INREV
ASSET LEVEL PERFORMANCE CALCULATION METHODOLOGY

19 February 2018
Summary

Vitaliy Tonenchuk
Senior Research and Analytics Manager

'NREV

1. Monthly asset level <u>total return</u> formula

$$TR_{m_k} = \frac{MV_{k_m} - MV_{k_{m-1}} + \sum D_{k_m} - \sum A_{k_m} - CAPEX_{k_m} + NOI_{k_m}}{MV_{k_{m-1}} + \sum A_{k_m} + CAPEX_{k_m}}$$

Where

TR – Total monthly return
MV – Market value at the end of the month
D – Dispositions
A – Acquisitions
m - Month
k - Asset

'NREV

2. Monthly asset level <u>income return</u> formula

$$IR_{m_k} = \frac{NOI_{k_m}}{MV_{k_{m-1}} + \sum A_{k_m} + CAPEX_{k_m}}$$

Where

IR – Monthly income return
MV – Market value at the end of the month
A – Acquisitions
m - Month
k - Asset

'NREV

3. Monthly asset level capital return formula

$$CR_{m_k} = \frac{MV_{k_m} - MV_{k_{m-1}} + \sum D_{k_m} - \sum A_{k_m} - CAPEX_{k_m}}{MV_{k_{m-1}} + \sum A_{k_m} + CAPEX_{k_m}}$$

Where

CR – Monthly capital return
MV – Market value at the end of the month
D – Dispositions
A – Acquisitions
m - Month
k - Asset

'N'REV

4. Estimation of asset's monthly NOI and CAPEX

CAPEX and NOI are collected over a quarter period therefore monthly values need to be estimated. After consultation with NCREIF we propose the following two options.

1. Equally distribute quarterly NOI and CAPEX to the months based on the number of days an asset is owned during the month.

$$CAPEX_{k_m} = \frac{Number\ of\ days\ an\ asset\ is\ owned\ in\ a\ month}{Number\ of\ days\ an\ asset\ is\ owned\ in\ a\ quarter} * CAPEX_{k_Q}$$

$$NOI_{k_m} = \frac{Number\ of\ days\ an\ asset\ is\ owned\ in\ a\ month}{Number\ of\ days\ an\ asset\ is\ owned\ in\ a\ quarter} * NOI_{k_Q}$$

2. Allow contributors provide monthly NOI and CAPEX for more precise performance calculation.

INREV

5. Estimation of asset's monthly <u>market values</u>

INREV's Proposal

$$E[MV_{k_m}] = MV_{k_{m-1}} - \sum D_{k_m} + \sum A_{k_m} + CAPEX_{k_m} + \textit{value change adjustment}$$

Value change adjustment

$$\frac{\textit{Number of days an asset is owned in a month}}{\textit{Number of days an asset is owned in a quarter}} \left(MV_{k_Q} - MV_{k_{Q-1}} + \sum D_{k_Q} - \sum A_{k_Q} - CAPEX_Q \right)$$

Where

$E[MV_{k_m}]$ – Estimated market value at the end of the month
MV_{k_Q} – Market value at the end of the quarter
D – Dispositions
A – Acquisitions
Q - Quarter
k - Asset

'NREV

6. Quarterly <u>asset level</u> monthly chain-linking

$$TR_Q = \left(1 + TR_{m_1}\right) * \left(1 + TR_{m_2}\right) * \left(1 + TR_{m_3}\right) - 1$$

Monthly returns are chain-linked to provide quarterly returns

Where

TR_Q − Total quarterly return
TR_{m_1} − Total monthly return
m − month

I'NREV

7. Annual <u>asset level</u> monthly chain-linking

$$TR_Y = \left(1 + TR_{m_1}\right) * \left(1 + TR_{m_2}\right) * \cdots * \left(1 + TR_{m_{12}}\right) - 1$$

Monthly returns are chain-linked to calculate annual return

Where

$TR_Y -$ Total annual return
$TR_{m_1} -$ Total monthly return
m – Month

'N REV

8. Currency conversion

Headline INREV Asset Level Index should not take exchange rates changes into account.

All monthly values: beginning market value, end market value, acquisitions, dispositions, NOI and CAPEX need be converted using the **first day the month exchange rate**.

'N REV

9. Monthly index/portfolio aggregation formula

$$TR^p = \frac{\sum(N^{a^1}, N^{a^2}, N^{a^2}, \dots)}{\sum(D^{a^1}, D^{a^2}, D^{a^2}, \dots)}$$

Where

TR – Monthly total return for portfolio or index
p – Portfolio or index
a – Asset
N – Numerator from the asset level total return performance formula
D – Denominator from the asset level total return performance formula

INREV

10. Quarterly index/portfolio monthly chain-linking formula

$$TR_q^p = \left(1 + TR_{m1}^p\right) * \left(1 + TR_{m2}^p\right) * \left(1 + TR_{m3}^p\right) - 1$$

Where

$TR_q^p -$ Total quarterly return for portfolio/index
$TR_{m1}^p -$ Total monthly return for portfolio/index
m – Month
Q – Quarter
P – Portfolio/index

'NREV

11. Annual index/portfolio monthly chain-linking formula

$$TR_y^p = \left(1 + TR_{m1}^p\right) * \left(1 + TR_{m2}^p\right) * \cdots * \left(1 + TR_{m12}^p\right) - 1$$

Where

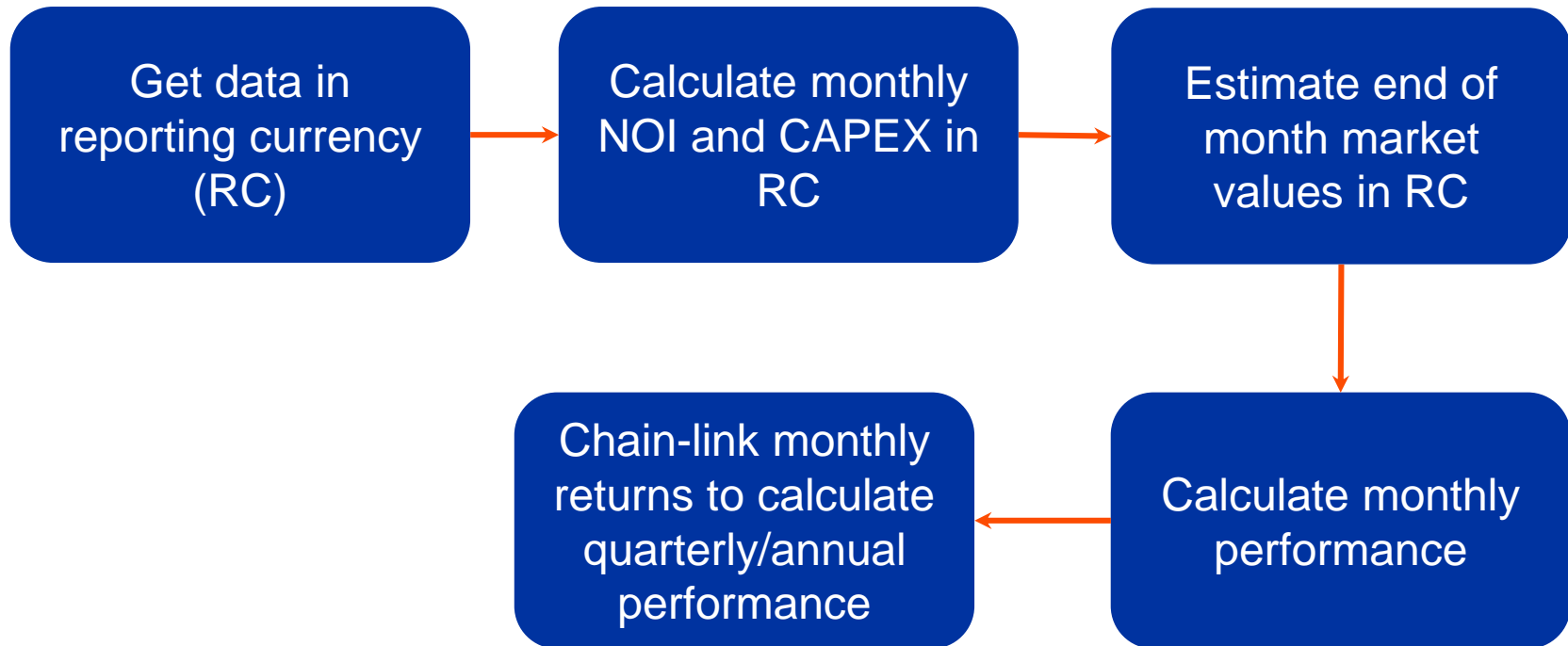$TR_q^p -$ Total annual return for portfolio/index
$TR_{m1}^p -$ Total monthly return for portfolio/index
m – Month
Y – Year
P – Portfolio/index

'N REV

12. <u>Asset level</u> performance calculation process

```
┌─────────────────────┐     ┌─────────────────────┐     ┌─────────────────────┐
│   Get data in       │ ──> │  Calculate monthly  │ ──> │  Estimate end of    │
│ reporting currency  │     │  NOI and CAPEX in   │     │   month market      │
│       (RC)          │     │        RC           │     │    values in RC     │
└─────────────────────┘     └─────────────────────┘     └─────────────────────┘
                                                                   │
                                                                   v
┌─────────────────────┐     ┌─────────────────────┐
│  Chain-link monthly │ <── │  Calculate monthly  │
│ returns to calculate│     │     performance     │
│   quarterly/annual  │     │                     │
│     performance     │     │                     │
└─────────────────────┘     └─────────────────────┘
```

To calculate asset level performance no currency conversion is required

'N REV

13. Index/Portfolio performance calculation process

Get asset data in reporting currency (RC)

Calculate monthly NOI and CAPEX in RC

Estimate end of month market values in RC

Convert CAPEX, NOI, MV's and other values using the **first day of the month** exchange rate

Calculate monthly index/portfolio aggregate return using converted values

Chain-link monthly returns to calculate quarterly/annual performance

'N REV