



Advanced
Fundamentals

BRIXX™
COMMERCIAL REAL ESTATE
INDEXES
METHODOLOGY



SEPTEMBER 2020

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Introduction

Traditional real estate indexes rely on appraisal, paired transaction and market capped methodologies to determine the investment returns associated with commercial real estate. Although each of these indexes have broad appeal in benchmarking, the traditional indexes suffer from significant disadvantages to support a liquid, sustainable, and reliable real estate derivatives market.

NAREIT, MSCI and Cohen & Steers Indexes use public market data to measure corporate stock performance that incorporates limits to measure the full capital stack that may result in differences to actual changes in property valuations. These indexes are used as benchmarks for over \$100 billion of REIT ETFs and Mutual Funds.

NCREIF, RCA/Moody and IPD Indexes rely on private market data sourced from transactions and survey data. The private market data is collected for benchmarking Pension and Investment Trusts, Private Funds, and Separate Accounts. These indexes include a lag period created from transactional timing and the subjective nature of data discovery.

BRIXX™ Commercial Real Estate (CRE) Indexes are the first family of real estate indexes to incorporate commodity pricing to overcome the limitations of appraisal lag, self-reporting, and leverage disparities to establish an accurate view of the real estate market. The performance of the BRIXX Indexes is calculated on an unlevered basis using publicly traded equities, resulting in a 12-month leading correlation to established private market real estate indexes that rely on survey, transaction, or appraisal data.

Market-Based Indexes

The BRIXX Indexes measure real-time changes in commercial real estate valuations across various sectors of the market to support hedging, benchmarking, and portfolio allocation strategies for both public and private real estate investors using data that is updated through continuous real-time changes in equity share prices, 10Q, 10K, and interim period 8K filings.

- BRIXX Residential Index (MXAFR)
- BRIXX Retail Index (MXAFT)
- BRIXX Office Index (MXAFO)
- BRIXX Hospitality Index (MXAFH)
- BRIXX Composite Index (MXAFC)

Key features of the BRIXX Indexes are:

- Real-time pricing
- Aggregates \$600+ billion in property values
- Unlevered returns
- Pricing in \$/Square foot, \$/Key, and \$/Unit
- Leading correlations to private market benchmarks

MIAX License Agreement

Miami International Holdings, Inc. (MIH), the parent holding company of the MIAX[®], MIAX PEARL[™] and MIAX Emerald[™] options exchanges (the MIAX Exchange Group[™]), and Advanced Fundamentals have partnered to develop a complex of proprietary financial products based on the BRIXX Indexes.

As part of this partnership, MIH has been granted an exclusive, worldwide license to develop and commercialize financial products based on the BRIXX Indexes. These products will be available exclusively on the MIAX Exchange Group. The first tranche of products, cash-settled options and futures on the BRIXX Indexes, are expected to be listed in 2020. All products remain subject to SEC and CFTC approval, respectively.

About MIH

Miami International Holdings, Inc. (MIH) is the parent holding company of Miami International Securities Exchange, LLC (MIAX[®]), MIAX PEARL, LLC (MIAX PEARL[™]) and MIAX Emerald, LLC (MIAX Emerald[™] and together with MIAX and MIAX PEARL, the MIAX Exchange Group), three fully electronic options trading exchanges.

MIAX, MIAX PEARL and MIAX Emerald leverage the MIAX Exchange Group's industry-leading technology and infrastructure to provide their member firms with traditional pricing and pro rata allocation (MIAX), maker-taker pricing and price-time allocation (MIAX PEARL) market structures, and a hybrid market structure with maker-taker pricing and pro rata allocation (MIAX Emerald).

MIAX Options serves as the exclusive exchange venue for cash-settled options on the SPIKES[®] Volatility Index (Ticker: SPIKE), a measure of the expected 30-day volatility in the SPDR[®] S&P 500[®] ETF (SPY). The MIAX Exchange Group's executive offices and National Operations Center are located in Princeton, NJ, with a Miami Operations Center and additional offices located in Miami, FL. To learn more about MIH and the MIAX Exchange Group visit www.MIAXOptions.com.

Market Factors

On August 31, 2016, the Global Industry Classification Standard (GICS[®]) included a new sector for Real Estate.

Equity REITs and other real estate companies were reclassified from the Financial Sector to the newly created Real Estate Sector. Real Estate should now receive more attention from institutional investors, individual investors and financial advisors, expanding to a larger group of owners. More important, we have recognized that the reclassification has led to a significantly reduced correlation between publicly traded real estate securities and the broader market as a whole.

Commercial Real Estate comprises a large asset class that is crudely estimated at \$16 trillion in total value in the U.S alone¹ – this can be compared with roughly \$35 trillion of U.S. corporate equity and \$33 trillion in

¹ <https://www.reit.com/sites/default/files/Size%20of%20CRE%20market%202019%20full.pdf>

household-owned U.S. residential real estate. Of the \$16 trillion, roughly half is thought to be composed of “institutional quality” assets. The institutional quality CRE asset base in the U.S. is comparable in size with the Treasury bond market or with the publicly traded corporate bond market. With increasing allocations to commercial real estate, it seems reasonable to expect that commercial real estate professionals working in institutional settings would face increasing pressures to deploy quantitative tools and transparency on par with the other components of their institution’s portfolio.

In 2019, U.S. real estate transaction volume totaled more than \$550 billion², representing nearly half of the global total, and more institutional real estate assets under management than the next three largest institutional markets combined; Japan, China and the U.K. This volume of activity provides steady opportunity for new real estate investment to include real estate derivatives, with futures, options and swaps under a common regulatory structure and shared market conditions with equities, bonds and commodities.

Market Coverage

The BRIXX Indexes are the only indexes that use real-time data from the public markets to generate real-time property valuations that do not require regression restraints, capped weighting, alternative market identifiers, and self-reporting.

BRIXX covers four (4) individual sectors and a Composite comprised of the four underlying sector returns:

Sector	Components*	Pricing	Property Values**
Residential	15	\$/Unit/1,000	\$200 billion
Retail	15	\$/Square Foot	\$225 billion
Office	15	\$/Square Foot	\$130 billion
Hospitality	15	\$/Key/1,000	\$85 billion
Composite	60	Index	\$640 billion

* If less than 15 components are eligible, the individual sector indexes will be calculated using less than 15 components, with a minimum of 10 components in each index. In the event that fewer than 10 companies are eligible for inclusion, the indexes will be supplemented with the next most eligible equity company to meet the minimum requirement within each individual sector until the minimum number of components is reached.

** As of 12/31/2019

² <https://www.cbre.com/research-and-reports/Global-MarketFlash-Global-Investment-Volume-Falls-by-2-in-2019-EMEA-Volume-Surges-in-Q4>

Methodology

Individual Sector & Composite Index Unit of Measure

The individual sector indexes are commodity priced on per unit metrics (“Per Unit Values”):

- Residential- \$/Unit/1,000
- Retail- \$/Square Foot
- Office- \$/Square Foot
- Hospitality- \$/Key/1,000

The base values were calculated as the total Enterprise Value (as defined below) divided by the total number of units for each sector using 12/31/2005 values. The base values for the Composite was set at 100 using a 12/31/2005 date.

Sector	Base Value	Pricing
Residential	\$88.03	Per Unit
Retail	\$132.83	Per SF
Office	\$258.67	Per SF
Hospitality	\$159.27	Per Key
Composite	100.00	Index

Component Selection

The composition of the Index is determined in a reconstitution on the Thursday before the third Friday of March, June, September, and December or the previous business day if this is a non-business day. At that time the most recent quarterly filing and share data are used as inputs. AF sources public data from audited SEC company filings and supplemental filings updated each quarter and intra-quarter based on 8-K, 10-Q, and 10-K filings.

Any routine changes to index components, other than changes due to Corporate Actions as described below, are made effective after the close on the third Friday of each quarterly month, or the previous business day if this is a non-business day.

The individual sector index components are determined from the equity companies that have the largest Enterprise Value within each individual sector and must also meet the minimum eligibility requirements. The individual sector index components are each an NMS stock as defined in Rule 600 of Regulation NMS under the Securities Exchange Act of 1934.

To be eligible for inclusion, an equity company must:

- be classified as an Equity Real Estate Investment Trust
- be listed on a U.S. Securities Exchange
- have a minimum Enterprise Value of \$1 billion
- have at least 85% of its revenue derived from the associated asset class
- have issued a quarterly filing or annual report after their initial listing

If less than 15 components are eligible, the individual sector indexes will be calculated using less than 15 components.

Component Weighting

Component weights for all indexes are reset monthly. Each component is equally weighted taking into account each of the components' Leverage Ratio with the equity component equal to Market Cap/Enterprise Value, as described in the below equations. The weights and Index Shares are set after the close on the Thursday before the third Friday of each month or the previous business day if this is a non-business day. At that time the most recent quarterly filing and share data are used as inputs. The new Index Shares are made effective after the close on the third Friday of each month, or the previous business day if this is a non-business day. Index weight not assigned to the REIT component securities is treated as a static cash balance.

For the Composite, each sector index is weighted in a ratio of the sum of its components Enterprise Values to the total sum of the Enterprise Values for all sector indexes.

Weighting of Components

Market Cap = Common Shares Outstanding * Common Share Price.

Enterprise Value = Market Cap + Total Liabilities + Minority Interest + Preferred Equity – Cash & Equivalents.

Leverage Ratio = $1 - (\text{Market Cap} / \text{Enterprise Value})$

Component Index Weight = $(1 - \text{Leverage Ratio}) / \text{Number of Components}$.

Index Calculation

Individual Sector Index Returns are calculated as follows:

$$Index_t = \frac{\sum_{i=1}^n x_{i,t} * p_{i,t}}{D_t}$$

where:

$x_{i,t}$ = Number of Index Shares of the Index Component i on Business Day t

$p_{i,t}$ = Price of Index Component i on Business Day t

D_t = Divisor on Business Day t

n = Number of Index Components

Composite Index Return is calculated in the same manner, with each component a sector index.

Balance Sheet Adjustments Summary

Adjustments are made to the index values during the quarterly reconstitution after the third Friday in March, June, September, and December, taking into account changes in each Component's Per Unit Value.

These adjustments are calculated as follows for each Component:

Per Unit Value₁ = Enterprise Value₁ / # Units

of Units

The # of Units for each Component is sourced from the latest quarterly filings and earnings reports (10-Q, 10-K, 8-K, or Supplemental).

BRIXX Residential Index = amount of residential units owned by the Component.

BRIXX Retail Index = amount of square footage owned by the Component.

BRIXX Office Index = amount of square footage owned by the Component.

BRIXX Hospitality Index = amount of hotel rooms owned by the Component.

These balance sheet adjustments provide for an index calculation that encompasses not only company performance as calculated through changes in share price, but also with respect to a company's real estate holdings and the underlying value of such holdings.

Modified Market Capitalization-Weighted Index Discussion

The BRIXX Indexes are modified market capitalization-weighted indexes. The Market Capitalization is used to determine the weight of each component in the following manner: First, the Market Capitalization is divided by one (1) minus the Enterprise Value (which is calculated as the Market Capitalization plus Total Liabilities plus Minority Interest plus Preferred Equity minus Cash and Equivalents) – which is called the “Leverage Ratio”; then, the Component Index Weight is calculated as one (1) minus the Leverage Ratio divided by the number of components.

Corporate Actions

Adjustments to the indexes may be made with respect to corporate actions of the components as follows:

Spin-off- A spun-off entity is not added to the index, unless it qualifies as of the beginning of the quarter immediately following the spin-off transaction. The spin-off is treated as a market-capitalization-neutral event, i.e., the weight of the company is maintained until the next quarter when an adjustment to the balance sheet is made, using the post spin-off financial statements.

Special Cash Dividend- Special Cash Dividends are treated the same as other dividends whereby the price of the day before the ex-date is adjusted for the special cash dividend.

Rights Offering- A Rights Offering is treated as a market-capitalization-neutral event, i.e., the weight of the company is maintained until the next adjustment to the balance sheet is made, using the adjusted market capitalization post rights offering.

Merger- A company that is merged into another company will be removed from the index upon the closing of a merger. For companies that survive a merger, the weight of the company is maintained until the following quarter at which point an adjustment to the balance sheet is made, using the post merger financial statements.

Bankruptcy/Delisting- If an index component files for bankruptcy protection or is delisted from its principal exchange because of reasons like failure to meet financial or regulatory standards, bankruptcy proceedings, or extreme financial distress, it will be removed from the index.

If a component is removed due to a merger transaction, bankruptcy, or delisting, the weighting of the removed component will be proportionally redistributed over the remaining index components

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In an effort to maintain Index integrity, reduce turnover and excessive adjustments and ensure that the Index continues to achieve its objective, we reserve the right to make exceptions when applying the methodology if the need arises. This includes, but is not limited to, quantitative data used to determine eligibility and the application of corporate actions. In any scenario where the treatment differs from the general rules stated in this methodology document, advance notice will be published to customers, whenever possible.

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