MSCI Property Indexes Methodology

Index construction objectives, guiding principles and methodology for the MSCI Property Indexes

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Overview

The **MSCI Property Indexes Methodology** outlines how MSCI creates and maintains its Property Indexes, market information and analytics, which are designed to address the needs of real estate and multi-asset class investors.

Section 1 provides an introduction to the indexes, market information and analytics, including a description of the real estate asset class and how the indexes can be used to benchmark portfolios of real estate investments.

Section 2 describes the data used for the index calculations.

Section 3 describes how index composition is defined.

Section 4 describes the principles, methodology and key procedures for calculating headline measures in the Property Indexes and related market information.

Section 5 describes the methodology for non-headline measures.

Section 6 describes the methodology for measures used for analyzing portfolio performance relative to the Property Indexes.

Appendix II provides a list of key terms, together with their definitions.

Note, MSCI Private Real Estate Indexes are governed by a set of methodology documents (Methodology Set) which define the full methodology governing a specific index. The Methodology Set for the MSCI Property Indexes includes:

- MSCI Global Data Standards for Real Estate Investment
- MSCI Real Estate - Index Policies
- MSCI Property Indexes Methodology (this document)
- MSCI Standards for Real Estate Valuations
- Additional methodology specifications, as appropriate to the market or index.

1   Introduction

1.1   OBJECTIVE

MSCI Property Indexes objective is to accurately and objectively measure the performance of direct private real estate investments. The constituents of the MSCI Property Indexes are real estate investment investments that are held in professionally managed portfolios. They therefore may include properties held in insurance and pension funds, sovereign wealth funds, listed property companies including REITs, unlisted pooled funds, charitable trusts, traditional landed estates, and by other large private property owners.

Real estate is a relatively illiquid and heterogeneous asset class. Each property asset is unique, differing from all others in terms of its location, size, tenants and physical characteristics. The time and cost involved in real estate transactions are significant. It typically takes 3-6 months for a large property to transact, with marketing, legal and taxation costs amounting to 5-10% of asset value in most countries around the world. Most individual properties are typically traded only once every 5-10 years. Real estate managers are also able to influence the value of their assets by re-leasing, refurbishing and sometimes completely redeveloping the properties for which they are responsible.

The MSCI Property Indexes are primarily based on real estate valuations, and where available, property transacted prices, supplied by its data providers. Groupings of MSCI property indexes include regional and market indexes and sector indexes.

1.2   INDEXES

MSCI distinguishes between Property Indexes (direct real estate), which measure the performance of aggregates of individual properties held within investment portfolios, and Property Fund Indexes, which measure the performance of fund vehicles in their entirety. (See MSCI Property Fund Indexes Methodology for more information on the Property Fund Indexes).

MSCI Property Indexes measure the performance of global, regional and individual national markets by calculating and aggregating the performance of individual properties. MSCI calculates a variety of Standard Property Indexes[1] together with sub-indexes that apply various segmentations and filters to the constituents of the

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[1] A Standard Index is the MSCI Private Real Estate Index for a country or region with the broadest market coverage, for a specific index methodology and for a specific reporting frequency. For example, for the UK, this includes the MSCI UK Quarterly Property Index, MSCI UK Annual Property Index.

Standard Indexes. These include client specifications that tailor the index to their specific investment strategies and/or mandate constraints. These indexes are then used to measure the performance of their investment portfolios or for market information and research purposes.

1.3   INDEX PERFORMANCE MEASURES

The measures most widely used and relied upon to evaluate the investment performance of commercial real estate are total return and its income and capital components, i.e., the total return (TR), capital growth (CG) and income return (IR) ("headline measures"). MSCI calculates these measures on a monthly basis and compounds them (time-weights/chain-links) over longer periods. Each months' measures are value-weighted, meaning that the contribution of each asset is in proportion to its monetary weight.

1.4   INDEX DETERMINATION AND DISSEMINATION STAGES

These index measures are compiled, produced and distributed in accordance with standardized procedures. The four main stages of index production are:

1. Data Collection and Validation

   - Gather, validate and verify data

   - Define the index universe ("dataset") by applying inclusion/exclusion rules to validated data

2. Index Composition

   - Apply filters

3. Index Calculation

   - Headline measures – TR, CG and IR.

   - Non-headline measures: e.g., market rental value growth, costs measures, yield measures

4. Make indexes and related data available, through a range of analytical tools, for portfolio analysis, performance measurement and attribution.

1.5   MARKET INFORMATION

Based on the Standard Indexes, market information comprises a consolidated set of global, regional, national, city and submarket indexes, often further partitioned with

segmentation by property type. In addition to index returns, measures such as cost ratios, yields and vacancy rates are also calculated.

1.6   ANALYTICS

Analytics products[2] are used to analyze investment performance and provide a range of related portfolio metrics, presenting results both on an absolute basis and relative to an index. These products commonly attribute returns across underlying structural factors, again both on portfolio absolute and index-relative bases. Most descriptive measures, also found in market data reports, can be expressed on a relative basis. Additionally, index and portfolio risk analytics, including income projections, are part of the overall analysis framework and are included in this methodology book.

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[2] The methodologies in this MSCI Property Indexes Methodology document do not apply to older MSCI's real estate analytics products. Differences in methodology in MSCI's real estate analytics products that do not conform to the MSCI Property Indexes Methodology are summarized in the document Methodology Changes for MSCI Real Estate Analytics Products.

2   Data Collection and Validation

To determine MSCI Property Indexes, market information and analytics, MSCI assembles a set of comparable information on real estate portfolios, which are compiled to meet the needs of a broad range of investment purposes. Property data are generally provided to MSCI by or on behalf of the managers of the real estate investment portfolios concerned. On occasion, MSCI supplements this data with information from public or third-party sources, such as published financial reports.

MSCI's goal is to cover the largest possible proportion of each professionally managed real estate investment market. Therefore, MSCI makes continual efforts to increase data coverage by recruiting new portfolios from both existing and new managers.

As with all private markets, data provision is voluntary, and MSCI's indexes can therfore never be expected to fully cover each market. MSCI measures the representativeness of its market indexes relative to a best estimate of the total size of the professionally managed real estate investment universe as a part of Real Estate Market Size Index Perspective report, which is carried out annually and can be found on www.msci.com.

2.1   DATA STANDARDS

Data gathered by MSCI can be divided into three categories: (1) data for index calculation, (2) classification data and (3) data for enhanced analytics and market information measures.

A mandatory core set of data used for the calculation of headline measures, is required in all market. The set includes capital value, transaction data, capital flows and net income.

In addition, non-mandatory data (not formally defined as mandatory and often specific to individual national markets) may be collected, if available, to allow for more detailed analyses and the production of customized sub-indexes. This information is not used for headline measure calculation but may be used in market information and analytic products to provide additional insight. This category of information may be used for yield calculations, rental level and growth measures, vacancy rates, income projections and risk analytics. Other examples of non-mandatory data are green building certifications, detailed cost breakdowns and information on the expiry of leases.

Details and definitions related to the data can be found in the MSCI Global Data Standards for Real Estate Investments, but these may be complemented with certain market specific data items.

Examples of data for category (1) and (2) are described in the tables below.

Examples of Data Used in Index Calculation

Data category	Examples of data used for calculating index returns
Valuation	Capital value based on a valuation
Transaction data	Property purchase prices, partial purchase expenditure, sale prices, partial sales receipts and corresponding dates and transaction costs
Revenue flows	Income revenue flows (including rents and other asset level income), irrecoverable operating expenditure (including maintenance and property management costs) or net income
Capital flows	Capital expenditure (including expenditure related to developments), capital receipts
Currency	Exchange rates*
Other assets	Indirect assets, debt and cash**
Market size estimates	Estimate of the size of the professionally managed real estate investment market***

Sourced from: WM Refinitiv
**Not used for calculating MSCI Property Indexes, used for asset to fund level performance reconciliation, where applicable.
***Sourced from MSCI's Real Estate Market Size report.

Examples of Data Used for Asset Classification and Index Inclusion/Exclusion

Data category	Examples of data used for classification of assets
Property type	Detailed property type classification to determine the sector classification
Property status	Development status, owner occupancy
Geographical location	Address, postcode, city, country, geographical hierarchical classification****
Size	Floor space
Sustainability	Green building certificates
Investor type	Type of investor

*****The geographical hierarchy is based on public sources including Eurostat, OECD, national statistical agencies and national postal services.*

2.2 HEADLINE MEASURE DATA REQUIREMENTS

Headline measures use two types of investment data: valuation data and accounting data, principally capital expenditure and receipts, and operating costs and income.

Valuation and tenancy data are sometimes provided directly by the valuer of the property on behalf of the data provider (most prevalent in the U.K.). However, valuation data are frequently read into in-house management systems, either by the property's owners or their managing agents, and thereafter provided to MSCI.

In addition to valuations, MSCI uses a variety of data from portfolio managers (such as operating revenues and costs, capital expenditure and receipts, classification data), which are typically used in financial reporting to their owners.

2.2.1 VALUATION STANDARDS

For most financial asset classes, investment performance measurement is based on transaction prices. In contrast, direct real estate is well known for being an illiquid and heterogeneous investment asset-class.

As a result, MSCI Property Indexes are predominantly based on professionally sourced market valuations, often carried out by independent valuers. Valuations are based on a set of market assumptions and as much recent transaction evidence as is available and deemed relevant.

MSCI aims to use only asset valuations that are theoretically achievable estimates of actual market transaction prices. Therefore, it provides a clear and precise definition of the sorts of valuation which should be provided by investors and managers. These

open market valuations are likely to be routinely used by the data providers and portfolio managers in their own financial reporting, including that to end investors and shareholders. More information on the specific standards for valuations that MSCI expects can be found in the MSCI Standards for Real Estate Valuations.

2.3   SPECIFIC DATA TREATMENT PRACTICES AND ASSUMPTIONS

In certain situations where data is unavailable, data may be derived from other data or from sources other than the direct data provider, for example publicly available sources. This section describes the data treatment practices applied by MSCI in these cases.

2.3.1   DEFAULT PURCHASER COSTS

In certain situations no transaction-related costs may be provided. As purchaser costs (usually tax, together with legal and agents' fees) are applicable in most circumstances, default purchaser costs are applied when the actual amounts are not provided. These standard purchase costs are reviewed on a regular basis by the Real Estate Index Committee (REIC).

2.3.2   AGGREGATED ASSETS

In some circumstances, individual properties may be grouped together by their owners/managers, either because they constitute single investments, have similar characteristics or are located in the same geographical area. However, in certain circumstances a group of assets may be grouped together that are not located in the same geographical area, but are linked together via a single lease or ownership agreement. Therefore, in those instances, it may not be feasible for a client to provide valuation data, revenues and expenses for each building or unit. Whenever assets cannot be mapped to an individual location, they will be classified as aggregated assets and will not be included in granular level analyses. However, those assets will contribute to national and portfolio level results.

2.3.3   MARKET SPECIFIC DATA PRACTICES – EUROPE

2.3.3.1 UK – INCOME DERIVATION BASED ON TENANCY INFORMATION

In most cases in the U.K., each property's rent receivable is derived from the accrued rent for each lettable unit. This is the rent due from the tenant calculated on a daily basis taking into account lease start dates, rent start dates, rent reviews, vacancies and rent-free periods, but not arrears of payment. When a rent review has occurred

during the month or is outstanding, the rent is calculated for the appropriate number of days at the old rent and, for the rest of the days in measurement period, based on the new rent. The market rent is substituted for the rent on outstanding reversionary rent reviews. Actual rent amounts are not backdated when a review is settled. Bad debts are recorded as non-recoverable costs when they are written off. The aggregate of rent receivable from all tenants is the rent receivable for the property.

However, some data providers in the U.K. provide actual net income amounts for individual properties in the portfolio. In these cases the rent receivable is derived as a residual amount by adding property management costs, ground rent and other irrecoverable costs, and deducting other income from the net income provided by client.

2.3.3.2 UK MONTHLY INDEX – OPERATING EXPENSE TREATMENT

For the calculation of the MSCI UK Monthly Property Index, operating expenses are not available on a monthly basis and so cannot be considered for index calculation purposes. The methodology therefore deviates from that of other indexes by not deducting operating expenses for net income calculations.

2.3.3.3 UK AND IRELAND – GROSS CAPITAL VALUE ADJUSTMENT

MSCI derives gross capital value for the U.K. and Ireland markets based on gross capital value adjustment, in cases where no gross capital values have been submitted. The gross capital value adjustment is based on Stamp Duty and other transaction cost assumptions. The gross capital value is not used for headline measure calculations, but is used in other measures, including certain yield measures, which are based on the gross capital value.

The table below shows how the U.K. gross capital value adjustment percentages have changed between 2015 and 2019 due to changes in the level of Stamp Duty.

PROPERTY OR TRANSFER VALUE IN UK (GBP)	STAMP DUTY LAND TAX (%)	GROSS CAPITAL ADJUSTMENT (%)
Old adjustment	4.00%	5.75%
APRIL 2015 TO DECEMBER 2018, SCOTLAND		
Up to £150,000	Zero	1.75%
The next £200,000 (the portion from £150,001 to £350,000)	3.00%	4.75%

The remaining amount (the portion above £350,000)	4.50%	6.25%
FROM JANUARY 2019, SCOTLAND		
Up to £150,000	Zero	1.75%
The next £100,000 (the portion from £150,001 to £250,000)	1.00%	2.75%
The remaining amount (the portion above £250,000)	5.00%	6.75%
FROM DECEMBER 2018, WALES		
Up to £150,000	Zero	1.75%
The next £100,000 (the portion from £150,001 to £250,000)	1.00%	2.75%
The next £750,000 (the portion from £250,001 to £1.000,000)	5.00%	6.75%
The remaining amount (the portion above £1,000,000)	6.00%	7.75%
FROM MARCH 2016, THE REST OF THE UK, INCLUDING WALES TO NOVEMBER 2018		
Up to £150,000	Zero	1.75%
The next £100,000 (the portion from £150,001 to £250,000)	2.00%	3.75%
The remaining amount (the portion above £250,000)	5.00%	6.75%

The table below lists the old assumptions for Ireland, the October 2017 changes, and those used in all subsequent reporting for Ireland.

PROPERTY OR LEASE PREMIUM OR TRANSFER VALUE IN IRELAND (EUR)	STAMP DUTY LAND TAX (%)	GROSS CAPITAL ADJUSTMENT (%)
Old rate	2.00%	4.46%
FROM OCTOBER 2017		
Non-residential	6.00%	8.46%
Residential up to EUR 1,000,000	1.00%	3.46%
Residential the remaining amount	2.00%	4.46%
FROM OCTOBER 2019		
Non-residential	7.50%	9.96%
Residential up to EUR 1,000,000	1.00%	3.46%
Residential the remaining amount	2.00%	4.46%

2.3.3.4 UK, IRELAND AND FRANCE – PROPERTY MANAGEMENT COSTS

MSCI derives property (base) management costs for the U.K., Ireland and France markets based on a percentage of rent receivable. These assumptions are applied only when no actual property management costs have been provided. The fee assumptions are based on the property management costs of those clients that have provided this data. The assumptions are made at sector level and are reviewed regularly by the REIC. The table below lists the assumptions adopted since 2016 across the three markets.

	OFFICES	RETAIL	INDUSTRIAL	RESIDENTIAL	OTHER
U.K.	0.8%	1.2%	1.4%	6.9%	1.8%
Ireland	1.1%	1.5%	0.9%	6.9%	1.8%
France	3.0%	3.0%	3.0%	6.0%	6.0%

2.3.3.5 FINLAND – KTI – STANDING INVESTMENTS

MSCI does not directly produce a Finland Property Index, but sources asset level data and the KTI Index from KTI, an independent real estate research organization and service company in Finland.

For producing composite indexes that incorporate properties located in Finland, MSCI re-computes a Finland Index from the provided data and cross-validates against the KTI Finnish Index before using the data in its global, European and other relevant regional indexes, and Finland sub-indexes. The data provided for Finnish properties by KTI only includes standing investments – i.e., do not include properties bought, sold or under development or major refurbishments during the measurement period. Finnish non-operating investments[3] are therefore not included in the MSCI Europe Annual Property Index and other relevant regional indexes.

2.3.3.6 GERMANY – ASYNCHRONOUS VALUATIONS

In the Germany data collection service not all assets are valued at end of December by data providers during annual submission period. This practice is prevalent particularly among non-residential (commercial) funds in the service. All assets are valued on an annual basis however, not all of them are valued in December. For those assets valued in intervening months, the last available valuation provided by data providers are carried down as December end valuations.

In the data collection template, the client submits the capital value field along with the respective valuation month in a year. The valuations provided are carried down after adjusting for net capital investment (if any), as December end valuation for index calculations.

When a new appraised valuation becomes available for the asset, there is no back interpolation performed between the previous and current appraised capital values.

2.3.3.7 SOUTH AFRICA – ASYNCHRONOUS VALUATIONS

In the South Africa data collection service, most assets in each of the contributing portfolios are generally valued at bi-annual frequencies. However, not all assets are valued at end of June and December by data providers during the respective biannual period.

In the data collection template, the data provider submits the capital value field along with the respective valuation month in a biannual period. The valuations provided are carried down after adjusting for net capital investment (if any), as June and/or December end valuation for index calculations.

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[3] Non-operating investments are those bought, sold or under development or major refurbishment during the measurement period.

2.3.3.8 GERMANY – NO APPORTIONMENT OF CAPITAL FLOWS

For the Germany data collection service, capital expenditure and other capital flows are generally provided in the month of valuation as a 12-month aggregated value by the data provider.

In the data collection template, the client provides the capital flows data in the respective datafields in a particular month of the year. These are timed in the performance calculations as submitted by the data provider.

2.3.4   MARKET SPECIFIC DATA PRACTICES – ASIA PACIFIC

2.3.4.1 ASIA – PUBLIC DATA COLLECTION

In certain situations, MSCI incorporates data from public sources in its indexes. For the MSCI Asia Annual Property Index, and the Japan, Hong Kong, Malaysia, South Korea and Singapore country indexes, data on some portfolios are collected from public sources, in order to increase the coverage in those markets. In these cases, MSCI applies the same quality control and inclusion criteria as it does for data provided by portfolio management firms.

2.3.4.2 ASIA – APPORTIONMENT OF REVENUE, EXPENSES, RECEIPTS AND EXPENDITURE

In the absence of property level disclosures on financial data in public sources, the data available at fund (portfolio) level are apportioned to derive amounts at property level. This is carried out for several portfolios in the MSCI Asia Annual Property Index, and the Hong Kong, Malaysia, South Korea and Singapore country indexes, again to increase the coverage in those markets. Apportionment is based on the capital value weights of the assets held at the end of the reporting (measurement) period. Apportionment is performed for income and expenses as well as capital expenditure and receipts, based on the most granular (segment) level disclosed in the applicable public source.

2.3.4.3 ASIA – ASYNCHRONOUS VALUATIONS

In the MSCI Japan Annual Property Index (Published Monthly) not all assets are valued at end of December. Underlying assets in each of the contributing portfolios are generally valued at bi-annual frequencies during different reporting month ends of a calendar year.

For the MSCI Asia data collection service, this practice is also prevalent albeit at varied valuation frequency of underlying assets.

While the actual valuations are carried out for partial dataset in a given month, the other assets among rest of the portfolios in the dataset are valued in other months. For periods when assets are not valued and when no financial information is available, these assets are not considered in the index calculations.

When a new appraised valuation becomes available for the asset, back interpolation is performed between the previous and current appraised capital values to provide a best estimate for the intervening period or periods.

2.3.4.4 KOREA – VALUATION DATA

For the computation of the MSCI Korea Annual Property Index, where valuations are not available from data providers, a third party professionally qualified valuer with international exposure and experience provides MSCI with valuations for the period under consideration. These valuations are not signed off by the asset owners or portfolio managers and could be based on automated property valuation models.

2.3.4.5 AUSTRALIA AND NEW ZEALAND – HELD-DOWN VALUATIONS

In the MSCI/Property Council of New Zealand Annual Property Index and The Property Council of Australia/MSCI Australia Annual Property Index, not all assets are valued by data providers during every quarterly submission period. In those periods when assets are not valued, the preceding valuations are held down (left unchanged) until a new appraised valuation is available for the asset.

In the data collection template, the client provides the capital expenditure and other capital flows for the asset, but the capital value field is left blank when the asset is not valued for the quarter.

In this scenario, the previous appraised capital value is used, adding any corresponding net capital expenditure to calculate the estimated capital value for the latest quarterly reporting period.

When a new appraised valuation becomes available for the asset, back interpolation is performed between the previous and current appraised capital values to provide a best estimate for the intervening period or periods.

2.3.4.6 JAPAN – TRUST FEES FOR INVESTMENT THROUGH TRUST BENEFICIARY INTEREST (TBI)

For investments made through a Trust Beneficiary Interest (TBI), the buyer of the Trust Beneficiary Certificate regularly pays "Trust fees" to the holder of the legal title to the property. In the case of non-availability of asset level data on trust fees in financial reports, the fees are derived as follows:

- If Trust fees are available at portfolio level, then these are apportioned across assets based on the net purchase price and the number of days the asset has been in the portfolio

- If Trust fees are not available, then these are assumed to be 0.045% of the net purchase price of each asset in the portfolio

2.3.4.7 JAPAN – PURCHASE COSTS

For properties purchased by listed funds (REITs), in the case of unavailability of purchase costs in financial reports, a rate of 4% is applied on all purchases. The gross purchase price is derived by adding transaction costs to the net purchase price.

2.3.4.8 JAPAN – APPORTIONMENT OF CAPITAL EXPENDITURE

In the absence of property level disclosures on capital expenditure of certain portfolios in financial data in public sources, the data available at fund (portfolio) level are apportioned to derive amounts at property level. This is carried out for the MSCI Japan Annual Property Index. Apportionment is based on the capital value weights of the assets existing at the end of the reporting (measurement) period.

2.3.5 MARKET SPECIFIC DATA PRACTICES – AMERICAS

Currently there are no market specific practices in the Americas for direct property data and indexes.

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3   Index Composition

3.1   STANDARD INDEXES

A Standard Index is the MSCI Private Real Estate Index for a country or region with the broadest market coverage, for a specific index methodology and for a specific reporting frequency. The Standard Index is also used for determining the materiality for announcing material index composition changes based on the Index Review section of the MSCI Real Estate – Index Policies and the Correction Policy.

In most Standard Indexes, the region refers to a single country or (for multinational indexes) a geographically distinct combination of several countries. For multinational indexes, the start date for including countries corresponds to the start date of the respective national market indexes. If multinational indexes comprise of countries that are included in the index but not separately reported (e.g., certain countries in the MSCI Asia Annual Property Index, MSCI Central and Eastern Europe Annual Property Index, MSCI Europe Quarterly Property Index and MSCI Global Quarterly Property Index) the threshold tests for announcing a material change to the index composition and Correction Policies do not apply at country level, but only at the multinational level (see the MSCI Real Estate - Index Policies for more information on this).

For certain multinational indexes there are exceptions to the Standard Index composition rules and procedures:

- The MSCI CEE Annual Property Index includes properties in Bulgaria, Romania and Slovakia for which MSCI does not currently produce a national level index, because the coverage in those markets is too low to produce individual Standard Indexes. These countries are also not included in MSCI's European and Global Annual Property Indexes.

- The MSCI Asia Annual Property Index includes properties from countries for which no national index is available (China, Indonesia, Thailand and Taiwan). MSCI considers the coverage of these markets too low to report the results as individual Standard Indexes, but they include sufficient relevant information to warrant inclusion in broad regional and market information.

- The MSCI Europe Annual Property Index and the MSCI Global Annual Property Index include the results for Finland, for which MSCI is not the index administrator but for which it receives the requisite granular (asset) information from KTI, an independent research organisation.

- The MSCI Global Annual Property Index does not include assets held in China, Hong Kong, Indonesia, Malaysia, Singapore, Thailand or Taiwan. These exclusions

relate to data collection procedures, market coverage levels and timeline issues for index release.

- For MSCI Europe and Global Quarterly Property Indexes, the details on index composition and market inclusion/exclusion are available in Appendix II.

- The MSCI/PREA U.S. ACOE Quarterly Property Index (Unfrozen) as well as the Property Council /MSCI Australia Core Wholesale Annual Property Index Published Quarterly are considered to be Standard Indexes to which all index policies apply, because of the earlier publication date although there are similar Standard Indexes within the same country, same index methodology, and same reporting frequency.

The reporting frequency of a Standard Index normally relates to its asset valuation frequency. Therefore, the minimum revaluation period for a monthly index is once a month, for a quarterly index is once a quarter, and so on. However, indexes may incorporate higher frequency valuation regimes than their own frequency. For example, a monthly valued property can be included in monthly, quarterly, biannual and annual indexes.

MSCI reviews the composition of composite indexes for potential new market inclusion on an annual basis. However, the question of the potential inclusion of any new market in a multinational Standard Index will become the subject of a public consultation with the real estate investment community.

3.1.1 ASSESSMENT OF THE VALUATION ACCURACY OF STANDARD INDEXES

Although real estate asset valuations often differ noticeably from the prices achieved in subsequent open market transactions, MSCI assumes that at the aggregate level, market valuations are unlikely to differ systematically from transacted prices.

Once a year, in all countries where this is feasible, MSCI monitors the average spread between valuations and transacted prices in order to assess the extent to which headline indexes reflect transaction price variations. MSCI's tests are designed to quantify, at the aggregate level, average spreads and any tendency for valuations to consistently under- or over-state market movements. To do this, MSCI reviews all properties that have been sold during the year and examines the difference between the transacted price and the preceding valuation, adjusted for estimated sector market value changes that have occurred between the valuation and transaction dates.

Properties valuations that were conducted less than three months before a transaction are not included in the analysis, as they may have been valued with knowledge of the agreed sale price, and could bias the conclusion. The results are included in the Valuation and Sale Price Comparison Reports which are available at msci.com.

3.1.2 ASSESSMENT OF THE REPRESENTATIVENESS OF STANDARD INDEXES

For each country level Standard Index, the REIC reviews its representativeness of the market it is designed to track. To do this, the aggregate value of all properties in the index is compared with independently published reports and assessments of the size of the relevant full professionally managed real estate investment market.

MSCI undertakes an annual market size survey to estimate the overall extent of each national property investment market where it publishes a national index for the Real Estate Market Size report. In this context, a national market is defined as the professionally managed investments held directly in portfolio structures. Lists of real estate investment portfolios are compiled by MSCI in each region and then processed by MSCI to identify the total unlevered direct real estate investments in each country, including those held in any new real estate portfolios that have been formed over the past year. This is done at an all assets but not at a sector level, as sector breakdown is not available for all identified portfolios.

Representativeness is reviewed on an annual basis to determine if an index is still representative of the underlying market. If there are questions about its representativeness, MSCI considers the possibility of terminating the index, the policy for which is outlined in the Index Termination Policy (included in the MSCI Real Estate - Index Policies).

However, for each derived index the results are made available only if the requirements for dominance and confidentiality (see section 4.6) are fulfilled.

3.1.3 CHANGES IN THE COMPOSITION OF INDEXES

Index composition changes may result from fund liquidations, as well as other changes to MSCI's access to fund data, including newly launched or existing portfolios providing their data to MSCI. The addition of new portfolios and the withdrawal/termination of existing portfolios are normal events in the administration of the MSCI Property Indexes. In accordance with the Index Review section of the MSCI Real Estate – Index Policies, where the resulting index composition change is deemed material, as defined in the MSCI Real Estate – Index Policies, MSCI will publish an index

announcement on the MSCI website detailing the change (for more information on these index composition rules, see the MSCI Real Estate - Index Policies).

The historical data provided by any data providers withdrawing from the index will be retained and continue to be used in index calculations. For an index with unfrozen history, new property data, that has met MSCI's quality standard, will be included in the index historically. For an index with frozen history, new data will only be included going forward.

All index compositions are checked for Asset and Fund Confidentiality Rules and Fund Dominance Rules defined below.

Any index may be discontinued or suspended, without notice, if fewer than the required minimum number of properties or portfolios are eligible and available for inclusion, or if a one portfolio dominates the composition, when applying a given methodology to a market. MSCI may resume calculation of such indexes if over time enough properties/portfolios become eligible and available.

Indexes may be discontinued based on the Index Termination Policy, either if fewer than the required minimum number of properties/portfolios are eligible and available for inclusion when applying a given methodology to a market, or due to portfolio dominance.

The index fact sheets on the MSCI website contain a statement of transparency setting out the profile for each index, detailing the number and total value of constituent funds in each market sector.

3.2 DIRECT REAL ESTATE RETURN COMPUTATION METHODS

Direct real estate performance measurement may be carried out at property, portfolio or market level, or for any other grouping of properties.

3.2.1 ALL ASSETS (MARKET INFORMATION PRODUCTS)

The returns on All Assets (also known as all direct property assets) include all direct investment properties within the portfolio, including those bought, sold and under development or major refurbishment during the measurement period, as well as owner occupied properties. These returns exclude assets held indirectly through investment funds and the impact of debt, fund management fees, corporate taxation and cash. Indexes of All Assets are designed to reflect investor returns including profits/losses from active management and the particular risks and costs associated with investment in a real asset.

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3.2.2 ALL ASSETS (ANALYTICS PRODUCTS)

The All Asset filter in MSCI's analytics products may deviate from the All Asset definition used for market information products due to custom-defined inclusion or exclusion requirements. In some custom-defined indexes designed to reflect specific management mandates, "non-physical" assets and liabilities (for example cash, debt, equity or other indirect real estate investments) may be included, and certain "physical" assets (for example owner occupied buildings or development projects) may be excluded.

3.2.3 STANDING INVESTMENTS

Standing Investment measures are intended to reflect underlying market trends over the period of analysis. The returns on Standing Investments are based solely on directly owned Standing Investments in completed and lettable properties and exclude any full or part transaction activity. Some specific types of property investments or circumstances are excluded for all relevant periods. These are:

- properties occupied by their owners

- short leasehold investments (mostly found in the U.K. and Ireland, and defined as those assets owned on a leasehold interest with less than 30 years to expiry)

- freehold ground rent investments (also mostly found in the U.K. and Ireland, and defined as assets for which the projected income stream in 9 years' time remains less than 20% of the current market rental value)

- properties with held-down valuations (mostly found in Australia and New Zealand where non-synchronized valuation regimes are common)

- properties under development

- real estate investments held indirectly through investment funds and all other financial overlays upon direct property investments, including the impact of debt, fund management fees, corporate taxation and cash

In addition, an asset's inclusion in a Standing Investment index in part depends upon the valuation frequency of the assets and their frequency of data provision. An asset is deemed to be a Standing Investment if it has no transaction or development activity throughout the period between two valuations, and is not under development at the time of either of those valuations.

In scenarios where there are (part) transaction or development activities recorded during valuation intervals, the assets will be excluded from the standing investment

sample for the corresponding valuation intervals and be re-included in the remaining part(s) of the full measurement period. For example, a quarterly valued asset may contribute to three, six, nine, or 12 months of an annual standing investment return, depending upon the number of quarters the asset is held as a standing investment.

3.2.4 NON-OPERATING INVESTMENTS

Non-operating Investments are those bought, sold or under development or major refurbishment during the measurement period. They effectively incorporate any direct property investment not included in the standing investment index for the period, including owner occupied, ground rent and short leasehold investments and held-down valuations. MSCI does not compute indexes specifically for Non-Operating Investments, though they are included in other broader categories.

3.2.5 SAME STORE

The Same Store sample is a subset of 'All Assets' that have been held in a portfolio over a full primary measurement period – the shortest unit of time (a quarter, half year, year) over which market or portfolio performance is being assessed. It applies a different set of exclusion rules from Standing Investments. This filter is particularly relevant for operating measures such as income and rental value growth. To qualify for inclusion in the Same Store sample, the asset must not, for the full duration of the primary measurement period, have been subject to:

- any development activity

- any part transaction activity

- owner occupation

- a short leasehold investment (mostly found in the U.K. and Ireland)

- a freehold ground rent investment (mostly found in the U.K. and Ireland)

- held-down valuations (mostly found in Australia and New Zealand)

Same store filters ensure a consistent sample of assets across a primary measurement period, based on the asset management status of the property. All assets in any Same Store sample will have been present in the portfolio at both the start and the end of the primary measurement period, and have not undergone any (re-)development or had any part transactions. If the primary measurement period is a calendar year, for a multi-year analysis the same store sample criteria are reset and checked for each 12-month period.

Key differences between Same Store and Standing Investment samples:

- Qualifying time periods for standing investment measures are based on the valuation frequencies of the properties, while same store samples are based on the asset or portfolio's primary measurement period. Therefore, based on an annual primary measurement period, a quarterly-valued asset may qualify as a Standing Investment for some quarters and a development for the rest of the year, but would not qualify at all for the Same Store sample for that year.

- A Same Store sample of properties is only defined by activity during the primary measurement period, not its status at the end of the previous period. Properties under development at the immediately preceding valuation date are not treated as Standing Investments for the subsequent measurement interval, even if there is no development activity in that period. However, properties with no development activity will qualify as Same Store, whatever the status at the end of the previous period. For example, an annually valued asset under development at December 2014 but with no development activity or part transactions during 2015, will qualify for the 12-month Same Store sample for 2015, but not the Standing Investment sample.

3.2.6   ACTIVE MANAGEMENT SEGMENTATION

In addition to the groupings for All Assets, Standing Investments, Non-operating Investments and Same Store, an additional summary active management segmentation is used. In this segmentation, each asset can only be attributed to one category for the duration of a measurement period. There are five possible categories: purchased, held stabilized, held non stabilized, held and sold. These are not always mutually exclusive – if an asset cannot be precisely classified as stabilized or non-stabilized, then the broader **held** category is used.

The asset will be classed as **purchased** for any period that includes the purchase month and as **sold** for any period that includes the sale month. In cases where both a purchase and sale occur in the same reporting period, it will be classified as **sold**.

For periods that do not include a transaction month, the properties are classified as held stabilized or held non-stabilized, based on their predominant occupancy levels. Where the asset is more than 75% let for more than half the reporting period, it is classified as **held stabilized**. If the asset is less than 75% let for half or more of the reporting period, it is classified as **held non-stabilized**. The assessment of occupancy levels is based on the floor space vacancy rate. If either the let floor space or total floor space have not been supplied and MSCI is unable to compute the vacancy rate, the

predominant level of occupancy cannot be used to determine whether the asset is stabilized or non-stabilized, and it will simply be classified as held.

Hotel properties will always be classified as held stabilized for periods when no transaction occurs. Hotel properties under development for at least half the period will be classified as **held non-stabilized**; development status will take precedence over any occupancy levels that are computed during the development period.

The period over which the predominant occupancy levels are calculated is the asset's lifespan within the reporting period. This means that properties with an artificial start or end date[4] may contribute to the measurement period for the held category, even though they do not have records covering the whole period. Thus, an asset artificially ending in May 2016 would contribute five months to the held non-stabilized category for the 12 months to December 2016, if it were less than 75% let for three or more months between January and May 2016 inclusive. This contrasts with an asset with records covering the whole reporting period, which must be less than 75% let for six or more months to contribute to the held non-stabilized segment for the 12 months to December 2016.

3.3   SECTOR INDEXES

Property types are a critical element in real estate investment segmentation. Property types are used to define groups of properties that share common attributes relating to their use but exclude other features that are used to create property segmentations, including location, size, tenure, age, lease terms and occupancy.

MSCI defines six sectors globally: retail (shopping centers, unit shops, supermarkets, retail warehouses, etc.), offices, industrial (warehouses, industrial, self-storage, data centers, etc.), residential (single and multi–family), hotels and other (including education, leisure, land, healthcare, garage/parking, mixed–use properties, service stations, etc.).

Sector results will not be made available if they do not meet requirements for dominance and confidentiality (see Section 4.6). Such properties will not be included in the sector "other" but will only be included in the all property results. For frozen indexes (see Section 4.8) the originally determined property type classification will be

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[4] An artificial sale or purchase of an asset may occur due to the merging or division of properties within an existing portfolio. This may also occur due to an asset that has existed historically in a portfolio not having records before a certain date.

retained historically, but for unfrozen indexes the property type and corresponding sector reporting will be changed historically.

3.3.1 DETAILED PROPERTY TYPE

MSCI's sector level classification can be refined to reflect more detail on the specific attributes of the broader property type. This is done at three levels, with sectors partitioned into broad property types that are further divided into more detailed property types, as follows:

Sector	Property type	Detailed property type
Retail	Shopping Centers	Super-Regional, Major Regional, Regional, Small Regional
		District/Community, Local/Neighbourhood, Local Convenience Center
		Lifestyle Center, Theme/Festival Center, Outlet Center, Power Center
		Other Shopping Centers
	Retail Warehouse/ Big Box Retail	Retail Warehouse Solus Units, Retail Warehouse Park, Other Retail Warehouses
	Standard Retails / Other Retail	Unit Shop, Showroom, Gallery, Kiosk, Bank, Post Office, Bars & Pubs, Restaurant, Supermarket, Hypermarket, Variety Store, Department Store, Arcade, Other Retail
Office		Free Standing Office, Office Terrace, Office Park (Whole Or Single Unit), High Rise Office, Low Rise Office, Medical Offices, Other Offices
Industrial	Warehouse/ Distribution	Warehouse, Distribution Center, Refrigerated Distribution, Industrial Outdoor Storage
	Manufacturing/ Production	Light Manufacturing, Heavy Manufacturing
	Other Industrial	Workshops, R&D Flex, Warehouse Showroom, Data/Switch Center, Truck

Sector	Property type	Detailed property type
		Terminal, Personal Storage/Self Storage, Industrial Park, Other Industrial
Hotel		Luxury, Upper Upscale, Upscale, Upper Midscale, Midscale, Economy, Other Hotels
Residential	Apartments, Houses Other Residential	Houses, Bungalow, High Rise Apartments/Flats, Low Rise Apartments/Flats, Other Housing With Shared Facilities, Student Housing, Other Residential
Other	Leisure	Cinema, Theatre, Holiday Resort, Health/Sports Center, Leisure Parks, Marinas, Other Leisure
	Education	Pre-School, Schools, Tertiary Education, Other Education
	Healthcare	Hospitals, GP Surgery, Dentist Surgeries, Medical Centers, Specialist Treatment, Physical & Learning Disability Homes, Mental Health Hospital, Nursing Homes, Care Homes, Ambulance Station, Other Healthcare
	Land	Farmland, Forestry, Development Land & Sites, Other Land
	Other – Other	Garage, Parking, Parking Box, Service Station, Community Hall, Places of Worship, Other – Other - Other

3.4   GEOGRAPHICAL INDEXES

Real estate performance can vary significantly based on geographic boundaries. Because sub-national geography is administered differently in every country, it poses challenges for establishing global standards of comparability. To address this, MSCI outlines and defines up to 10 levels of standard regionalization below the global level, six of which function within national boundaries. In practice, the number of levels available in any given country depends on the physical scale of the national territory,

the concentration of investment properties within the country's boundaries and the complexity of sub-national administrative layers.

MSCI includes a metropolitan area as an alternative to the domestic region in the hierarchy. The metropolitan area is not typically an administrative level of government and may cross the administrative boundaries of the domestic region and state/province levels described below.

For assigning properties to each of the levels, MSCI matches, to the extent possible, each asset's physical address (as reported by the data provider) against recognized external sources of national and subnational definitions. These sources include, among others, the International Standards Organization (ISO); the Organization for Economic Cooperation and Development (OECD); Eurostat; national statistical agencies; and national postal services.

3.4.1 ADMINISTRATIVE HIERARCHY

The table below shows each level of the administrative hierarchy with a general description of the level and examples of how each level is applied in practice. The administrative hierarchy may differ both in structure and in naming conventions from market to market.

Overview of the Administrative Geographic Hierarchy

Name	Description	Examples:
Global Region	The Global Region is typically continental or pan-continental	Europe, Africa, Asia-Pacific, Americas
Global Sub Region	The Global Sub Region is a smaller grouping of national markets within a Global Region	Southern Europe and Northeast Asia
Country	Country definitions equate directly to the geographic boundaries of MSCI's national indexes	Canada, Germany, Australia, South Africa
Domestic Region	In larger countries, a Domestic Region is typically defined as a grouping of constituents from the highest subnational layer of government administration. In most countries, this means a	In Europe NUTS1 level[1]

Name	Description	Examples:
	group of provinces, states, or prefectures.	
Domestic Division	The Domestic Division is only applicable in the U.S. where Domestic Regions are further disaggregated, while still using the same underlying constituents as the Domestic Region Level.	For example, the U.S. Mountain States and Pacific States are two groupings that together form the larger Domestic Region defined as the U.S. West at the Domestic Region Level.
State/ Province	The State/Province Level is typically the highest level of subnational government administration	For example, this level can be a state, as in Australia or the U.S.; a province, as in Canada or China; or a prefecture, as in Japan. In Europe, this level is typically defined as NUTS2.
Sub State/ Sub Province	The Sub State/Sub Province tier is typically the second level of government administration below the Country level.	In the U.S., for example, this would be a county; in Europe, the equivalent is the NUTS3 level.
Town/City/ Municipality	The Town/City/Municipality level is typically a form of municipal administration, though definitions vary from country to country. In some countries, it is the closest equivalent definition available to a town, city, or municipal government.	In the U.S., this level is equivalent to what the national statistical agency defines as the "Place" level. In most of Europe, it is the LAU1 or LAU2 level.[1]
Postcode/ Neighborhood	The Postcode/Neighborhood is intended to be a level of administration below the	In a few countries, a sub municipal neighborhood definition has been used

Name	Description	Examples:
	Municipal level. In most countries, this level is a postal delivery area with distinct boundaries that can closely, if not perfectly, nest within higher levels of geography.	instead of a postcode. Reasons for substitution may include: lack of any national postcode administration (as in Hong Kong); lack of a formal postal mapping with statistical geography (as in South Africa); or the existence of a widely recognized and applicable system of sub-municipal boundaries (as in Japan's ward, or "ku" system).

[1] *Eurostat uses various widely recognized acronyms for its geographic standards, including NUTS (Nomenclature of Territorial Units for Statistics) and LAU (Local Administrative Unit).*

3.4.2   METROPOLITAN HIERARCHY

The metropolitan area differs from other subnational definitions in that it is not typically an administrative level of government, nor is there any existing or widely used global standard for setting metropolitan boundaries. Nevertheless, the metropolitan level is a crucial unit of comparability that is vital to the understanding of real estate performance. For its metropolitan hierarchy, MSCI leans heavily on national and pan-national statistical agencies to determine metropolitan boundaries. In some countries the metropolitan area will cross administrative boundaries of the domestic region and state/province levels.

In Europe, metropolitan definitions are sourced from Eurostat based on groupings of sub-state/sub-province levels.

In the U.S., the official definitions of metropolitan areas are set by the Office of Management and Budget (OMB) and are based on groupings of counties. In many countries, no authoritative rules exist for defining metropolitan boundaries. Where this is the case, MSCI has used reasonable endeavors to align metropolitan boundary assumptions with well-regarded approaches used in other countries such as the Core-Based Statistical Area (U.S.), the Functional Urban Region (Europe), the Census

Metropolitan Area (Canada), the Major Metropolitan Area (Japan), and the Greater Capital City Statistical Area (Australia).

Example of Administrative and Metropolitan Hierarchy in Germany
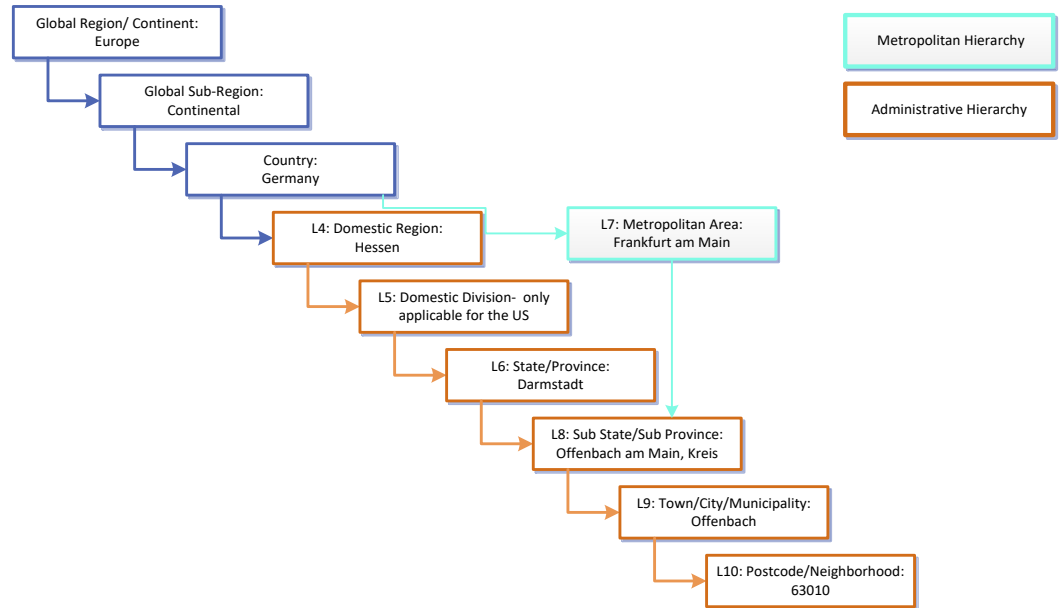
In developing standards of geographic comparability, MSCI makes reasonable assumptions to compensate for limitations, exceptions and inconsistencies in available sources. Examples of such situations are provided below.

- The full 10 levels of geography cannot be provided in all countries. The *number* of levels in each country and the *level* to which the available layers are assigned in the MSCI hierarchy depend on (1) how sub-national territories are administered within each country and (2) how national statistical agencies classify and segment sub-national areas.

- In some cases, the geographic segmentations used by postal agencies do not align with administrative or statistical boundaries. In other cases, postal delivery areas, statistical areas and administrative areas do not always share the same names, even when these areas overlap.

- Geographic boundaries are never static. Postcodes are added and retired. Metropolitan areas grow and extend their zones of influence. Municipalities and

counties merge. New provinces are carved out of existing ones. Cities deemed to be significant have their administrative status reclassified. MSCI recognizes that geographic definitions are fluid, and that a global standard requires ongoing maintenance to remain valid.

3.4.3   UK REGIONS

Within this globally consistent geographical hierarchy, a more bespoke local geographical breakdown may be required for some real estate investment market analyses. One example is the U.K., where MSCI uses its own definitions, developed over many years in collaboration with industry bodies, and based on Royal Mail postcodes for the key London sub-markets – City, Mid-Town, West End and Inner London. This local segmentation sits within a broader national region structure based on the adminstrative hierarchy. The following table shows this more detailed breakdown of the relevant regions and sub-regions.

Region	Definition
City[1,2]	The area roughly bounded by Clerkenwell Road / Old Street, City Road, Spitalfields, Whitechapel, Aldgate East, the Tower of London, the River Thames and Farringdon Road.
	Postcodes: E1 6, E1 7, E1 8, EC1A, EC1M, EC1R, EC1V, EC1Y, EC2A, EC2M, EC2N, EC2R, EC2V, EC2Y, EC3A, EC3M, EC3N , EC3R, EC3V, EC4M, EC4N, EC4R, EC4V.
MidTown[1,2]	The area bounded by Albany Street, Kings Cross Road, Pentonville Road, Farringdon Street, Farringdon Road, Clerkenwell Road, Charing Cross Road, Haymarket, Northumberland Avenue and the River Thames.
	Postcodes: EC1N, EC4A, EC4Y, WC1A, WC1B, WC1E, WC1H, WC1N, WC1R, WC1V, WC1X, WC2A, WC2B, WC2E, WC2H, WC2N, WC2R.
West End[1,2]	The area bounded by Earls Court Road, Kensington Church Street, Edgware Road, Bayswater Road, Northumberland Avenue, Haymarket, Charing Cross Road, Tottenham Court Road, Marylebone Road, Park

Region	Definition
	Lane, Kensington Gardens, Gloucester Road, Beaufort Street and the River Thames.
	Postcodes: NW1 2, NW1 3, NW1 5, NW1 6, SW1A, SW1E, SW1H, SW1P, SW1V, SW1W, SW1X, SW1Y, SW3, SW7, W1B, W1C, W1D, W1F, W1G, W1H, W1J, W1K, W1S, W1T, W1U, W1W, W2 1, W2 2, W8 4, W8 5.
Inner London [2]	This area includes the following postcodes: W11, W6, W14, SW5, SW6, SW10, SW11 and SW8. It also includes part of NW1, NW8, W2, W8, SE11, SE1, E1, EC1, N1, EC2 and E14 (Isle of Dogs, South of East India Dock Road).
Outer London [2]	The remainder of London within the old London Boroughs, excluding the City, West End, Mid-Town and Inner London.
South East [2]	Buckinghamshire, Berkshire, East Sussex, Hampshire, Isle of Wight, Kent, Oxfordshire, Surrey and West Sussex.
South West	Avon, Cornwall, Devon, Dorset, Gloucestershire, Somerset and Wiltshire.
Eastern [2]	Hertfordshire, Bedfordshire, Essex, Cambridgeshire, Norfolk and Suffolk.
East Midlands	Derbyshire, Leicestershire, Lincolnshire, Northamptonshire, Nottinghamshire and Rutland.
West Midlands	West Midlands, Herefordshire and Worcestershire, Shropshire, Staffordshire and Warwickshire.
Yorkshire and the Humber	North, South and West Yorkshire, and Humberside.
North West	Greater Manchester, Merseyside, Cheshire, Cumbria and Lancashire
North East	Tyne and Wear, Durham, Cleveland and Northumberland
Scotland	

Region	Definition
Wales	
Northern Ireland	
Offshore UK	Channel Isles and Isle of Man

[1] Central London comprises the regions: City, Mid Town and West End.

[2] South Eastern comprises Central London, Inner London, Outer London, South East and Eastern.

3.5 PEER GROUP INDEXES (PORTFOLIO LEVEL SCREENS)

These are indexes produced to include or exclude a group of portfolios, rather than individual properties, which share same or similar characteristics or investment objectives. These portfolio level indexes are produced by the application of filters – at the portfolio level – which may include (but not limited to) the following:

- Peer group filters
  Peer group filters are based on characteristics of the portfolio rather than the underlying properties and may be linked to the type of investor, the structure of the fund, its investment strategy or mandate, and its overall size.

- Portfolio size bands
  Some peer group indexes are published based on portfolio value bands, such as "pension funds less than 250 mn"

- Sector diversification
  Property type filters are usually employed at the portfolio level to match a specialist or diversified investment mandate. The most frequently referenced attribute is property sector, as defined in Section 3.4 above. This is usually based either on the type of properties held within the portfolio or the target sector allocation. Examples of this type of index include "balanced funds in the UK Property Index"

- Exclusion filters
  Indexes defined by clients that exclude specific portfolios fall into this category. Such screening is commonly used when clients need to exclude their own (fund, portfolio or house) contribution to an index for the purposes of relative measurement.

Peer Group Indexes may be a combination of various categories. However, such indexes require a large enough sample of portfolios to produce a meaningful index.

3.6 VALUE BAND FILTER INDEXES

3.6.1 RECALIBRATED VALUE BAND FILTERS

Indexes based on recalibrated value band filters are normally required when the property value is one of the mandate and/or index defining criteria, e.g., shopping centers >£20m at period end. As property values change over time, an index of shopping centers with a value over £20m in 1999 (for example) is likely to be very different from one based on the same threshold in 2017.

Therefore, a new value threshold has to be set for each month of the full measurement/ comparison period to ensure the same scale of property will be included over time. The threshold values are usually indexed back (and forward if necessary) from the criteria date of the index, using the MSCI Standing Investment capital growth series for the type of asset concerned.

This methodology means that a property may contribute to the index from one month to the whole history of the index, depending on whether its value has moved in line with the market average. Some indexes are recalibrated so that the value threshold is always indexed back from the latest key date (e.g., calendar year end). The historic results in any such index will change at each recalibration.

Alternatively, recalibration can be performed so that the date of the original threshold specification remains fixed. With this approach, the threshold is indexed forward at each new reporting date, reducing the degree of historical restatement.

3.6.2 FIXED VALUE BAND FILTERS

Index based on fixed value band filters are based on filters for which a value band is maintained over time (static). This type of value band filters is mainly being used when the value band is not time sensitive and will not change without any (re)development or part transaction activity. Fixed value bands are for instance based on the year of construction or the floor space of a property (e.g. offices with a floor space between 5,000 and 20,000 square meters or properties having a construction year in the period 1990 to 1999).

3.7   GREEN PROPERTY INDEXES

Green property indexes are based on properties that have a green building certificate. The method of awarding green certificates varies by country and occasionally within countries. All green certificates are provided by clients based on the certifications they have received or else are taken from public sources. Green indexes are not based on actual energy use.

3.8   SPLICED INDEXES

In this procedure, two or more peer group (or other) indexes are linked historically to produce one longer term index. This process may be used when clients wish to change their benchmarking criteria (say because the fund has grown or declined in value more than originally anticipated) but require the index history to remain unchanged. It may also be relevant when the investment mandate has changed in terms of target allocations to property type or geography.

However, this approach has the drawback of only being able to produce long term rankings among portfolios that were in both of the spliced indexes over all the measurement years. Such long term rankings may therefore be based on substantially smaller samples than those available for individual years.

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4 Index Calculation Methodology

MSCI calculates index returns on a monthly basis, irrespective of their reporting frequency.

4.1 DATA PREPARATION FOR INDEX CALCULATION

4.1.1 DATA TREATMENT FOR ASSETS WITH SHARED OWNERSHIP

MSCI calculates index returns based on data collected at shared ownership based on contract share[5]. The data treatment based on shared ownership ensures accurate reflection of the ownership of assets in the dataset and only to the extent of what is provided to MSCI by the data provider based on their respective investment exposure. Assets with shared ownership, if reported at full share (100%) would result in over-weighting of shared assets in index and impact the representativeness of the index.

4.1.2 INTERPOLATION TREATMENT OF VALUATIONS

MSCI calculates estimated capital and rental values for the intervening months for assets that are not valued every month. This interpolation process spreads capital and rental value changes across the period between two genuine data points.

A globally consistent approach to interpolation is applied with the aim of using the best available market evidence of capital growth throughout the year. Values will be linearly interpolated for all quarterly indexes. Annual indexes in markets where a quarterly index is published use the quarterly returns to shape the interpolation. In these markets, the one exception to using shaped interpolation is for those assets in multinational funds with data that is not provided domestically. Unless quarterly valuations are available, these assets will be subject to linear interpolation. All other annual indexes will adopt linear interpolation.

In all cases, capital value interpolation is adjusted for reported intervening capital expenditure, capital receipt and part transactions.

4.1.3 APPORTIONMENT OF CAPITAL AND REVENUE FLOWS

Capital expenditure, which is deducted from the change in capital value when calculating total return and capital growth measures, is apportioned equally across

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[5] The contract share represents the fund's share of the investment at acquisition. This share typically will not change unless there is a significant capital event during the period such as a Joint Venture buyout or partial sale.

measurement periods if only available in aggregate for a longer period. This procedure is also applied to other capital flows, revenues and non-recoverable revenue expenditures that are not provided on a monthly basis. For properties bought or sold over the period, any capital expenditures are divided equally over the months concerned, excluding the month when the transaction took place; for these properties, revenue expenditures are divided equally over the months, with a half-month allocation made to the purchase or sale month.

4.2   TOTAL RETURN

As the most widely recognized "bottom line" figure, total (investment) return is the most important measure of overall investment performance used to compare different assets across time periods. It incorporates both capital and income elements, and is calculated as the percentage value change plus net income accrual, relative to the capital employed. It is recognized by GIPS (the Global Investment Performance Standard set out by the Chartered Financial Analyst Institute) as the standard composite measure of investment performance.

For index composites with market size reweighting, (refer to section 4.9 in the MSCI Property Index Methodology document) the data fields used in the calculation of Total Return measure is market size reweighted.

With respect to a single month, total return is defined as:

$$TR_t = \left(\frac{CV_t - CV_{t-1} - CExp_t + CRpt_t + NI_t}{CV_{t-1} + CExp_t} \right) * 100$$

Where:

TR_t is the total return in month t;

CV_t is the capital value at the end of month t;

$CExp_t$ is the total capital expenditure (includes purchases and developments) in month t;

$CRpt_t$ is the total capital receipts (includes sales) in month t;

NI_t is the rent receivable during month t, net of property management costs, ground rent and other irrecoverable expenditure, except for the MSCI UK Monthly Property Index, where other irrecoverable expenditure is not included in index calculation.

4.2.1 TOTAL RETURN INDEX VALUES

Starting from a base value of 100, each successive index value is calculated by multiplying the preceding index value by (1+monthly return):

$$\text{Index}_{t=0} = 100$$
$$\text{Index}_t = \text{Index}_{t-1} \times \left[1 + \frac{\text{TR}_t}{100} \right]$$

Where:

TR_t is the total return for the period t-1 to t, expressed as a ratio

4.2.2 MULTI-PERIOD TIME-WEIGHTED TOTAL RETURN

The basis for calculating all annual and quarterly performance measures is time-weighted. Annual measures are calculated by compounding 12-monthly figures and annual figures are shown only when 12 months' figures are available. These measures give an equal weight to each month. To calculate quarterly and annual returns it is necessary first to construct an index from monthly values.

The 12-month return, for example, is calculated as the percentage change in the index (Xt) over the relevant 12 months.

$$12 \text{ Month Total Return} = \left[\frac{\text{Index}_t}{\text{Index}_{t-12}} - 1 \right] \times 100$$

4.2.3 ANNUALIZED RATE

The annualized rate is the geometric mean of the individual annual rates of change for a series of years. It is calculated as the nth root of the final indexed score converted back into a percentage:

$$\text{Annualized Rate} = \left[\left(\frac{\text{Index}_t}{\text{Index}_{t=0}} \right)^{1/n} - 1 \right] \times 100$$

Where:

n is the number of years
Index_t is the final indexed score.
$\text{Index}_{t=0}$ is the initial indexed score.

4.3   CAPITAL GROWTH

Capital growth, also known as indirect return or appreciation, measures the change in asset capital value over a period of time, net of any capital expenditure and receipts over the period, relative to the capital employed. This measure of the "growth" component of performance is based on the change in value for properties held at the start and end of an analysis period based on valuations. However, for MSCI Property Indexes, where a transaction has occurred and is applicable, the achieved price for bought or sold assets, rather than a valuation, will be used for index calculation.

For index composites with market size reweighting, (refer to section 4.9 in the MSCI Property Index Methodology document) the data fields used in the calculation of Capital Growth measure is market size reweighted.

With respect to a single month, capital growth is defined as:

$$CG_t = \frac{(CV_t - CV_{t-1} - CExp_t + CRpt_t)}{(CV_{t-1} + CExp_t)} * 100$$

Where:
CG_t is the capital growth in month t;
CV_t is the capital value at the end of month t;
$CExp_t$ is the total capital expenditure (includes purchases and developments) in month t;
$CRpt_t$ is the total capital receipts (includes sales) in month t.
Monthly figures are compounded, as described for total return, over 12 months to give an annual rate.

4.4   INCOME RETURN

Income return or direct return measures the net income receivable in relation to the capital employed over a period. This measure is calculated net of all irrecoverable costs incurred by the investor – which will depend upon the terms of the tenant lease contracts in place.

For index composites with market size reweighting, (refer to section 4.9 in the MSCI Property Index Methodology document) the data fields used in the calculation of Income Return measure is market size reweighted.

With respect to a single month, income return is defined as:

$$IR_t = \frac{NI_t}{CV_{t-1} + CExp_t} * 100$$

Where:
IR_t is the income return in month t;
CV_t is the capital value at the end of month t;

$CExp_t$ is the total capital expenditure (includes purchases and developments) in month t;
NI_t is the rent receivable during month t, net of property management costs, ground rent and other irrecoverable expenses, except for the MSCI UK Monthly Property Index where other irrecoverable expenses is not included in index calculation.
Monthly figures are compounded over 12 months to give an annual rate.

4.5 SEPARATION OF INCOME AND CAPITAL COMPONENTS

The components of total return are calculated separately using chain-linked time-weighted rates of return. Multi-period capital growth and income return do not sum perfectly to total return, due to the cross product that occurs when capital and income returns are combined within compounded total returns.

4.6 RULES FOR PERFORMANCE REPORTING

4.6.1 ASSET AND PORTFOLIO CONFIDENTIALITY RULES

In order to protect the confidentiality of both the asset and fund level data provided, MSCI applies strict confidentiality rules, which set the minimum number of constituents necessary to permit the reporting of a sample dataset. In any aggregate, the minimum acceptable number of portfolios and assets are three and five respectively.

4.6.2 PORTFOLIO DOMINANCE RULES

In order to avoid the possibility of the weight of one portfolio dominating the representativeness of an index, MSCI employs investor dominance rules and guidelines when determining the composition of an index.

When calculating an index, the maximum weight for any single contributing portfolio is calculated based on capital value. When the weight of a contributor in any index series exceeds 75% of index capital value, the results will not be made available.

4.7 RANKING / DISTRIBUTIONS OF RETURNS

A percentile measure indicates the value below which a given percentage of a group of observations fall. For example, the 20th percentile is the value (or score) below which 20 percent of the observations may be found. The term percentile and the related percentile rank are often used to report scores describing performance levels, and are therefore very popular in summarizing a portfolio's return position within a peer group. For example, if a score is on the 86th percentile, it is higher than 86% of the other scores. In MSCI property return reporting, the minimum sample required for showing

percentile distributions at asset level is at least 5 assets While it is three at the portfolio level.

The 25th percentile is also known as the first quartile (Q1), the 50th percentile as the median or second quartile (Q2), and the 75th percentile as the third quartile (Q3). In general, percentiles and quartiles are specific types of quantiles.

In computing the weighted average of a compounded measure over longer than one month, a different sample of funds may be included as the period lengthens. When calculating percentiles, only those portfolios or assets that have contributed in every period are included. Therefore, the ranked sample may be smaller than the weighted aggregate results sample.

4.8   FROZEN HISTORY REPORTING

In most cases, the MSCI Property Indexes are subject to historical restatement when new data becomes available or corrections are made, in order to maximize the robustness and accuracy of the reported historical results. However, when the sample size for a market is large and the impact of including additional data contributors is therefore relatively small, value may be gained from freezing historical results. A key advantage of frozen (fixed) histories is that they provide a much more robust base for manager remuneration. The decision to freeze an index is however made only after consultation with local market participants.

The Frozen Standard Property Indexes currently are:
- MSCI UK Annual Property Index (frozen as of March 2017)
- MSCI UK Quarterly Property Index (frozen as of August 2016)
- MSCI UK Monthly Property Index (frozen as of July 2016)
- MSCI France Annual Property Index (frozen as of October 2016)
- MSCI Netherlands Annual Property Index (frozen as of September 2016)
- MSCI UK March September Biannual Property Index (frozen as of March 2021)
- The Property Council of Australia/MSCI Australia Core Wholesale Annual Property Index Published Quarterly (frozen as of December 2022)

In general, the composite property indexes are constructed by aggregating the underlying unfrozen country indexes (even for those Frozen Standard Property Indexes).

MSCI reviews each unfrozen national market index regularly to decide whether these indexes potentially should also be frozen. However, the question of the potential freezing of any MSCI index will become the subject of a public consultation with local market participants.

A decision to freeze an index history is based on the likelihood of future revisions to historical data. This in turn will depend upon:

- Market coverage level: The higher the ratio of MSCI market coverage to the estimated overall size of the total real estate investment market, the greater the likelihood that historical market results will remain broadly unchanged through the addition of new portfolios to the index. This issue is addressed in MSCI's Real Estate Market Size – Index Perspective report (see below).

- Review of historical restatement: Comparing the difference between published results and results including any newly provided data gives an indication of the consistency of historical results.

- Trends in valuation frequency: Changing portfolio valuation frequencies will affect the number of portfolios available to contribute to a particular index.

- Trends in numbers of portfolios joining the index and their perceived likelihood of supplying historical data.

If a decision is taken to freeze an index, that decision will be announced to the public before implementation as per the Methodology and Index Consultation Policy.

4.9   INDEX COMPOSITES: MARKET SIZE REWEIGHTING

The MSCI multinational composite Property Indexes aggregate the performance of a set of countries, requiring the results from each country to be re-weighted in a consistent way. The multinational composite annual property indexes are constructed by aggregating the underlying unfrozen country indexes. The MSCI Europe Quarterly Property Index and the MSCI Global Quarterly Property Index are constructed based on quarterly valued assets that meet the data provision / quality requirements and timelines for the publication of standard property indexes. Considering the different time-table for publishing these quarterly composite indexes, there may be assets that qualify for inclusion in these indexes that may not contribute to a standard quarterly property index. MSCI is unable to achieve 100% market coverage due to the voluntary nature of data provision in all private markets. This means that the level of coverage inevitably varies from country to country, and so the results from each country must be re-weighted to reflect their underlying market sizes as accurately as possible.

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MSCI undertakes an annual market size survey to estimate the overall extent of each national property investment market for which it publishes a national index and publishes the results in the Real Estate Market Size report. In this context, a national market is confined to professionally managed investments held in portfolio structures. Lists of real estate investment portfolios are compiled by MSCI in each region and then processed by MSCI to identify the total unlevered direct real estate holdings in each country, including those held within any new real estate portfolios that have been formed over the past year.

The results of this analysis, expressed in terms of year-end capital values, are used for weighting individual markets in composite indexes (except for the MSCI Central and Eastern Europe Annual Property Index). The Market Size reweighted indexes published by MSCI are below:

- MSCI Global Annual Property Index

- MSCI Europe Annual Property Index

- MSCI Europe Hotel Annual Property Index

- MSCI Nordic Annual Property Index

- MSCI Iberia Annual Property Index

- MSCI Asia Annual Property Index

- MSCI Global Quarterly Property Index

- MSCI Europe Quarterly Property Index

Refer to Appendix II for details on the segmentation and start dates for the above indexes and their underlying constituents.

Since 2016, the monthly weights have been calculated from estimates of the investment capital employed in each included market. To adjust capital value estimates and estimated capital employed, MSCI assumes the same level of activity in each market as is recorded within the relevant investment universe. The ratio of capital employed to capital value for each month in the universe dataset is applied to the estimated market capital value, to approximate the market capital employed.

For deriving the market size estimate the following process is applied:

- The initial market size estimates are set as the start period market values. These estimates are denominated in domestic currencies. The start market size estimates are announced in June/July of the index year based on the results of

the MSCI's Real Estate Market Size report (e.g., the June 2017 announced market sizes are used as the start period value for 2017-year performance).

- For quarterly composite indexes, the estimates are calculated based on the most recently available market size.

  - For example; for Q2 2020, the start market size estimates are based on the Market Size at Dec 2019 announced in July 2020. For subsequent periods till Q1 2021 market size estimates are adjusted for monthly capital growth rates

  - The monthly capital growth rates are computed as per the country or regional segments, as appropriate, within MSCI Europe or Global Quarterly Property Index.

- For annual composite indexes, the estimates are calculated based on the most recently available market size.

  - For example; For Dec 2020 Annual Index, the start market size estimates are based on the Market Size at Dec 2019 announced in July 2020.

  - The monthly capital growth rates are computed from the national Standard Annual Property Index and in cases where a higher frequency index is available, the capital growth rates from higher frequency property indexes are applied. E.g, for UK assets, the capital growth rates from MSCI UK Quarterly Property Index are applied, while for France assets, the capital growth rates from MSCI France Biannual Property Index are applied.

- Estimated market capital values are converted into estimated capital employed levels by applying capital employed adjustment ratios (the ratio of capital employed to capital value in MSCI's relevant universe sample, as noted above).

$$Market\ Capital\ Employed_{i,t}$$
$$= Market\ Size\ Estimate_{i,t}$$
$$* \frac{Sample\ Capital\ Employed_{Standing\ Investment,i,t}}{Sample\ Capital\ Value_{Standing\ Investment,i,t}}$$

- Currency conversion is applied to the intervening month-end capital employed estimates at the month-end currency rate.

- The reweighted measures are calculated by applying a reweighting multiplier to the data points that are contributing to the calculation of respective measures. The reweighting multiplier is calculated as follows:

$$Reweighting\ Multiplier_{i,t} = \frac{\sum_{i=1}^{n} Market\ Capital\ Employed\ Weight_{i,t}}{\sum_{i=1}^{n} Sample\ Capital\ Employed\ Weight_{i,t}}$$

$$Market\ Capital\ Employed\ Weight_{i,t} = \left(\frac{Market\ Capital\ Employed_{i,t}}{\sum_{i=1}^{n} Market\ Capital\ Employed_{i,t}} \right)$$

$$Sample\ Capital\ Employed\ Weight_{i,t} = \left(\frac{Sample\ Capital\ Employed_{i,t}}{\sum_{i=1}^{n} Sample\ Capital\ Employed_{i,t}} \right)$$

where
t denotes the month of return computation, and
i denotes the ith segment out of a total of n segments

Monthly returns are compounded over the measurement period to give the returns for the period under measurement.

4.10   USER SUPPLIED WEIGHTING

In addition to sample weighted and market size reweighted indexes, another common requirement for reweighting is where a user chooses or is constrained to keep to a particular portfolio structure defined as a set of fixed weights, or weight ranges, for each property sector, property type, region or some combination of all three. Examples of such targeting might include, at a national level, an index with 75% High Street shops and 25% provincial offices, or, at a pan-European level, a custom index with maximum weights for one or more of the major national markets within an otherwise flexible Eurozone mandate.

4.11   STRUCTURE-MATCH WEIGHTING

In addition to market-size and user supplied weighting, clients might also require an index that matches the structure of their portfolio. This custom index is likely to inform and constrain the structural composition of the client's portfolio (relative to the specifically chosen segmentation) by reweighting the segment-by-segment market return in accordance with the segment weights in the client's portfolio.

4.12 CURRENCY CONVERSION

Many MSCI multinational Property Indexes cover more than one currency area. As the underlying property or fund data are always collected in local currency terms, the calculation of these indexes requires values to be converted to a common currency. Depending on the usage of the output, this calculation is either performed on a fixed ("local currency") or variable exchange rate. For all country level indexes, the standard currency is the local currency, except in the case of Poland, Hungary and Czech Republic, where data is being collected and returns are stated in Euros.

4.12.1 FIXED RATE CONVERSION

Fixed rate conversion is applied to remove the impact of currency on measure calculations. A monthly fixed rate method is applied to eliminate the need for historical changes. The application of this methodology for different performance measures is as follows:

- For monthly compounded growth measures, MSCI converts the relevant data using the exchange rate of the base month. For example, the data required for December 2022 growth measures are converted using the November 2022 exchange rate.

- For all spot measures – such as capital value, rent passing, rental value and capital expenditure – with data collected as at month-end, values are converted using the corresponding month-end exchange rate. For example, December 2022 rent passing is converted using the December 2022 exchange rate.

- Similarly for spot ratios, such as gross rent passing yield, the appropriate month-end exchange rate is used to convert both the numerator and denominator values in the calculation.

- For measures calculated by summation over time, such as 12-month net investment or net income per square meter (where the numerator is calculated by summation), all values are converted using the exchange rate as at the end of final month of computation.

4.12.2 VARIABLE RATE CONVERSION

For variable rate reporting, each data item is converted using the corresponding month-end mid-rate, defined as the median of the bid and offer rates on the last day of the month. Performance measures based on variable rates include the impact of monthly changes in exchange rates. An exception to this is capital expenditure data,

which are weighted to the start of the month in growth measures and are converted using the previous monthly rate.

For 1994 and later data, MSCI uses exchange rates from WM Refinitiv. For earlier data, rates from EcoWin and others are used.

5 Other Market Information Reporting

Not all measures included in this section may be available for all markets. Availability depends on the data specification for each market.

5.1 MARKET RENTAL VALUE (MRV) GROWTH

The increase in the market rental value, expressed as a percentage of MRV at the beginning of the month.

$$MRV\ Growth_t = \frac{(MRV_t - MRV_{t-1})}{MRV_{t-1}}$$

Monthly figures are compounded over 12 months to give an annual rate.

5.2 GROSS RENT PASSING GROWTH

The increase in gross rent passing (GRP) less ground rent (GR), expressed as a percentage of (GRP - GR) at the beginning of the month.

$$GRP\ Growth_t = \frac{(GRP_t - GR_t) - (GRP_{t-1} - GR_{t-1})}{(GRP_{t-1} - GR_{t-1})}$$

5.3 YIELD MEASURES

Net Reversionary Yield
The market rental value net of all non-recoverable operating costs (NMRV) expressed as a percentage of the (net) capital value (CV) at the same date.

$$Net\ Reversionary\ Yield_t = \frac{NMRV_t}{CV_t}$$

Net Initial Yield

Annual rent passing plus 12-month turnover rents and other income, less 12-month non-recoverable operating costs, expressed as a percentage of the (net) Capital Value (CV) at the same date.

Net Operating Income Yield (also known as Net Income Receivable Yield)
Net income over the preceding 12 months expressed as a percentage of the (net) Capital Value (CV) at the period end date.

Gross Rent Passing Yield
Gross rent passing at end of period expressed as a percentage of the (net) Capital Value (CV) at the same date.

Gross Rent Receivable Yield
Rent as invoiced for the period (including turnover rent) gross of ground rent expressed as a percentage of the (net) Capital Value (CV) at the same date.

Gross Reversionary Yield
Market rental value at period end expressed as a percentage of the (net) capital value (CV) at the same date.

Equivalent Yield
Only used in the U.K. and Ireland, the discount rate that equates future income flows to the gross capital value. This is calculated on a quarterly in advance (true equivalent yield) basis. The equivalent yield discounts the current rental value in perpetuity beyond the last review date recorded for the tenancies in the subset.

Equivalent yield is calculated by solving the equation iteratively for the rate *r*:

$$GCV_t = \frac{NR_{y1}/4}{(1+r)^0} + \frac{NR_{y1}/4}{(1+r)^{0.25}} + \frac{NR_{y1}/4}{(1+r)^{0.5}} + \frac{NR_{y1}/4}{(1+r)^{0.75}} + \frac{NR_{y2}/4}{(1+r)^1} + \cdots$$
$$+ \frac{FCF/4}{(1+r)^{9.75}} + \frac{FCF/4}{(1+r)^{10} * (1 - (1+r)^{-0.25})}$$

Where:
GCV_t is the capital value gross of purchasers' costs in month t;
NR is the net projected rental income; r is the equivalent yield;
FCF is the final cash flow in the 10th year.

5.4 OPERATING COSTS

5.4.1 OPERATING COST HIERARCHY

Operating costs hierarchy enables consistent cost analysis across different markets at a granular level both at net and gross basis. The operating costs hierarchy is illustrated below.

Operating Costs Framework – Granular Bifurcation

Aggregate	Sub-Category	Description
Total Net Operating Costs*	Net Fixed Costs	Costs in this sub-category includes net property taxes, net utilities costs, net insurance costs, and ground rent
	Net Maintenance and Care Costs	Costs in this sub-category includes net maintenance costs and net care costs
	Unallocated Net Running Cost	Costs in this sub-category includes residual costs that are unallocated to the fixed costs or maintenance and care costs
	Net Management and Administration cost	Costs in this sub-category includes net management costs and net administration costs
	Letting Costs**	Costs in this sub-category includes letting costs
	Net Other Costs	Costs in this sub-category includes net other costs, bad debt write-off, and costs of vacancies
Total Gross Operating Costs*	Gross Fixed Costs	Costs in this sub-category includes gross property taxes, gross utilities costs, gross insurance costs, and ground rent
	Gross Maintenance and Care Costs	Costs in this sub-category includes gross maintenance costs and gross care costs
	Unallocated Gross Running Cost	Costs in this sub-category include residual costs that are unallocated to the fixed costs or maintenance and care costs

Aggregate	Sub-Category	Description
	Gross Management and Administration cost	Costs in this sub-category includes gross management costs and gross administration costs
	Letting Costs**	Costs in this sub-category includes letting costs
	Gross Other Costs	Costs in this sub-category includes gross other costs, bad debt write-off, and costs of vacancies

*Total operating costs also includes unallocated operating costs that is not provided at sub-category level;

**Letting costs are provided as one amount and not provided at gross and/or net level

5.4.2 OPERATING COST RATIOS

In markets where real estate owners face heavy outgoings from their gross income, such as the Nordic region, the Netherlands and South Africa, it is important to measure income lost through non-recoverable operating costs. The operating expenses of similar properties can be compared using the following measurements, which assess the impact on overall returns:

- Total gross operating costs (both irrecoverable and recoverable) as a percentage of gross income

- Total gross operating costs per square meter (based on the owned area, which is the total floor space of the asset adjusted for the ownership share)

- Total net operating costs (irrecoverable) as a percentage of gross income

- Total net operating costs per square meter (based on the owned area, which is the total floor space of the asset adjusted for the ownership share)

These cost ratios can be further analyzed by comparing each type of cost such as utilities, insurance, (property) taxes, maintenance, management and letting, with the operating income and with floor space. Cost ratios may also be sub-divided into fixed and variable costs. In certain cases, where data providers have not provided the breakdown of costs into sub-categories, only the aggregated costs or net income is used for return calculations.

5.5   VACANCY RATE

MSCI produces two vacancy rates:

- Floor space vacancy, which is calculated as vacant floor space (based on the owned area) divided by the total floor space (based on the owned area).

- Financial vacancy, which is calculated as the market rental value (MRV) of the vacant units divided by the total market rental value (MRV) of the property.

5.6   DECOMPOSITION OF CAPITAL GROWTH

The data collected by MSCI allow the underlying drivers of capital growth to be identified, isolating the separate effects of changes in income, investment , valuation yields or capitalization rates and active management.

The figure below identifies the components of capital growth.
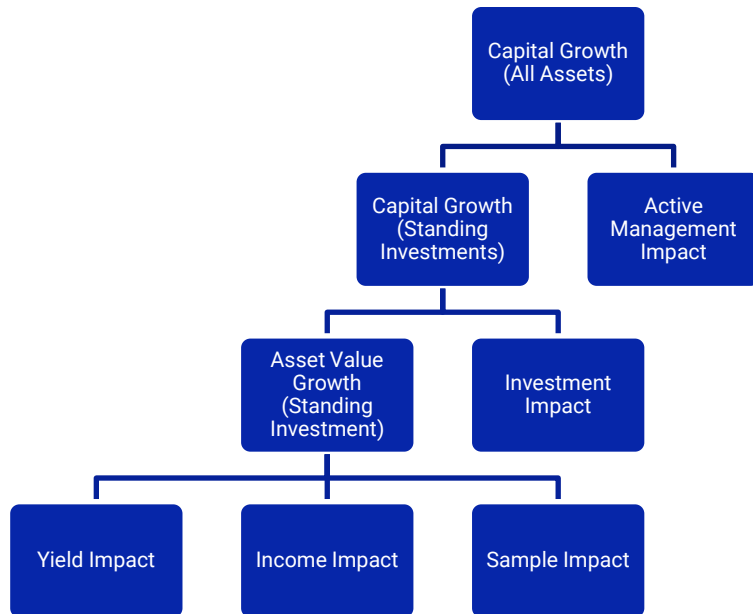
Active Management Impact: Active management impact represents the difference between all asset return and the standing investment return. It is only relevant for an all asset capital growth decomposition and would not be calculated for standing investments. A positive active management impact indicates that transaction and development activity have been accretive while a negative result means that transactions and development have been dilutive to the overall capital growth.

Investment Impact: Investment impact measures the difference between (asset value growth for standing investments and the capital growth for the same set of assets. Because capital growth includes net investment in the numerator and is calculated with a capital employed denominator, it is virtually always lower than asset value growth. Investment impact is therefore expected to be negative but should not be viewed as a bad impact.

Yield Impact: This measure indicates the effect of yield change on Capital Values. All else equal, if yields fall then this will cause the capital value of an asset to increase and vice versa. It is calculated monthly as the ratio of the month-start to month-end yield with the sign reversed, so that a rise in yields is shown as a negative impact and vice versa.

$$Yield\ Impact_t = \left[\frac{Yld_{t-1} - Yld_t}{Yld_t}\right] * 100$$

where:

Yld_t is the yield at the end of month t.

The monthly figure is calculated on a consistent set of properties and compounded over the relevant period. The yield measures used for calculation of yield impact varies from market to market due to varied data collection practices and valuation methods.

Income Impact: Income impact measures how the change in yield numerators has impacted capital values. The interpretation of this measure is directly linked to what yield has been used as the basis for the decomposition. For example, if reversionary yield has been used, then a positive income impact suggests that market rental value has increased. If valuer capitalization rate has been used, a positive income impact implies that valuers have increased their income expectations, et cetera.

Sample Impact: In cases where the asset sample used to calculate yield, income and investment impact matches the standing investment asset sample used to calculate capital growth there will be no sample impact. However, in some circumstances, it will not be possible to calculate yield, income and investment impact on the full

standing investment capital growth sample. In such cases, sample impact is needed to reconcile the difference between the capital growth of the assets which have contributed to the decomposition and the broader standing investment sample. When comparing different decompositions (over time, between countries, or with different base yields) sample impact can be viewed as an indication of the relative reliability of the decompositions. A larger sample impact means the decomposition results should be interpreted with greater caution.

5.7 NET OPERATING INCOME GROWTH

Net operating income growth measures the change in net income receivable calculated net of all irrecoverable costs, between two periods. This measure is measurement period-specific and exists in three variants: year on year (y-o-y), half-year on half-year (h-o-h) and quarter on quarter (q-o-q).

The measure itself dictates the period over which the comparison is made, i.e., the gap between the final period and initial period. The selected summation period controls the number of months' income to be included in the numerator (final period) and denominator (initial period). For all three measures, the formula can be stated in the same way as:

$$NOIG = \left[\left(\frac{Sum\ of\ Income\ over\ Final\ x\ Months}{Sum\ of\ Income\ over\ Initial\ x\ Months} \right) - 1 \right] \times 100$$

where there is no transaction or development activity between the first month of the initial period and the last month of the final period. Any asset with such activity is excluded from the sample.

The ratio above is multiplied by -1 when the sum of income during the initial months is negative.

Only the year on year (y-o-y) net operating income growth measure is computed for summation periods of longer than 12 months, and then the period must be a multiple of 12 months. For longer time periods the measure is computed as separate 12-month y-o-y measures, which are then compounded together.

5.8 INDEX RISK CHARACTERISTICS

MSCI's private real estate indexes are valuation based indexes (VBIs) and therefore incorporate an element of appraisal smoothing that makes them not fully suitable for

risk measurement. Nevertheless, MSCI does calculate measures of variation. These are the following traditionally defined measures:

Standard deviation − Portfolio or asset risk is defined as the standard deviation of the series of annual returns around the arithmetic mean.

Semi deviation − The semi (downside) deviation aims to calculate the deviation of returns below the expected return, and ignore above average deviation. The expected return (h) is the geometric mean of the income return on real estate over the whole period. The semi deviation is the square root of the variance.

$$SD = \sqrt{\frac{1}{n-1} \times \sum_{i=1}^{n} [(x_i - h)^2, x_i \leq h]}$$

Where:

SD	is the semi deviation
n	is the number of periods
h	is the geometric mean of the income return over the whole period
X_i	is the total return in a period

5.9 INTERNAL RATE OF RETURN (IRR)

The Internal Rate of Return (IRR) is similar to the total return as both are measures of overall performance. However, they have different characteristics and are appropriate in specific circumstances. The Internal Rate of Return (IRR) is the discount rate over any period of time that equates all cash flows through the asset or portfolio back to the initial value. Unlike total return, which is neutral with respect to the timing of capital injections, the IRR is a money-weighted measure of return that explicitly takes account of the timing of cash flows within the measurement period. The IRR is rarely used for comparison of a portfolio with an index, but may be a more suitable measure for analyses of performance in some instances, especially where the portfolio is expected to grow or shrink significantly during the period under analysis, or to analyze assets with large changes in capital flows, such as developments or part transactions.

In terms of calculation, the IRR is the discount rate that equates the initial value, final value and intervening cash flows of an asset or portfolio to give a net present value of zero. Calculations assume monthly cash flows (net income less net capital expenditure) timed to the mid-point of each month. The start value is the initial capital value of all held properties at the beginning of the period under analysis; the end value is the current capital value for properties held at the end of the period.

The IRR is calculated by solving the following expression iteratively for the term r.

$$CV_0 = \frac{(NI_1 - C_1)}{(1+r)^{1/2}} + \frac{(NI_2 - C_2)}{(1+r)^{3/2}} + ... + \frac{(NI_n - C_n)}{(1+r)^{(n-1/2)}} + \frac{(CV_n)}{(1+r)^n}$$

Where:

NI_n is the net income receivable in month n
C_n is the net capital expenditure in month n (including gross purchase costs and net sale receipts on all transactions);
CV_0 is the initial capital value
CV_n is the final capital value

Portfolio IRRs include transactions and developments. For purchases $CV_0=0$ and for sales $CV_n=0$; with their respective gross purchase prices and net sale receipts taken into account in the net capital expenditure terms (capital expenditure less capital receipts).

The above expression represents the average monthly internal rate of return (MIRR) over the period. The general formula for the IRR over any period of months is:

$$((1+MIRR)^n - 1) * 100$$

Where:

n is the number of months
MIRR is the monthly IRR

5.10 PORTFOLIO RISK ANALYTICS

MSCI measures real estate portfolio risk using standard statistical measures, and analyses the sources of risk based on a wide variety of factors specific to real estate assets.

MSCI reports the volatility of returns using the following traditionally defined measures:

Risk or volatility – Portfolio or asset risk is defined as the standard deviation of the series of annual returns around the arithmetic mean.

Risk adjusted return – The ratio of the arithmetic average return over the period to the volatility of returns measured by the standard deviation.

Risk adjusted relative return – The volatility or risk adjusted relative return is the ratio of the arithmetic mean of a portfolio's relative return over a defined number of periods to the standard deviation over the same number of periods.

$$Risk\ Adjusted\ Relative\ Return_t = Relative\ Return_t / \sigma$$

Where:

σ is the standard deviation of the monthly relative returns over the period.

5.11 ASSET VALUE GROWTH

Asset Value Growth measures the change in asset capital value over a period of time. The Asset Value Growth is similar to the Capital Growth, however the growth does not take into account any capital expenditure and receipts over the period, relative to the previous asset capital value. This measure of the "growth" component of performance is based on the change in value for properties held at the start and end of an analysis period based on valuations.

For index composites with market size reweighting , (refer to section 4.9 in the MSCI Property Index Methodology document) the data fields used in the calculation of Asset Value Growth measure is market size reweighted.

With respect to a single month, asset value growth is defined as:

$$AVG_t = \frac{(CV_t - CV_{t-1})}{(CV_{t-1})} * 100$$

Where:

AVG_t is the asset value growth in month t;
CV_t is the capital value at the end of month t;
Monthly figures are compounded, as described for total return, over 12 months to give an annual rate.

6 Analytics Reporting - Direct Real Estate

6.1 RELATIVE RETURN

The ratio of the return of the portfolio, segment or individual asset, to that of the chosen index for benchmarking purposes, expressed as a percentage.

$$RR_t = \left[\frac{1 + PtRet_t/100}{1 + BmkRet_t/100} - 1 \right] * 100$$

Where:
RR_t is the relative return in month t;
$PtRet_t$ is the portfolio return in month t;
$BmkRet_t$ is the index return in month t.

6.2 WEIGHTED CONTRIBUTION TO ABSOLUTE PORTFOLIO RETURN

The weighted contribution of an individual asset or group of assets (set k) to the return of the portfolio over a defined period (n months) is its money return over the reporting period (the sum of monthly total return numerators) expressed as a percentage of the portfolio capital employed for the period.

$$UWTC_k = \frac{\sum_{k=1}^{n} AtNum_{k,t}}{PtDen_t} * 100$$

Where:
$UWTC_k$ is the unapportioned weighted contribution for set k;
$AtNum_{k,t}$ is the asset numerator from set k in month t;
$PtDen_t$ is the portfolio denominator in month t.

6.3 WEIGHTED CONTRIBUTION TO RELATIVE PORTFOLIO RETURN

This is a measure of the contribution of an individual asset or group of assets to the relative return of the portfolio to the index over a defined period.

It is calculated for a single month as the relative return of an asset weighted by that asset's capital employed (to give a money numerator of the asset's relative return), expressed as a percentage of the whole portfolio's capital employed.

$$UWTCRR_t = \left(\frac{\sum_{k=1}^{n} [RR_{k,t} \times AtDen_{k,t}]}{PtDen_t} \right) * 100$$

Where:

$UWTCRR_t$ is the unapportioned weighted contribution to relative return in month t;
$RR_{k,t}$ is the relative return from set k in month t;
$AtDen_{k,t}$ is the asset denominator from set k in month t;
$PtDen_t$ is the portfolio denominator in month t.

The sum of the individual asset or segment weighted contributions would ideally equal the absolute/relative return, but this is rarely the case in real estate analysis, particularly where there has been a large change in capital employed or significant expenditure during the analysis period. This discrepancy between the unapportioned weighted contribution and the portfolio level relative performance, known as the reconciliation term, is apportioned across the asset or segment weighted contributions. The apportionment is based on the average weight of capital employed during the analysis period.

$$WTCRR_k = UWTCRR_k + Reconciliation\ Term * AvCapEmpWtd_k$$

Where:

$AvCapEmpWtd_k$ is the portfolio's segment average capital employed in the period as a percentage of the total portfolio average capital employed and k is the segment or asset. For index composites with market size reweighting , (refer to section 4.9 in the MSCI Property Index Methodology document) the data fields used in the calculation of Average Capital Employed weight measure is market size reweighted.

6.4   ATTRIBUTION OF RELATIVE RETURNS

Attribution analysis is a powerful technique for understanding the reasons for a portfolio's outperformance or underperformance against an index. It breaks down the relative return into structure-specific and property-specific scores, allowing the influences of submarket allocations and asset selection to be clearly distinguished.

This section explains the computation of attribution analysis scores, together with the statistical components that underlie those calculations.

Attribution analysis distinguishes that part of the relative return derived from the portfolio's abnormal weightings in strong or weak sectors of the market (allocation), from that part derived from the exceptional performance of the assets in the portfolio within each segment of the market (selection). The analysis is performed month by month.

Allocation − The portion of relative return attributable to the weighting of the portfolio relative to the index in each of the segments used in the analysis. It is calculated on a monthly basis as:

$$A_t = (PTSegW_t - BmkSegW_t) * \left[\frac{1 + BmkSegR_t/100}{1 + BmkR_t/100} - 1\right] * 100$$

Where**:**

A_t is the allocation in month t;
$PtSegW_t$ and $BmkSegW_t$ are the portfolio segment weight and index segment weight (as a proportion of capital employed) respectively;
$BmkSegR_t$ is the index segment return;
$BmkR_t$ is the overall index return.

Thus, if a portfolio has an above-average weighting in a strongly performing segment of the market, the allocation for the segment is positive. Conversely, an above-average weighting in a poorly performing segment of the market results in a negative allocation score.

Monthly scores are chain linked to calculate quarterly and annual allocation scores.

Selection − The portion of relative return attributable to the performance of the portfolio's properties relative to the index for each segment. It is calculated as:

$$US_t = SAW_t * \left[\frac{1 + PtSegR_t/100}{1 + BmkSegR_t/100} - 1\right] * 100$$

$$SAW_t = PtSegW_t * \left[\frac{1 + BmkSegR_t/100}{\left(1 + \sum_{Seg=1}^{L} PtSegW_t * BmkSegR_t\right)}\right]$$

Where:
US_t is the unapportioned selection in month t;
SAW_t is the segment adjusted weight, i.e., the proportion of capital employed in the portfolio, adjusted by the growth rate of the segment relative to the index.
$PtSegW_t$ is the portfolio segment weight (as a proportion of capital employed);
$PtSegR_t$ is the portfolio segment return;
$BmkSegR_t$ is the index segment return.

Thus, if a portfolio's properties have recorded above-average returns relative to the index in a segment of the market, the resultant selection score is positive; if their performance is below average, the score is negative. Monthly scores are chain-linked to calculate quarterly and annual selection scores.

The sum of allocation and selection would ideally equal the relative return of the portfolio against the index, but in reality this is rarely the case, particularly where there has been a large change in capital employed or significant expenditure in the analysis period.

The residual is removed by apportioning it across the segment selection results for the period. It is apportioned by segment average capital employed weight:

$$S_t = US_t + Residual_t * AvCapEmpWtd_k$$

Where:

$AvCapEmpWtd_k$ is the portfolio's segment average capital employed in the period, expressed as a percentage of the total portfolio average capital employed.

The allocation and selection scores at a particular segment level are computed by summing up the corresponding scores of all the underlying segments as per the configuration in the enterprise analytics products.

When a segment is held in the portfolio but not in the benchmark, then the segment weight in the benchmark is zero, and the benchmark segment return is undefined. To avoid this in attribution calculation, the benchmark segment return is assumed to be equal to the portfolio segment return, and the relative benchmark weight is assumed to be equal to the relative portfolio weight.

6.5 INCOME PROJECTIONS

Income projections play an important role in the calculation of capital values used in performance measures (see above).

MSCI income projections and related measures are constructed from tenancy level data on lease terms, rent passing and market rental value, where available.

Income projections are based on the following assumptions:

- **Letting of vacancies and developments** – Vacant units and developments are assumed let from the actual or estimated rent start date. The anticipated rent start date for developments is taken to be the rent commencement date under a pre-let agreement or the date a developer guarantee takes effect. Otherwise the portfolio manager's expected rent start date is taken. If the expected rent start date is not known, MSCI assumes a letting date for developments at the end of a 30-month construction phase. If the letting date is not known for vacant completed properties, units are assumed to be let after 18 months.

- **Contracted rent passing** – Throughout the income analysis, all measures related to top slice (see below) and future income growth prospects are based on the contracted tenant rent.

Over-renting – Where open market rental values are below current tenant rents, properties are termed "over-rented."

Top slice income – Where current rent is above open market rental value, the excess income is termed "top slice" income.

Reversionary potential – the ratio of current market rental value to rent passing (both gross of ground rent), expressed as a percentage. The measure represents the income growth potential for the sample.

Vacancy - a vacant unit is defined as having:

- No lease

- No previous lease holding over

- No temporary contract in place

- Any previous lease has been disclaimed

Vacancy does not apply to tenants in administration where leases are technically in place.

6.6 PERFORMANCE AND RISK ANALYTICS: METHOD SPECIFICATIONS

In addition to the above, and primarily for the purpose of investigating the sources of volatility, MSCI breaks down portfolio and index risk into 10 constituent factors, identifying where the strengths and weaknesses of a portfolio lie. Analyses also explore the relationship between performance and risk.

At asset level, measurement extends to the risk derived from covenants, lease length, vacancy and development exposure.

At portfolio level, analyses focus on concentration risks (asset, location and tenant concentrations), exposure to risky markets and income risk.

At fund level, the debt profile is added to give a complete picture of risk.

Asset risk factors

- **Development exposure** – Percentage of capital employed in developments at period-end. The higher the development exposure, the riskier the portfolio's structure.

- **Vacancy rate** – The higher the vacancy rate, the riskier the portfolio's structure.

- **Unexpired lease term** – Average number of years left to expiry. The longer the unexpired lease term, the safer the portfolio's structure.

- **Risky covenants** – Rent exposure to risky covenants. Risky covenants are defined as tenants whose risk band is high risk or maximum risk (derived from Dun & Bradstreet data). The higher the exposure to risky covenants, the riskier the portfolio's structure.

Portfolio risk factors

- **Asset concentration** – Percentage of a portfolio's capital value that is held in its five largest assets. The higher the asset concentration, the more vulnerable the portfolio is to events affecting those assets.

- **Location concentration** – The five locations to which the portfolio is the most exposed (by capital value). Standard MSCI regions are used to define the locations. The higher the concentration, the riskier the portfolio's structure.

- **Company concentration** – Percentage of a portfolio's contracted rent that is derived from its 10 largest companies. A company is the aggregation of all the tenants with the same name. The higher the company concentration, the riskier the portfolio's income profile.

- **Structural difference** – The extent to which a portfolio's structure differs from the index structure, in terms of capital value in each market segment. A score of zero indicates that the portfolio structure matches that of the index exactly. The higher the score, the more different is the portfolio structure from the index structure. The higher the difference score, the riskier the portfolio's structure.

$$Structural\ Difference_t = \sum_{seg=1}^{L} (PtSegCV_t - BmkSegCV_t)^2$$

Where:
$PtSegCV_t$ is the segment proportion of portfolio capital value in month t;
$BmkSegCV_t$ is the segment proportion of index capital value in month t.

- **Segment volatility exposure** – The degree of portfolio exposure to the more volatile segments of the market. Volatility is measured by a weighted beta. Where available, 15-year beta coefficients are calculated for each market

segment against the index all property return. Where data available is less than 15 years, the segment beta is assumed to be 1.

The portfolio level weighted beta is calculated by weighting each segment beta by capital value exposure. The higher the weighted beta, the riskier the portfolio's structure.

- **Income return** – 12-month income return calculated as the net income receivable for the year, expressed as a percentage of the capital employed over the year. This measure is preferred to a forward-looking yield as it does not incorporate future (uncertain) income, and to initial yield as it is a measure of actual income collected rather than potential income. Though not commonly used as a measure of risk, it is included because the income component of total return is invariably more secure and less volatile than the capital component. Therefore the assumption is that the higher the income return, the safer the portfolio's structure.

7 APPENDIX I: Transaction Linked Indicators

In recent years, MSCI has developed a hybrid indicator methodology that combines transaction information with standard valuation data in order to give a more robust measure of the volatility in direct real estate markets. The methodology, which falls into four distinct stages, is summarized below.

Stage 1 − Create dataset

The dataset used to create transaction linked indicators is the same as that used to produce standard MSCI valuation-based indexes. Some filtering is required so that the model is not distorted by extreme cases and that an adequate valuation history is available.

All Continental European countries with a statistically sufficient sample are modelled together using data specified in euros and then converted to local currency. The U.K. has an independent model as its data series extends back further than that used to generate Continental European transaction linked indicators.

Stage 2 − Regression on sale sample

For each quarter's model, sales from the preceding six months are identified. This reflects the fact that, owing to the low liquidity of property investments, there are usually insufficient sales in a single quarter for stable models to be estimated.

A reference set of valuations for each sale sample is defined using valuations two quarters prior to the quarter being analyzed. This aims to ensure that the valuations are not influenced by sale negotiations. In the case of national markets with biannual or annual valuations, interpolated figures are used for dates between actual valuations.

Once the relevant sales and their reference valuations are defined, the natural log of the sale price and the capital value in each case are computed. Meanwhile, dummy variables are created to identify the main property type and the country of each asset in the dataset. The dummy variables are defined to strike a balance between disaggregation and representation, such that sales for each category are observed in the majority of periods.

An ordinary least squares (OLS) regression is then run for every quarter in the time period. The regression model has the following form:

$$lnP = \alpha + \beta_1 \, lnV + \beta_2 D_j + \beta_3 D_k + \varepsilon$$

Where:

t identifies a particular quarter;
j identifies a country and Dj is a vector of country dummies;
k identifies a sector and Dk is a vector of sector dummies;
P is the gross sale price and
V is the most recent uninfluenced capital valuation (t-3).

Stage 3 − Mass appraisal of all assets

The coefficients from the regressions are used to predict sale prices for assets that were not traded. Two predictions are made for properties held in each quarter. First, a start price is predicted using coefficients from the regression on the sale sample for the preceding period.

Second, an end price is predicted from the output for the regression on the sale sample for the current period. So, for Q4, predicted start prices are derived from the regression on Q2-Q3 sales and predicted end prices are derived using the regression on Q3-Q4 sales.

These predicted prices are in log form rather than the cash terms that are required for generating indexes. The predicted log prices are transformed in the following manner to correct for bias:

$$\hat{P} \ = \ exp\,(ln\hat{P}) \ * \ exp\left(\frac{\widehat{\sigma^2}}{2}\right)$$

Where:

σ² is the Mean Squared Error of the regression generating the predicted price.

Stage 4 − Generation of indicator

The transformed start and end prices are then each summed for all assets within a particular country or sector. The difference between these two totals, in percentage terms, represents a value-weighted capital movement derived from transaction evidence.

These rates of change are chain-linked quarter-on-quarter to produce time series by country and sector.

8 APPENDIX II: Composition and Re-weighting profile for Composite Indexes

Country	Global Annual Property Index	Europe Annual Property Index	Europe Hotel Annual Property Index	Nordic Annual Property Index	Iberia Annual Property Index	Asia Annual Property Index	Global Quarterly Property Index	Europe Quarterly Property Index
Index Start Date								
Canada	Dec-00						Dec-10	
US	Dec-00						Dec-07	
Brazil	Dec-18							
Australia	Dec-00						Dec-07	
Japan	Dec-01					Dec-05	Dec-19	
China						Dec-06		
Hong Kong						Dec-05		
Malaysia						Dec-08		
Indonesia						Dec-08		
Singapore						Dec-06	Dec-19	
Korea	Dec-05					Dec-05	Dec-19	
Taiwan						Dec-06		
Thailand						Dec-06		
New Zealand	Dec-00							
France	Dec-00	Dec-00	Dec-00				Dec-07	Dec-07
Germany	Dec-00	Dec-00	Dec-00				Dec-07	Dec-07
Ireland	Dec-00	Dec-00	Dec-00				Dec-07	Dec-07
Netherlands	Dec-00	Dec-00	Dec-00				Dec-07	Dec-07
UK	Dec-00	Dec-00	Dec-00				Dec-07	Dec-07
Belgium	Dec-04	Dec-04	Dec-04				Dec-07*	Dec-07*
Luxembourg	Dec-16	Dec-16	Dec-16				Dec-07*	Dec-07*
Czech Republic	Dec-04	Dec-04	Dec-04				Dec-10*	Dec-10*
Bulgaria							Dec-10*	Dec-10*
Hungary	Dec-04	Dec-04	Dec-04				Dec-10*	Dec-10*
Poland	Dec-04	Dec-04	Dec-04				Dec-10*	Dec-10*
Romania							Dec-10*	Dec-10*
Slovakia							Dec-10*	Dec-10*

Norway	Dec-00	Dec-00	Dec-00	Dec-99		Dec-07*	Dec-07*
Sweden	Dec-00	Dec-00	Dec-00	Dec-99		Dec-07*	Dec-07*
Denmark	Dec-00	Dec-00	Dec-00	Dec-99		Dec-07*	Dec-07*
Finland	Dec-00	Dec-00	Dec-00			Dec-07*	Dec-07*
Portugal	Dec-00	Dec-00	Dec-00		Dec-00	Dec-07*	Dec-07*
Spain	Dec-00	Dec-00	Dec-00		Dec-00	Dec-07*	Dec-07*
Italy	Dec-02	Dec-02	Dec-02			Dec-07*	Dec-07*
Austria	Dec-03	Dec-03	Dec-03				
Switzerland	Dec-01	Dec-01	Dec-01				
South Africa	Dec-00	Dec-00	Dec-00				

* For the derivation of month-end market size estimates regional capital growth rates are being used due to the limited quarterly sample in those individual markets: Nordics (Denmark, Finland, Norway and Sweden), Southern Europe (Italy, Spain and Portugal), CEE (Bulgaria, Czech Republic, Hungary, Poland, Romania, and Slovakia) and Belgium & Luxembourg (Belgium & Luxembourg).

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9 APPENDIX III: Glossary of Terms

Accruals accounting principle	The assumption that payment is timed to the due date rather than to the date of monetary transfer.
Active management	Management that results in significant alteration to the physical condition or letting situation of a property.
All Assets	The returns on all assets (also known as all direct property assets) include all investment properties within the portfolio, including those bought, sold and under development or major refurbishment during the measurement period, as well as owner occupied properties.
Allocation (also known as Structure score)	In Attribution Analysis, the portion of the relative return of a portfolio attributable to its weightings relative to the index in each market segment.
Appraisal	See Valuation.
Arithmetic mean	The sum of numbers in a series divided by the count
Attribution analysis	Technique used to calculate that part of a portfolio's relative return derived from its relative weighting in the strong or weak sectors of the market (allocation) and that part which is due to the exceptional performance of the portfolio's own assets within each segment of the market (selection).
BMR Benchmark	BMR Benchmark is an MSCI Private Real Estate Index for which MSCI Limited has provided written permission in each instance to its client to be used for a BMR regulated use. A BMR Benchmark may be a Standard Index or an index automatically calculated from a Standard Index using pre-configured specifications
Capital employed	The denominator of the total return, capital growth and income return measures, which is calculated as the sum of the start-period capital value of all assets covered and the capital expenditure over the period.
Capital expenditure	Expenditure on purchase, development, refurbishment or major improvement of property.
Capital growth (also known as indirect return)	The increase in the value of a property or group of properties net of capital expenditure or capital receipts, expressed as a percentage of the capital employed. For index composites with market size reweighting , (refer to section 4.9 in the MSCI Property Index Methodology

	document) the data fields used in the calculation of Capital Growth measure is market size reweighted.
Capital receipts	Receipts for changes in the owner's interest in a property and other payments such as surrender premiums that can be capitalized where the loss has an impact on the value of the asset.
Covenant (lease)	In real estate risk analysis, an estimation of the level of tenant credit-worthiness. This is usually derived from information from a credit rating agency.
Development	Property under construction or land where construction is planned.
Direct investment/holding	For real estate, properties held within an investment portfolio or fund, either individually or as a group, as distinct from any financial structures that may support them.
Direct return	See Income return.
Equivalent yield	The discount rate that equates future income flows to the current gross capital value.
Fixed rate currency conversion	For multinational real estate reporting, a monthly fixed rate method is applied in which monthly fixed rates are used.
Frozen index history	The case where all historical results are fixed, so that the addition of new data into the relevant index will not affect the results stated for earlier periods.
Fund	A financial structure, usually in the form of a co-ownership vehicle, by which investors come together to hold real estate. The performance of a fund as obtained by its unit-holders derives not only from the properties it contains, but also from the effects of debt (gearing/ leverage), cash holdings and fees.
Geometric mean	The nth root of the product of a series of numbers (where n is the count of the numbers). Geometric means are generally used for calculating average rates of growth.
GIPS	Global Investment Performance Standards created and administered by the CFA Institute.
Headline measures	The most important performance measures for investors, namely the total return, capital growth and income return for MSCI's Property Indexes.

Held non-stabilized	Asset filter that excludes any properties with development or transaction activity and also excludes properties less than 75% let for more than half the reporting period.
Held stabilized	Asset filter that excludes any properties with development or transaction activity and only includes properties more than 75% let for more than half the reporting period.
Income return (also known as direct return)	The net income receivable for a property expressed as a percentage of the capital employed. For index composites with market size reweighting , (refer to section 4.9 in the MSCI Property Index Methodology document) the data fields used in the calculation of Income Return measure is market size reweighted.
Indirect investment/holding	In real estate, investment in a fund or other financial structure that holds property assets.
Indirect return	See capital growth.
International Valuations Standards (IVS)	Internationally agreed standards for the valuation of real estate, as established by the International Valuations Standards Council (IVSC).
Irrecoverable expenses	Non-rental costs incurred for the day-to-day operation of a property, which cannot be recovered from its tenants.
Lettable	The state of a property in which it is able to be leased, fully or partially, to tenants.
(Market) Capital value	Capital value of the property net of assumed purchasers' costs as defined by the International Valuation Standards Committee, being "the estimated amount for which a property should exchange on the date of valuation, between a willing seller and a willing buyer in an arm's-length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without compulsion."
Market rental value	The rental income estimated to be achievable were a property or occupational unit to be newly leased, assuming a normal market lease contract.
Methodology Set	The set of methodology and policy documents that describe the methodology used to determine MSCI Private Real Estate Indexes, including BMR Benchmarks
Mid-rate	For currency conversion, the mid-point of bid and offer rates.

Money-weighted	For performance measures, those in which returns generated by different assets or groups of assets are weighted in proportion to their monetary value. All real estate performance measures are money-weighted over monthly periods.
Multinational	In MSCI reporting, covering two or more national markets.
Net income receivable	Income receivable on a property from rental contracts or any other sources by the owner over a defined period, less any irrecoverable operating expenditure incurred.
Non-operating investments	Properties are treated as non-operating investments if they are bought, sold or under development or major refurbishment during the measurement period
Open market capital value	See Market capital value.
Operating costs	Non-rental costs incurred for the day-to-day operation of a property.
Over-renting	For let property units where the open market rental value is less than tenant rent payable, the difference.
Portfolio	A group of properties or other assets managed as an entity on behalf of an investor or investors.
Part transaction	Transaction activity on an existing asset, which can include the selling or purchasing of (adjacent) parcels of land or units in an existing property, the acquisition of a head lease interest or an increase or decrease in ownership share
Property management cost	Cost incurred by the owner for administering a property, including rent reviews and lease renewals, but excluding portfolio management costs.
Real Estate Market Size report	Annual survey by MSCI of the value of the size of the professionally managed global real estate investment market at a national level.
Real Estate Index Committee (REIC)	The Real Estate Index Committee (REIC) is responsible for overseeing the development and interpretation of methodologies and data collection for real estate indexes.
Relative return	The ratio of the return on a portfolio, segment or individual asset, to that of a benchmark, expressed as a percentage.
Rent passing	Income receivable annually on rental contracts in place, as at the end of a defined period.

Rent receivable	Income receivable on rental contracts from a property by the owner over a defined period.
Reversionary potential	The ratio of current market rental value to rent passing (both gross of ground rent), expressed as a percentage.
Reversionary yield	The open market rental value of a property expressed as a percentage of the capital value.
Same Store	Same store is a subset of all properties and ensures a consistent sample of properties across the measurement period without any part transactions or development activity.
Selection (also known as property score)	In Attribution Analysis, the portion of the relative return of a portfolio attributable to the performance of its properties relative to an index in each market segment.
Standard Index	A Standard Index is the MSCI Private Real Estate Index for a country or region with the broadest market coverage, for a specific index methodology and for a specific reporting frequency.
Standing investment	Properties are determined as standing investments following their first actual valuation after completion of development, or after purchase in the case of investment properties, and continue to be included as standing investments until their final valuation prior to sale.
Time-weighted	For performance measures, those in which returns generated for different time periods are weighted equally in producing returns for longer periods, irrespective of the amount of capital employed in each period.
Top slice income	For rental units where, current rent is higher than open market rental value, the difference.
Total return	The most important measure of overall investment performance used to compare different assets across time periods. It incorporates both capital and income elements, and is calculated as the percentage value change plus net income accrual, relative to the capital employed. For index composites with market size reweighting , (refer to section 4.9 in the MSCI Property Index Methodology document) the data fields used in the calculation of Total Return measure is market size reweighted.
Transaction linked indicator	A hybrid market indicator published by MSCI in which transactions and open market capital values are linked to

	produce measures of market movement that capture more of the true volatility of real estate investments than is possible using capital values alone.
Unexpired lease term	The period of time remaining until the current lease contract ends.
Vacancy	MSCI defines a vacant unit as one with no lease, no previous lease holding over and no temporary contract in place, and where any previous lease has been disclaimed. Vacancy does not apply to tenants in administration where leases are technically in place.
Valuation	The process by which an estimation of market capital value is made for an investment property. The valuation process also generates a large amount of supporting data used by MSCI for analyzing portfolios and markets.
Variable rate currency conversion	For multinational real estate reporting, converting all currencies throughout the performance history at the exchange rates in effect at the end of each month.
Volatility	Portfolio or asset risk, defined as the standard deviation of the series of returns around the arithmetic mean.
Weighted contribution to return	Measure of the contribution of an individual asset or group of assets to the return of the portfolio over a defined period. The weighted contributions of all the assets in a portfolio sum to its return.
Yield	The ratio of income to capital value expressed as a percentage.
Yield impact	The impact of a change in yield on capital value, expressed as a percentage.

10 APPENDIX IV: Versioning Table

Version	Publication Date	Key Changes
V1.0	March 2016	Clarification of valuation requirements: valuations that are external and compliant with international valuation standards are preferred, but internal valuations and values compliant with a local professional standard are accepted, provided they are Market Values.
		Change to the Asset Exclusion Policy: reflects the decision to discontinue discretionary asset exclusion and not to exclude assets for reasons other than insufficient data quality.
		Change to the Correction Policy: correction period extended from 12 to 36 months.
V1.1	June 2016	Added Section 4 on real estate index usage, which was left out in the March 2016 edition due to an administrative error and was included in previous versions of the methodology documents.
V2.0	July 2016	Several methodological enhancements impacting the results were implemented:
		Discontinuation of discretionary flagging
		Introduction of a new global interpolation method
		Implementation of a global dominance rule
		Amended currency conversion
		New index reweighting
		Standardization of global yields
		New "same store" index type
		Revised assumptions on property management fees
		New global market size reweighting
V2.1	February 2017	Several amendments have been made to the document:
		Paragraph 3.9 is added on Geographic Reporting, explaining the geographical hierarchy used in reporting.
		Paragraph 2.1 text on the direct real estate return investment computation methods amended to give more clarity on the definition and the difference between the samples.
		Paragraph 5.1 added on the real estate index design guidelines.

Version	Publication Date	Key Changes
V2.2	November 2017	Several amendments have been made to the document:
		Paragraph 2.1 held-down valuations are included in the all asset grouping
		Paragraph 2.1 Active Management Segmentation is added
		Paragraph 2.2.7 is added on Net Operating Income Growth
		Paragraph 2.4.1 Modified Dietz Methodology is amended to give more clarity on the definition
		Paragraph 3.3.1 Fixed Rate Conversion. The first paragraph, which referred to the old methodology, has been removed
		Paragraph 4.1.4 Weighted Contribution to Relative Portfolio return is expanded to apportion the reconciliation term
		Paragraph 4.1.5 Attribution of Relative Returns is expanded to apportion the residual
		Paragraph 4.1.5 Attribution of Relative Returns.
		Terminology change from Structure Score to Allocation and from Property Score to Selection
V 2.3	April 2018	Several amendments have been made to the document:
		Additional paragraph in section (2.1) on the all assets filter in analytics products
		Added section 2.1.10 on internal rate of returns
		Added the gross capital adjustment for Ireland in section 2.2.3
V 3.0	January 2019	A large number of amendments have been made to the document. The most important are highlighted below:
		The MSCI Property Fund Index Methodology has been separated out and included in the MSCI Property Fund Indexes Methodology
		The Index Design Guidelines and Policies section has been moved to the MSCI Real Estate - Index Policies
		The methodology deviation section within the real estate analytics products has been separated out and included in the Methodology Changes for MSCI Real Estate Analytics Products
		The Valuation Guidelines have been separated out and included in the MSCI Standards for Real Estate Valuations
		The below sections have been added:
		2.3 Data Treatment Practices and Assumptions
		3.1 Definition of Standard Indexes

Version	Publication Date	Key Changes
		3.3.1 Detailed Property Type
		3.4.3 Geographical Breakdown for UK Regions
		3.5 Peer Group Indexes
		3.6 Value Band Filter Indexes
		3.7 Green Property Indexes
		3.8 Spliced Indexes
		4.7 Ranking / Distributions of Returns
		4.11 Client Supplied Weighting
V 4.0	June 2019	Name of the document changed from MSCI Global Methodology Standards for Real Estate Investments into MSCI Property Indexes Methodology
		The below section has been added:
		3.6.2 Fixed Value Band Filters
		Updated the wording of several sections in the document
V 4.1	February 2020	Paragraph 2.3.3.3 UK and Ireland – Gross Capital Value Adjustment. The adjustments for Ireland have been updated on the back of the change in stamp duty rates in Ireland.
		Paragraph 2.3.3.7 has been added on Germany – Asynchronous Valuations
		Paragraph 2.3.3.8 has been added on Germany – No Apportionment of Capital Flows
		Paragraph 2.3.4.3 has been added on Asia – Asynchronous Valuations
		Paragraph 3.1 Standard Indexes. A note has been added to clarify that both the MSCI/PREA U.S. ACOE Quarterly Property Index (Unfrozen) as well as the Property Council /MSCI Australia Core Wholesale Annual Property Index (Unfrozen) are considered to be Standard Indexes.
		Paragraph 4.1.1 Data treatment for assets with shared ownership. Note added on the treatment of assets with shared ownership.
		Paragraph 5.4.1 has been added on Operating Cost Hierarchy
		Paragraph 5.11 has been added on Asset Value Growth
		Updated the wording of several sections in the document

Version	Publication Date	Key Changes
V 4.2	September 2020	Section 2.3.3.1 updated to clarify the treatment of bad debts Section 5.4.1 updated reference to bad debt write off Updated the wording of several sections in the document
V4.3	November 2020	Section 2.2: Removed reference to lease details as headline measure Section 4.2 and 4.4: Replaced operating expenditure with other irrecoverable expenditure to align with net income methodology for UK Monthly Property Index Section 5.6: Changes made to Decomposition of Capital Growth to align with the current methodology and how the analysis is presented in products Section 5.8: Correction to the formula of Semi Deviation (added square root) Section 5.10: Removed Tracking Error since it not is published in any of the products Section 6.4: Correction to Selection formula to align with the existing methodology
V4.4	January 2021	Updated definition for Segment volatility exposure
V4.5	March 2021	Updated the following definitions • Asset Value Growth (Section 5.11) • Total Return (Section 4.2) • Income Return (Section 4.3) • Capital Return (Section 4.4)
V4.6	December 2021	Updated section 2.3.4.4 to include a note on automated valuation models adopted by Third-party valuers in Korea Updated section 6.4 to provide further clarity on attribution calculation logic Removed the reference to Sharpe Ratio from Sec 5.8 and Sec 8 (Glossary) as the measure is now not used after de-commissioning of LIBOR
V4.7	June 2022	Updated Section 3.1 and 4.9 to include details on reweighting methodology for MSCI Europe and Global Quarterly Property Indexes methodology Added Appendix II on Composition, Re-weighting Profile for Composite Indexes

Version	Publication Date	Key Changes
V4.8	March 2023	Updated section 2.3.3.4 to reflect the current property management cost assumptions used in France Updated Section 3.5 to align with the current filters configured w.r.t. Peer Group Indexes Updated section 4.11.1 to align with the current methodology on the fixed currency conversion Deleted definition for Yield ratio from Section 6.5 and Glossary of Terms (Appendix III) as it is not published in any product Included two new frozen indexes in section 4.8 on frozen history reporting - MSCI UK March September Biannual Property Index and The Property Council of Australia/MSCI Australia Core Wholesale Annual Property Index Published Quarterly Updated the wording of several sections in the document
V4.9	September 2023	Removed section 2.3.3.5 on the market specific practice of excluding residential assets from France Bi-annual Property Index In section 4.7 amended the criteria on minimum sample requirement for showing percentile distributions from 10 portfolios to 5 assets
V5.0	February 2024	Updated section 5.6 to reflect additional layer of standing investment capital growth decomposition
V5.1	April 2024	Updated sections 2.3.4.1 and 2.3.4.2 to reflect change in market specific data practices for South Korea Added a section 2.3.3.7 to reflect market specific data practices for South Africa Added student housing and industrial outdoor storage within residential and industrial sector respectively in section 3.3.1

MSCI

Contact us

realestate@msci.com

+ 44 20 7336 4783

AMERICAS
Canada	+ 1 416 687 6284
US	+ 1 212 804 3900

EUROPE, MIDDLE EAST & AFRICA
UK	+ 44 20 7336 9200
France	+ 44 20 7336 4783
Germany	+ 49 691 3385 900
Italy	+ 44 20 7336 9684
Spain	+ 34 93 467 7403
South Africa	+ 27 11 656 2115
Sweden	+ 46 8 400 252 30

ASIA PACIFIC
Australia	+ 61 2 9033 9300
Hong Kong	+ 852 2844 9333
Singapore	+ 65 6826 9339
Japan	+ 81 3 5211 1455

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