REAL ESTATE THEORY AND MODELLING

The Chronicles of Christophe Pineau, Senior Advisor, IEIF

INSTITUT DE L'ÉPARGNE IMMOBILIÈRE & FONCIÈRE

CHRONICLE N°15

Net operating income: the overall impact under strong assumptions

For this fifth Chronicle on net operating income, and for the following ones on this theme, we are making the simplifying assumption (which will be lifted at a later date) that we are working on the case of a single-tenant building leased in part (between 0 and 100% of the building) at the initial date t_0.

Unless otherwise specified, all calculations will be made per square metre (m^2). To obtain the total amount, simply multiply by the surface area concerned.

The aim of this series of Chronicles is to define a simple but complete formulation of net operating income and its rate of change.

Our starting point is the general formula presented in **Chronicle 10**.

$$(1)\ noi = (nrv.(1+ri\%).(1-sm\%) - mc).(1-vac\%)$$

with:
- noi : net operating income
- nrv : net rental value
- $ri\%$: rent indexation
- $sm\%$: support measures (% of net rental value)
- mc : management costs
- $vac\%$: vacancy rate

Let's look at time. The property is let at the beginning of year 0 and the owner receives annual income adjusted for the various impacts (vacancy, management costs, etc.) over the following years. We consider that the support measures only concern the first year.

During the first year, the owner receives an income based on the net rental value less support measures impact and management costs, adjusted for the vacancy rate:

$$(2)\ noi_{0,1} = (nrv_{0,1}.(1-sm\%_{0,1}) - mc_{0,1}).(1-vac\%_{0,1})$$

In the second year, the support measures no longer have any effect, and the owner then receives an income based on the net rental value increased by rent indexation and reduced by management costs, adjusted for the vacancy rate:

$$(3)\ noi_{1,2} = (nrv_{1,2}.(1 + ri\%_{1,2}) - mc_{1,2}).(1 - vac\%_{1,2})$$

In the third year, the support measures no longer have any effect, and the landlord receives an income based on the net rental value increased by rent indexation and reduced by management costs, adjusted for the vacancy rate:

$$(4)\ noi_{2,3} = (nrv_{2,3}.(1 + ri\%_{2,3}) - mc_{2,3}).(1 - vac\%_{2,3})$$

Simultaneous consideration of the impact of rent indexation, support measures, management costs and vacancy rate

In order to simplify the analysis, we will start by making the additional assumption that the rate of increase in management costs and the rate of indexation of rents are identical:

- **rent indexation = management cost growth rate ($ri\% = mc\%$)**

This hypothesis will be discussed and lifted in our next Chronicle, but let's keep it for the time being in order to arrive at simple and fundamental formulations defining net rental income and its variations.

As we saw in **Chronicle 12**, the **support measures** can be spread over the entire firm term of the lease:

$$(5)\ asm\% = \frac{smtc/ftl}{nrv}$$

with:
$asm\%$: average support measures (as % of net rental value over the firm term of the lease)
$smtc$: support measures total cost
ftl : firm term of the lease
nrv : net rental value

The direct impact of the support measures on rental income can then be written as follows:

$$(6)\ noi_{t,t+1} = nrv_{t,t+1}.(1 - asm\%)$$

We saw in **Chronicle 13** that, under strong assumptions (identity between the rate of indexation of rents and the rate of growth in management costs), the direct impact of growth in **rents and management costs** could be written as follows:

$$(7)\ noi_{t,t+1} = nrv_{t-1,t}.(1 + ri\%) - mc_{t-1,t}.(1 + ri\%) = (nrv_{t-1,t} - mc_{t-1,t}).(1 + ri\%)$$

We saw in **Chronicle 14** that the impact of the **vacancy rate**, or more simply the **occupancy rate**, can be written as follows:

$$(8)\ noi_{t,t+1} = nrv_{t,t+1}.\left(1 - vac\%_{t,t+1}\right) = nrv_{t,t+1}.occ\%_{t,t+1}$$

with: $occ\%$: occupancy rate: $occ\% = (1 - vac\%)$

If we **add up all these effects** and rewrite equations (2) to (4) we find:

$$(9)\ noi_{0,1} = (nrv_{0,1}.(1 - asm\%) - mc_{0,1}).occ\%_{0,1}$$

$$\begin{aligned}(10) noi_{1,2} &= \left(nrv_{1,2}.(1 - asm\%) - mc_{1,2}\right).occ\%_{1,2} \\ &= \left(nrv_{0,1}.(1 + ri\%).(1 - asm\%) - mc_{0,1}.(1 + ri\%)\right).occ\%_{1,2} \\ &= \left((nrv_{0,1}.(1 - asm\%) - mc_{0,1}).(1 + ri\%)\right).occ\%_{1,2}\end{aligned}$$

$$\begin{aligned}(11) noi_{2,3} &= \left(nrv_{2,3}.(1 - asm\%) - mc_{2,3}\right).occ\%_{2,3} \\ &= \left(nrv_{1,2}.(1 + ri\%).(1 - asm\%) - mc_{1,2}.(1 + ri\%)\right).occ\%_{2,3} \\ &= \left((nrv_{1,2}.(1 - asm\%) - mc_{1,2}).(1 + ri\%)\right).occ\%_{2,3}\end{aligned}$$

And so, the growth rate of net operating income ($noi\%$) is written:

$$(12)\ (1 + noi\%_{1,2}) = \frac{noi_{1,2}}{noi_{0,1}} = \frac{\left((nrv_{0,1}.(1 - asm\%) - mc_{0,1}).(1 + ri\%)\right).occ\%_{1,2}}{(nrv_{0,1}.(1 - asm\%) - mc_{0,1}).occ\%_{0,1}}$$

$$= (1 + ri\%).\frac{occ\%_{1,2}}{occ\%_{0,1}}$$

$$(13)\ (1 + noi\%_{2,3}) = \frac{noi_{2,3}}{noi_{1,2}} = \frac{\left((nrv_{1,2}.(1 - asm\%) - mc_{1,2}).(1 + ri\%)\right).occ\%_{2,3}}{(nrv_{1,2}.(1 - asm\%) - mc_{1,2}).occ\%_{1,2}}$$

$$= (1 + ri\%).\frac{occ\%_{2,3}}{occ\%_{1,2}}$$

In the general case, we have:

$$(14)\ \leftrightarrow\ noi\%_{t,t+1} = (1 + ri\%).\frac{occ\%_{t,t+1}}{occ\%_{t-1,t}} - 1$$

Under simplifying assumptions, net operating income is equal to net rental value less the impact of average support measures, management costs and the vacancy rate (occupancy rate), and the rate of growth in net operating income is directly linked to the rent indexation and the rate of growth in the occupancy rate.

Under all the simplifying assumptions made, the core of the net income dynamic depends essentially on the dynamics of rent indexation and vacancy.

If I insert these results into the **general formula for total return** presented in **Chronicle 9**, we find the following result:

$$(15)\ tr = ir + cr = \ ir \ + \frac{(1 + \partial noi)}{(1 + \partial ir)} - 1$$

$$(16)\ tr = ir + cr = \ ir \ + \frac{(1 + ri\%).\frac{occ\%_{t,t+1}}{occ\%_{t-1,t}}}{(1 + \partial ir)} - 1$$

$$\mathbf{(17)\ tr = ir + cr = \ ir \ + \frac{(1 + \partial ri).(1 + \partial occ)}{(1 + \partial ir)} - 1}$$

with:

tr	: total return
ir	: income return
cr	: capital growth
∂noi	: the growth rate of net operating income
∂ir	: the growth rate of income return
∂ri	: rent indexation (the growth rate of the index)
∂occ	: the growth rate of the occupancy rate

Before looking at the dynamics of the income return, we will examine all the simplifying assumptions we had to use to arrive at the simplified net rental income equation.

In the next Chronicle, we will begin by examining the hypothesis of the link between rent indexation and growth in management costs.

These chronicles are linked to my activity at the IEIF. a Paris based think tank on real estate where I conduct research into the modelling of major property variables.
For those less familiar with property analysis. these chronicles can be a source of information and a knowledge base. For experts in the field. their purpose is to launch discussions and exchanges on the various subjects I cover.
Some of the chronicles will be based on known and familiar elements. while others will deal with research elements and present some of the results of my work.