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# A NEW APPROACH TO THE CAPITAL ADEQUACY ASSESSMENT OF COMPANIES

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### **ABSTRACT**

The author proposes a new model for assessing a company's insolvency risk. The model is based on financial statement data available from companies' annual reports, meaning that the results can be obtained for investors, banks and other interested parties. It is an excellent tool for performing a fast analysis of business partners and their financial stability. Three main indicators are formulated; these are also mathematically connected. They therefore enable the analyst to obtain more than 19 quantified statements about a company's financial balance. Indicators are based on a theoretical background of net working capital, which is compared with long term liability requirements. They are suitable for analyzing a particular industry as a whole. Indicators are empirically tested on the sample of 1,856 companies in Slovenia over three years.

**Keywords:** insolvency, capital adequacy, financing structure, indicators

### 1. INTRODUCTION

In modern finance, the structure of the financing of a company is addressed through a variety of theories, including: the theory of the costs of financial distress (trade-off theory), pecking order theory, signaling theory and market timing theory. None of them have yet received unequivocal confirmation of empirical research, but they have been subject to a number of critical comments. Trade-off theory is still at the heart of the debate. We can see its positive aspects in particular in:

- a principled explanation of the behavior of the company regarding its own fundamental objective;
- an interpretation of the impact of borrowing (financial leverage) on the value of the company;
- a theoretical proof of the existence of an optimal financing structure;
- an ability to unravel the recent developments related to the borrowing company;
- the promotion of new research in the field of the optimization of financing structure and the generation of new theories.

Trade-off theory's main weakness lies primarily in the interpretation of past events and the fact that it remains less useful for decision making. Our opinion is that the root cause of this "impotence" lies in the numerous significant shortcomings of the theory:

- 1. For each company, estimation of the costs of financial distress is extremely risky because these costs are very difficult to calculate.
- 2. Summing up the different types of probability distributions regarding the occurrence of costs and revenues when estimating the costs of financial distress is professionally unacceptable.
- 3. The complexity of the calculations means that the results are relatively unreliable (e.g. the recommended intervals for borrowing from 20 % to 40 % of total liabilities).
- 4. The theory is based on a cost-benefit approach, which is a basic principle of economics. Such a view on the financial policy of the company could be in direct conflict with business ethics.
- 5. The assumption of the long-term growth of the value of common equity also includes the satisfied interests of other stakeholders. The company that operates unethically to internal and external stakeholders cannot be successful in the long term.

<sup>1</sup> For more on those theories, see: Smart *et al.* (2003), Samuels *et al.* (1995), Arnold (1998), Bessler *et al.* (2011) and Brigham *et al.* (1999).

 Entrepreneurial risk in relation to solvency changes significantly depending on the maturity structure of the debt, despite the unchanged ratio between foreign and own sources of financing. The risk increases if short-term debt as a proportion of all the company's debts increases, and vice versa.

The principles of managing current assets ("current asset management") and the principles of short-term financing try to reduce the disadvantage of trade-off theory regarding maturity. Both types of principle are covered in the literature under working capital management. The authors work from the basic principle of finance, which requires consistency in maturities of liabilities with maturities of sources of financing.

In the literature, this principle is known as the "maturity matching principle" or "maturity matching approach" (e.g. Walsh, 1996, 148; Brigham *et al.*, 1999, 635) or "matching policy" (Rao, 1987, 528). The simplification of this principle from an accounting perspective means a rule that permanent working capital (*permanent current assets*) should be financed on a long-term basis.

There is the lack of a definition of permanent working capital in the various authors' texts. Brigham understands it as current assets at the lower end of the cycle (Brigham et al., 1999, 635), while Smart (2004, 777) refers only to a constant part of current assets. Arnold adds cash to the minimum inventories and receivables (Arnold, 1998, 549). Samuels defines permanent working capital indirectly through seasonal, fluctuating current assets (Samuels et al., 1995, 721). Rodić assumes that only long-term bonded inventories have long-term character (Rodić, 1990, 433). Cohen (1990, 146) and Kilig (2006, 366) understand inventories and trade receivables (cycliques employments or employments temporaires) to be long-term working capital. Numerous and vague definitions of permanent working capital are the cause of the huge difficulties that have arisen in designing useful information for decision-making on company solvency.

We believe that this weakness can be reduced with a different approach, one that is typical of the idea of capital adequacy, but that should be applied to non-financial organizations. We developed a new approach which will be discussed in this paper.

### 2. NEW COMPREHENSIVE FINANCIAL POLICY MODEL

Backgrounds of the model are as follows:

 In its decisions, management should not take into account company insolvency as a useful option. This option makes an unethical assumption regarding the potential benefits of insolvency. It follows that short-term spontaneous liabilities (*SL*) in a given volume of business are relatively easy to distinguish from payment deadlines in a particular industry which are known or contractually agreed. The company should respect them. In the best case, the possible extension of payment deadlines represents a hidden liquidity reserve in the event of *force majeure*.

- 2. If a company wants to meet its business obligations on time, it is necessary to take into account the maturity of debts, which means that it is not enough simply to monitor the leverage factor (the vertical structure of financing).
- Steps should be taken to ensure that long-term tied current assets are financed by long-term sources. Deviations must be carefully considered. This means that information for decision-making is based primarily on estimates of the actual and required working capital of the company.

Based on the above model, Figure 1 presents a comprehensive financial policy that uses the capital adequacy of a company as a starting point. Management is able to manage the risks of insolvency in the long run by providing capital adequacy. The capital adequacy of a company is defined as the consistency between the actual net working capital ( $NWC_{act}$ ) and the corresponding net working capital required for the financing of the permanent current assets ( $NWC_{need}$ ). The actual net working capital is the surplus of long-term company financing over long-term investments. The need for net working capital is defined as current assets tied to the long-term in the form of trade receivables (spontaneous receivables – SR) and inventories, including long-term reserves for risk management in the business), less trade payables (SL) or "spontaneous liabilities" in Brigham et al. (1999, 636).

Any increase in the deficit of the actual *NWC* compared with the required amount means a greater need for a continuous renewal of short-term resources, which poses a greater risk of insolvency, (although the financing costs are lower). By contrast, a company with a surplus has higher financing costs, but less risk with regard to insolvency.

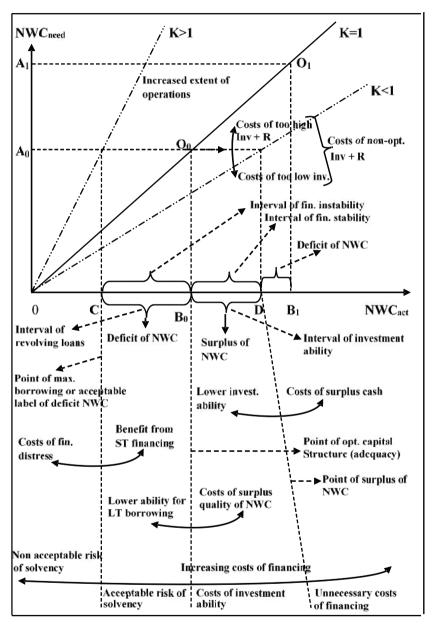


Figure 1: Model of a comprehensive financial policy

The main characteristics of the elements in Figure 1 are:

 The upper part of the image on the abscissa and the ordinate shows the actual net working capital and the required net working capital. Capital adequacy is depicted as a straight line with an inclination of

- 450. The points on this line show equality between actual net working capital and required net working capital ( $K = NWC_{need} / NWC_{act} = 1$ ) at different volumes of operations (sales revenue).
- 2. It is understood that the line represents a theoretical starting point, because it is merely incidental for a company to be on this line. Deviations are therefore normal, the most important thing is to create information on their movements in relation to the line. The ratio K may be greater or less than one, as shown in two dotted lines with a larger or smaller inclination.
- 3. Point A0 shows the optimal stock level (Inv) and spontaneous trade receivables (R), i.e. permanent current assets minus current liabilities according the volume of business. This is a rough estimation of the net working capital required.<sup>2</sup>
- 4. Point B0 shows the volume of the actual net working capital, which is equal to the net working capital required, shown by O0 point on the line that represents K = 1.
- 5. Point A1 shows the need for net working capital if the volume of business increases from point O0 to point O1.
- 6. Point C shows a situation in which the actual net working capital is less than adequate, but the deficit still can be replaced by revolving short-term loans. Therefore, point C represents the limit of a short-term borrowing of the company or the interval of financial instability (lability) in relation to point B0.
- 7. Point D shows a situation in which the actual net working capital is higher than adequate. The company has surplus, which shows its ability to invest on long-term, which could be financed with short-term loans. This is the interval of financial stability in relation to the point B0.
- 8. Point B1 with the distance to point D shows a deficit of net working capital in the event that the actual net working capital does not increase appropriately regarding an increase in the volume of business to point O1.

Based on the identified elements in Figure 1 the following areas can be defined as important in particular analysis and business decisions, regarding their impact on the optimal financing, and therefore on the solvency of companies:

1. The amount of net working capital required with a given volume of business should be stated. This means finding the point A0 on the ordinate axis.

<sup>2</sup> For reasons of simplification, we assume that this is also the assessment of adequate working capital, which includes appropriate reserves for risk management.

- Furthermore, it is necessary to determine where the company is on the abscissa, and how much net working capital in relation to the required NWC it has. We therefore have to analyze the capital adequacy of the company.
- 3. In accordance with the above point, an analysis of the company's ability regarding revolving (renewing) short-term loans in the future and the risks in this regard, must be taken after the deficit of net working capital is estimated. In this way, we can estimate the distance between points C and B0.
- 4. Any increase in the deficit (moving to the left of point C) means company over-indebtedness (too many short-term loans). The costs of revolving short-term financing become too high and exceed the benefit when compared with long-term financing. The insolvency risk is unacceptable and unethical, and also requires the appropriate action to be taken under the insolvency legislation.
- 5. Any movement from point Bo to the left (within the interval CB0) still represents an acceptable liquidity risk. Among other things, it is important to consider the direction of movement of the net working capital deficit in the past and in the business plan for the future.
- 6. Any movement from point B0 to the right (within the interval B0D) represents the ability to invest and/or the ability to increase the volume of business, which would increase the need for net working capital in the amount of the surplus. At the same time the deviation means higher funding costs, which represent the cost of the investment capability of the company.
- Any movement from point D to the right means high (excessive) solvency and represents the surplus of net working capital, which is commercially unnecessary. It causes unnecessary costs of funding (the cost of excessive solvency and/or excessive investment capabilities).
- 8. The company has an optimal structure of net working capital (quality of NWC)<sup>3</sup> in point B0, i.e. the ratio between long-term debt and equity. A higher proportion of long-term debt to total long-term liabilities means less long-term borrowing ability under the assumption of unchanged profitability on the part of the company. By contrast, a smaller proportion of long-term debt leads to higher financing costs (including the cost of equity), which represent the costs of an excessively high quality of net working capital. These cost are also the costs of the ability for long-term borrowing.

<sup>3</sup> From the professional point of view, the capital of the company must be adequate not only in size but also in structure.

- When moving from point C to the right (increasing the actual NWC), financing costs constantly increase. Management must analyze the indicated intervals in order to obtain additional information for decision making.
- 10. Interval *CB0* is the interval of financial instability, because the company does not have reserves for maintaining solvency. Instability increases with movement toward point *C*. Increased attention is required in this interval, particularly the monitoring and control of solvency and the constant monitoring of the movement of point *C*.
- 11. Interval *BOD* is the interval of financial stability because the company has reserves to the extent of excess net working capital. Therefore, in this interval (and of course, also in the interval from point *D* to the right), it is useful to make decisions on development projects and increasing business volume (or reducing long-term liabilities).
- 12. In point *A0*, a company may decide on an alternative policy for managing current assets, such as relaxed, moderate and restricted (Brigham *et al.*, 1999, 594). A restricted policy causes the reduction of the need for net working capital, but possibly increases costs because of excessively low inventories. A relaxed policy increases the need for net working capital while increasing the costs of higher inventories (*Inv*) and also the costs of higher trade receivables (*R*). In Figure 1, this is shown with an interval from excessive permanent current assets to excessively low inventories, with the costs of non-optimal volume of current assets which are tied on long-term basis.

We can see, that Figure 1 shows the main features of financial policy from a company solvency viewpoint.

## 3. A NEW MODEL FOR CAPITAL ADEQUACY ASSESSMENT OF A COMPANY

Point C in Figure 1 is crucial for maintaining company solvency. It requires an assessment of the maximum deficit of net working capital (NWC). For assessing capital adequacy, it is therefore very important to find out two pieces information: the amount of actual NWC and the amount of required NWC. The difference is the deficit (or it may be the surplus) of NWC. The next step for an analysis of capital adequacy is an assessment of the maximum deficit of NWC, which depends on the ability of the company to renew short-term financial liabilities in the future.

<sup>&</sup>lt;sup>4</sup> We cannot find an example of an analysis of required *NWC* in the literature. Brigham showed only a formula for *forecasting* "additional funds needed" (Brigham *et al.*, 1999, 342), and there is no analysis of actual position of a company, something we consider very important.

Actual NWC is the difference between long-term liabilities and long-term assets (it is a common known definition), something that is easily obtainable from the balance sheet.

In Figure 1 we have already assumed that *the need* for *NWC* stems from long-term engaged spontaneous receivables (*R*) and long-term engaged inventories (*Inv*) which are not financed by long-term payables (*LTP*). This amount can be obtained through several methods that require a greater or lesser amount of additional analytical work.

Under the simplest (and also the fastest method, we assume actual *R* and *Inv* as optimal amounts of working capital (*WC*), and also actual *LTP* as the optimal amount of financing of *WC.*<sup>5</sup> In this case we can find the approximate amount of the difference between actual and required *NWC* from the balance sheet of the company in two ways:

- 1. We subtract the difference between WC and long-term payables (LTP) from the difference between long-term financing and long-term assets. The result is the surplus or the deficit of NWC.
- 2. From the Equation 1, which shows the causes of the change in cash:

(1)

As we see, every change of cash is a result of a change in net short-term financial debts (NSTFD) and/or a change in NWCsurplus or NWCdeficit. Equation 1 means that important changes in cash are occasioned by changes in capital adequacy (NWC surplus or deficit), because changes in NSTFD are mainly the source of required cash or the possibility of short-term financial investments. From equation 1 we derive:

(2)

We can see that *NWCsurplus* or *NWCdeficit* is the difference between cash and net short-term financial debts (or net short-term financial receivables).

Now we can formulate a ratio  $R_1$ , which in the numerator shows a surplus or deficit of *NWC* and in the denominator spontaneous liabilities (*SL*):7

$$R_1 = \frac{SR + Inv - NWC}{SL} = \frac{CL - STFR - Cash}{SL}$$
 (3)

If  $R_1 > 1$ , then ratio  $R_1$  shows  $NWC_{deficit}$  as a share of spontaneous liabilities (SL). Conversely (if  $R_1 < 1$  or  $R_1 < 0$ ) ratio  $R_1$  shows a percentage of over SL. Hence, we name  $R_1$  as the rate of financing of permanent short-term assets.

<sup>5</sup> Of course, trade receivables should be adjusted to normal turnover rate.

<sup>6</sup> With a negative sign it becomes net short-term financial receivables (NSTFR).

<sup>7</sup> Equivalence for  $R_1$  in Equation 3 is the result of Equation 2.

The second important ratio is  $R_2$ :

$$R_2 = \frac{SL}{SR + lnv} \tag{4}$$

 $R_2$  is the rate of financing of permanent short-term assets with spontaneous liabilities.

Multiplying  $R_1$  and  $R_2$  we get the third ratio:

$$R_3 = R_1 \cdot R_2 = \frac{SR + Inv - NWC}{SR + Inv} = \frac{CL - STFR - Cash}{SR + Inv}$$
 (5)

 $R_3$  is the rate of short-term financing of permanent short-term assets.

The equation  $R_3 = R_1 \cdot R_2$  is the equation of financing of permanent short-term assets. With these ratios, which we name capital adequacy indicators, we can find out the structure of financing of permanent short-term assets which is shown in Table 1.

Table 1: Structure of financing of permanent short-term assets (PSTA)8

Share	Formula	Ratio
Long-term financing PSTA	NWC/PSTA	$1 - R_3$
Spontaneous financing PSTA	SL/PSTA	$R_2$
Short-term financing PSTA	STL <sub>corr</sub> /PSTA8	$R_3 - R_2$
Sum	1	100 %

The equation of financing of permanent short-term assets is useful on the level of an individual company, a particular industry and the economy as a whole. In these analyses we can use the mathematical connectivity of ratios to obtain more information.

The NWC needed is different in different industries because of different cash conversion cycles. With empirical research we can estimate the critical values of the ratios for adequate financing of permanent short-term assets. These values can be set into a critical equation of the financing of permanent short-term assets (PSTA) for each industry.

In the case of 1,856 Slovenian companies, we estimated critical equations of financing of permanent short-term assets for 21 industries based on data from 1994 to 1996. Due to space constraints, Table 2 only contains estimated critical equations for three industries, which are quite different to each other regarding the cash conversion cycle.

<sup>8</sup> STL<sub>corr</sub> means short-term loans minus short-term investments and cash.

<sup>9</sup> The cash conversion cycle is explained in several items of literature, e.g. in Brigham et al. (1999, 668).

<sup>10</sup> In these period, data on companies' frozen current accounts was recorded by special state-owned payment transaction institution. This institution no longer exist. Therefore it is not possible to approve the signification of the results on new data. However, the author's consulting practice approve the usefulness of the model.

Industry 1 has relatively high  $R_2$  which requires a high level of *NWC* surplus. It does not need short-term loans because of high spontaneous financing. A higher  $R_1$  would require higher short-term financing at unchanged  $R_2$  and cause higher risk of insolvency.

Industry2 has  $R_2$  closest to value 1. *PSTA* are therefore financed mostly by spontaneous liabilities (*SL*). A higher  $R_1$  would require higher short-term loans at unchanged  $R_2$  and cause higher risk of insolvency.

	Industry	Rate of capital adequacy:	Rate of spontaneous financing of PSTA:	Rate of short- term financing of PSTA:
1	Hotel-keeping, restaurants and catering	0.47	2.28	1.07
2	Metal products	1.01	0.71	0.72
3	Machine engineering	1 21	0.65	0.80

**Table 2:** Critical equations for financing PSTA

The highest level of short-term loans is "allowed" in machine-engineering industry, but the  $R_1$  is not higher than 1.21, which means an *NWC* deficit at the level of 21% of *SL*.

It is interesting to note, that critical values of the ratios do not "allow" a great deal of short-term indebtedness. This is quite different comparing with the praxis of some companies. However, they may have no liquidity problems. The only answer is in the ability to renew short-term loans. The main problem in assessing a company's capital adequacy is therefore related to providing a good assessment of the risk of changing this ability in the future. This was more than convincingly proved during the recent global financial and economic crisis.

Empirical testing of the predicting power of capital adequacy indicators with Logit model, showed their strong significance with relatively low error of the second type (21.4%). It means that most of companies with no liquidity problems (78.6%) were classified right. On the other side the error of the first type was higher (35%), which means that still most of companies with liquidity problems were classified right, but at higher risk.

It should be noted that the model of indicators points to the risk of company insolvency and does not estimate the likelihood of its account being frozen. If this fact is taken into account, the results obtained in statistical processing are sufficiently convincing in terms of the usefulness of the model as well, which can be seen in the following in particular:

- the simplicity and use of available accounting data;
- the insensitivity of indicators to the extent that allow an analysis of companies regardless of their size;
- indicators can be very useful as the first "sieve" that sufficiently determines secure companies, and points to additional questions and analyses for companies rated as risky;
- indicators can be useful for analyzing particular business activities (changes in financial condition of the company) from the perspective of various options for ensuring solvency.

As a fundamental advantage of the model, we should once again emphasize the theoretical basis of the selection and the content of the indicators, which enables their detailed explanation and decision-making to be conducted on this basis.

In any case the ratios are, in principle, a tool for more relevant but not optimal decisions, since the importance of other and even uncertain factors prevents the analytical results from being accurate (Finnerty, 1986, 5).

### 4. CONCLUSION

The presented model for assessing the capital adequacy is one of theoretical approaches and does not mean a rigid framework. Its main weakness is a static analysis of accounting data that does not directly integrate costs optimization of financing. Its advantage is relative simplicity, especially for the external analysts. Undoubtedly, in a particular company, the deviations from the estimated capital adequacy can be fully justified (it may also be said that it is normal), but it is important that we know about them as much as possible, and in particular about their movements. It means that each company should identify and provide an appropriate capital adequacy to its operations. This model gives a possibility in obtaining the necessary arguments for such business decisions.

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### **APPENDIX**

An example of the analysis of a particular company's capital adequacy is shown Table 3.

Table 3:	Analysis	of capital	l adequac	/ indicators
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Year	Rate of capital adequacy: R <sub>1</sub>	Rate of spontaneous financing of <i>PSTA</i> :	Rate of short-term financing of <i>PSTA</i> :
X	1.20	0.666	0.80
X + 1	1.30	0.700	0.91
X + 2	0.90	0.500	0.45

### Table 3 provides several findings, including:

- 1. In the first period, *PSTA* exceeded *NWC* by 20% of spontaneous liabilities (*SL*). This is therefore an estimate of the *NWC* deficit. The deficit increased to 30% in the following year, but a surplus of 10% of *SL* arose in the last year. The reason for the improvement was the faster increase in the company's long-term liabilities compared to long-term investments (increase in net working capital).
- 2. The *NWC* deficit was covered mainly by short-term loans, which amounted in the first year to 13.3% of all *PSTA*. The difference (86.6%) was financed by *NWC*. In the second year, the increase in the *NWC* deficit was partly covered by an increase in *SL* (the percentage of *PSTA* financed with *SL*, increased by 5%) and partly by an increase in short-term loans, which amounted to 21% of all *PSTA* (the proportion of

- short-term loans increased by 62%). In the last year, the increase in *NWC* resulted in a surplus of *NWC* and an increase in the rate of long-term financing of *PSTA* from 9 to 55% (in the first year it was 20%).
- 3. The increase of *NWC* in the last year was used by the company in part to reduce the proportion of *SL*. As a result they are now financing *PSTA* only on the level of 50%. We can conclude that in the first two years, the company made met it business obligations to a less satisfactory extent and thus transferred the burden of its net working capital deficit to its suppliers. The second part of the increased working capital in the last year was used to repay *all* short-term loans. Now, *NWC* plus *SL* together exceed *PSTA* by 5% and are financing short-term financial investments and cash. This means that the *NWC* surplus in the last year amounted to 5% of the *PSTA*.
- 4. In the first year, short-term loans were 16.7% of reduced short-term liabilities, or 20% of all spontaneous liabilities. They were 66.6% of *NWC*. In the second year, they increased to 23.1% of reduced short-term liabilities, or 30% of spontaneous liabilities and 70% of *NWC*. In the last year, the company repaid all its short-term loans.
- 5. The company financed 66.7% of spontaneous receivables and inventories with spontaneous liabilities in the first year (70% the next year and only 50% in the last year).
- 6. Assuming that, in the last year, the company managed to normalize its payment deadlines for suppliers (a realistic assumption, as there was no other reason in normal operations), we can set 0.50 as the desired value of ratio  $R_2$ . This is confirmed by the conclusion from point 2 that the company transferred part of the working capital deficit to its suppliers. If not, it should hire additional short-term loans, and ratio  $R_1$  would increase to 1.6 in the first year and to 1.82 in the second year. Short-term liabilities would not increase ( $R_3$  would remain unchanged), but their structure would deteriorate due to the increase in short-term loans, and thus would cause the deterioration in the company' the capital adequacy as well.
- 7. Assuming a critical indicator of  $R_3 = 0.60$  for the activity of our company and the normal financing of stocks and operating receivables with  $R_2 = 0.50$ , we can conclude that there is the corresponding capital ratio of the company  $R_1 = 1.20$  ( $K_1 = K_3 / K_2$ ). This value was achieved in the first year, but to the detriment of suppliers, so the short-term indebtedness of the company ( $R_3$  was 0.80) was also higher. We can see that in the first year, the company provided adequate solvency mainly by extending payment deadlines to suppliers, whether such extensions were agreed or not.