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SIGNIFICANCE OF RESIDUAL VALUE IN ASSET VALUATION

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Abstract

The construction of residual value is a key element of income methods in asset valuation. Its main task is to include asset value at the end of the forecasted cash flow period. Although it is common to apply simplified models of residual value in valuation practice, its meaning in shaping the final outcome is substantial.

The aim of the article is to emphasize the role of using an appropriate formula in determining residual value in the valuation process. Moreover, alternative methods of estimating residual value will be presented together with scenarios of applying them.

Key words: valuation, DCF method, residual value.

JEL Classification: R30.

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1. The crux of residual value

Residual value[1] is a category connected with income based valuation methods. In these methods, value is determined as the sum of discounted net cash flows generated by the subject of the valuation in the forecasted time period. Due to the fact that, in most valuations, a long time period of analysis is assumed (the indefinitely long period of generating cash flows by valuated asset), this time period is divided into two slots: the period of detailed analysis and the continuation period. A generalized idea of the DCF valuation method is, thus, determined by the following formula:

$$V = \sum_{t=0}^{n} \frac{CF_t}{(1+d)^t} + RV \cdot \frac{1}{(1+d)^n} \qquad (1)$$

where:

V – market value;
CF_t – annual cash flow;
RV- residual value;
d - discount rate;
n - duration of forecast period.

Residual value is defined as the value of an asset at the end of the period of detailed analysis (NATIONAL COMMON VALUATION STANDARDS). It allows cash flows generated by the valuated asset after the forecasted period or the potential income that it is possible to obtain from selling the subject of valuation at the end of a forecast to be included. Omitting residual value would result in the

[1] or *terminal value* as can be found in western literature.

assumption that the valuated good will function and generate income solely for the definite number of years specified in the period of detailed analysis; after the analysis finishes, the value of the good will equal zero (SZCZEPANKOWSKI 2007).

2. Significance of residual value in valuation

According to the formula (1), the outcome of the DCF method is the sum of two components: the sum of discounted cash flows forecasted for n consecutive years of detailed analysis, and discounted residual value. The significance of RV in the final result of the valuation depends on the number of factors, including the following:

- The subject of valuation (category of the valuated asset),
- Expected investing and development activities in the forecast period,
- The risk involved with the generated cash flows in the continuation period,
- The length of the analysis period.

The last of the listed factors is most significant in the process of valuation. As the period of detailed analysis shortens, the role of residual value increases. The relation between the length of a forecast period and the importance of residual value have been presented in Fig. 1.

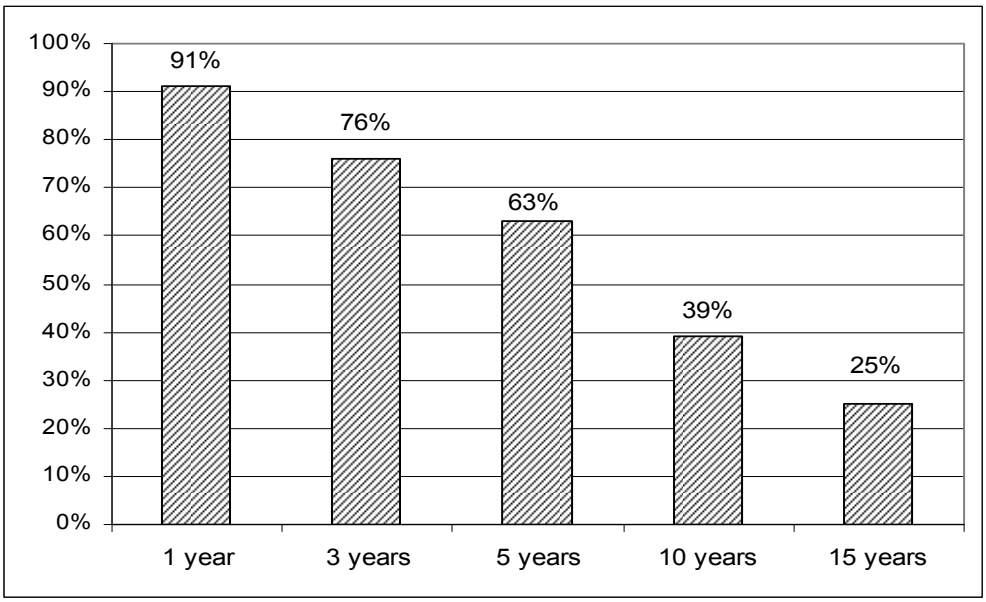

Fig. 1. Discounted residual value as a % of market value, *Source*: POLSON (2006).

The analysis of Polish valuations also provides evidence of the significance of residual value. Both in the case of enterprise and property valuation, the role of residual value in the final outcome is considerably higher than the role of discounted cash flows from the forecast period (see Table 1).

Table 1

Role of residual value in Polish valuations

Subject of valuation	Enterprise	Real estate
Number of valuations	40	19
Average length of detailed analysis (years)	7.8	4.5
% share of RV in the market value	59%	72.5%

Source: prepared by the author.

According to presented data, the level and significance of residual value is strictly dependent on the length of the forecast period. A properly determined period of detailed analysis should:

- give the opportunity to prepare the most probable cash flow forecast,
- include the full market cycle that the valuation subject concerns. If a forecast period is too short it may bring about the risk of the significant overvaluation of an asset (in the case of a market growth phase) or underestimation of the value (in case of a market downturn),
- include both the realization phase and the operational phase of an investment if the valuation assumes development or investment activity,
- include the years of cash flow fluctuation (its end should be marked by signals of cash flow stability or stability in the pace of cash flow changes).

It should also be pointed out that the role of a valuer in detailed analysis is a reflection of the fluctuation of cash flows as a result of factual market conditions. It shouldn't be an individual prediction of market movements. Forecasting is prone to errors which affect the quality and credibility of valuation, leading to individual rather than market value.

3. Models for estimating residual value

Literature provides a number of examples of estimating residual value. Among these methods, the following can be found: comparative methods (including multiplier methods), and methods of liquidation, replacement, and book value (TUZIMEK 2011). However, the most popular solutions in this field are income concepts based on definite or perpetual cash flows.

3.1. Model of capitalized perpetual annuity

This model assumes the stability of cash flows generated by the subject of a valuation in an indefinite time period. Residual value is determined as capitalized perpetual annuity:

$$RV = \frac{CF_n}{D_n} \tag{2}$$

where:

RV – residual value;

CF_n – annual cash flow in the continuation period;

D_n – terminal capitalization rate

The difficulty of applying the above formula is connected with the necessity of appropriately designating capitalization rate. It needs to be noted that in order to calculate residual value, this should be the terminal (D_n) not going-in (D_0) capitalization rate. Terminal capitalization rate is a reflection of the market participants' expectations as to the level of the going-in capitalization rate at a specified time in the future. The valuator's task is to determine the capitalization rate that the market expects at the end of the detailed analysis period. It ensures the logical coherence of a model in which both net income and capitalization rate are evaluated for the same moment in time.

The following are listed among the factors determining variations between the going-in and terminal capitalization rate: a greater risk of forecasting for future time periods, the physical depreciation and functional obsolescence of tangible assets, e.g., property (which may influence future cash flows). Due to this fact, D_n is usually > D_0. Also, expectations concerning changes in selected market conditions have a significant influence on the relations between rates. Expected market prosperity in the future signalized by a drop in interest rates, decreasing investment risk, and increasing demand may lead to adopting a reverse rate relation ($D_0 > D_n$). Empirical studies for real estate markets indicate that the differences in the levels of both rates reach 0.5-1 percentage point (CORGEL, LEE 2011).

3.2. The Gordon model

This model assumes a constant pace of cash flow change in the continuation period. Residual value is determined on the basis of the following formula:

$$RV = \frac{CF_n \cdot (1+g)}{d-g} \quad \text{for} \quad d > g \tag{3}$$

where:

RV – residual value;
CF_n – annual cash flow in the last year of detailed analysis;
d – discount rate;
g – cash flow growth rate in the continuation period.

The appropriate application of the model is connected with the need to determine the level of the g coefficient. Basic instructions concerning forecasting the rate of cash flow changes can be found in literature (DAMODARAN 2006):

- for a long time period, it should not exceed the long-term economic growth rate (or the selected market growth rate),
- it can be expressed in nominal terms (other RV components are also included in nominal values) or real ones (if residual value is estimated in real terms),
- it can be a negative number (scenario of stable cash flow decline over consecutive years),
- it should reflect the life cycle phase of the valuated asset.

4. Alternative formulas of residual value

The presented models of residual value may be applied under the condition that cash flows or the pace of their changes are stable during the continuation period. These scenarios are not always applicable in the process of valuation. The life cycle phase of a valuated asset (e.g., property, enterprise, tangible assets) ought to be of significance when making a decision concerning the formula of residual value. The marketing concept of a product life cycle identifies four basic stages in the life of commercial goods. Each of them is characterized by different dynamics of revenues and profits associated with a product (see Fig. 2).

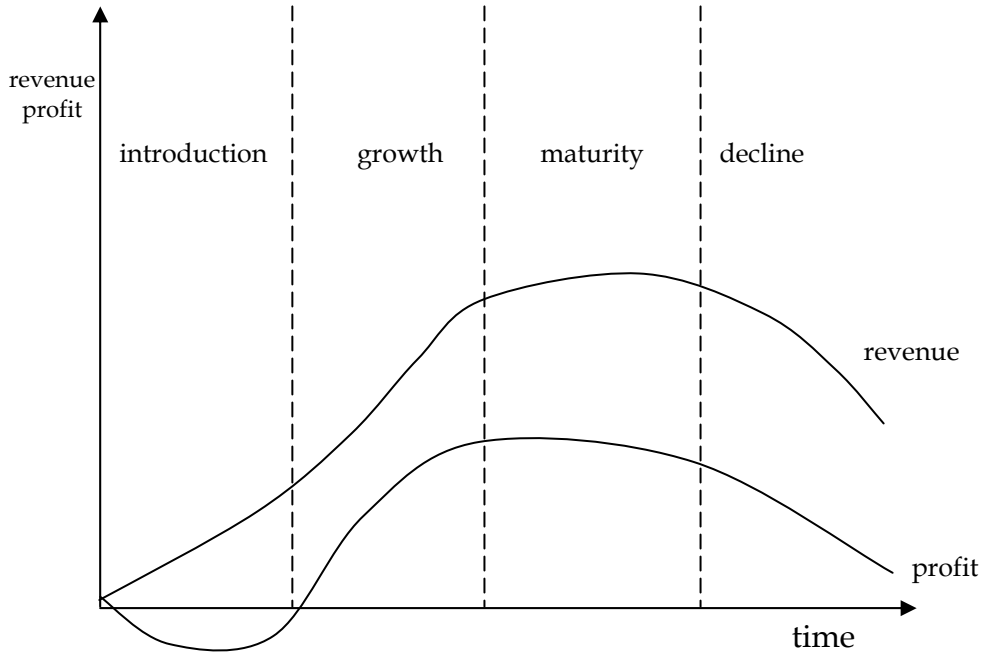

Fig. 2. Stages of the product life cycle, *Source:* prepared by the author.

Asset valuation, particularly in the early stages of the cycle of their existence on the market, which are characterized by a high rate of changes in cash flows, requires adopting an appropriately long time period so as to carry out a detailed analysis (until the forecasted cash flow stability has been achieved) or applying a residual value formula that includes different growth rates of future cash flows.

Therefore, two- and three-stage models of changes in cash flows may, for example, prove useful in the valuation process. Originally applied in company valuation, they can easily become an efficient tool in calculating residual value for other types of assets.

4.1. The two-stage H model

The model presented in 1984 by R. Fuller and C. Hsia assumes a linear drop of the cash flow rate in the first phase (from the extraordinary g_1 level to the long-run g_2 rate), followed by its stability for an indefinite period of time (FULLER, HSIA 1984), (see Fig. 3).

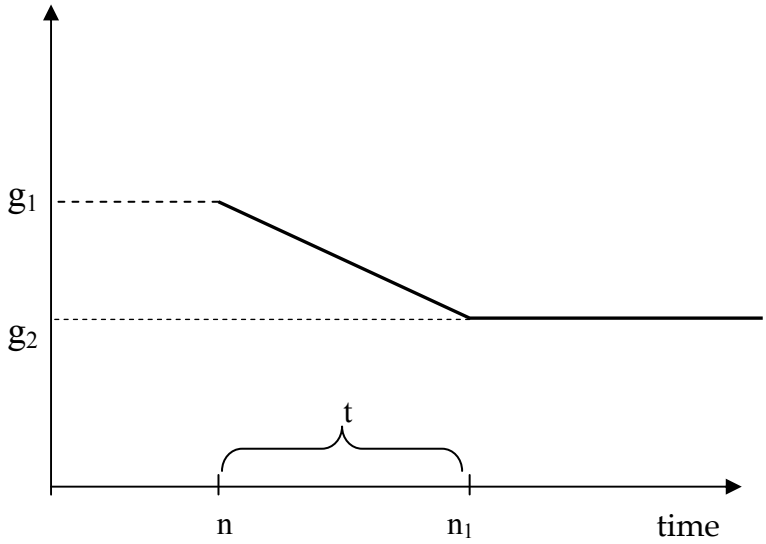

Fig. 3. Change in the growth rate of cash flows in the H model, *Source:* prepared by the author.

When taking into consideration the above assumptions, residual value calculated at the end of the period of detailed analysis is expressed by the following formula:

$$RV = \frac{CF_n \cdot (1+g_2) + CF_n \cdot \frac{t}{2} \cdot (g_1 - g_2)}{d - g_2} \qquad (4)$$

$$\text{for } d > g_1 > g_2$$

where:

RV – residual value;
CF_n – cash flow from the last year of the detailed analysis;
d – discount rate;
g_1 – initial growth rate of cash flow;
g_2 – long-term growth rate of cash flow;
n – end of detailed analysis period
t – expected time of decline in the growth rate of cash flows from a g_1 to g_2 level.

The H model creates an appropriate solution in the valuation of assets characterized by high dynamics of an increase in cash flows that, in consecutive years, will show decreasing tendencies (e.g., due to increasing market saturation or the ageing process of a product) until a long-term growth rate has been achieved. As opposed to the other two-stage models, the H model assumes a transition phase between the periods of extraordinary and long-term cash flow increase (elimination of a rapid change in cash flow increase) (PINTO 2010).

4.2. The three-stage model

This model features three consecutive periods characterized by different dynamics in cash flows. In the first stage, which lasts t_1 years, cash flows increase at a g_1 rate (an extraordinary cash flow increase). The second stage assumes a linear decline in the growth rate of cash flows from the g_1 level to g_2. In the last stage, cash flow rate is stabilized at a long-term level of g_2 (see Fig. 4).

Considering the above assumptions, residual value determined at the end of the detailed analysis period is expressed by the following formula:

$$RV = CF_n \cdot \frac{(1+g_1)}{d-g_1} \cdot \left(1 - \left(\frac{1+g_1}{1+d}\right)^{t_1}\right) + CF_n \cdot \left(\frac{1+g_1}{1+d}\right)^{t_1} \cdot \left(\frac{(1+g_2) + \frac{t_2}{2} \cdot (g_1 - g_2)}{d - g_2}\right) \qquad (5)$$

for $d > g_1 > g_2$

where:

RV – residual value;
CF_n – cash flow from the last year of the detailed analysis;
d – discount rate;
g_1 – initial rate of cash flow increase;
g_2 – long-term rate of cash flow increase;
n – end of detailed analysis period;
t_1 – duration of the first stage;
t_2 – duration of the second stage.

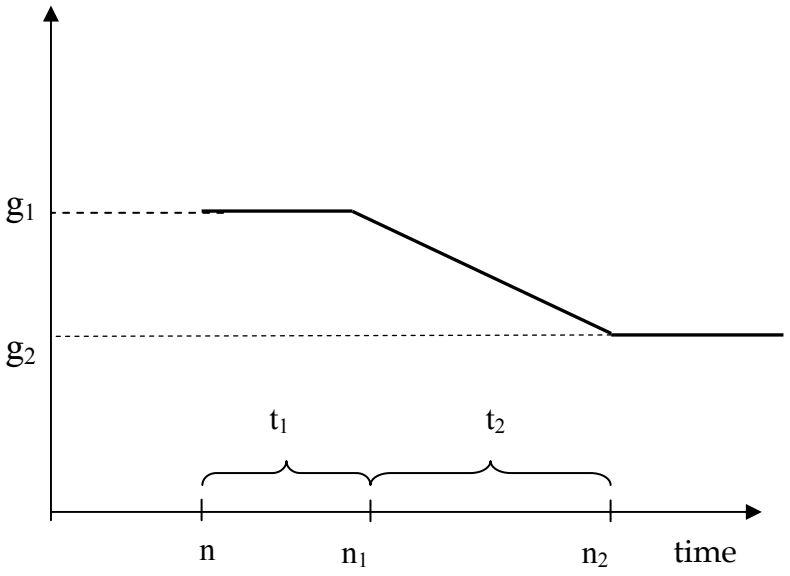

Fig. 4. Change in the growth rate of cash flows in a three-stage model. *Source:* prepared by the author.

The three-stage model may become a useful tool in the valuation of assets that are facing an expansion stage and a dynamic increase in cash flow that is connected with it (for a definite number of years). Along with maturing on the market, their dynamics will decrease according to the assumed long-term level. A certain limitation, as far as its practical application is concerned, may be its complexity and the necessity to estimate the required parameters of the model (e.g., t_1, t_2, g_1, g_2).

When summarizing all of the presented models of calculating residual value, it is worth noting the manner in which the influence of inflation on the individual components is included. The above formulas may be applied for real values (e.g., valuation of properties) and nominal values (e.g., valuation of enterprises). This has particular importance when interpreting the individual concepts of residual value[2]. Applying real values in the model of capitalized perpetual annuity (cash flow and discount rate) is equivalent to the assumption that, in the consecutive years of the continuation period, real cash flows will remain at the same level (it is therefore assumed that cash flows in nominal terms will grow at the inflation rate). On the other hand, the same model including nominal values (cash flow and discount rate) assumes a drop in the real value of cash flows in the continuation period (sustaining nominal cash flow at the same level).

5. Summary and conclusions

National and international valuation practice confirm the paradox of the DFC method that places a great emphasis on accurately forecasting cash flows in the years of detailed analysis, when their significance may be disproportionately small in relation to residual value constructed with a number of simplifying assumptions. This means that the incorrect assumptions adopted when selecting a formula of terminal value bring with them a risk of the significant overestimation or underestimation of value.

[2] The same model of residual value will reflect other scenarios of changes in cash flow when applying nominal and real values.

Realizing the influence of residual value on the outcome of the valuation process should lead to greater reflection on choosing the model of residual value that will present the most probable scenario of how a given valuation subject will function in the continuation period. The classic approach to residual value estimation is not always the appropriate solution.

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