REAL ESTATE THEORY AND MODELLING

INSTITUT DE L'ÉPARGNE IMMOBILIÈRE & FONCIÈRE

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CHRONICLE N°3

The sensitivity of capital return to its main components (1/2)

As we saw in Chronicle n° 1, capital return can be defined as the variation in price (selling price minus purchase price) minus capital expenditure (capex), divided by the purchase price plus capex. Capex is used to maintain (as far as possible) the same quality of asset.

In practice, the capex is often not sufficient to maintain the quality of the property and, all other things being equal, the asset loses value. Over the last 30 years, the positive effect (on asset values and therefore on overall returns) of the downward trend in income return has largely concealed the negative effect of the continuing deterioration and obsolescence of assets. This is no longer the case. Not only are rates rising again, but at the same time we have to deal with the 'climatic' obsolescence of buildings, which requires higher capex. This 'climatic' obsolescence is in addition to the 'traditional' deterioration and obsolescence (technical, functional, territorial, etc.) of buildings. I'll be coming back to all these factors in more detail in future Chronicles.

Capital return can be defined as follows:

$$cr = \frac{\Delta p}{Pp + capex} - \frac{capex}{Pp + capex}$$

To keep the equations as simple as possible, and because average annual capex generally represents only 1 to 2% of the purchase price, we will use the following equation:

$$(1)\ cr \cong \frac{\Delta p}{Pp} - \frac{capex}{Pp}$$

With:

cr : capital growth/return
Pp : selling price
Δp : price variation
capex : capital expenditure

Capital return is nearly equal to the variation in price, divided by the purchase price, minus capital expenditure, divided by the purchase price.

We can then develop capital return as follows:

$$(2)\ cr \cong \frac{\Delta px}{Pp} - \frac{capex}{Pp} = \frac{Sp - Pp}{Pp} - \frac{capex}{Pp} = \frac{Sp}{Pp} - 1 - \frac{capex}{Pp}$$

With: *Sp* : selling price

And the price is equal to the net operating income divided by the income return:

$$(3)\ p = noi/ir$$

With: *noi* : net operating income
ir : income return

This means:

$$(4)\ \frac{Sp}{Pp} = \frac{Snoi/_{Sir}}{Pnoi/_{Pir}} = \frac{Snoi}{Pnoi} . \frac{Pir}{Sir}$$

And net operating income is equal to net rental value multiplied by the occupancy rate (1 - vacancy rate):

$$(5)\ noi = nrv.(1 - vac) = nr.occ$$

With: *nrv* : net rental value
vac : vacancy rate
occ : occupancy rate

Replacing (5) in (4) gives:

$$(6)\ \frac{Sp}{Pp} = \frac{Snrv.(1 - Svac)}{Pnrv.(1 - Pvac)} . \frac{Pir}{Sir} = \frac{Snrv}{Pnrv} . \frac{Socc}{Pocc} . \frac{Pir}{Sir}$$

If I call ∂x the growth rate of the variable x then I find:

$$(7)\ Sx = Px + \partial x.Px = (1 + \partial x).Px \leftrightarrow \frac{Sx}{Px} = (1 + \partial x)$$

With: *Sx* : the variable x at the time of sale
Px : the variable x at the time of purchase

If, for example, a price rises by 10%, this means that the selling price is 10% higher than the purchase price, so that the selling price (Sp) is equal to the purchase price (Pp) plus 10% of the purchase price.

I can therefore replace the ratios in equation (6) by their expression in growth rates (7), and we find:

$$(8)\ \frac{Sp}{Pp} = (1 + \partial nrv).\left(\frac{1 - Svac}{1 - \mathrm{P}vac}\right).\frac{1}{(1 + \partial ir)}$$

$$(9)\ \frac{Sp}{Pp} = (1 + \partial nrv).(1 + \partial occ).\frac{1}{(1 + \partial ir)}$$

With:
- ∂nrv : the growth rate of net rental value
- ∂occ : the growth rate of occupancy rate
- ∂ir : the growth rate of income return

If I replace (9) in equation (2) I find that:

capital return is a direct function of:

- **the growth rate of net rental value (∂nrv)**
- **the growth rate of occupancy rate (∂occ)**
- **the growth rate of income return (∂ir)**
- **the capex rate (capex%)**

$$(10)\ cr \cong (1 + \partial nrv).(1 + \partial occ).\frac{1}{(1 + \partial ir)} - 1 - \frac{capex}{Pp}$$

$$(11)\ cr \cong (1 + \partial nrv).(1 + \partial occ)/(1 + \partial ir) - 1 - capex\%$$

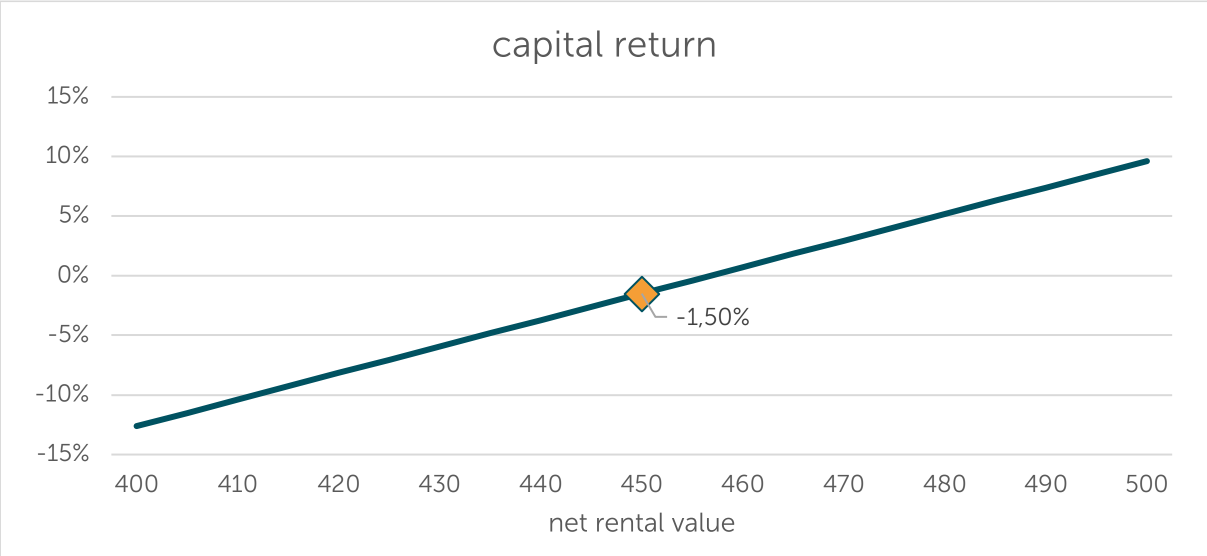
Using this equation, and assuming a credible initial situation for the Ile-de-France office market, I can calculate the sensitivity of the capital return to each of these components.

I'm going to take as my initial situation a point close to the average for the current Paris office market, i.e. a net rent of around €450 per square metre, a vacancy rate of around 8% and therefore an occupancy rate of around 92%, an income return of around 4% and a capex rate of around 1.5%.

The graph below shows me what the return on capital would be if, starting at €450, the rent for the property analysed moved to between €400 and €500, with all other variables remaining stable.

If the **rental value** itself remains stable at €450, then nothing changes and so the return on capital is equal to minus the rate of capex spent on maintaining the quality of the property; in the example -1.5%.

$$cr \cong (1 + ((net\ rental\ value - 450)/450)).\frac{(1+0)}{(1+0)} - 1 - 1{,}5\%$$

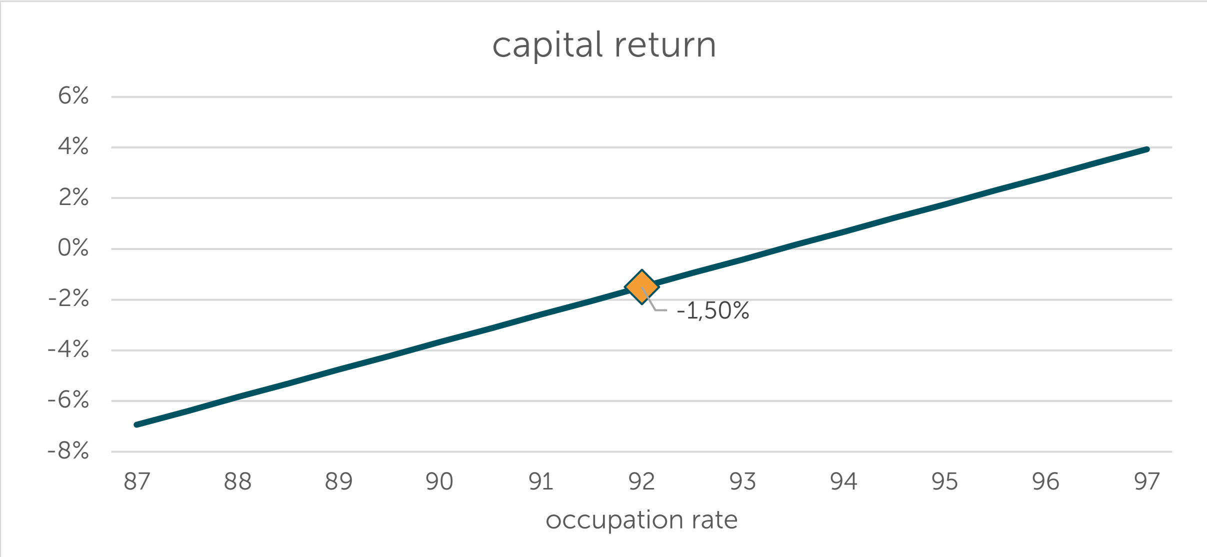


source: MSCI, IEIF calculation

The graph below shows me what the return on capital would be if, starting from 92%, the occupancy rate of the property analysed moved to between 87% and 97%, with all the other variables remaining stable.

If the **occupancy rate** itself remains stable at 92%, then nothing changes and so the return on capital is equal to minus the rate of capex spent on maintaining the quality of the property; in the example -1.5%.

$$cr \cong (1+0).\frac{(1+((occupancy\ rate - 92\%)/92\%))}{(1+0)} - 1 - 1{,}5\%$$

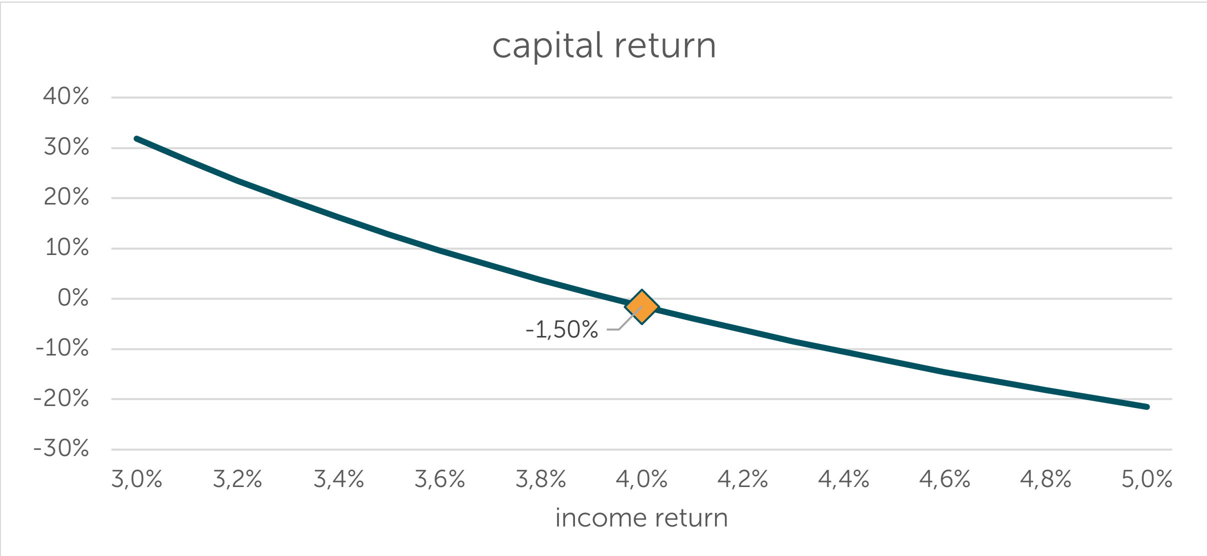


source: MSCI, IEIF calculation

The graph below shows me what the return on capital would be if, starting from 4.0%, the income return on the property analysed moved to a yield of between 3.0% and 5.0%, with all other variables remaining stable.

If the **income return** itself remains stable at 4.0%, then nothing changes and the return on capital is therefore equal to minus the capex rate spent on maintaining the quality of the property, in the example -1.5%.

$$cr \cong (1+0).\frac{(1+0)}{(1+((income\ return-4\%)/4\%))}-1-1{,}5\%$$

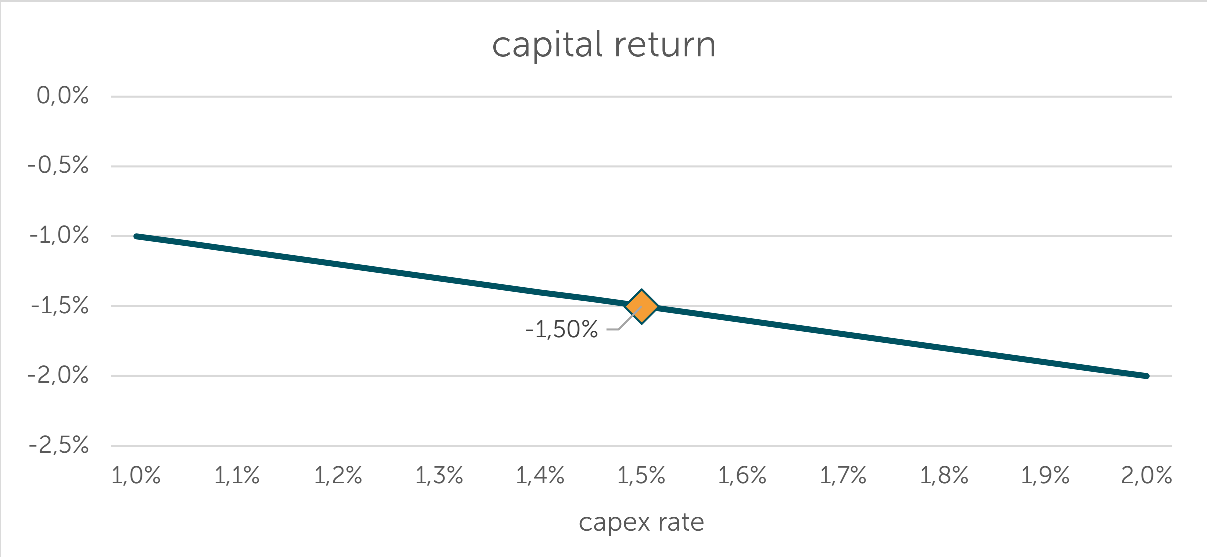


source: MSCI, IEIF calculation

The graph below shows me what the return on capital would be if, starting from 1.5%, the capex rate of the asset analysed moved to between 1.0% and 2.0%, with all other variables remaining stable.

In fact, equation (11) shows us that if nothing changes then the rate of return on capital is equal to minus the **capex rate**.

$$rdc \cong (1+0).\frac{(1+0)}{(1+0)} - 1 - capex\ rate$$



source: MSCI, IEIF calculation

Looking at the y-axis (vertical) of the four graphs, one might get the impression that the return on capital is very insensitive to the capex rate, slightly more sensitive to the occupancy rate, then to the net rental value, and finally very sensitive to the rental yield. This is only partially true, as we must always be wary of scale effects.

Furthermore, it is crucial to understand that the capex rate does not only influence the return on capital as a cost... Of course, capex is a cost, but it is also an investment. Above all, capex is a means of maintaining the quality, attractiveness and therefore the value of the property more or less constant over time, all other things being equal. In the absence of capex, the property depreciates intrinsically, independently of its occupancy rate. This depreciation is due to the increase in its income return and the reduction in its rental value relative to other properties that have been maintained.

We will analyse the historical sensitivity of the capital return to its components in more detail in the next Chronicle.

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.