Discounting Cash Flows in Real Estate Valuation in due Consideration of Systemic and Non-Systemic Risks

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Status Quo
The purchase of real estate in Germany is currently one of the most attractive ways for financial investment. However, for stable prediction of the possible profit the knowledge of its real value is a major precondition. The prediction of future Cash Flows (rental), including rents, maintenance and modernization cost and residual market values build the basis of valuation.

Classical valuation methods mainly work on experienced data from the past, which cannot provide information of future markets, in particular on starkly volatile sectors. All comes down to estimate and manage the inherent risks properly. Systemic risk factors go with the systems the property is operated and sold in, e.g. markets, locations, trends, while non-systemic risks are connected with properties of the real estate and directly depending on the object itself and can therefore be widely influenced.

In order to estimate appropriate values of property the influence and development of systemic and non-systemic risks needs to be analysed and quantified which is the goal of this research.

Valuation on financial markets
Discounting of future cash flows (CF) is the basis of all valuation methods for investments, where the value (PV) is derived from earnings which are directly economically quantifiable. With the time t and the discount rate r, this sums up to:

\[ PV = \sum_{t=1}^{n} \frac{CF_t}{(1 + r)^t} \]

Assuming the investment cost equating the present value of the investment, the discount rate reflects exactly the return on which the invested capital pays off.
According to the principle of opportunity cost, the return on a safe (i.e. risk-free) investment is equal to the risk-free interest rate \( r_f \) at which the capital could alternatively be invested. If the investment involves a risk, the risk-free interest rate is charged a risk premium, which can be determined in different ways.

There are two major types of equilibrium theories in financial literature treating asset pricing: The Capital Asset Pricing Theories (CAPM) and the Arbitrage Pricing Theory (APT). Generally, both issue statements regarding the relationship between expected returns and attributes of assets making use of different assumptions. Another possibility for asset pricing is the use of factor models, which explain the returns of assets through common pervasive factors.

The use of financial valuation methods in the real estate market
Since there are no accepted models for the determination of returns or discount rates existing in the real estate market, and since property is recently understood more and more as an asset instead of a purely physical object, utilizing valuation methods from the capital market for the real estate market seems sensible.

Due to their strict restrictions and not transferable assumptions as well as to the poor availability of data and missing transparency on the real estate market, the CAPM and the APT are less suitable. The factor model, on the other hand, offers the opportunity to address the data provision problem by explaining real estate returns \( r_i \) on causal factors \( F_k \) such as the key interest rate or GDP coming from far more transparent markets:

\[
  r_i = a_i + \sum_{k=1}^{K} \beta_{i,k} * F_k + \varepsilon_i
\]

Here, \( a_i \) is the market-independent expected component of \( r_i \), \( \varepsilon_i \) the market-independent random element of \( r_i \) and \( \beta_{i,k} \) a measure of volatility, or systemic risk, of \( r_i \) in comparison to factor \( F_k \).

Various studies have identified several factors influencing the real estate market and thus real estate returns. Fig. 1 shows the verification of such a relationship, which was also tested for delayed effects with the help of time lags.

Fig. 1: Scatter plot of returns for office properties and number of employed persons for three German cities.

Time-series-cross-section analysis (TSCS)
Once all relevant factors have been identified, the beta-factors can be determined using time series data for different cities. The complex structure of this data set requires the use of special regression methods, e.g. the TSCS methods. In addition to the determination of non-systemic risks from object data, a well-determined return can be obtained. Based on this return value, the present value of a property is expected to be derivable with a high level of reliability.

References