

# APPROPRIATE DETERMINATION OF NET WORKING CAPITAL IN CORPORATE FINANCIAL MANAGEMENT

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## Abstract

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Liquidity and working capital management belongs to one of the fundamental tasks of short-term financial management. However, in the context of net working capital, the issue of management of current assets and liabilities significantly overlaps with long-term financial management, in which the effects of various decisions have long-term consequences, with considerable inertia and possibility of high losses. The present study is therefore focused on the determination of appropriate amount of working capital, as an important part of financial decision making process in the company. The paper presents an empirical research aiming to identify the appropriate approach to accurate calculations of net working capital and determining its needs. The main contribution of the study can be found in the verification of calculation method of net working capital needs, which, according to the authors, may be beneficial both for business practice and teaching of financial management at universities.

Keywords: net working capital, current assets, short-term funds, cash conversion cycle, production and sales costs, business, receivables, inventories, payables

## INTRODUCTION

Asset management is an important part of financial management for the business. Working capital management and working capital policies are then one of the basic components of asset management. Since working capital includes receivables, inventories and short-term financial assets, working capital management means influencing all these constituents and falls into the area of operating management. However, setting policy on working capital also has implications for strategic management because it provides the requirements for purchase, production and storage. The relevance of accounting data, which should give a true and fair view of the company's performance under different accounting standards, can be considered as another important factor. (Beranová and Polák, 2014; Kislingerová, 2010; Pavelková and Knápková, 2009).

Changes in the size of these working capital constituents may have a significant impact on

business costs and revenues, which has been supported by authors' preliminary research. In this regard, a significant influence of changes in the size of receivables and inventories on the size of sales has been confirmed by the model verified. Consequently, a strong influence of these changes on the development of costs can be expected as well. In agreement with Tomek (2007), authors of the study believe that providing a longer maturity of receivables and a shorter delivery time of products may attract new customers and increase sales. On the other hand, these sales promotion tools are associated with an increase in receivables and inventories, which results into an increase in costs. This is also affirmed by Lind *et al.* (2012) who stated that an increase in working capital constituents leads to an increase in tied-up capital and, as a consequence, to a decrease in return on investment. Further, the authors suppose that changes in average collection period are mostly offset by changes in creditor's payment period; hence, these are the inventories that have a major

impact on cash conversion cycle. With respect to this idea, working capital management should be primarily focused on inventory management. Likewise, Bei and Wijewardana (2012) assume that a concentration on management of appropriate constituents of working capital is highly important, especially because of time constraints and profitability effects.

It has become obvious that working capital management significantly affects corporate performance and that this is an issue the managers are really preoccupied with. As stated in Pavelková and Knápková (2009), corporate performance is particularly influenced by asset turnover. This has been also supported by Kislingerová and Hnilica (2008). According to Režňáková (2010), aggressive net working capital management enhances business performance from the perspective of the owners because the impact of increase in return on capital employed is higher than the impact of lower profit resulting from a decline in sales. The assumption is in line with Vahid *et al.* (2012), who argue that a company should try to shorten the length of cash conversion cycle. Moreover, Bellouma (2011) considers the shortening of cash conversion cycle as an opportunity for financing SMEs in emerging markets. But, as reported by Režňáková (2010), it is crucial to take into account differences between sectors, which are, according to Filbeck and Kruger (2005), constant in time.

Nevertheless, Baños-Caballero, García-Teruel and Martínez-Solano (2014) assume a concave relationship between business performance and level of working capital. Based on their research, the authors believe that the length of cash conversion cycle should be extended only to a certain point, which is defined as the derivation of the observed relation. This is in compliance with Nazir and Afza (2009, A): More relaxed asset management policy, i.e. higher proportion of current assets on total assets, results in higher profitability. Thus, it may be supposed that the observed industrial branch is located on rising part of concave curve described above. Similar findings were observed by Tufail (2013). To the contrary, Bei and Wijewardana (2012) examined the practice of using working capital management policies in Sri Lanka and found that the majority of companies use aggressive policy of working capital management. From these results, we can assume that significant differences exist not only between industries but also between different regions.

The opinion on the territory influence were confirmed by other studies, for example, Hill, Kelly and Higfield (2010) or Nazir and Afza (2009, B). While the results do not agree in all aspects, there is a positive correlation between size of cash-flows and working capital investments. From this fact, it can be deduced that firms prefer to invest money in working capital rather than in securities or other investment activities. Yet, it cannot be universally determined if firms invest money or leave it since

a number of specific factors affects this decision-making. For instance, these are size of the firm and its marketability on stock exchange (Al-Najjar, 2013; Bigelli and Sánchez-Vidal, 2012), level of production diversification (Subramaniam, Tang, Yue and Zhou, 2011), impact of separation of ownership and management (Ozkan and Ozkan, 2004) or financial constraints in obtaining external sources as mentioned by all above authors.

Based on the above findings, we believe that the research on the impact of working capital management on business performance incorporates many aspects and it is affected by particular industries and particular territories and as well as by other factors such as company's size, marketability on stock exchange or macroeconomic development.

Working capital management is an important part of financial management with demonstrable impact on long-term strategic management. In the context of the present article, we have been specifically focused on determining the appropriate calculation method for net working capital.

There are two basic approaches to the calculation of net working capital (Kislingerová, 2010; Režňáková, 2010; Růčková, 2012; Synek and Kislingerová, 2010). The first approach is based on cash conversion cycle and average daily costs associated with the company's operation. The second approach respects the rules of funding when the difference in current assets, short-term debts and long-term receivables represents a permanent part of current assets. It takes the form of resources fixed in inventories and receivables for a period longer than the maturity of short-term debts. For this reason, it is advisable that these assets should be covered by long-term sources. In more detail, the calculation is examined by Dluhošová (2010), Hrdý and Krechovská (2013), Marek (2009) or Váchal and Vochozka (2013).

The calculation of net working capital on the basis of cash conversion cycle emerges from the daily costs associated with the operation and the time that elapses from the payments to suppliers of materials and services until the cash receipts from the sale of goods and rendering services (see Kislingerová, 2010; Režňáková, 2010; Růčková, 2012; Synek and Kislingerová, 2010). Cash conversion cycle is shortened by average payment period and lengthened by average collection period and average age of inventory. The average age of inventory can be divided according to manufacturing cycle, sales cycle and more closely in the context of transformation of one form of inventories to another. However, a detailed classification of average age of inventory constituents is out of the scope of this work.

Influencing the average daily costs of company's operation and the individual components of cash conversion cycle may result in reduction of tied-up resources. In other words, the need for capital commitment follows from the maintaining efficiency requirement and from the systematic management of current assets. This method of net

working capital calculation is preferred, probably due to the possibility of a thorough analysis. Also, it is practically applicable to predict net working capital needs in financial planning. Working capital management is an important and topical issue, particularly from the perspective of business performance measurement and serious impact on business cash-flows (Gitman, 2006; Valach, 1999). The issue is analyzed in greater depth in authors' forthcoming studies that examine the impact of net working capital management on business performance.

Based on a comparison of current approaches to net working capital calculations, the present study aims to suggest and verify the appropriate and accurate method of net working capital calculation and determination of its needs.

### Methodology

For research purposes, the data of only one industry sector and one country were selected. As follows from Introduction section, different sectors and regions evince different levels of net working capital. Consequently, this fact would make impossible the verification of calculation method. Moreover, the level of net working capital is also influenced by company's size due to various options in obtaining financial resources. The research is then focused on medium-sized businesses resident in the Czech Republic; all the businesses belong according to the CZ NACE classification to section Manufacture of machinery and equipment (code 28).

Data were obtained using the Amadeus database and financial reports published by the Ministry of Justice of the Czech Republic. Information gained from the Amadeus database was not sufficient enough for the research purposes, but it provided the list of businesses fulfilling the above mentioned criteria. Based on the knowledge of businesses' trade names, the published financial statements were acquired. Companies with incomplete entries for years 2012 and 2011 were removed from the sample. Hence, from the original database of 73 companies, 35 companies were excluded. The first method, which can be called as difference method, is described in equation 1. This method can be considered as fundamental and precise and it is used as a base for verification of accuracy of other calculation methods. Nevertheless, this approach to calculation of working capital size does not provide many opportunities to plan net working capital needs. For this purpose, authors use a calculation method that is based on the length of the cash conversion cycle. This approach is depicted in equation 2. However, in our opinion, this calculation is inaccurate since it does not include short-term financial assets, which also need to be covered by financial sources. Therefore, according to our considerations, equation 2 has been modified. The result of this adjustment can be seen in equation 3. For the avoidance of doubt, the financial

statement items entering into the calculation are precisely defined.

$$NWC = CA - LTR - STD, \quad [1]$$

where

NWC.....net working capital calculated by the difference method,

CA .....represents current assets,

LTR.....represents long-term receivables,

STD .....represents short-term debts.

$$NWC_2 = CCC \times DC, \quad [2]$$

where

NWC<sub>2</sub>.....net working capital calculated on the basis of the cash conversion cycle; the proposed modifications are not applied,

CCC.....cash conversion cycle,

DC .....represents daily costs.

$$NWC_{\text{from CCC}} = CCC \times DC + STFA, \quad [3]$$

where

NWC<sub>from CCC</sub>.....net working capital calculated on the basis of the cash conversion cycle; the proposed modifications are applied,

STFA.....represents short-term financial assets.

$$DC = \frac{ESG + PC + PE + TF}{360}, \quad [4]$$

where

ESG .....represents costs of goods sold,

PC .....represents production consumption,

PE .....represents personal expenses,

TF .....represents taxes and fees.

$$CCC = \frac{\emptyset STC}{DC} + \frac{\emptyset REC}{DS} - \frac{STD}{DC}, \quad [5]$$

where

$\emptyset STC$ .....represents average stocks,

$\emptyset REC$ .....represents average short-term receivables,

DS.....are daily sales.

$$DS = \frac{SSG + SOPS}{360}, \quad [6]$$

where

SSG.....are sales from goods sold,

SOPS.....are sales from own products and services.

$$NWC = \text{const.} + NWC_{\text{from CCC}} + \epsilon, \quad [7]$$

where

const. ....the constant term of the regression model,

$\epsilon$ .....the additive error term.

It may be supposed that the use of equation 3 for the calculation of net working capital yield the same results (i.e. statistically insignificant deviations) as in the case of the use of equation 1. This presumption is to be verified by using a regression model described by equation 7. If the relationship

is verifiable, the coefficient of determination for the variable  $NWC_{\text{from CCC}}$  will be close to 1; it follows that the presumption is not rebutted. Data for year 2012 were used for calculations, average values were determined as the arithmetic average of initial and final state of the variable. Regression models were developed and verified by using software program Gretl.

## RESULTS

Based on the calculation methods introduced in Methodology section, three options of net working capital were calculated. The first value was determined as the difference between current assets decreased by long-term receivables and short-term debts. This value provides a basis for comparison of results obtained by other calculations methods.

When comparing the basic values of net working capital to the values determined using only cash conversion cycle and daily costs, significant differences occurred. Therefore, this option was omitted, and another option, which compares the basic value of net working capital to the values determined using cash conversion cycle, daily costs and short-term financial assets, was followed. At first sight, the values did not show significant differences, as was confirmed by verification of the model.

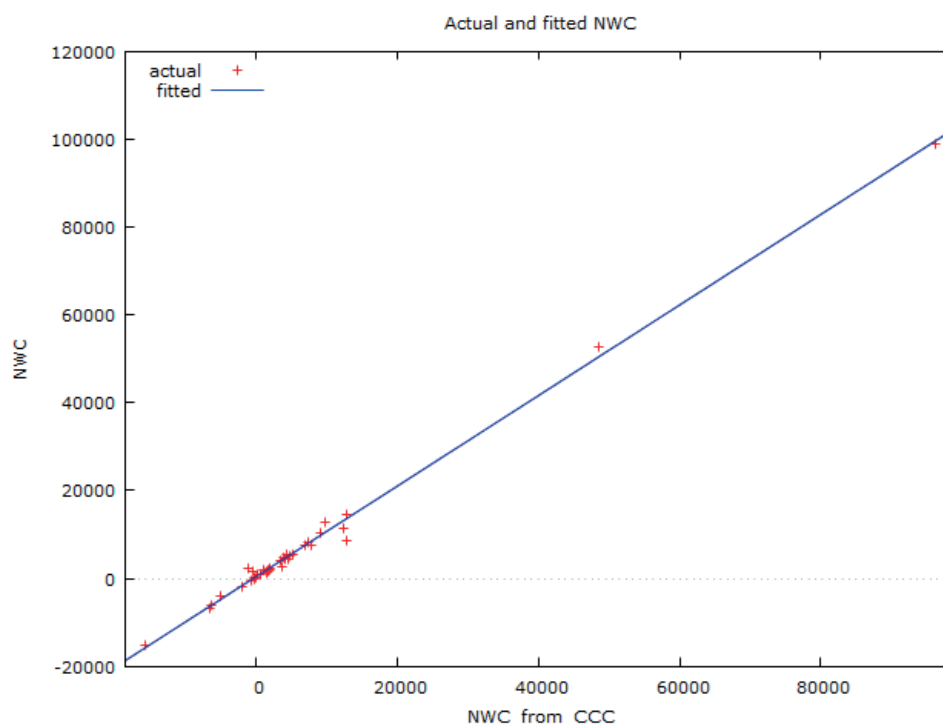
When assembling the model, the problem with extreme values emerged since one of these values greatly distorted the results. After the elimination of extreme values, the model, presented in Tab. I, has been acquired.

However, the model could not be verified; the identified heteroskedasticity influenced the results of further tests of the model. Heteroskedasticity problems were caused by two values. These

I: Explanation of NWC value using calculations based on cash conversion cycle and short-term financial assets

|                    | Coefficient | Std. Error | t-ratio            | p-value   |     |
|--------------------|-------------|------------|--------------------|-----------|-----|
| Const              | 424078      | 222822     | 1.9032             | 0.06503   | *   |
| NWC_from_CCC       | 1.03067     | 0.0120688  | 85.3999            | < 0.00001 | *** |
| Mean dependent var | 6641.921    |            | SD dependent var   | 18,270.80 |     |
| Sum squared resid  | 60668954    |            | SE of regression   | 1298.171  |     |
| R-squared          | 0.995088    |            | Adjusted R-squared | 0.994952  |     |
| F (1, 36)          | 7293.136    |            | P-value (F)        | 3.67-43   |     |
| Log-likelihood     | -325.3034   |            | Akaike Criterion   | 654.6069  |     |
| Schwarz Criterion  | 657.8820    |            | Hannan-Quinn       | 655.7722  |     |

Source: Authors' calculations



1: Actual and fitted values for modified calculation of CCC

Source: Authors' calculations

II: Explanation of NWC value using calculations based on cash conversion cycle and short-term financial assets (the model with corrected heteroskedasticity)

|                                               | Coefficient | Std. Error | t-ratio            | p-value   |     |
|-----------------------------------------------|-------------|------------|--------------------|-----------|-----|
| Const                                         | 539159      | 140.145    | 3.8471             | 0.00047   | *** |
| NWC_from_CCC                                  | 1.01265     | 0.0119716  | 84.5873            | < 0.00001 | *** |
| <b>Statistics based on the weighted data:</b> |             |            |                    |           |     |
| Sum squared resid                             | 274.5895    |            | SE of regression   | 2.761790  |     |
| R-squared                                     | 0.994994    |            | Adjusted R-squared | 0.994855  |     |
| F (1, 36)                                     | 7155.008    |            | P-value (F)        | 5.16-43   |     |
| Log-likelihood                                | -91.49579   |            | Akaike Criterion   | 186.9916  |     |
| Schwarz Criterion                             | 190.2668    |            | Hannan-Quinn       | 188.1569  |     |
| <b>Statistics based on the original data:</b> |             |            |                    |           |     |
| Mean dependent var                            | 6641.921    |            | SD dependent var   | 18,270.80 |     |
| Sum squared resid                             | 64429426    |            | SE of regression   | 1337.799  |     |

Source: Authors' calculations

were substantially distant from other values as it is shown in Fig. 1. Although these values are distant from the others and they are the reasons for heteroskedasticity problems, their relative size corresponds to other values. It may be assumed that this significant distance is affected by larger size of two businesses that subsequently generated distant values. Consequently, since this deficiency does not significantly impact the results of the model, the model with corrected heteroskedasticity is applied. The model is illustrated in Tab. II.

Model with corrected heteroskedasticity is statistically significant, as well as all independent variables. The model describes 99.499% variability of the sample and the error term is normally distributed. Based on the model results, it may be stated that if the size of net working capital is determined using cash conversion cycle, daily costs and short-term financial assets, a deviation of 1.26% can be expected. The constant term is also statistically significant, which indicates that if the size of net working capital determined using cash conversion cycle and short-term financial assets equals to zero, the real size of net working capital is approximately 539 000 CZK. In our opinion, these deviations can be caused by the fact that for calculation of cash conversion cycle the average values are used. Furthermore, due to data unavailability, the average values were assessed using only initial and final state of the variable.

## DISCUSSION

The authors of the present study use two different types of net working capital calculations. The first method is based on computation of difference; more specifically, it is the difference between the current assets and the sum of long-term receivables and short-term debts (Dluhošová, 2010; Proud and Krechovská, 2013; Marek, 2009; Váchal and Vochozka, 2013). Some of the authors (such as Kislingerová, 2010) use the concept of current liabilities to which all short-term debts are

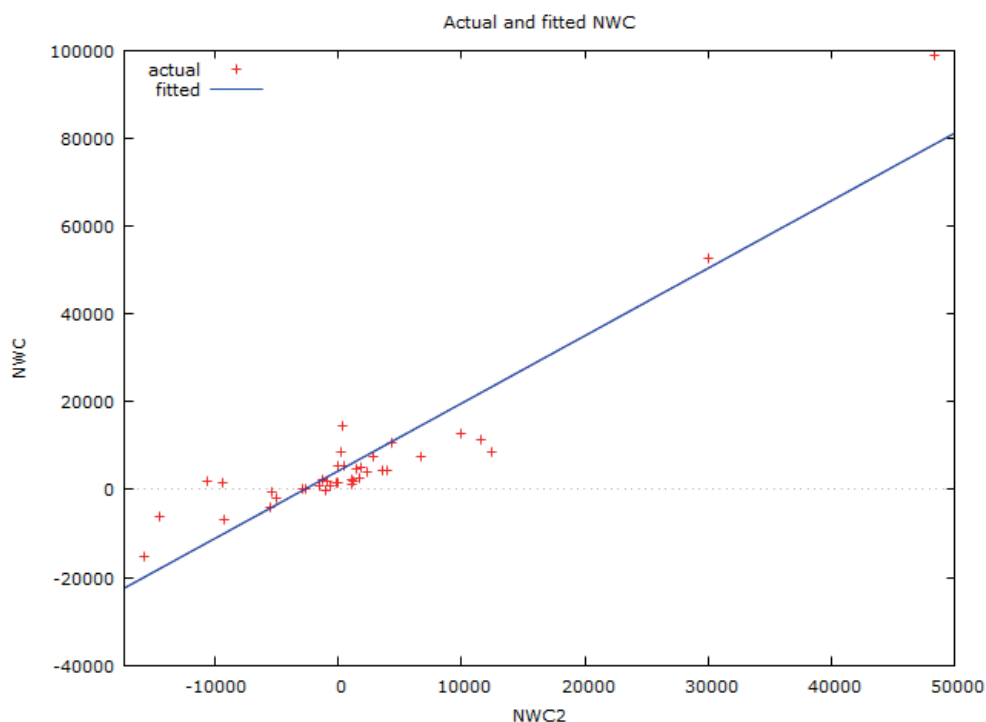
ranked. This type of calculation is considered as the fundamental one since it determines precisely the amount of long-term resources needed to finance short-term assets. The logic of the principle is that long-term resources should cover a part of short-term assets that are obliged on a long-term basis.

The second method is calculated as the number of days of the cash conversion cycle multiplied by the average costs associated with the company's operation, i.e. the costs of production and sale. Available scientific resources usually do not specify particular items belonging to these operating costs. The calculation method is applicable in the situation with no significant changes in the length of cash conversion cycle; as stated for example by Režňáková (2010).

Both of the approaches have been compared. It has been reported that the results of both methods indicate different values of net working capital. The difference in the methods is indicated by Fig. 2. The first calculation method, i.e. the method based on the difference, is represented by the points in the graph that are marked as actual. The second calculation method, i.e. the method based on cash conversion cycle, is represented by the line labeled as fitted. Findings may indicate that the calculation on the basis of cash conversion cycle is not suitable for application in the business.

In case of the regression model that explains the explanatory variable NWC using the variable  $NWC_2$ , all the variables are statistically significant, as well as the model itself. However, the model cannot pass the economic verification since the value of variable  $NWC_2$  is 1.54 and the constant member approaches the value of 4 250 000 CZK. According to our opinion, this fact demonstrates that the calculation using the cash conversion cycle without the modification is not accurate.

To eliminate this shortage, the methodology has been extended by adding short-term financial assets to the result of net working capital calculation based on cash conversion cycle. When comparing



2: Actual and fitted values for calculation of CCC – without modification  
Source: Authors' calculations

the values of net working capital calculated by difference method and by modified method of cash conversion cycle, it has been shown that the differences are statistically insignificant. These negligible differences may be caused, for example, by averaging the values in the calculation since it was necessary to use available data.

The findings follow the research presented in Introduction section (Baños-Caballero, García-Teruel and Martínez-Solano, 2014; Nazir and Afza,

2009, A; Tufail, 2013; Nazir and Afza, 2009, B). Hill, Kelly and Higfield (2010) use cash conversion cycle for determination of net working capital. The obtained findings, however, indicate probable inaccuracy of previously mentioned studies. Hence, further survey on determination of net working capital using cash conversion cycle might consider extending the models by addition the short-term financial assets.

## CONCLUSION

The study presents the modified approach for calculation of net working capital using cash conversion cycle and adding short-term financial assets into the formula. Concurrently, the items entering the calculation have been precisely defined. The modified method was verified using a regression model. In our opinion, the calculation method presented in current scientific literature has been specified and concretized.

Minimizing the disadvantages of net working capital calculation by using cash conversion cycle may contribute to business practice. More specifically, the benefits can be seen in the area of planning the needs of net working capital and allocating the resources in the company. Consequently, the companies can directly determine the required level of immediate liquidity for the next period.

Other advantages can be seen in the field of theory and pedagogy. The specification of the calculation procedure provides students with the possibility of deeper insight into the presented issues and the understanding of current assets and its funding. The findings can be reflected in teaching the subjects relating to financial management.

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