

Edina Cziglerné Erb

# *The Re-emergence of the Residual Income Model in the Valuation of Firms and Investment Projects*

---

**SUMMARY:** Residual income valuation was already known and used in valuation theory and practice previously, however, the method has been subject to increasing attention in the past decades. By comparing the discounted cash flow method and the residual income model, this paper seeks to answer the question of what practical implications the difference in theory results in. The discounted cash flow method continues to be widely popular in literature and international practice, however, it may give rise to flawed results in certain cases. With the help of specific business examples, the study highlights that in such cases, the risks of under or overestimation can be mitigated with the help of the RIM model. The largest benefit of the residual income model compared to the DCF method is that instead of deriving the value solely from the future, it gives a central role to the already known book value, and the speculative value – determined based on the accounting income – plays a less significant role in the course of valuation.

**KEYWORDS:** residual income, discounted cash flow valuation methods, intrinsic value

**JEL CODES:** G11, G12, G32

**DOI:** [https://doi.org/10.35551/PFQ\\_2020\\_3\\_7](https://doi.org/10.35551/PFQ_2020_3_7)

---

**I**n the theory of business and investment valuation, the theoretical and methodological basics of the Residual Income Model (RIM) were established in the middle of the twentieth century. The RIM model is a valuation method based on the principles of financial accounting that was never an accepted tool in corporate finances, an area primarily dominated by the discounted cash flow method. Dividend and cash flow valuation methods had an al-

most exclusive role in the literature on equity valuation for long decades. The main reason behind this is that the value of equity can only be approximated authentically in a forward-looking manner, based on the estimation of future cash flows. This also meant that the accounting data documenting past and present values are not suitable for estimating the value of the equity. Cash flow forecasts have been subject to more and more criticism in the past decades due to the wide scale business instability and the unpredictable and hectic nature of cash flows and investment

---

*E-mail address:* [cziglerne.erb.edina@ktk.pte.hu](mailto:cziglerne.erb.edina@ktk.pte.hu)

spendings. The belief that the equity of the company – accrued until the time of valuation – and the estimated residual income could provide a better basis for estimating capital value was gradually growing stronger. This turn gives relevance to a closer examination of the residual income method.

My study “re-explores” the valuation method based on residual income and the accounting value of the company’s capital, while also presenting its advantages together with a criticism on the DCF methods. The study represents an added value both from a theoretical and practical perspective. On the one hand, the Hungarian financial and valuation literature rarely includes studies of such approach, and thus the comprehensive theoretical review of the paper can be considered novel in Hungarian literature on its own already. On the other hand, the practices illustrated through numeric examples elaborated in the paper should be considered as new scientific findings as they highlight the fact that due to the theoretical differences, the residual income model outperforms the discounted cash flow model in certain cases.

## A REVIEW ON THE HISTORY OF THE DEVELOPMENT OF THE RESIDUAL INCOME VALUATION METHOD

We need to go back in time to identify the first traces of residual income in theory, manifested by *Marshall’s* (1890) normal profit concept. Under normal profit, Marshall means the residual profit the owner of the firm is entitled to for the contribution he or she makes to the business. One of such contributions is the investment of the personal capital of the owner for the sake of the business, and the other is making the “power” of organizing and administering the business activity available

to the corporation. According to Marshall, to ensure that the owner (and/or entrepreneur) make such inputs available on a continuous basis, a minimally required reward is needed – i.e. the normal profit. The normal profit is, essentially, an opportunity cost, which requires the reward to be bigger than it would be if these inputs generated a return in an alternative utilisation scenario.

The valuation method based on the estimation of capital value and the process based on accounting data appeared in literature close in time, in the 1930s. *Fisher* (1930) as well as *Graham and Dodd* (1934) mention the importance of the intrinsic value of stock. Fisher positively states that the present value of assets is not determined by past data, but future proceeds. Even though Graham and Dodd’s referenced paper and Graham’s (1973) work on stock analysis also base present value on discounting expected future returns. In his latter work, Graham calls the readers attention to the fact that in the course of valuation, we should separate what we know (past and present figures) from what we don’t know, and only speculate by building on accounting data. Graham was aware that the valuation is completed with a long-term forecast, however, with the increase of the estimation horizon, the uncertainty of the forecast will also grow. As a matter of fact, the two valuation approaches referenced here still form the two fundamental directions of business valuation unto this day (hungarian authors refer to valuation based on capital value as the return value approach, while they generally call valuation based on accounting as the asset value approach, see *Takács*, 2007 for example.

The history of the residual income valuation model dates back a long time. The thought that the value of the business was based on “excess profit” emerged in the 1930s. In one of his early works, *Preinreich* (1932) clarified the components of equity as per the books.

The first component is the present value of the originally invested equity, the second one is the profit retained and reinvested in the growth phase not paid out as dividend: this generates an equity increment, the present value of which should be taken into consideration. The third component is the payment of the return as dividend later. In addition to defining book value, Preinreich (1936) divides the returns generated into two parts: one of them is the annual interest on capital (the interest of capital expenditure), with the other being the excess return above the interest rate. The very first article including a reference to the clean surplus relationship was Preinreich's (1938) study, where the author claims that "capital value equals book value plus excess profit". In his article, he placed a significant emphasis on the value of the firm, earned either by discounting the dividend or the excess profit. According to Preinreich (1936), the firm's profit generating power is the primary source of capital value.

*Lundholm* (1995) claims that Preinreich's references to residual income has been mainly ignored in literature, and the reemergence of the thesis is owing to the authors of financial accounting literature. The turn started with *Lücke's* (1955) article, in which the author recommends the residual income valuation model as an alternative to discounted cash flow valuation. Preinreich (1937) previously wrote about how the capital value of profit equals the capital value of the cash flow balance in the long term. Lücke realised that the profit flow of subsequent time periods and the cash flow are asynchronous with each other in the short term. The averaging and recognition of differences only takes place in the longer term, and the discounting of residual income forms the link between the two valuations. On a perpetual time horizon, the discounting of the profit and the cash flow gives identical valuation results. This revelation was later

named the Preinreich-Lücke hypothesis. The relevance and longevity of this thought is justified by the article of *Takács et al.* (2020), who consider the changes in the balance sheet generating the differences between the earnings and the cash flow as zero in average in the forecasted years when developing cash flow forecasts in their empirical model, by claiming that these fluctuations balance each other in the long term.

Additional important events had taken place in relation to equity valuation until residual income valuation was rediscovered by Lücke. *Williams* (1938) presented the dividend as a fundamental element of equity valuation, and this approach was pursued as a tradition for a long time. The method of discounted cash flow (DCF) valuation also spread rapidly at the same time. The financial accounting literature has formulated the need for the more pronounced role of accounting data in business decisions. The more recent presentation of the residual income valuation method was provided by *Edwards and Bell* (1961). They realized that so that accounting could fulfil a role in valuation, it is necessary and indispensable that the data used be based on the measurement of the net return.

*Ohlson* (1995) brought a turning point in the introduction and acceptance of the residual income valuation model, with an article outlining the residual income model developed by him. The model is based on capital budgeting techniques and the net present value rule. The model assumes that a project has value only if it has a net present value, which means that the return of the capital invested must exceed the cost of the capital invested. Then the excess return models set out that the return must exceed the costs of capital as a basic principle. Following the Preinreich-Lücke tradition, Ohlson also expresses the value of the business with two components: one being the book value of

the invested capital, while the other is the present value of the excess return of the capital invested.

## THE MOST WIDELY APPLIED VALUATION MODELS AND THEIR CRITICISM

### Dividend valuation method

Following Williams' (1938) article, both valuation theory and practice considered the dividend paid by the firm as the basis of valuation. The formula of the dividend discount model can be written down as follows:

$$V_0 = \frac{d_1}{(1+r_E)} + \frac{d_2}{(1+r_E)^2} + \frac{d_3}{(1+r_E)^3} + \dots + \frac{d_n}{(1+r_E)^n} \quad (1)$$

where:  $d_i$  = is the annually paid dividend

$r_E$  = is the cost of equity

$n$  = is the number of years

According to *Penman* (2006), the dividend discount model manifests the idea of the firm's equity equaling the present value of expected future dividends, and the given dividend payments will be paid in the certain future periods. The proposition that the approximate value of the firm can be determined by discounting the dividend flow received heavy criticism. It was observed that many firms (even continually) do not pay dividends. A company striving for continuous development cannot pay the large part (or entirety) of its realized profit as dividend, as it would result in its own liquidation. *Modigliani and Miller*'s (1958) hypothesis of dividend irrelevance was based on this revelation. Based on the hypothesis of dividend irrelevance, the value of the firm does not depend on dividend. The dividend pertains to the division of the value, and not the generation of the same.

According to *Modigliani and Miller*, dividend influences the book value of the capital and not the income. Based on the clean surplus relationship, dividend payment (as a complement of retained and reinvested profit) influences the book value, and does not have an impact on the current revenue.

According to the hypothesis of dividend irrelevance, neither is the investment activity of firms influenced by dividend payment, since, as we have already discussed, the dividend rather manifests the division of the value than the generation of the same. This implies that the value originates from investments, and thus the dividend valuation model captures the value generated by the investment. The importance of the clean surplus relationship needs to be highlighted in relation to the dividend valuation model. If fulfilled, the dividend of the current year will be paid from the annual earnings (and not the registered capital), and the postponement of pay-out should also be precluded.

### Discounted cash flow valuation method

From the 1960s on, the discounted cash flow (DCF) method became the most dominant means of valuation. The arguments for the DCF method grew out from the criticism of accounting-based valuation methods. It was a widely held opinion that balance sheet data can be manipulated, and the books may show a "paper profit", that is, the business authenticity of the data serving as the basis of valuation might be compromised. Thus, the analysts considered cash flow more important than the accounting results. The DCF valuation method featuring a clear logic has remained the most generally used unto this day. The value of the firm is the total of the projects' NPV values. The same model

is used for valuing the project and the firm. In addition to valuing projects and firms, the method also proved to be useful and popular on special areas including corporate simulations (Tarnóczy, Fenyves, 2010) and the valuation of financial instruments (Szücs, Ulbert, 2017). In its original version, the DCF model can be written as follows:

$$V_0 = \frac{CF_1}{(1+r)} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \dots + \frac{CF_n}{(1+r)^n} \quad (2)$$

where:  $CF_i$  = is the annually generated cash flow (cash inflow – cash outflow)

$r$  = is the cost of capital (weighted average cost of capital, WACC)

$n$  = the length of the forecast period in years

The DCF valuation is based on the retrospective estimated data and estimated data pertaining to the future of the cash flow statement. The strength of discounted cash flow models is that they are rooted in corporate financing and emphasise the importance of the valuation of cash flows. A further weakness of this model is its heavy reliance on the terminal value: it is very sensitive to the estimated growth rate and the weighted average cost of capital. Consideration is strongly influenced by the timing of pay-out flows, and the cash flows can be quite volatile in time.

In one version of the discounted cash flow valuation model the discounted value of the free cash flow determines the value of the firm, in the following manner:

$$V_0 = \frac{FCF_1}{(1+r)} + \frac{FCF_2}{(1+r)^2} + \frac{FCF_3}{(1+r)^3} + \dots + \frac{FCF_n}{(1+r)^n} \quad (3)$$

where:  $FCF_i$  = is the value of the annual free cash flow (Free Cash Flow)

$r$  = is the cost of capital (weighted average cost of capital, WACC)

$n$  = the length of the forecast period in years

The free cash flow is an extraordinary indicator calculated based on the financial statements of the firm. It is derived by starting

off from the accounting earnings of the current year, with the help of the corrections through changes in the balance sheet resulting in cash flow, but not influencing the earnings with the following formula (Fernandez, 2002):

*Earnings Before Interest and Taxes (EBIT)*

- The theoretical tax burden on EBIT =
- = **After-tax profit without loan capital**
- + Amortisation
- Investment
- Incremental working capital
- = FREE CASH FLOW, FCF

Based on accounting rules, the investment is indicated in the balance sheet as an asset, and therefore the double definition of the investment is what causes the theoretical problem. Firms carry out investments in order to generate value, however, the free cash flow recognises the investment as a negative item: firms reduce free cash flow with increasing investments and increase it by liquidating the investments, regarding every other factor unchanged. They consider corporate investments the foundation of future perspectives, and thus their neglect for any shortsighted approach may become the source of severe losses in the longer term. Firms generating appreciation do not only “consume” cash flows, but generate cash on the longer term. This double definition of the investment cannot be handled by valuation models.

The source of problems is that if a firm has good investment options on a continuous basis, then even though the series of investments generated value, there could still be negative free cash flow (even on a continuous basis). Accordingly, they handle investments as a depreciation factor. The reason for this is that free cash flow is not a value added type of concept. The investment is carried out so that value can be generated with it, this however

can only take place by reducing free cash flow. This is why the latter becomes a liquidation concept, as the free cash flow increases when the assets are liquidated, and this can only be a perverse action from the point of continuously growing-developing firms.

Based on all this, it can be concluded that the free cash flow may give misleading valuation results. According to Penman's (2010) definition, free cash flow can be regarded as resources that can be used for dividend payment favouring shareholders and serving the net loan capital, however, it is not suitable for producing consistent valuation results. The investment must be recognized in the balance sheet as an asset, but handled as a deduction from the point of cash flow, it may give false results. This is why the free cash flow cannot be a correct indicator of value without reservations.

### Residual income-based valuation

In the residual income model (RIM), the intrinsic value of the firm has two components: one is the book value of equity capital, while the other is the present value of the future residual income.

	<i>Book value of equity capital</i>
+	<i>Present value of the perpetual future residual income</i>
=	<i>Residual value of equity capital</i>

where the cost of equity charge must be applied as a discount rate to determine the present value of future residual income.

According to Penman (2001), this method focuses more on the balance sheet (book value) and the income statement (earnings), than on the cash flow statement. In this method, investments are placed in the balance sheet, and are not deducted from the net income (earnings). This gives rise to two important

circumstances: one the one hand, handling the investment in this manner prevents the perverse changes of free cash flow. The other consequence warns us that the value can be both won and lost by the shareholders in the absence of proper cash coverage.

According to the fundamental perception of the residual income model, an asset that generates profit has a value, therefore, a firm purchasing an asset purchases profit, where the main question is how much they could pay for it. When the DCF method became widely used, one reason for that was the distrust against earnings and the over-confidence in cash flow estimation. The supporters of the residual income valuation model strived to use the book value and profit as a basis in the course of valuation. Penman (2010) however also raises the attention to the fact that even though profit should be in the focus of valuation, the present price paid for the profit should be formed diligently, thus avoiding the risk of overpayment.

There is according to accounting literature in that residual income may primarily serve the substantiation of short-term investment decisions. The residual income model is based on the clean surplus relationship of accounting, as demonstrated by the following formula:

$$B_t = B_{t-1} + NI_t - d_t \tag{4}$$

where:  $B_t$  = is the ending book value of the equity

$B_{t-1}$  = is the beginning book value of the equity

$NI_t$  = the net income of the current year (profit)

$d_t$  = dividend paid in the current year

A required rate of return is needed for determining the residual income which can be expressed as the product of  $r \times B_{t-1}$ , where  $r$  is the minimum return expected from the equity capital. Based on the foregoing, the residual income of the current year ( $RI_t$ ) can be defined as follows:  $r \times B$ .

$$RI_t = NI_t - r \times B_{t-1} \quad (5)$$

Pursuant to this formula, the residual income is the difference of net income and equity charge expressed in money. In this model, the book value gives the extent of the invested capital, and the latter can be perceived as the previously accumulated and capitalized accounting income. The company is generating value if the net income per equity capital unit exceeds the required rate of return on equity capital. According to Preuss (2016), the residual income valuation concept is based on the assumption that the investors' opportunity cost is integrated into the model, which leads to the fact that the investment decision can only be made in circumstances where the expected profit of the investment increases the return on equity capital.

Pursuant to the Preinreich-Lücke hypothesis, the amount of the present value of all future owners' cash flow (CF) equals the sum of the net income (NI) series when examining a sufficiently long T period (due to the long term balancing of the changes in the balance sheet not affecting earnings, but generating cash flow):

$$\sum_{t=0}^T \frac{CF_t}{(1+r)^t} = \sum_{t=0}^T \frac{(NI_t - r \times B_{t-1})}{(1+r)^t} \quad (6)$$

Based on the foregoing, the residual income valuation formula can be established, consisting of the two previously discussed components: of the current book value of the company's equity capital, and the present value of the future residual income. This can be expressed with the following formula:

$$V_0 = B_0 + \sum_{t=1}^{\infty} \frac{RI_t}{(1+r)^t} = B_0 + \sum_{t=1}^{\infty} \frac{(NI_t - r \times B_{t-1})}{(1+r)^t} \quad (7)$$

where:  $V_0$  = is the value of the firm,

$B_0$  = the ending book value of equity,

$B_{t-1}$  = the book value of equity capital in the previous period

$RI_t$  = residual income of future periods

$NI_t$  = the net income of the current period

$r$  = the required rate of return on equity capital

In light of the foregoing, it is possible to recognise the model's strengths and weaknesses. The strengths of the residual income valuation model include the following:

- it is a valuation method based on already known data,
- the speculative value represents a smaller part in the course of the valuation, smaller extent of uncertainty, lower risks of valuation errors,
- it can also be used in the case of firms not paying dividend, or in the case of which the expected rate of dividend pay-out is hard to estimate,
- it can also be used in the case of corporations carrying out fixed capital investments on a continuous basis, which would result in a negative free cash flow in the case of the DCF model,
- the method recognizes the importance of book value (which is not a result of future speculations).

At the same time, the residual income model also has its weaknesses:

- the accounting data can be manipulated, which may give rise to false valuation results,
- the model can only be applied if the accounting rule of the clean surplus relationship prevails,
- the residual income (and its alternative concepts: the economic profit or the abnormal profit) is not a stable return in the longer term, the competition between firms or the cease of the exceptional business ability crumbles additional incomes and reallocates them between the participants of the innovation, development and market competition.

A traditional financial statement is made in a manner to reflect the income available for the owners. Traditional accounting leaves it up to the owner to determine whether the income received is sufficient to cover the cost of equity, however, the residual income model shows the satisfaction of this criterion explicitly. This is demonstrated by the following simple example:

The total assets of the corporation of 2,000,000 thousand Forints is financed by loan capital and equity capital in 50-50%, respectively. The EBIT rate of the corporation is 10%, the pre-tax cost of the loan capital is 7%, the cost of equity is 12%, while the rate of income tax is 30%. The net income of the corporation can be determined as follows (in thousand Forints):	
EBIT (2,000,000 × 10%)	200,000
– Interest burden on loan capital (2,000,000 × 50% × 7%)	70,000
= Pre-tax earnings	130,000
– Income tax (30%)	39,000
= Net income	91,000
The extent of the residual income can be calculated from the data, for which the cost of equity capital expressed in money must be determined and then deducted from the net income, as follows:	
Net income	91,000
– Cost of equity capital (2,000,000 × 50% × 12%)	120,000
= Residual income	–29,000

Even though the firm was profitable in the year examined in the example from an accounting point of view, it still failed to realize a net income to cover the cost of equity, and thus ultimately the firm has a negative residual income. The residual income is also referred to as the economic profit, as it represents the earnings of the business that remains after deducting all costs of capital – both

the costs of loan capital and equity capital. The term abnormal returns is also in use. If we presume that – in the longer term – the firm realises the cost of its capital (originating from all sources), then any excess return above the cost of capital can be considered an abnormal income. The future income of the firm is determined by the net assets available to managers and the rate of return that can be realised on them (profitability) on the one hand. If a corporation realises a return above the cost of capital, such circumstance gives rise to a positive residual income. The companies realising a return below the cost of capital generate a negative residual income. The firms expected to generate a positive residual income can be sold with a premium above the book value of the equity. However, the companies expected to achieve a negative residual income can be sold for a discounted price lower than the book value of the equity. As a main feature, the residual income valuation model makes balance sheet and income statement data as well as the role of the cost of capital explicit.

Summing up the method, it can be concluded that the residual income model highlights that return-based valuation methods should not be neglected in certain life stages of firms, yet accounting data may also be used. Being familiar with the value of the business calculated with the help of the residual income method, it is possible to answer the question of how the market value is related to profit, book value and dividend when the clean surplus relationship is fulfilled.

### COMPARISON OF CASH FLOW-BASED AND RESIDUAL INCOME-BASED VALUATION

*Perek and Perek* (2012) claim that the discounted cash flow valuation method (DCF) and the residual income valuation

method (RIM) are the most examined and compared to one another. While the DCF method determines the discounted sum of the net cash flow sequence, the residual income model is based on a hybrid approach including insights from both the income approach and the cost approach. The RIM model includes in the value of a company not only the discounted future abnormal earnings but also the book value of the company as of valuation day.

The capital models pertaining to the investment projects and the valuation of firms may produce the same results with the application of various calculation bases, may it be cash flow, profit or residual income. This is substantiated by the aforementioned Preinreich-Lücke hypothesis, which shows that there is a relationship between the values, and such values can be applied interchangeably (Lücke 1955; 1991). As a result, the fact that the equivalence of the DCF and RIM models is only valid on a perpetual horizon, while the practical valuation can only be implemented on a finite horizon is a source of controversy.

In a conceptual sense, it does not make a difference whether we apply a discounted cash flow approach or the residual income model in the course of valuation. Then why would the analyst apply the residual model? One of the reasons is the timing of the recognition of the value, which is one of the great advantages of the residual income model, as forecasting future cash flows is generally not easy. In the DCF type approach, the majority of the value is in the calculation of the terminal value. The longer the forecast period, the larger the uncertainty concerning the future cash flow. The other reason is the role of the terminal value. In many residual income valuation contexts, the terminal value is considered zero. It is easier to determine the present book value than forecasting the terminal value due in ten or twenty years. The application of

the residual income model is the most useful when the firm has negative free cash flow over many years, but is expected to be able to generate positive free cash flow in the future (for example in the case of a new or rapidly growing firm, where investments stimulate future growth.)

Penman (2006) refers to Graham's opinion who claimed that the residual income model separates solid basic information and future speculations from each other. Penman and *Sougiannis* (1998) compare the dividend discounting, the discounted cash flow and the residual income model. The authors concluded that the residual income model entails a smaller rate of evaluation errors than any of the other two, if the results are compared to current stock prices. *Francis, Olsson and Oswald* (2000) state that the greater accuracy of the residual income model can be due to the sufficiency of book value of equity as a measure of intrinsic value and also because the predictability and precision of abnormal earnings are greater. In their article, the authors claim that the residual income model explains about 71 percent of the cross-sectional variation in stock prices. Based on the tests, the RIM model significantly outperforms the DDM and DCF valuation models.

The use of the original discounted cash flow approach is the most suitable for the valuation of projects, where we can assess the implementation of the investment with the calculation of the cash flows generated. The indicator suitable for business valuation is the free cash flow, therefore in the case of using the DCF approach, valuation takes place by determining the free cash flows, hereinafter referred to as FCF. In the followings, I will demonstrate the advantages of the residual income model against the free cash flow-based version of the traditional discounted cash flow valuation method as discussed above with two simple business examples. There are certain

special circumstances when the DCF type of methods do not represent the real value of firms like the American Apple or T-Mobile in a given point in time, one of the reasons for which may be the management of the aforementioned investments, with which we must make corrections in the case of the DCF models.

I carried out the calculations based on the corporate data available on the macrotrends.com website. I valued said firms with the help of the parameters available in Aswath Damodaran’s public database. In terms of the year 2019, I used the total market average as basis from the database in the case of both the cost of equity and the growth rate. In 2019, the cost of equity is 8.21%, the expected growth rate of fundamentals is 6.33%. In the case of the previous FCF calculation, – in which case corrections must be made with the amortisation and investments of the current year – the change of the investments is determined in the examples. The increase

or decrease of investments in the current year encompasses both the amortisation recognised and the investments, the deduction of which I will not detail here.

The shareholder’s equity of the T-Mobile US corporation is demonstrated by *Table 1* by applying the FCF approach and the RIM model, calculated with the growing perpetuity method.

The comparison of the two calculations demonstrate it vividly that the FCF model recognizes the investment as an item reducing cash flow (which can be concluded from the fact that the investments of 2019 increased in the amount of USD 13 429 million compared to the data of the previous year), as a result we receive a negative free cash flow for the year subject to examination, and capitalizing it for a perpetual time period will result in a negative shareholder’s equity. Therefore, according to the data of the example, the FCF model could classify a dynamically growing and continuously profitable firm as

Table 1

**THE SHAREHOLDER’S EQUITY OF T-MOBILE US FOR 2019 PURSUANT TO THE FCF AND RIM MODELS (DATA IN MILLION USD)**

FCF		RIM	
		Equity in the current year	28,789
Net earnings	3,468	Net earnings	3,468
– Increment on investment	13,429	Cost of capital (24,718×0.0821)	2,029
–Increment on current assets	699	Residual income in the current year	1,439
= Free Cash Flow	–10,660		
Shareholder’s equity [–10,660×1.0633/(0.0821–0.0633)]	–602,926	Shareholder’s equity [28,789 + 1,439×1.0633/(0.0821–0.0633)]	110,172

Source: own edited

valueless (as demonstrated by the USD –602 926 million shareholder’s equity). However, the calculation at the right side of the table shows that the residual income model regards investments as the means of producing future income and not as a value-decreasing factor. According to the calculation with the RIM model, the shareholder’s equity of T-Mobile US is USD 110 172 million. In light of the profitable operation and the growth potential of the firm, this is a much more realistic result than the negative value given by the FCF model. Taking the average stock prices of 2019 into consideration, which data also originate from the *macrotrends.com* and are based on the stocks at the end of 2019, the market value of T-Mobile US is USD 65 059 million.

Similarly to the previous example, the shareholder’s equity of the American Apple corporation is deducted with the FCF approach and the RIM model in the table below (See *Table 2*).

In this case, the fault of the FCF model

lies in that the significant decrease in investments (indicated in the formula as a negative investment) is quantified as an item increasing the cash flow, which results in a distorted, unreasonably high cash flow data. Projecting this to perpetuity, the model gives a shareholder’s equity of 6 601 649 million USD, which is unrealistically high compared to the present equity of the company. Even though in this case the RIM model is also overrated compared to the average market price of the Apple stocks in 2019 – 968 182 million USD –, but the differences in shareholder’s equity are more than double, once again constituting an unrealistic result.

## CONCLUSIONS

Summing up the theoretical background presented in the study and the numerical links demonstrated in the examples, we can conclude that even though discounted cash

*Table 2*

### THE SHAREHOLDER’S EQUITY OF APPLE FOR 2019 PURSUANT TO THE FCF AND RIM MODELS (DATA IN MILLION USD)

FCF		RIM	
		Equity in the current year	90,488
Net earnings	55,256	Net earnings	55,256
– Increment on investment	–58,689	Cost of capital (107,147×0,0821)	8,797
– Increment on current assets	–2,777	Residual income in the current year	46,459
= Free Cash flow	116,722		
Shareholder’s equity $116,722 \times 1.0633 / (0.0821 - 0.0633)$	6,601,649	Shareholder’s equity $[90,488 + 46,459 \times 1.0633 / (0.0821 - 0.0633)]$	2,718,148

Source: own edited

flow methods continue to be widely popular in literature and international practice, however, they may give rise to flawed results in certain cases. In the case of the FCF method, the main reason of the errors is the fact that the model recognizes the present investments substantiating future profits as value-decreasing factors. The largest benefit of the residual income model compared to the DCF method is that instead of deriving the value solely from the future, it gives a central role to the already known book value, and the component calculated from the future is not

determined by accounting rules but by the profit principle of the economy, where the judgement of the profit achieved comes from comparison with the cost of capital. The two business examples show that there may be special situations even in the case of globally known firms such as the American Apple or T-Mobile, when the DCF type models do not represent the real value of the corporation in a given point of time. The main reason for that is the management of investments, with which corrections need to be made in the case of DCF models.

---

#### REFERENCES

- EDWARDS, E. O., BELL, P. W. (1961). *The Theory and Measurement of Business Income*. Berkeley: University of California Press
- FERNANDEZ, P. (2002). *Valuation Methods and Shareholder Value Creation*. Academic Press, San Diego, California
- FISHER, I. (1930). *The Theory of Interest*. The Macmillan Company, New York
- FRANCIS, J., OLSSON, P., OSWALD, D. R. (2000). Comparing the accuracy and explainability of dividend, free cash flow, and abnormal earnings equity value estimates. *Journal of Accounting Research* 38. (Spring), pp. 45-70
- GRAHAM, B. (1973). *The Intelligent Investor*. 4th Edition, Harper and Row, New York
- GRAHAM, B., DODD, D. I. (1934). *Security Analysis*. Fifth International Edition, Mc Graw-Hill Book Company, New York
- LUNDHOLM, R. J. (1995). A Tutorial on the Ohlson and Feltham/Ohlson Models. *Contemporary Accounting Research*, Vol. 11, No. 2, pp. 749-761
- LÜCKE, W. (1955). *Investitionsrechnungen auf der Grundlage von Ausgaben oder Kosten?*. Zeitschrift für handelswissenschaftliche Forschung, pp. 310-324
- LÜCKE, W. (1991). *Investitionslexikon*. München
- MARSHALL, A. (1890). *Principles of Economics*. MacMillan and Co., London
- MODIGLIANI, F., MILLER, M. H. (1958). The Cost of Capital, Corporate Finance and Theory of Investment. *The American Economic Review*, Vol. 18, No. 3
- OHLSON, J. A. (1995). Earnings, Book Values and Dividends in Equity Valuation. *Contemporary Accounting Research*, pp. 661-687
- PENMAN, S. H. (2001). *Financial Statement Analysis and Security Valuation*. McGraw-Hill, New York
- PENMAN, S. H. (2006). Handling Valuation Models. *Journal of Applied Corporate Finance*, Vol. 18, Nr. 2

- PENMAN, S. H. (2010). *Accounting for Value*, Columbia University Press, New York
- PENMAN, S. H., SOUGIANNIS, T. (1998). A comparison of dividend, cash flow, and earnings approaches to equity valuation. *Contemporary Accounting Research*, Vol. 15, pp. 343-383
- PEREK, A., PEREK, A. (2012). Residual Income Versus Discounted Cash Flow Valuation Models: An Empirical Study. *Accounting and Taxation*, Vol. 4 (2), pp. 57-64
- PREINREICH, G. A. D. (1932). Stock Yields, Stock Dividends and Inflation. *The Accounting Review*, Vol. 7 (4), pp. 273-289
- PREINREICH, G. A. D. (1937). Valuation and Amortization. *The Accounting Review*, Vol. 12 (3), pp. 210-226
- PREINREICH, G. A. D. (1936). The Fair Value and Yield of Common Stock. *The Accounting Review*, Vol. 11 (2), pp. 130-140
- PREINREICH, G. A. D. (1938). Annual Survey of Economic Theory: The Theory of Depreciation. *Econometrica*, Vol. 6 (3), pp. 219-241
- PREUSS, B. (2016). Mathematical integration of the EVA and RI approach. [https://www.researchgate.net/publication/292391253\\_Mathematical\\_integration\\_of\\_EVA\\_and\\_RI\\_approach](https://www.researchgate.net/publication/292391253_Mathematical_integration_of_EVA_and_RI_approach), <https://doi.org/10.13140/RG.2.1.2242.4085>
- SZÜCS T., ULBERT J. (2017). Role and measurement of fair valuation in the Hungarian credit institution sector. *Financial and Economic Review*, 16 (3), pp. 51-73
- TAKÁCS A. (2007). A számított vállalatérték és a tőzsdei részvényárfolyam kapcsolata a magyar tőzsdei vállalatoknál. (The relationship between computed firm value and share price in the case of Hungarian quoted companies.) *Hungarian Statistical Review*, 85 (10-11), pp. 933-964
- TAKÁCS A., ULBERT J., FODOR A. (2020). Have investors learned from the crisis? An analysis of post-crisis pricing errors and market corrections in US stock markets based on the reverse DCF model. *Applied Economics*, 52 (20), pp. 2208-2218, <https://doi.org/10.1080/00036846.2019.1686114>
- TARNÓCZI T., FENYVES V. (2010). A vállalatértékelés komplex szimulációs modellje. (Complex simulation model of business valuation.) *Acta Scientiarum Socialium*, (31), pp. 95-106
- WILLIAMS, J. B. (1938). *The Theory of Investment Value*. Harvard University Press, Cambridge, Massachusetts