RESIDUAL INCOME IN FOUR DIMENSIONS: GOAL-CONGRUITY, CONTROLLABILITY, UNDERSTANDABILITY AND PRACTICABILITY

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The article discusses ten versions of residual income known in the literature from the point of view of four criteria that are of special importance if the measure is to be the basis of managerial bonuses: goal-congruity, controllability, understandability and practicability. There is – on average – a considerable trade-off between goal-congruity and the three remaining criteria. However, there are residual income versions – like net economic income (NEI) and the variant of residual income that is based exclusively on unadjusted book values (RI^{BV}) – which demonstrate outstandingly favorable levels of goal-congruity, controllability, understandability and practicability. Although NEI exhibits the highest level of goal-congruity among the ten versions of residual income studied in the article and acceptable levels of three remaining features, it is deficient of intensive scientific examination which is necessary to make such a new tool the subject of justified recommendation. On the other hand, RI^{BV} is the most controllable and seems to be the most understandable and the most practicable among the ten versions analyzed in the paper. However, its goal-congruity is relatively low. Yet, it can be improved without making the computational formula more complex simply by including some mechanisms making managers less myopic in bonus plan architecture.

Key words: **residual income (RI), net economic income (NEI), residual income that is based exclusively on unadjusted book values (RIBV), goal-congruity.**

JEL Classification: **M10, G30, L25.**

1. Introduction

Residual income is a well-known, although not extensively used in practice, measure of firm periodic performance. It differs from standard accounting income in inclusion of opportunity cost of capital in its calculation. The basic premise of its utilization relates to the benefits the metric can offer as the basis of managerial bonuses: the inclusion of opportunity cost of capital should aim managerial effort at firm value maximization and result in more goal-congruent investment decisions made by the firm executives. However, to serve as an effective incentive compensation tool, residual income has to satisfy some preliminary conditions referring to its controllability, understandability and practicability, besides the aforementioned goal-congruity. Residual income variants known from the literature satisfy these conditions to different degrees. There are residual income concepts exhibiting outstandingly high goal-congruity, yet hardly utilizable in practice. On the other hand, there are forms of the measure which reveal lower goal-congruity but which are considerably more understandable and practicable. Assuming that there are trade-offs among the degrees to which the four above mentioned criteria can be fulfilled by residual income, it seems reasonable to choose the version of the metric that is characterized by the best proportions in satisfying the conditions. There is no comprehensive comparative analysis of various residual income concepts in these four dimensions in the existing literature. This paper tries to fill the gap by evaluating ten variants of residual income known in the literature from the points of view of their goal-congruity, controllability, understandability and practicability. The aim of the paper is to give some preliminary recommendations as to the way the potential users of residual income should choose the form of the metric that is the most adequate in light of the internal (i.e. motivational and compensational) premises of its utilization.

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The remainder of the paper is organized as follows. The first section discusses the essence, forms and premises of utilization of residual income. The second section looks at the fundamental criteria that should be used in evaluating different residual income concepts assuming that the metric is to be the basis of managerial bonuses (goal-congruity, controllability, understandability and practicability). Section three examines ten residual income variants known from the literature by using a four-dimensional matrix including the aforesaid criteria. Finally, the fourth section provides a conclusion.

2. The Essence, Forms and Premises of Utilization of Residual Income

Residual income is defined as income from capital invested in a firm's assets including opportunity cost of the capital. It is calculated as the monetary difference between return on capital and cost of the capital, the latter variable being the result of multiplication of invested capital and the interest rate on it (*Figure 1*).

Although the concept of the firm performance measurement was popularized at the end of the 20th century by the value-based management (VBM) movement – a theory assuming the firm's value maximization as its ultimate goal – its history is much longer and it is tracked to the renowned Adam Smith's thoughts by some authors (Mepham, 1980; Bughin – Copeland, 1997; Arnold, 2000).

One of the most important advantages of residual income is its multi-tasking character. Although undoubtedly it is a periodic performance metric, it can also be used as tool allowing selection of investment projects in the way that is consistent with the signals given by the NPV method or as firm valuation tool, ensuring the same estimates as the widely accepted standard DCF method. The issue is covered in more detail in the second section of the article referring to – among other things – NPV-compatibility (or DCF-compatibility) of residual income.

Figure 1. Universal formula of residual income

Source: Author

There are at least several versions of residual income known today. They can be divided into three groups differing in the valuation model they are based on: accounting, economic and hybrid (*Figure 2*).

Accounting variants of residual income utilize the historic cost concept in fixed assets valuation and their consumption (depreciation) estimation. Expectations concerning future results affect no variable of which the residual

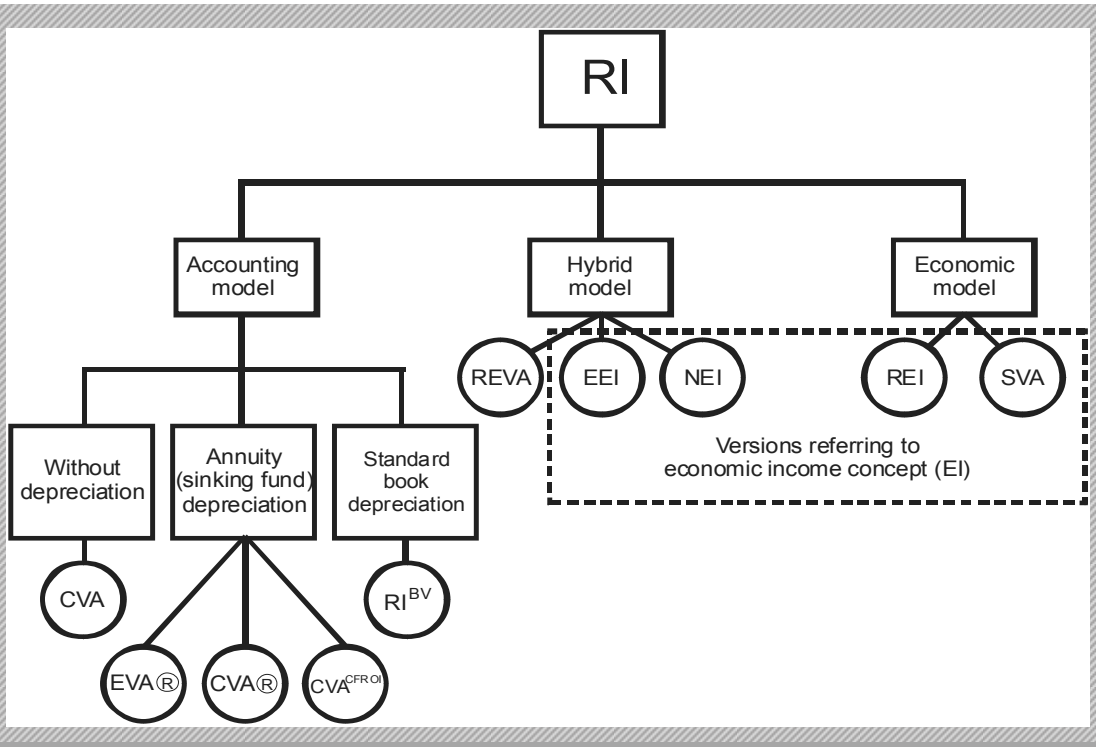

Figure 2. Three groups of residual income concepts

Source: Author

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income formula consists of[1]. The group is represented by the oldest and the simplest version of the measure which is residual income based exclusively on unadjusted book values. It will be marked RI^{BV} hereafter (see for example McTaggart et al., 1994). The group contains also the most famous adaptation of the residual income concept, namely economic value added – EVA® – marketed by Stern Stewart & Co (Stewart, 1991; Ehrbar, 1998; Young – O'Byrne, 2001)[2]. Three versions of cash value added – CVA – the most important competitor of EVA, are also included in the group (Knight, 1998; Young – O'Byrne, 2001; Weissenrieder, 2000; Martin – Petty, 2000)[3]. Some of the accounting versions of residual income – like RI^{BV} – make use of standard book depreciation (e.g. straight line), other (EVA, CVA® and CVA^{CFROI}) exploit annuity depreciation or its mutation which is the sinking fund method (the class they are included in will be marked RI^{ANN} henceforth), while – finally – CVA in its simplest form is calculated before subtracting depreciation. RI^{ANN} can be computed with cost of capital rate (see for example Stewart, 2002) or with IRR (see for example Grant, 2003; Young – O'Byrne, 2001; Cwynar, 2009).

The perspective taken in the residual income calculation that is based on the economic model is completely different. While the accounting model is past oriented, the economic one is forward-looking. It assumes that the value of capital invested in a firm's assets is determined by future cash flow from the capital. In other words, the value of the assets the firm's capital was invested in – named economic value – as well as their consumption (so called economic depreciation), is affected by expectations concerning future results. The logic that is behind the model is clearly reflected in the discounted cash flow (DCF) valuation model. The residual economic income – REI – can be considered a representative of the group (Bausch et al., 2003). Shareholder value added (SVA), the well-known variant of residual income created by A. Rappaport (1986), can be regarded a mutation of REI[4].

The third group of residual income variants – hybrid – consists of concepts combining features of the accounting model with the economic model. For this reason the measures included in the group are sometimes treated as syncretic or eclectic (see for example Skinner, 1998; Leistikow – Ferguson, 1998). For instance, in refined economic value added – REVA – calculus (Bacidore et al., 1997) the measure of invested capital is the firm's market value (economic view) while the measure of return on the capital is net operating profit after tax (NOPAT), i.e. a measure of income diminished by standard book depreciation (accounting view). Besides REVA, the group is represented by earned economic income – EEI (Grinyer, 1985; Grinyer, 1987) and net economic income – NEI (Drukarczyk – Schueler, 2000)[5]. It is worth noticing that two measures standing for the group – EEI and NEI, as well as REI – classified in the previous group – refer to I. Fisher's (1906) and J. Hicks's (1946) concept of economic income (hereafter EI) which is reflected in their names.

The authors of some metrics classified as residual income variants in the article do not consider them that way (see for example Grinyer, 1985 and Rappaport, 1986). However, each performance measure in which the computational formula can be re-arranged to a monetary difference between periodic return on capital and periodic cost of capital (capital charge) was supposed to be a form of residual income in the article (notabene, it is worth noticing that in some residual income variants depreciation is subtracted in return on capital estimation while in others – in capital charge estimation). In fact, all the metrics discussed in the paper – including J. Grinyer's EEI and A. Rappaport's SVA – satisfy this condition.

The premises of residual income utilization are twofold. One can distinguish external and internal premises. The difference deals with the ultimate users of residual income. External premises relate to the utilization of the measure by outside users (financial analysts, brokers, investors) and are based on the assumption that residual income can improve investment choices made by them (see for example Grant, 1996; Grant, 2003; Abate et al., 2004; Grant–Abate, 2001; Leifkowitz, 1999). Internal premises refer to the utilization of residual income by a firm's managers and assume that the measure – used as the basis of evaluation and compensation of the managers' achievements – can improve their investment decisions, ultimately aimed at the firm's value maximization (see for example Stern et al., 1996; Stewart et al., 2002). It seems that internal premises are put on the first plan, at least in VBM theory. The existing literature on residual income evidently exposes the internal premises. From the internal premises perspective, the fundamental function of residual income is to motivate managers – evaluated and remunerated on the basis of its level – to make decisions translating into the firm's value maximization and to reward them for results of the decisions. To be effective in the field, residual income has to become the centerpiece of the incentive compensation plan, the foundation of managerial bonuses.

3. Evaluation of Residual Income Forms: Key Criteria

There are some basic criteria that must be fulfilled by residual income if it is to be an effective motivational tool (see for example Ponssard – Larmande, 2004; Ponssard – Larmande, 2006; Grinyer – Lyon, 1989; Stronka, 2004;

[1] In fact expectations concerning future results can influence these versions of residual income via cost of capital assuming that it is calculated as a weighted average cost of equity and debt (WACC) with market shares of them in total capital (which is typically recommended). Because all residual income variants are diminished by cost of capital, the inclusion of market values in WACC calculation does not differentiate the competing forms of the measure. For this reason the impact of expectations concerning future results – via WACC – on residual income was excluded from the analysis in the article.

[2] EVA is registered trademark of Stern Stewart & Co.

[3] The simplest form of CVA is presented in S.D. Young, S.F. O'Byrne (2001) and J.A. Knight (1998). Another version of the measure is the registered trademark of Anelda AB (it will be marked CVA® hereafter) presented in F. Weissenrieder (2000). However, probably the most popular is the version marketed by Credit Suisse that is calculated on the basis of CFROI® (it is registered trademark of Credit Suisse), presented in J.D. Martin, J.W. Petty (2000), among others. It will be marked CVACFROI henceforth.

[4] It is worth noticing that A. Rappaport doesn't consider his own metric a variant of residual income.

[5] It is worth noticing that J. Grinyer doesn't consider his own metric a variant of residual income.

Merchant, 2007). They are presented in *Figure 3*. Firstly, it must be goal-congruent, which means that the decisions made by managers who are evaluated and compensated on the basis of the measure maximize the firm's value. Secondly, it must be controllable which means that the factors determining residual income are under the managers' control. Thirdly, it must be understandable and practicable which means that managers can easily comprehend the way their bonuses are determined and the methods that can be used to increase the firm's residual income, its value and their own bonuses and – what's more – the utilization of residual income calculus must be easy and straightforward in practice.

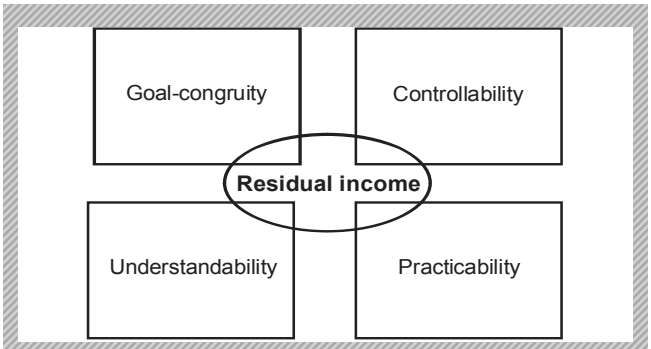


Figure 3. Key criteria of residual income evaluation

Source: Author

Goal-congruity

According to agency theory (Jensen, 1986; Jensen – Meckling, 1976) preferences of managers – owners' agents may differ from the owners' (principals of managers) preferences which can result in making decisions by managers in a way that is not optimum from the owners' point of view (that doesn't maximize the firm value). In the field of investment decisions it means that managerial selection of projects may be driven by a rule differing from the non-negative NPV maximization rule which is regarded as the capital budgeting decision imperative ensuring the firm value maximization (see for example Solomon, 1963). The imperative requires managers to accept all investment projects exhibiting non-negative NPV (and only those projects) under the unlimited investment budget assumption, and to accept investment projects having the highest positive NPV under the limited investment budget assumption and in the setting in which one must choose among mutually exclusive investment projects (see for example Pfeiffer, 2004). To assure conformity of managers' interests with their own interests, the firms' owners must employ mechanisms that could make managers into owners. One of them is a managerial bonus plan utilizing a strongly goal-congruent periodic performance measure. As G. Friedl (2005, p. 5-6) pertinently points out, the measure satisfies the goal-congruity requirement "if a better-informed manager, whose compensation is based on this performance measure, takes the same actions as headquarters or the owners would take if they had the same information". It means that in light of the non-negative NPV maximization imperative "we need a performance measure, which ensures that it is optimal for the agent to select the NPV-maximizing portfolio" (Mohnen, 2004, p. 3).

There are three forms (degrees) of residual income goal-congruity discussed in the literature (see for example Dutta – Reichelstein, 2005; Mohnen – Bareket, 2007): weak, strong and robust (or perfect). Although the existing literature doesn't mention such a form, distinguishing semi-strong goal-congruity of residual income also seems to be justified (*Figure 4*).

The weak form of goal-congruity should be interpreted as merely NPV-compatibility of residual income. Residual income is NPV-compatible (or DCF-compatible) if the sum of

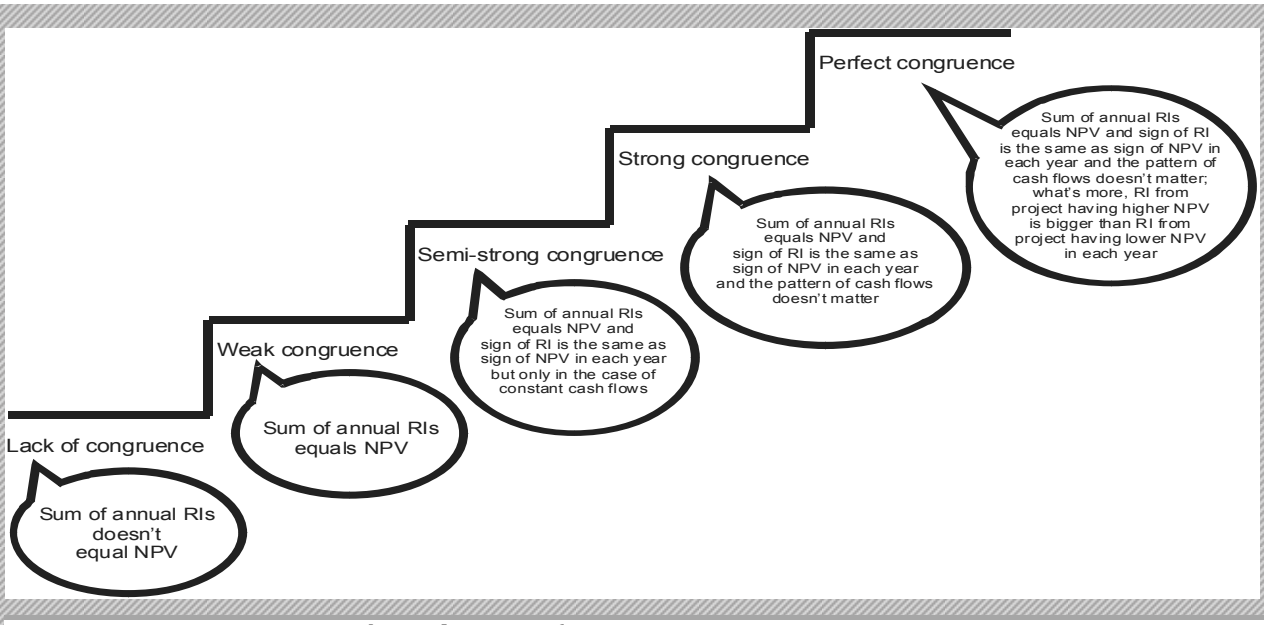


Figure 4. Forms of residual income goal-congruity

Source: Author

all periodic residual incomes from the entire economic life of an investment project – after discounting – equals NPV of the project (see for example Pfeiffer, 2004; Drukarczyk – Schueler, 2000). Weak-goal congruity ensures proper (i.e. NPV, and ultimately firm value, maximizing) investment decisions made by managers only on the condition that they are not impatient (myopic) as well as on the condition that the discount rate assumed by them is the same as the discount rate assumed by the firm's owners. If these two requirements are fulfilled, then the residual income variant exhibiting only weak goal-congruity should make managers realize an NPV-maximizing investment program even under the limited investment budget assumption and in the setting in which one must choose among mutually exclusive projects (see Mohnen, 2004, p. 1). However, if managers are impatient, which means that they do not take into consideration – for various reasons – cash flows from throughout the entire economic life of the project in their investment decisions, or they are more risk averse than the firm's owners are, which is reflected in the higher discount rate assumed by these managers, then weakly goal-congruent residual income utilized as the basis of managerial bonuses can fail as the tool of selecting investment projects in the proper (i.e. firm value maximizing) manner.

The attribute of the strong form of goal-congruity is conformity of the sign of residual income in each and every period of the investment project's economic life with the sign of its NPV. Strong goal-congruity should be considered an improved form of weak-goal congruity in the sense that to become strongly goal-congruent, residual income must be firstly NPV-compatible. Strong goal-congruity ensures NPV-maximizing decisions made by managers even under the managerial impatience supposition (as well as in the situation in which the discount rate assumed by managers is higher than the discount rate assumed by owners) which seems to be a much more realistic assumption than that of managerial patience. As W. Schulze and A. Weiler (2008, p. 7) rightly indicate, the compliance of the sign of residual income in each and every period of a project's economic life with the sign of its NPV "creates a situation in which every period provides the same investment incentive. That is, even if the manager cared only about his rewards of a single period, he would still choose the efficient investment level. This is true for every period and therefore the manager's discount rate and time horizon are irrelevant for his evaluation of the desirability of a project". Yet strong goal-congruity doesn't guarantee the proper capital budgeting decisions in terms of a limited investment budget as well as in the setting assuming the necessity of choice among mutually exclusive projects.

The meaning of semi-strong goal-congruity is the same as the meaning of strong goal-congruity, however it can be achieved only on condition that periodic cash flow is assumed to be constant.

Robust (perfect) goal-congruity is achieved when residual incomes exhibited by investment project having higher NPV are higher in each and every period than residual incomes of another investment project having lower NPV. The residual income variant which is perfectly goal-congruent should ensure the proper capital budgeting decisions in all possible settings (under managerial patience and under managerial impatience assumptions, in the situation in which managers assume the same discount rate as the owners do and in the situation in which the discount rates of these two groups differ, under unlimited and limited investment budgets, in the situation requiring the choice among mutually exclusive projects). A. Mohnen and M. Bareket (2007, p. 3) appropriately point out that consistency of the sign of residual income in each and every period of the project's economic life with its NPV sign (strong goal-congruity) can't assure the proper investment decisions in the capital rationing scenario because it doesn't refer to the size of various projects' NPV and ranking of the projects based on the size.

Among the concepts discussed in the article there are two versions of residual income that do not offer even weak goal-congruity: the simplest variant of CVA and REVA. CVA can't be NPV-compatible (weakly goal-congruent) because the preliminary condition of the identity is subtraction of depreciation in the residual income formula. However, CVA in its simplest form is a periodic performance measure before deducting depreciation. The REVA case is more troubling and complex because it measures residual income after subtracting depreciation. Yet the sum of all periodic REVAs from the entire economic life of a project is the same as its NPV but only when the periodic REVAs are not discounted. In light of the NPV-compatibility definition, REVA is not NPV-compatible because the identity requires discounting of expected residual incomes.

Residual income based exclusively on unadjusted book values (RI^{BV}) is weakly goal-congruent. NPV-compatibility of the simplest and the oldest version of the metric has got a long history and was proved for the first time by G. Preinreich (1937).

Further, the most famous forms of residual income promoted by consulting firms – EVA, CVA^{CFROI} and CVA® – represent the semi-strong goal-congruity class. No matter the basis of RI^{ANN} calculus (COC or IRR), under the constant cash flow assumption the version of residual income must have the same sign – in each and every period of the project's economic life – as the sign of its NPV because of some mechanisms embedded in the calculus. Assuming that it is based on COC, one obtains a stream of constant RI^{ANN} because constant total cost of assets' ownership (capital charge plus depreciation) is subtracted from constant cash flow. The sign of NPV determines the sign of the difference. On the other hand, assuming that RI^{ANN} calculus is based on IRR, then one obtains constant periodic return on capital rates equal to IRR which – after subtracting the cost of capital rate – determine the RI^{ANN} sign. The sign must be the same as the NPV because the latter one depends on the difference between IRR and cost of capital rate (Cwynar, 2009).

REI can be considered a strongly goal-congruent variant of residual income but only on condition that it is calculated

with IRR as the basis of the calculation. In fact, REI computation – as RI^{ANN} – may utilize IRR or cost of capital rate (COC) in economic value and economic depreciation estimations (these two versions of REI will be marked REI^{IRR} and REI^{COC}, respectively, hereafter). In terms of fixed cost of capital rate – which was assumed here – REI^{IRR} must have the same sign in each and every period of a project's economic life as its NPV sign, because the attribute of the residual income form is constancy of periodic return on capital rate, which coincides with IRR. It means that if NPV of the project is positive, then its rate of return on capital – equal to IRR – must be higher than COC in every period resulting in every period's positive REI^{IRR}. However, the most important drawback of REI^{IRR} is that its calculation assumes IRR as the reinvestment rate. It is argued that assuming cost of capital, reflecting a so-called normal return, as the reinvestment rate is much more realistic (see for example Skinner 1993, p. 738). IRR is a project-specific return that may not be automatically achieved on other investments. The REI^{COC} formula eliminates the weakness by assuming cost of capital as reinvestment rate. Yet, REI^{COC} can't be goal-congruent in the normal sense because as long as actual results are as expected, REI^{COC} equals exactly zero. It means that at the outset of each investment project one obtains a stream of expected residual incomes amounting to zero in all periods economic life of the project consists of. As J. Drukarczyk and A. Schueler (2000, p. 263) correctly point out, the entire "expected value created by a project is attributed to the starting point". Positive REI^{COC} results from exceeding expectations while negative ones are exhibited when actual outcome is smaller than expected. What's more, in the method of residual income calculation the sum of periodic depreciations (even after discounting) is not the same as initial capital outlay.

Another strongly goal-congruent form of residual income is J. Grinyer's EEI. The metric–based on Ladelle-Brief-Owen's (LBO) method of depreciation (see Brief, 1967; Brief–Owen, 1968; Skinner, 1993) – avoids the weaknesses of REI^{IRR} and REI^{COC}: the assumed reinvestment rate is cost of capital (as in REI^{COC}), yet the sum of periodic depreciations from the entire economic life of a project equals the amount of capital initially invested in it (as in REI^{IRR}). However, to be strongly goal-congruent, EEI requires cash flow from all periods included in the project's economic life to be positive. Strong goal-congruity of the version of residual income – although not under the name of EEI – was formally proved by S. Reichelstein (1997) and W. Rogerson (1997) which is mentioned by T. Pfeiffer (2004).

Although NEI is not NPV-compatible in the standard manner, it can guide managers' investment decisions in the way that results in realization of an investment program that maximizes NPV in all possible settings (perfect goal-congruity). This view can be easily justified knowing that periodic NEI equals a periodic change in NPV (assuming that NPV at the end of the period results from multiplication of NPV at the beginning of the period by the cost of capital rate factor[6]). It means that if only NPV at the beginning of the project's economic life is positive, it must become bigger and bigger at the end of each consecutive year because the cost of capital factor is always positive. On the basis of the observation, one can draw a justified conclusion according to which NEI must have the same sign in each and every period as the sign of the project's expected NPV (strong-goal congruity). For the same reason NEI for a project exhibiting higher NPV must be higher in each and every period than NEI for another project exhibiting lower NPV (robust goal-congruity) if only cost of capital rates as well as economic lives of the projects are exactly the same.

Assessment of goal-congruity of SVA is problematic because of unique properties of the concept (e.g. the perpetuity assumption). They result in doubts as to the way SVA should be calculated on the individual investment project level. A. Rappaport, the inventor of SVA, not even once gives the example of such a calculation in his influential book (Rappaport, 1986). SVA calculus carried literally from entire firm level to the individual project level (utilizing the annuity assumption instead of the perpetuity assumption because of the limited economic life of majority of investment projects) reveals that SVA is at best weakly goal-congruent.

Controllability

Controllability of a periodic performance measure reflects the degree to which its current level depends on decisions made by managers. Normally, a firm performance metric reveals not only results of their decisions but they are also affected by so-called systematic factors illustrating the situation in the economy as well as in the sector in which the firm competes. Economic values (and especially market values) are usually considered less controllable than book values. For instance, periodic return on a company's shares is on average more influenced by systematic factors than its return on capital invested in assets employed in operations and measured by operating profit. What's more, economic values mirror expectations concerning future results and not actual results already achieved. Seen from this perspective, economic values can be considered rather an opinion concerning a firm's future performance than actual performance as an unquestionable fact. The performance measure that is based heavily on economic values would compensate managers for business promises reflected in expected performance rather than for actual performance that has already materialized. As A. Barton (1974, p. 672) rightly argues, the measure "refers to transactions that have *not yet occurred*. It relates to the transactions that are expected to occur in the future. It is a case of counting one's chickens before any is hatched". Assuming that controllability of expected performance is limited, one can say that a performance measure is controllable to a substantial degree when its current level depends mainly on managerial decisions reflected in actual results achieved so far and not expected results to be

[6] Cost of capital rate factor equals 1+COC.

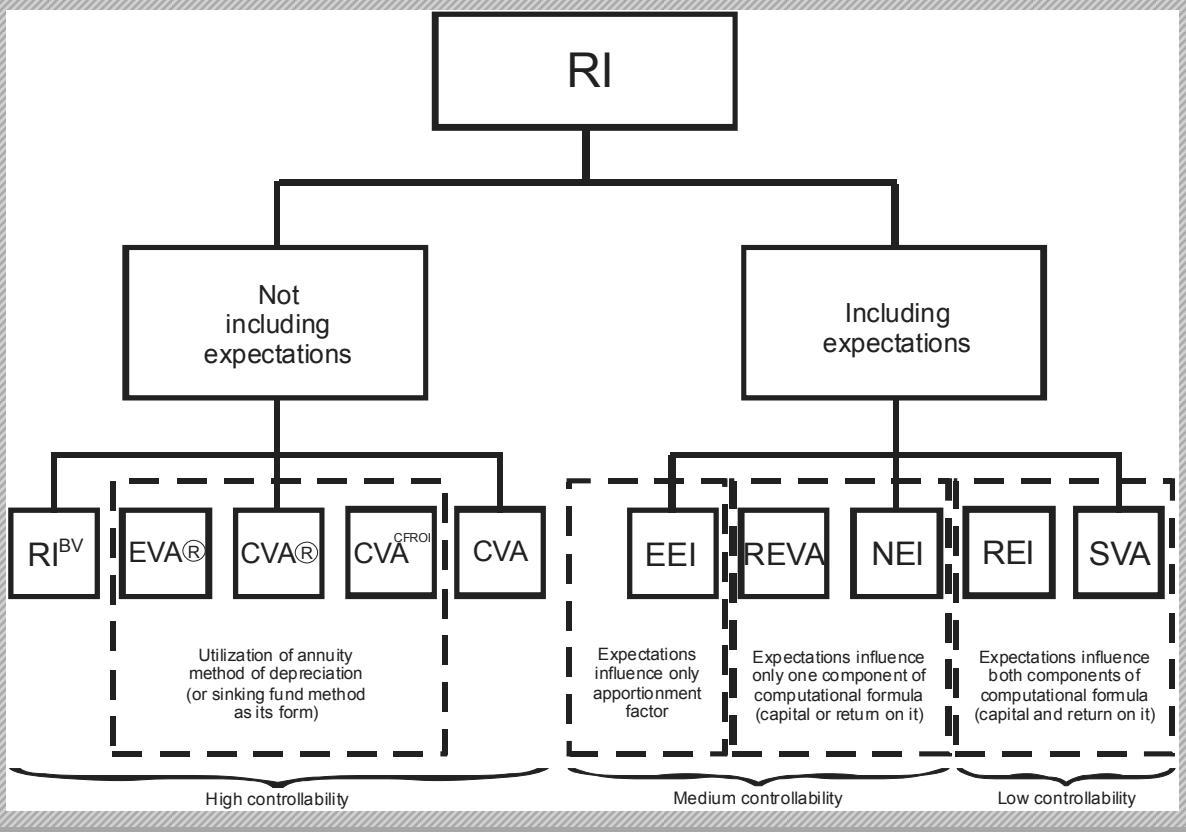


Figure 5. Controllability of ten residual income variants analyzed in the article

Source: Author

achieved in the future. This issue is worth highlighting because the current level of the metric can be profoundly dependent on results of managerial decisions but yet expected in the future. On the basis of the observation one can argue that controllability of residual income is inversely dependent on the extent to which expectations concerning future results are included in its formula via economic values: the greater impact of expectations on residual income level, the lower its controllability.

Three groups of residual income differing in the level of controllability can be distinguished from this point of view (*Figure 5*). The first group, consisting of RI^{BV}, EVA and three versions of CVA, exhibits high controllability. Expectations concerning future results are entirely not included in their computational formulas (except their impact on the formulas via cost of capital rate; the issue was mentioned in the second section of the article). Two other groups consist of residual income concepts including expectations but to different degrees. REVA, EEI and NEI demonstrate medium controllability in the sense that expectations influence only one component of their computational formulas (invested capital in REVA, return on capital in NEI and the so-called apportionment factor in EEI). The last group is represented by the residual income concepts that are exposed to expectations in each part of their computational formulas – REI and SVA.

Understandability and practicability

Literature on goal-congruity of residual income is plentiful. Its controllability is the subject of scientific interest to a considerably smaller degree. However, a bibliography referring solely to understandability and practicability of residual income is extremely rare (see for example short commentaries on the complexity of chosen residual income concepts in Morin – Jarrell, 2001, p. 339 or in Young – O'Byrne, 2001, p. 430) although the issue should not be regarded as of secondary importance. For example, J. Knight (1998, p. 200) writes: "If the measure is difficult to calculate, the manager is not likely to use it for decision making". If he has to use it because performance measured by the metric determines his bonus, then utilization of such an incomprehensible measure may result in frustration and low efficiency. K. Merchant (2007, p. 14) rightly indicates that "measures that aren't understood have no motivational effects". J. Martin and W. Petty (2000, p. 215) add that if the metric is too complex, then "it will become known simply as another finance exercise and fail to accomplish the desired changes in operating

decision making within the company". However, the understanding of the way performance measure's values are set can come along with its limited practicability. Even the most understandable metrics may end up as just theoretical devices, whose practical use is – for a reason – excluded, despite their clarity and ease of comprehension. This can result – for example – from deficiency of data required in the measure calculation.

To fill the gap in the knowledge on comparative understandability and practicability of the residual income concepts discussed in the article, empirical research has been conducted by its author. Because the research variables – understandability and practicability – are subjective in nature (opinions on understandability and practicability of the same performance metric may differ considerably), the reasoning on the issue was based on the judgments collected via questionnaire. The questions included in it were answered by post-graduate students of Value Based Management Study (fifteenth and sixteenth editions), Company Valuation Methods Study (third and fourth editions) and Managerial Accounting and Controlling Study (tenth and eleventh editions) conducted by Warsaw School of Economics. The choice of the studies was dictated by their programs including such topics as firm performance measurement and management, and firm value management as well as expected competences of their participants. From their first editions the studies were attracting persons having high financial qualifications, often representing top management of large firms, their owners' authorities or those dealing with financial issues, and especially with firm performance measurement, in their work. This fact let us assume that the contents of the questionnaire would not be unfamiliar to them. 265 students were asked to fill in the questionnaire between the beginning of May 2008 and the end of November 2008. 60 persons returned the questionnaire with their answers to the questions included in it. It is worth noticing that from the point of view of the research purpose the rate of return (22,64% in the study) was not of special importance as it is in a typical social study. The aim of the research was analogous to the aim of the pilot test that precedes the main study and is aimed at evaluating the research tool. Yet, in contradistinction to a standard pilot test, the aim of the study was to examine a managerial decision making tool, i.e. residual income presented in six variants marked in the following manner:

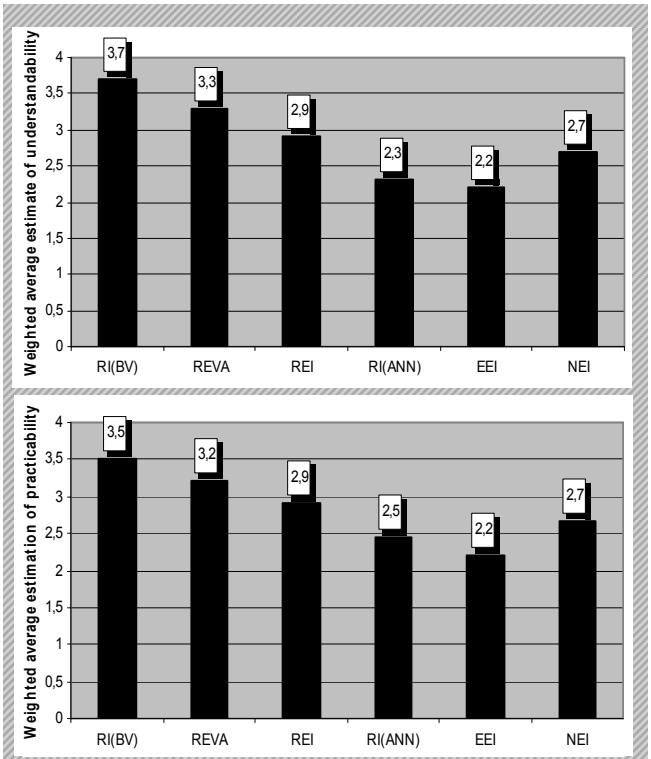
1) RI_1 – RI^{BV},
2) RI_2 – REVA,
3) RI_3 – REI,
4) RI_4 – RI^{ANN},
5) RI_5 – EEI,
6) RI_6 – NEI.

CVA in its simplest form (assumed to be the least useful in the studied set of residual income concepts because of its NPV-incompatibility) and SVA (assumed to be a more complex form of REI) were not included in the research. To preserve clarity of the study, two versions of REI calculation (based on IRR and based on COC) were not distinguished in the questionnaire. As mentioned in the second section of the article, RI^{ANN} should be considered a class of residual income concepts containing such forms of the measure as EVA, CVA® and CVA^{CFROI}.

The study respondents were asked to classify the six variants of residual income measurement into one of four sets: misunderstandable / impracticable, little understandable / little practicable, tolerably understandable / tolerably practicable and completely understandable / completely practicable. Further, respondents' opinions on understandability and practicability of the six variants of residual income measurement given in the questionnaire were converted into indices according to the following rule:

1) misunderstandable / impracticable – 1,
2) little understandable / little practicable – 2,
3) tolerably understandable / tolerably practicable–3,
4) completely understandable/completely practicable– 4.

Then, for each variant (and for each feature – understandability and practicability – separately) weighted average indices were estimated assuming the procedure in which the weight is the percentage share of opinions indicating particular intensity of the feature in the total number of opinions that were given by the respondents. The indices obtained by respective residual income measures are depicted in the *Graphs 1 and 2*.



Graphs 1 and 2.
Weighted average estimations of understandability and practicability obtained in the study

Source: Author

One can make several interesting observations on the basis of the opinions given by the respondents who took part in the study. Firstly, their evaluations of understandability of the respective versions of residual income and their

Table 1

Values of indices placed on the residual income variants examined in the study and degrees of understandability / practicability matched to them

Value of the index	Degree of intensity of understandability / practicability
1,00 – 1,50	Misunderstandable / Impracticable
1,51 – 2,50	Little understandable / Little practicable
2,51 – 3,50	Tolerably understandable / Tolerably practicable
3,51 – 4,00	Completely understandable / Completely practicable

Source: Author

evaluations of practicability of them are very similar (however for each residual income variant the understandability index was higher than the practicability index). Rankings of the six residual income measurement concepts included in the study – based on these two facets – are exactly the same. Secondly, according to the respondents' opinions, the most understandable – and at the same time the most practicable – form of residual income is the oldest one – RI^{BV}. No respondent considered it misunderstandable or impracticable. Thirdly, it is worth noticing that NEI – the residual income variant exhibiting the highest degree of goal-congruity in the set of measures that was studied – was regarded relatively well understandable and practicable (more than RI^{ANN} represented by the most popular, contemporaneous variations such as EVA and CVA^{CFROI}). Fourthly, EEI was found to be the least understandable and the least practicable version of residual income in the examined set of measures.

Four-dimensional matrix of residual income variants

The observations coming from the study presented in the previous section were used in the creation of a four-dimensional presentation of the residual income variants analyzed in the article (including goal-congruity, controllability, understandability and practicability). In order to do that, the understandability and practicability indices, obtained in the study described briefly in the previous section, were converted into degrees of intensity of these two features in the manner depicted in *Table 1*.

Figure 6 illustrates 10 versions of residual income examined in the article from the point of view of four criteria:

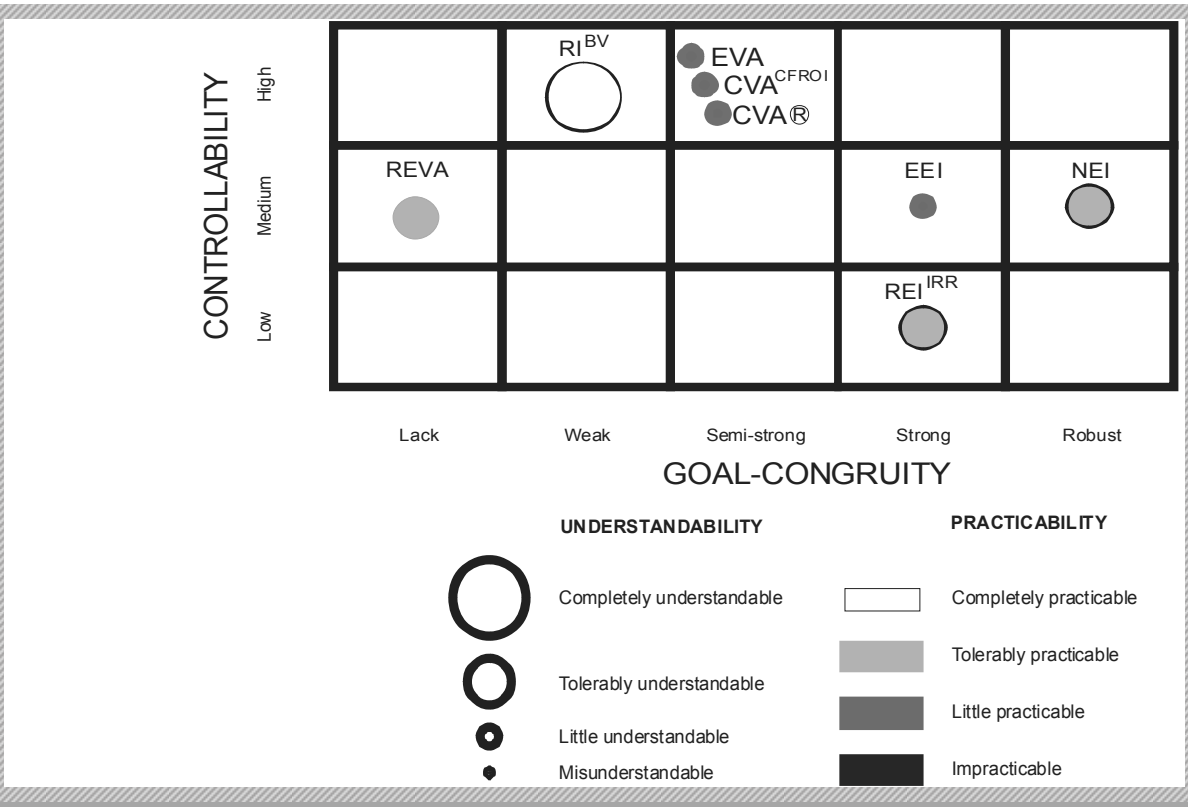


Figure 6. Four-dimensional matrix of residual income variants

Source: Author

ultimate goal-congruity, controllability, understandability and practicability. The graph can be used as a simple, yet helpful, guide in choosing the residual income concept that is the most adequate as the basis of managerial bonuses. There are several observations – key from the point of view of the choice – that can be made on the basis of its contents.

Firstly, if the primary and necessary condition that must be satisfied by the metric aspiring to be an effective managerial incentive compensation tool is its ultimate goal-congruity – at least in the weak form – then two of the ten residual income concepts discussed in the article – CVA in its simplest form and REVA – can be excluded from further analysis. They do not ensure even weak goal-congruity. REI^{COC} should also be excluded for slightly different reason, although still relating to the goal-congruity issue. At the outset of each project – no matter its NPV (positive or negative) – the project exhibits a stream of REI^{COC} amounting to zero in each and every period of the entire economic life of the project. It means that the stream is not able to send the proper decisional signals concerning the desirability of the project realization. In this case NPV is not periodized – as in other residual income concepts that are NPV-compatible – but it is attributed to the moment of time on which the project is analyzed. In the case of this residual income concept the managers could be motivated and remunerated on the basis of deviations from expected performance, although such incentives may cause inappropriate managerial behavior (see for example Leistikow – Ferguson, 1998 and Bausch et al., 2003).

Secondly, one can argue that among the four features of residual income examined in the article (goal-congruity, controllability, understandability and practicability) controllability is of secondary importance. This view can be justified by the fact that residual income can be the proper basis of bonuses only in the case of top managers because this is the only group of managers who can control – at least partly – all variables of which the residual income formula consists of. For example, the decisional rights concerning the way a firm's capital mix is structured are typically limited to top management. Therefore if we assume that residual income is to be utilized as the basis of *top management* bonuses, then the importance of the controllability issue decreases because this is the only team of the firm's managers who can directly affect not only book values but also economic values (although to a limited degree). What's more, one can argue that in the case of top management the problem of controllability – at least in the sense that the top managers can't control so-called systematic factors influencing economic values – doesn't exist (see for example Copeland – Dolgoff, 2005, p. 230) or can be easily eliminated (by including systematic factors explicitly via indexation or implicitly via structure of top managerial pay – see for example Rappaport, 1999 and Guay et al., 2001).

Thirdly, understandability and practicability may become crucial criteria when considering implementation of one of the competitive residual income concepts. Even the most goal-congruent version of the metric can be rejected in the choice because of its extremely limited understandability and practicability. It is worth noticing that there is a trade-off between goal-congruity and two other discussed features – understandability and practicability. Achieving successive degrees of goal-congruity of residual income (from weak through robust) comes at the cost of a bigger and bigger decrease in its understandability and practicability. The prime driver of the improvement in the goal-congruity is the way fixed assets' depreciation is estimated. In RI^{BV} calculation (weak goal-congruity) it is standard book depreciation which is commonly understood and trivial in the calculation. RI^{ANN} (semi-strong goal-congruity) – represented by EVA, CVA® and CVA^{CFROI} – requires annuity or sinking fund depreciation which is not so easily comprehended and much more complex in calculation. It is symptomatic that – as S. O'Byrne (2000, p. 116) writes – "only one EVA company (...) has ever used sinking fund depreciation (...). Many EVA companies have considered sinking fund depreciation, but rejected it as too complicated to justify the benefit". The shift from semi-strong to strong goal-congruity requires substitution of annuity (sinking fund) depreciation for another, even more complex, one (LBO method in EEI estimation or economic method in REI calculus).

Fourthly, the RI^{ANN} group is not homogeneous from the point of view of understandability and practicability. EVA complexity increases along with the extent to which its calculation includes almost legendary accounting adjustments. For example S. Young and S. O'Byrne (2001, p. 430) regard EVA as a measure exhibiting high ease of calculation when it is estimated without the adjustments and medium ease of calculation when it is estimated with them. The complexity of CFROI is well-documented in VBM literature. Even the author of the measure – B. Madden (1999, p. 210) – agrees that in the field of ease of implementation it is less attractive than EVA because of higher difficulty of computation. Complexity of CVA® is much less scrutinized in the literature, however one can easily observe some problematic issues that can influence its understandability / practicability (e.g. the need for converting nominal cost of capital values into real). However, it appears to be the most understandable and practicable representation of the RI^{ANN} class (assuming that EVA is calculated in the way recommended by its architects, i.e. with accounting adjustments).

Fifthly, from the perspective of the four discussed criteria of evaluation – goal-congruity, controllability, understandability and practicability – RI^{BV} deserves a relatively high rate in comparison with RI^{ANN}. It exhibits the same level of controllability as RI^{ANN} does, yet it can be considered much more understandable and practicable. Although its goal-congruity is lower than it is for RI^{ANN}, it is so only under the assumption according to which periodic cash flow is constant, which is rather a theoretical case. The advantage of

RI^{ANN} over RI^{BV} is thus only theoretical (at least in the setting in which the goal-congruity effect of accounting adjustments is not taken into consideration). Knowing that, one can formulate a justified opinion according to which RI^{BV} – from a practical point of view – seems to be a slightly more adequate basis of managerial bonuses than RI^{ANN} is.

Sixthly, assuming that the issue of controllability is of secondary importance in utilization of residual income to motivate and compensate top managers, one can formulate the thesis according to which the choice of the most adequate form of residual income for incentive compensation must be based on comparative analysis of goal-congruity and understandability / practicability of the two available options – it seems that the choice can be reduced to a choice between RI^{BV} and NEI. Thus, the first option is RI^{BV} exhibiting only weak goal-congruity, yet highly understandable and practicable at the same time. The other option is NEI – a robustly goal-congruent residual income variant while characterizing considerably lower understandability / practicability than RI^{BV}. NEI appears to be a better choice than EEI or REI^{IRR} because at the same level of controllability and a comparable level of understandability / practicability, it ensures a higher level of goal-congruity being the fundamental criterion in residual income concepts evaluation.

However, there are some important issues that can decrease the rate placed on NEI one should take into consideration. The first one is deficient literature on the method of measuring residual income and lack of profound formal tests as well as empirical studies dedicated to the way NEI drives investment decisions made by managers. In fact, to the best knowledge of the author of the article, there is only one publication presenting this very promising residual income form (Drukarczyk – Schueler, 2000). Recommendation of a method that has not been extensively tested is at least questionable. Another important issue that should be mentioned is the behavior of NEI under uncertainty (when actual performance differs from expected performance). It can be easily shown that additional (incremental) NEI resulting from unexpectedly better / worse performance of a firm is the same as abnormal stock return earned by the firm owners in the same period of time (in which the market was informed about the unexpected improvement / decline in performance). However, the unexpected change in performance causes the firm to exhibit incremental NEIs also in subsequent years although the value creation for the firm owners – measured by abnormal stock return – was limited to the year in which the information on unexpectedly better / worse performance went public (Cwynar, 2009). Further, utilization of NEI requires acceptation of a particular method of invested capital estimation. J. O'Hanlon and K. Peasnell (2001), referring to the work of R. Anthony (1982), name it unrecovered capital. The use of an alternative method of capital estimation means that there exists an alternative accounting being utilized in the firm. W. Schultze and A. Weiler (2008) have reasonable doubts as to its relevance from the point of view of other users of accounting information. They write that "it is unclear, if such goal-congruent accounting rules still result in information which is also relevant for other purposes of accounting, in particular for external users for making economic decisions" (Schultze – Weiler, 2008, p. 4). What's more, the use of NEI would be probably relatively easy in the firms that are quoted on stock exchanges, yet it would come across substantial obstacles in firms that are not (because of the necessity of economic value estimations on a regular basis).

The most important weakness of the competitor of NEI – RI^{BV} – is its low goal-congruity. However, as it was mentioned in the second section of the article, it becomes robustly goal-congruent under the condition according to which firm managers are not impatient (myopic), taking cash flow from the entire economic life of investment projects into consideration while making capital budgeting decisions. In such a setting, the problem of low goal-congruity disappears. To make it disappear one must find a way to lengthen the managerial decisional horizon. The existing literature discusses some potential solutions to the problem. One of them is a so-called bonus bank recommended by Stern Stewart & Co., among others (see for example Stewart, 1991). The observation means that there are two alternative ways of achieving improvements of residual income goal-congruity (see Schultze – Weiler, 2008): shifts in the method of fixed assets valuation and their consumption (depreciation) estimation (inside the metric formula) and utilization of additional mechanisms aimed at lengthening the decision horizon of managers (outside the metric formula). What's more, there are some preliminary empirical findings suggesting that managerial decisions under various metrics' regimes may be more goal-congruent than theory predicts. For example, Arnold et al.(2006) note that managers may behave as if they do not take exclusively their own interests into consideration when making investment decisions but consider a broader, social context of the decision making process. It may suggest that RI^{BV}, weakly goal-congruent in theory, is actually more goal-congruent in practice. Further, J. Grinyer et al. (1999, p. 14) notice that managerial myopia may not be as obvious as many authors suggest. Because of some negative consequences of maximization of current profits (e.g. overoptimistic market reactions may cause an unjustified increase in expectations which can frustrate and threaten job security of managers), the managers may not prefer maximization of current profits to growth in profits over a long period of time.

4. Conclusions

Residual income should be considered rather a set of metrics than one particular metric. The options that are within the set differ in fundamental aspects: their goal-congruity, controllability, understandability and

practicability. These aspects are of special importance assuming that residual income is to serve as a behavioral, i.e. incentive compensation tool. Although goal-congruity of residual income should be regarded the prime criterion, strongly or even perfectly goal-congruent versions of the metric may fail as the basis of managerial bonuses because of low controllability or – even more plausible – low understandability and practicability. The decision as to the method of residual income measurement which will be utilized in practice must be based on careful and comprehensive analysis of the available options in at least four crucial dimensions including not only goal-congruity but also controllability, understandability and practicability. The results of the analysis presented in the article reveal that two forms of residual income may deserve special attention. One of them is net economic income (NEI), the only robustly goal-congruent variant of the metric within the set studied in the paper. The other one is the oldest and the simplest version of residual income based exclusively on unadjusted book values (RI^{BV}). Its main advantage is high controllability, understandability and practicability, while the major disadvantage is relatively low goal-congruity. However, there are some reasons for which one can expect that goal-congruity of RI^{BV} in practice is higher than in theory. Even if that would not be true, there are some ways – not related to the manner in which the residual income formula is structured – that can be used to improve its goal-congruity. In contradistinction to RI^{BV}, extensively discussed and tested for many years, NEI – although a very promising variation of the residual income concept – can't be the subject of a justified recommendation because of insufficient theoretical and practical examination.

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