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## **GOAL-CONGRUENCE OF VARIOUS VERSIONS OF RESIDUAL INCOME**

**Apstrakt:** *In contemporary literature on business finance the prevailing attitude is that realization of projects of non-negative net present value is a safe way for maximizing the wealth of its owners as the ultimate goal of corporations. Since owners make only one of interest groups claiming the right on outcomes, managers, who are operationally independent and superb regarding information, may make decisions on projects which do not contribute to the wealth of corporation as expected at a given moment. Endeavouring to prevent such activities, owners create and choose such metrics of goal achievement to persuade managers to accept only projects of non-negative net present value (goal congruence). Variants of residual income taken as the difference between return on capital and capital charge are often used as performance measures which could considerably vary regarding goal congruence.*

**Key words:** *business finance, goal-congruence, variants of residual income*

## **CILJNA USKLAĐENOST RAZLIČITIH VARIJANTI REZIDUALNOG PRINOSA**

**Apstrakt:** U savremenoj literaturi iz oblasti poslovnih finansija preovlađuje stav da je realizacija projekata čija je neto sadašnja vrednost pozitivna, siguran put za maksimiziranje vrednosti za vlasnike, kao primarnog cilja korporativnih preduzeća. Obzirom da vlasnici predstavljaju samo jednu od interesnih grupa koja polaže pravo na efekte aktivnosti, menadžeri, nezavisni u operativnom smislu i informaciono superiorni, mogu svoje odluke usmeriti i na projekte koji u datom trenutku ne daju očekivani doprinos vrednosti preduzeća. U pokušaju da spreče takve aktivnosti, vlasnici osmišljavaju sisteme menadžerskih kompenzacija, koje povezuju sa merilima ostvarenja postavljenog cilja (*goal-congruent*). Varijante rezidualnog prinosa, shvaćene kao razlika prinosa na kapital i cene kapitala, predstavljaju često korišćena merila ciljne usklađenosti.

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**Ključne reči:** poslovne finansije, ciljna usklađenost, varijante rezidualnog prinosa

**JEL Classification:** G32

### **Introduction**

The ultimate goal of each enterprise is to maximize the wealth of its owners. Yet the enterprise can be considered as a set of investment projects. Therefore the projects should be chosen in a way that ensures owners' wealth maximization. Many years ago E. Solomon<sup>1</sup> proved that the proper choices are driven by the rule of non-negative net present value (NPV): acceptance of all projects having non-negative NPV (and only those projects) when the investment budget is unlimited, and acceptance of projects having the highest positive NPV when the investment budget is limited or when one must choose among mutually exclusive projects. We will refer to this as the firm's NPV maximization rule. Because of the separation of ownership and management functions typical in today's corporations and the resulting possible conflict of interests (agency conflict), the owners must use mechanisms that will cause managers to make their decisions on the basis of the firm's NPV maximization rule. Typically these mechanisms take the form of incentive compensation plans. They always require a measure (or measures) of achievements (i.e. performance measure) that will determine a variable portion of the managers' remuneration. Under the firm's NPV maximization as a governing rule, the owners should choose a metric that will cause managers (being evaluated and compensated on the basis of it) to select an optimum investment program (i.e. a program maximizing the firm's NPV). A metric having this property can be called goal-congruent. Goal-congruence (or goal-congruity) should be considered a fundamental, yet not sole, feature of a periodic performance measure.

### **Residual income**

Various metrics are goal-congruent to different degrees. A quite promising one in this field is residual income (RI). In fact the term "residual income"

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<sup>1</sup> E. Solomon, *The Theory of Financial Management*, Columbia University Press, New York 1963.

should be considered a range of metrics – each being the difference between return on capital and capital charge (capital multiplied by the cost of capital rate) – rather than one particular metric. The same components of the residual income formula (figure 1) – capital, return on capital (i.e. profit before subtracting cost of capital) and the cost of capital rate – can be calculated in many different ways.

Figure 1 Universal formula of residual income

$$\boxed{\text{RI}} = \boxed{\begin{array}{c} \text{RETURN} \\ \text{ON} \\ \text{CAPITAL} \\ (\$) \end{array}} - \boxed{\begin{array}{c} \text{COST OF CAPITAL} \\ (\$) \\ \hline \text{CAPITAL} \times \text{COST OF} \\ \text{CAPITAL} \\ \text{RATE} \end{array}}$$

Source: Author

### Residual income and goal-congruence

There are at least several variants of residual income known today, although only a few can be considered popular. Their goal-congruence is also not the same. The most important reason for the differences is the depreciation method that is used in RI calculation. While goal-congruence of residual income in comparison with accounting income is extensively discussed in the literature, there are virtually no papers comparing goal-congruence of various types of residual income. This article is an attempt to fill this gap and to start discussion on this interesting and important subject from a practical point of view. It seems that academicians as well as practitioners should notice the range of residual income versions and appreciate the differences among them concerning not only goal-congruence, but also other crucial features of each periodic performance measure, i.e. controllability and simplicity. However, this article is focused exclusively on congruence.

### Variants of residual income

To study goal-congruence of residual income we will consider 10 versions that can be found in value based management (VBM) literature. Our choice is

based on their popularity as well as on the features that distinguish them among the entire group. First is the oldest version of residual income based on book values (and on book depreciation). We will mark it  $RI^{BV}$ . This version is represented by McKinsey's<sup>2</sup> as well as Marakon's<sup>3</sup> economic profit (EP). The second version is residual income in its most famous form: economic value added (EVA®)<sup>4</sup>. Three successive versions represent what is known as cash value added. In this group we will distinguish cash value added in its simplest form, mentioned by S. Young & S. O'Byrne<sup>5</sup> as well as by J. Knight<sup>6</sup> (marked CVA), cash value added developed by Anelda AB, a Swedish consulting firm (marked CVA®)<sup>7</sup>, and finally, cash value added with cash flow return on investment (CFROI®) as a measure of the profit rate (marked CVA with CFROI)<sup>8</sup>. EVA, CVA® and CVA with CFROI are based on annuity depreciation (in the case of CVA with CFROI it is a special form of the annuity method called sinking fund depreciation). Further, these three variants of RI and  $RI^{BV}$  and CVA do not include expectations concerning future performance. The five remaining variants include them (via economic – e.g. market – values), but to a different extent. These are: earned economic income (EEI)<sup>9</sup>, net

<sup>2</sup> T. Copeland, T. Koller, J. Murrin, *Valuation. Measuring and Managing the Value of Companies*, John Wiley & Sons, New York 1994 and T. Koller, M. Goedhart, D. Wessels, *Valuation. Measuring and Managing the Value of Companies*, John Wiley & Sons, New York 2005.

<sup>3</sup> J.M. McTaggart, P.W. Kontes, M.C. Mankins, *The Value Imperative. Managing for Superior Shareholder Returns*, The Free Press, New York 1994.

<sup>4</sup> EVA is registered trademark of Stern Stewart & Co. The concept was presented in several books, e.g. G.B. Stewart, III, *The Quest for Value. The EVA™ Management Guide*, HarperBusiness, New York 1991.

<sup>5</sup> S.D. Young, S.F. O'Byrne, *EVA and Value-Based Management. A Practical Guide to Implementation*, McGraw-Hill, New York 2001.

<sup>6</sup> J.A. Knight, *Value Based Management. Developing a Systematic Approach to Creating Shareholder Value*, McGraw-Hill, New York 1998.

<sup>7</sup> CVA® is registered trademark of Anelda AB. The concept was presented in (among several other publications) F. Weissenrieder, *Value Based Management: Economic Value Added or Cash Value Added?*, www.ssrn.com.

<sup>8</sup> CFROI is registered trademark of Credit Suisse and its subsidiaries (except Great Britain). The concept was presented in B.J. Madden, *CFROI. Cash Flow Return on Investment Valuation. A Total System Approach to Valuing the Firm*, Butterworth\_Heinemann, Oxford-Burlington 1999.

<sup>9</sup> J.R. Grinyer, *Earned Economic Income – A Theory for Matching*, "Abacus" 1985, vol. 21, nr 2.

economic income (NEI)<sup>10</sup>, residual economic income (REI)<sup>11</sup> and its special mutation – shareholder value added (SVA)<sup>12</sup>, and finally, refined economic value added (REVA)<sup>13</sup>.

### Degrees of RI goal-congruence

According to the literature there are three degrees of RI goal-congruence: weak, strong and robust (perfect). We will add semi-strong congruence to the range<sup>14</sup>.

#### *Weak goal-congruence*

Weak goal-congruence of residual income means that the sum of expected residual incomes from a project (after discounting) equals expected NPV. This identity is sometimes named “NPV compatibility”<sup>15</sup>. The first person who

<sup>10</sup> J. Drukarczyk i A. Schueler, *Approaches to Value-based Performance Measurement*, in: G. Arnold, M. Davies (red.), *Value-based Management: Context and Application*, John Wiley & Sons, Baffins Lane 2000.

<sup>11</sup> The name “residual economic income (REI)” is used by A. Bausch, B.E. Weissenberger, M. Blome, *Is Market Value-Based Residual Income a Superior Performance Measure Compared to Book Value-Based Residual Income?*, [www.wiwi.uni-giessen.de/dl/showfile/Entrepreneurship/4162](http://www.wiwi.uni-giessen.de/dl/showfile/Entrepreneurship/4162). It was also discussed by many earlier authors (although not under the name), e.g. C.R. Emmanuel, D.T. Otley, *The Usefulness of Residual Income*, “Journal of Business Finance & Accounting” 1976, vol. 3, nr 4. REI can use cost of capital as discount rate (we will mark it REI<sup>COC</sup>) or IRR as discount rate (it will be marked REI<sup>IRR</sup>).

<sup>12</sup> A. Rappaport, *Creating Shareholder Value. A Guide for Managers and Investors*, Free Press, New York 1998.

<sup>13</sup> J.M. Bacidore, J.A. Boquist, T.T. Milbourn, A.V. Thakor, *The Search for the Best Financial Performance Measure*, “Financial Analysts Journal” 1997, vol. 53, nr 3.

<sup>14</sup> The names weak goal-congruence and strong goal congruence are coined by T. Baldenius, G. Fuhrmann, S. Reichelstein, *Zurück zu EVA*, w: *Betriebswirtschaftliche Forschung und Praxis*, Jg. 51, p. 54 (quoted after A. Mohnen, *Managerial Performance Evaluation with Residual Income – Limited Investment Budget and NPV-Maximization*, [www.ssrn.com](http://www.ssrn.com), p. 1-2). A. Dutta and S. Reichelstein (*Accrual Accounting for Performance Evaluation*, “Review of Accounting Studies” 2005, vol. 10, nr 4) use the term robust goal-congruence, while A. Mohnen (op. cit.) – perfect goal-congruence. The term semi-strong goal-congruence was coined by the author.

<sup>15</sup> Np. T. Pfeiffer, *Net Present Value-Consistent Investment Criteria Based on Accruals: A Generalisation of the Residual Income-Identity*, “Journal of Business Finance & Accounting” 2004, vol. 31, nr 7.

studied and expressed it was G. Preinreich (in the 1930s)<sup>16</sup>. Under weak congruence, a manager who is offered a fixed percent of residual income as a bonus (which is assumed here), would be driven in her / his investment decisions by the firm's NPV maximization rule only under very restrictive assumptions: what is needed is an equality of her / his and the owner's time horizons as well as discount rates. In reality managers are impatient (less patient or more myopic than owners: time horizons determining their investment decisions are shorter than those of the owners') and they assume higher discount rates. Managerial impatience can be explained by the fact that they "will retire, quit or be promoted in the meanwhile"<sup>17</sup>. Relatively high discount rates result from greater (in comparison with owners) exposure to risk: in their case diversification is excluded. As a result, although those variants of residual income that can offer weak goal-congruence can be considered periodic (e.g. annual) NPVs (no other performance measure having the property), the allocation of NPV-number (value) among periods (years) does not guarantee that managers, evaluated and compensated on the basis of RI, will make investment decisions maximizing the firm's NPV. In other words, under weak goal-congruence managers can accept investment projects having negative NPV (exhibiting substantial positive cash flows at the outset of the project) and reject projects having positive NPV (exhibiting substantial positive cash flows at the end of the project). Congruence of RI<sup>BV</sup> is limited to its weak form.

### ***Semi-strong and strong goal-congruence***

Semi-strong and strong goal-congruence is manifested by the same sign of residual income from a project in each year of its economic life such as the sign of NPV. We will name the property "conformity of signs". It means that when a project has got positive (negative) NPV, then RI from each and every year of the project's life is also positive (negative). The difference between semi-strong and strong congruence is that the conformity of signs is valid for fixed (constant) cash flows (semi-strong congruence) and for any pattern of cash flows (strong congruence). However, the conformity of signs will ensure investment decisions that maximize the firm's NPV only when the investment budget is unlimited. Under capital rationing constraints (as well as when there is

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<sup>16</sup> D.A. Preinreich, *Valuation and Amortization*, "Accounting Review" 1937, vol. 12, nr 3.

<sup>17</sup> R.W. Scapens, *Profit Measurement in Divisionalised Companies*, "Journal of Business Finance & Accounting" 1979, vol. 6, nr 3, p. 284.

a need to choose among mutually exclusive projects) RI that offers semi-strong or strong goal-congruence can fail: managers evaluated and compensated on the basis of it can choose an investment program that is not optimal (they can accept projects that do not have the highest NPV). Simple, but not formal, numerical tests concerning various characteristics of projects and investment choices suggest that this degree of congruence is offered by EVA, CVA®, CVA with CFROI (semi-strong) and  $REI^{IRR}$  (strong). Only EEI was formally proved to have strong goal-congruence<sup>18</sup>.

### ***Perfect (robust) goal-congruence***

Perfect (robust) goal-congruence means that despite the size of the investment budget (limited or not), the managerial time horizon (shorter than the owner's or not) and discount rate (higher than the owner's or not), managers who are evaluated and compensated on the basis of residual income will choose an investment program that maximizes the firm's NPV. To reach the degree of congruence, residual income must be calculated in a way which results in the following feature: for any pair of projects, RI of a project having higher NPV is bigger in each year than RI of a project having lower NPV<sup>19</sup>. In other words, if we assume that we consider two projects – A (higher NPV) and B (lower NPV) – then RI for A must be bigger than RI of the same year for B and – what's more – the rule must be repeated in each and every year. Among the 10 variants of RI that are analyzed in this paper only NEI seems to offer perfect (robust) goal-congruence. The problem with this version of RI is that there have been no formal tests confirming its perfect congruence so far. The conclusion according to which NEI can offer perfect goal-congruence is based on simple numerical tests and from this point of view it can not serve as sufficient justification of recommendation.

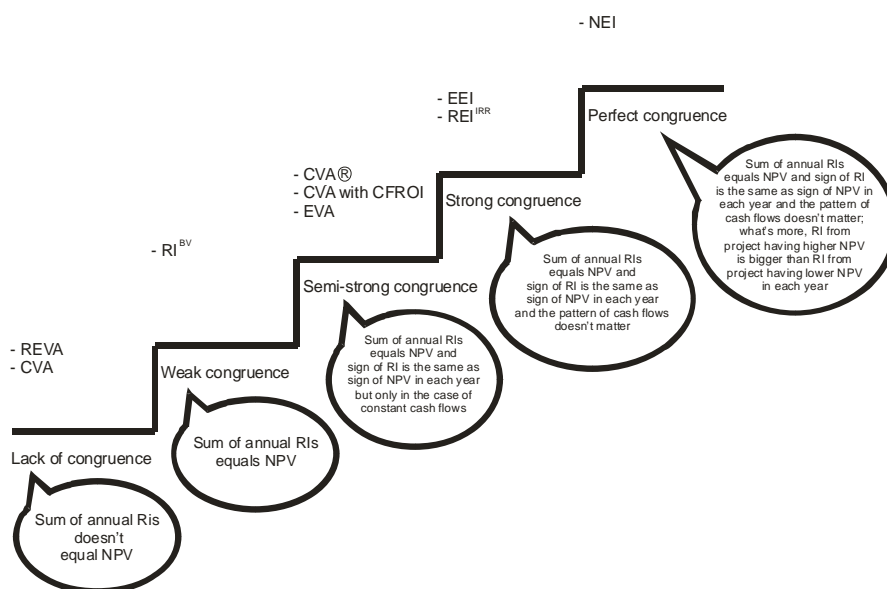
From the goal-congruence perspective  $REI^{COC}$  represents a special case. As long as reality confirms expectations, each investment project exhibits a stream of  $RI^{COC}$  that equal zero in each and every year (no matter the sign and the size

<sup>18</sup> W. Rogerson, Intertemporal Cost Allocation and Managerial Investment Incentives: A Theory Explaining the Use of Economic Value Added as a Performance Measure, "Journal of Political Economy" 1997, vol. 105, nr 4 and S. Reichelstein, Investment Decisions and Managerial Performance Evaluation, "Review of Accounting Studies" 1997, vol. 2, nr 2.

<sup>19</sup> A. Mohnen, M. Bareket, *Performance Measurement for Investment Decisions Under Capital Constraints*, "Review of Accounting Studies" 2007, vol. 12, nr 1.

of NPV). It is very hard to locate this version of RI on the scale of possible goal-congruence degrees because of the properties of the economic model  $RI^{COC}$  is based on: “the expected value created by a project is attributed to the starting point”<sup>20</sup>. As a result, “NPV is included but not referred to explicitly”<sup>21</sup>. When actual performance perfectly confirms expected performance, a project having positive NPV shows immediate profit at the start and “EBV (economic book value – *note by author*) and market value (MV) of the investment will inevitably coincide”<sup>22</sup>.

Figure 2 Goal-congruence of various versions of residual income



Source: Author

<sup>20</sup> J. Drukarczyk, A. Schueler, op. cit., p. 263.

<sup>21</sup> Ibidem, p. 265.

<sup>22</sup> G. Owen, *VBM: A New Insight into the Goodwill Dilemma?*, w: G. Arnold, M. Davies (red.), *Value-based Management: Context and Application*, John Wiley & Sons, Baffins Lane 2000, p. 311.



SVA is also a problematic case, although for different reason. Because of the assumptions built into the concept, it is very difficult (if at all possible) to calculate its value at the individual project level and therefore test its goal-congruence.

### **Lack of goal-congruence**

There are also RI variants that are not goal-congruent (they are not even NPV-compatible). The examples are REVA and CVA.

### **Practical implications**

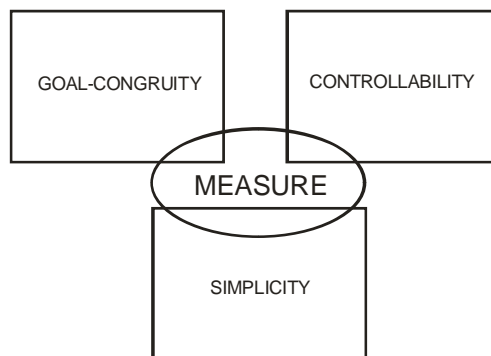
Concluding remarks must be formulated around three issues. First, one must remember that goal-congruence is not the sole criterion that should be used in the choice of the most appropriate periodic performance measure. As we mentioned earlier, there are three crucial features of summary metrics like residual income: congruity, controllability (the extent to which the value of the metric is under control of the person who is evaluated and compensated on the basis of the value) and simplicity. In the case of RI there is an obvious trade-off between congruence and controllability. The most congruent are the versions of RI that are the least controllable at the same time. The reason is that the most congruent variants are based to the biggest extent on economic (market) values that reflect expectations concerning future performance. Some authors say that “the proportion of stock price (i.e. market value – *note by author*) changes that can be ‘explained’ by macroeconomic and competitive factors is high, in some markets and situations perhaps as high as 98%”<sup>23</sup>. Although it may not be problematic in the case of top management because it has got direct influence on book as well as economic (market) values, it can pose some problems in evaluation and compensation of managers representing lower levels of organization. Increase in the degree of congruence is also related to modifications in depreciation schedules. Such modifications make the performance measure more complex – it is hard to understand the way its values are set, it is hard to communicate it to others, and – as a result – it is hard to use

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<sup>23</sup> K.A. Merchant, *Evaluating General Managers’ Performances*, “Strategic Management” 2007, vol. 88, nr 11, p. 14.

it in practice. Even if it is possible, the costs of such implementation may be more than proportional in comparison with its benefits resulting from greater congruence. It seems that the optimum choice may be compromise among congruence, controllability and simplicity.

*Figure 3 Essential properties of periodic performance measure*



*Source: Author*

Second, the as yet small number of studies analyzing the impact of RI implementation on the decision paradigm in firms seems to suggest that in an agency conflict setting managers make decisions that are more goal-congruent than decisions predicted by theory<sup>24</sup>. In other words, managers seem to behave as if they take into account not only their own interest but also the social context of their decisions. It could be another argument in favor of a RI variant that doesn't offer the highest possible congruence but exhibits balanced proportions of congruence, controllability and simplicity.

Finally, it should be mentioned that further analysis, especially empirical research, concerning features of competitive residual income versions is clearly needed. The relative weights of congruence, controllability and simplicity of residual income in the choice of its most appropriate version deserve the most academic attention.

<sup>24</sup> E.g. M.C. Arnold, R.M. Gillenkirch, S.A. Welker, *Do You Get What You Pay For? An Experimental Analysis of Managers' Decisions and Owners' Expectations*, www.ssrn.com.