents of the index. Dividends paid in underlying component securities are reinvested on the day the security goes ex-dividend. In this paper, we use MSCI's total return index using dividends paid net of withholding taxes ("EM NTR Index"). The net dividend is reinvested after deduction of withholding tax, applying the rate to non-resident individuals who do not benefit from double taxation treaties. Withholding tax rates applicable to Luxembourg holding companies are used, as Luxembourg applies the highest rates. By contrast, when "gross dividends" are used to measure return, withholding taxes are not considered.

The Emerging Markets ETF

Blackrock manages an Exchange-Traded Fund (ticker symbol EEM) that holds a portfolio designed to track EM. EEM trades like a US stock; we measure EEM closing prices by taking the midpoint of the bid and ask prices at 4pm, NY time.

We also measure historical Net Asset Values (NAV's) for EEM, which is based on each constituent's closing price in its local market converted into U.S. dollars at the prevailing exchange rate at 4pm, NY time.

mini MSCI Emerging Markets Futures

Futures contracts on the EM index began trading at the NYSE Liffe US futures exchange in September, 2009. In June 2014 they migrated to ICE Futures US. The contract is set to equal \$50 times the MSCI EM price return index level (i.e., without dividends reinvested), so it has an approximate value of \$50,000. Although mini MSCI EM Index futures trade close to 24 hours per day, settlement occurs at 4:00pm, NY time, daily, based on the one-minute volume-weighted average price of the future between 3:59 and 4:00 pm.

There are a couple of important points to note during the period covered in this study. First, from September 2009 through June 2011, non-fungible, identical contracts traded on the Chicago Mercantile Exchange (CME). Prices of these contracts have not been considered in this analysis. Second, prior to August 2011, daily settlement of the futures contracts occurred at 4:15pm, based primarily on the prevailing bid/ask spread at that time. No effort has been made to adjust these prices to reflect current markets at 4pm. It is likely that if these two factors had been reflected in the analysis, the tracking performance of the futures relative to the index and ETF would have improved. Therefore, the results of this analysis are possibly on the conservative side.

Comparing EM Index with the EEM ETF

Passive investors that use ETFs or Futures are worried about “Tracking Error”; that is, the extent to which the return of their investment matches the performance of the index. In this instance, tracking error can be defined as the annualized standard deviation of the monthly total return differences between the MSCI EM NTR index, the ETF using closing prices, the ETF using NAVs, and the “synthetic portfolio” using futures. The EM NTR Index Return can be measured as follows:

$$\text{EM Index Return} = \frac{\text{EM Ending Value} + \text{EM Dividends} - \text{EM Beginning Value}}{\text{EM Beginning Value}}$$

EM ETF returns can be measured applying the formula above to either closing EEM prices or closing Net Asset Values of the underlying portfolio. Since the NAV is measured in US dollars, each stock’s closing price is converted into dollars at the prevailing exchange rate at that time.

Table 2 compares the monthly total returns for the EM Index, EEM ETF using closing prices and EEM ETF using NAVs from October 2009 through December 2013.

	COMPOUND ANNUAL RETURN	ANNUAL TRACKING ERROR VS. EM
MSCI EM Index	4.63%	—
EEM Using Market Prices	3.65%	5.56%
EEM Using NAVs	3.48%	1.43%

Return difference over long periods of time can be explained by the following:

- ETF Management Fees
- Stock loan income
- Timing differences in the reinvestment of dividends

From a risk perspective, the EEM NAV matched MSCI EM most closely with a Tracking Error of 1.43%. The main reason for this risk is the time differences in measuring currency rates. Also, at certain times of the year, some Latin American markets close after 4pm New York time. MSCI EM is calculated in U.S. dollars using 4pm London rates. EEM NAV uses 4pm New York rates.

Tracking error grows significantly to 5.56% when EM returns are compared to EEM returns using secondary market prices. The reason for this increase has to do with the timing of the EEM index calculation versus what is happening in the ETF when the major U.S. markets close. The implication, then, is that a very significant portion of the tracking error associated with the ETF returns derives from the timing issue.

Tracking Error and Fair Value Adjustment

An alternative method of accounting for the timing issue is to adjust the EM Index value to estimate what the index would look like were all the components priced at 4pm NY time. In Table 1 we showed that prices of MSCI EM Index component stocks become fixed as local markets close throughout the day, starting with the Philippines at 12:10 am NY time and ending with several Latin American markets closing at 4:00pm (although some markets may close past 4pm NY time during certain times of year due to differences in daylight savings time conventions). So by the time 4pm NY time rolls around, roughly three-quarters of the EM index is essentially “stale” in that it doesn’t reflect where its stocks would be trading if all of the home markets were open.

To correct for this timing discrepancy, many funds that invest in international securities make a “Fair Value” adjustment to the closing prices in the local markets when determining the fund’s Net Asset Value. The idea of the FV adjustment is to estimate what the price of the stock would be if it were trading when the market closed in New York.

As of June 30, 2014, MSCI began making a fair value adjustment in calculating EM each day. So we can compare the monthly returns of the fair value adjusted MSCI Emerging Markets index versus the unadjusted return of the index to determine the impact of stale pricing on returns.

When the actual returns of EEM are compared with the MSCI EM fair value adjusted index tracking error declines from 5.56% to 3.49%, confirming our view that a portion of the tracking error between EEM ETF returns and EM can be explained by the different time each vehicle is valued. The remaining tracking error possibly can be attributed to:

- EEM market participant disagreement with the methodology the index calculator used to make the fair value adjustment and apply their own adjustment

Comparing the MSCI EM index with EM Futures

As mentioned earlier, one way investors buy exposure to MSCI EM is by establishing a long position in mini MSCI EM futures. We test the following strategy to track EM with futures:

- Establish a long position in mini MSCI EM futures with a notional value equal to the desired exposure
- Roll the position every three months, one week prior to expiration
- Invest all cash in 3 month LIBOR

Below we compare the annualized return from October 2009 through December 2013 for EM, iShares MSCI EM ETFs and the mini MSCI EM futures strategy:

TABLE 3

	COMPOUND ANNUAL RETURN	ANNUAL TRACKING ERROR VS. EM
EM Index	4.63%	-
EEM Using Market Prices	3.65%	5.56%
mini MSCI EM Futures	3.47%	5.50%

Notice a similar tracking error between EM Futures and EEM ETFs versus the index. This is not surprising, given that EM futures are valued each day at 4:00pm NY time, the same time as the 4pm prices used to value EEM ETFs, and hours after most of the index is closed.

When you compare the returns of the futures strategy versus those of the Fair Value-adjusted MSCI EM Index referenced earlier, tracking error declines from 5.50% to 3.47% - again confirming our view that a good portion of the tracking error between the futures strategy returns and EM can be explained by the different time each vehicle is valued. Further, the tracking error between the returns on the futures strategy and the returns on the EEM ETF is only 160 basis points, significantly less than versus the index and once more reinforcing the impact of stale pricing in the index. Still, the return on the futures strategy is below the index as well as the ETF. To explain that difference we look to how the futures have been priced in relation to the Fair Value. Our Fair Value calculation follows the basic formula:

$$\text{Fair Value} = \text{Index} + \text{Index} * (\text{LIBOR} - \text{Dividend Yield}) * \frac{\text{\# of days until expiry}}{365}$$

We compare the Fair Value of calendar spread on the last day of the month prior to expiration with the actual spread that day. We use net dividends in forecasting the dividend yield.

It turns out that over the simulation period, MSCI calendar spreads were 27 basis points per quarter rich, which impacts return by 108 basis points per year. This richness is consistent with behavior described in Morgan Stanley's report, "Global Equity Index Futures Roll Summary Paid Preview March 2013", although the periods studied are different and although Morgan Stanley used Gross Dividends to measure Fair Value. However, it should be noted that richness of the roll declined substantially over the period analyzed, and for the last four quarters, averaged just 15 basis points versus the 27 basis point average of the entire period.

Bibliography

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