DYNAMIC AND STATIC LIQUIDITY MEASURES IN WORKING CAPITAL STRATEGIES

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Abstract

Liquidity management in a company may be analyzed in terms of the dynamic approach represented by the cash conversion cycle or the static approach represented by the current ratio. The mutual relationships between these measures change depending on the working capital level. The author considers the CR to be a dependent ratio, assuming that the CCC reflects the operational decisions affecting the level of current assets and liabilities. In the study, 61 regression models were used to assess liquidity ratios in non-financial companies listed on the Warsaw Stock Exchange in the period 1997–2010. In the aggressive and moderate strategies, the current ratio grew with the number of cash conversion cycles per year, while the relaxed policy resulted in the CR increasing with a decrease in the number of cash conversion cycles.

Keywords : Liquidity, cash conversion cycle, working capital

Introduction

The cash conversion cycle, current ratio, quick ratio and acid test) should be taken into consideration in managerial decision making. Unfortunately, the relationship between the cash conversion cycle and the current ratio is not direct as it depends not only on the level of current assets and liabilities, but also on sales and costs of goods sold, which determine the turnover ratios. Moreover, short-term management is a difficult problem since usually companies do not employ working capital managers, and the levels of current assets and liabilities result from operational performance: negotiations determining the level of receivables and inventory strategies connected to production or sales combined with purchases and short-term debt. The debt level to an ever greater degree results from the

banking strategy, offering credit to entities with the ability to pay it back. Such a strategy may be very aggressive and managers may decide to incur more short-term debt than necessary from the company's point of view.

The cash conversion cycle (CCC) should be related to the current ratio (CR), since both measures deal with current assets and liabilities. The author has chosen them to examine how the relationship between these measures changes over time under different working capital strategies. The study is conducted on the developing Polish market, where such changes can be observed. If a company follows a negative working capital strategy, this means that it represents a strong position in the market and can decrease its liquidity, as the managers expect that invoices will be paid on time and can make the subcontractors wait for their payments, which results in a negative cash conversion cycle. The cash conversion cycle may be measured in days or in the number of cycles per year. The latter approach is better comparable with the liquidity ratios. The aggressive strategy is characterized by a low current ratio, but the number of cycles per year is high. If a company delays its payments, the cash conversion cycle may be negative. If a company has a low CR (<1) and a low number of cycles per year, this means that it is losing liquidity. In the case of the moderate strategy, the number of cycles will be high with a tendency to decline with an increasing CR. Sometimes the moderate strategy is defined as zero working capital, but it is very difficult to establish the current ratio at 1 and maintain current receivables and liabilities at the same level. That is why the author proposes a different classification: the range of the moderate strategy extends from 1 to the upper marginal value proposed in the literature as the optimal CR range (CR = 2). If a company follows a relaxed working capital management policy, then the CR will exceed the marginal value. Literature data suggest that this value is 2, but it should be tested against a profitability function, and when it starts to decrease it is a signal that the level of current assets is too high. If a company prefers liquidity over profitability and the investors accept this, then a relaxed policy can be implemented. This can be easily tested and it has been found that, for example, Polish investors prefer profitability over liquidity (Bolek and Wolski, 2012) and Lyroudi (2012) analyzed the trade-off between liquidity and profitability for Polish market. Current assets can be divided into permanent and temporary assets financed by trade credit, and other payables and accruals that arise spontaneously in the firm's day-to-day operations. A company may decide to use a hedging strategy of financing based on maturity matching, where each type of assets will be offset with a financing instrument of the same maturity. In this concept, fixed assets and the fixed portion of current assets are financed with long-term debt and equity, and the long-term profitability of the

assets will be supposed to cover the long-term financing costs of the firm. Seasonal needs are financed with short-term loans and under normal operations a sufficient cash flow is expected to cover the short-term financing costs. In this method, the level of current assets and the method of financing those assets are dependent on the role they play in business. A conservative policy of high current asset levels permits a more aggressive method of financing current assets, since their permanent level (as, e.g., in the case of stores) is treated as fixed assets, because this part of current assets must be in a company and is financed by long-term capital, mostly equity. The seasonal part can be financed with short-term liabilities, but if they exceed the level of spontaneous current assets, then an aggressive approach can be pursued. It is difficult to recognize this kind of strategy using typical financial statements.

The relationship of the levels of current assets and short-term liabilities with turnover ratios (the latter being expressed as a single liquidity measure, that is, the cash conversion cycle) is used in an attempt to determine the optimal level of working capital, which affects the rate of return and risk. This method of analyzing the market may bring interesting results, showing the real problems the managers face regarding working capital management.

The present paper is meant to analyze the problem of the relationship between the current ratio (CR) and the cash conversion cycle (CCC) depending on the working capital strategies companies pursue. The author seeks to determine the correlation between these measures using accumulated data for different strategies. Over a longer period it may appear that the relationship disappears, especially that a company's liquidity strategy also depends on the condition of the economy. Cross-timing analysis will be applied to show changes in the relationship between these measures over time.

Literature

Liquidity is considered a very important strategic goal for many managers, while short-termism may be criticized by others. Rappaport (2005) contended that "short-termism" is the disease; earnings and tracking error are the carriers. He posed the question "Is corporate management's focus on short-term earnings self-serving or also in the best interests of its shareholders?" Long-term management decisions seem to be more important, and analyzing the capital structure and earnings one can find a direct connection to the company's value and its maximum level. Liquidity can be regarded as a company's ability to pay the bills, but it is also related to the capital necessary to finance its positive working capital and risk. Managers can use a number of liquidity measures while performing analyses and making decisions. They can be divided into static and dynamic measures. Static measures are defined as such because they reflect the nature of the balance sheet structure, while dynamic ones are

connected to turnover metrics. Since both kinds of measures are liquidity ratios and the relationship between them is not direct, it is important to seek the best methodology for determining this relationship based on theoretical assumptions.

The optimal corporate performance has long been the subject of interest. Courtis (1978) stated that in selecting financial ratios for the purpose of determining the financial condition of a company, the analyst must ensure that the set he chooses encompasses all relevant aspects of the entity. Courtis further proposed a systematic and comprehensive approach to financial ratio analysis by identifying linkages between different ratios and explaining how those ratios interrelate to map a profile of corporate financial characteristics. Solvency is considered a category representing a company's ability to pay its obligations. It is further subdivided into subcategories; the first one is short-term liquidity connected to payment of short-term liabilities on time, according to the operational approach. The second subcategory discussed by Courtis is long-term solvency, meaning the ability to meet the principal and interest payments on time. The third subcategory is connected to concept of viewing a firm as a reservoir of liquidity assets supplied by inflows and drained by outflows. In Courtis's opinion, these three subcategories are sufficient to determine a firm's ability to meet its short- and long-term financial obligations, and all of them refer to liquidity. From the time of Courtis's publication the problem of liquidity has emerged from time to time, but the discussion has not been resolved, especially that the role of working capital and liquidity management is underrated among both businesses and scholars.

Richards and Laughlin presented a new idea of liquidity in their 1980 paper. According to them, working capital management receives less attention in the literature than longer-term decisions, but in fact financial managers work on it most of their time. Nowadays, other managers (especially sales managers) develop liquidity policies in companies. Working capital represents the level of short-term investment resulting from the policy and skills of the management connected with external factors influencing inventory and receivables levels, since the latter depend on the competitive strength of a company and the former on the sales or production predictability and management. In their fundamental work in the field of liquidity, Richards and Laughlin proposed the cash conversion cycle as a measure of liquidity, making liquidity analysis less intuitive than in the case of static financial ratios. The relationship between static and dynamic liquidity measures is not simple or linear. An increase in turnover ratios in the field of working capital may be connected with an increase or decrease in the current ratio. It is connected to many factors influencing a company's operational processes. Accounts receivable turnover is an indicator of the frequency with

which a firm's receivables are converted into cash. There are some competition-related factors influencing the level of this ratio, such as the collection policy. Sales will increase faster from the turnover point of view and the turnover ratio will fall, affecting negatively the CCC, while the CR will grow at the same time. Inventory turnover is connected to the synchronization of purchasing, production and distribution, and the more inventory is engaged in the sales process, the lower the turnover ratio. The current ratio will also grow if a company will not modify its payment conditions altogether with access to short-term credit. As it was initially defined, the cash conversion cycle, by reflecting the net time interval between actual cash expenditures on productive resources and the ultimate recovery of cash receipts from product sales, represents the period of time required to convert a dollar of cash inflow from a firm's regular course of operations. A more extended operating cycle, associated with a declining inventory and receivables turnover, increases a firm's potential liquidity management problems. Conversely, a longer payment period associated with a declining payables turnover tends to moderate liquidity management problems. Working capital management policies that create a longer CCC can be expected to produce a higher current ratio position for the firm. Larger amounts of fixed cash expenses, lower current asset turnovers and reduced availability of borrowing capacity increase liquidity volatility in revenues, and the CCC incorporates these three factors. The paper by Richards and Laughlin has changed the way we think about liquidity, as managers look for a free cash-flow to buy products and sell them later rather than pursue a policy that is the result of operational decisions, as it is stated in this paper.

According to Moss and Stine (1993), there are many reasons why businesses are faced with liquidity problems. This is especially true for small businesses, since most of them must operate with fewer sources of both short- and long-term financing than larger firms. As less financing is available, more assets must be held in liquid form to meet daily transactions and emergency requirements. Larger firms, which have better access to both money and capital markets, can afford to hold fewer current assets and meet cash requirements quickly and efficiently through borrowing.

Shilling (1996) described the cash to cash cycle (C2C) as "the cash conversion cycle which mirrors the operating cycle, measures the interval between the time cash expenditures are made to purchase inventory for use in the production process and the time that funds are received from the sale of the finished product." This definition is the most widely accepted in the literature. Lancaster and Stevens (1999) showed that working capital from operations and cash flow from operations to be industry-specific measures that cannot be generalized across

all firms. The methodology proposed in this paper would require a much larger sample of data to incorporate Lancaster's findings. It is possible that developing businesses rely on the growing skills of their managers, and so Lancaster's conclusion that the incremental explanatory power of accrual income for changes in measures of static liquidity is found almost exclusively in the manufacturing industry may be not so relevant for the results presented in this paper.

Kim and Mauer (1998) examined firms' decisions to invest in liquid assets when external financing is costly with the optimal amount of liquidity determined by a tradeoff between the low return earned on liquid assets and the benefit of minimizing the need for costly external financing. Thus, investment in liquidity depends on several factors and empirical tests on a large panel of U.S. industrial firms supported the model's predictions.

Cote and Latham (1999) explored the limitations of the traditional measures of working capital management present in financial ratio analysis and proposed to combine three current asset and liability accounts into a single Merchandising Ratio, providing a measure of the net effect of a firm's working capital management strategy, since the interpretation of results may be difficult if they bring conflicting evidence. The simplifying approach is characteristic and people expect easy answers to complicated problems.

Lyroudi and Lazaridis (2000) studied the cash conversion cycle as a liquidity indicator for the Greek food industry and also tried to determine its relationship with the current and the quick ratios and with its component variables. The results indicate that there is a significant positive relationship between the cash conversion cycle and the traditional liquidity measures (the current and quick ratios).

In their paper, Farris and Hutchison (2002) focused on C2C. According to them, supply chain management has grown in importance because of the reshaping of the organizational focus from functional structures toward integrated activities in projects and processes to achieve the lowest costs by synergistic interaction of all supply chain components, in companies such as Dell and Cisco. The profile of business is changing and the dynamic metrics are becoming more and more important in a global world defined by outsourcing and logistics, and they determine the static liquidity measures.

Ortin-Angel and Prior (2004) observed in their work that financial statements, and especially accounting ratios, are typically used to evaluate actual managerial performance and predict the consequences of the managers' decisions (firm value or financial distress). For a better understanding of empirical results and to improve evaluation of managerial decisions, it is necessary to establish a link between accounting ratios and concrete managerial

decisions. The way the turnover ratios are measured based on financial statements may not be accurate and that is why Ortin-Angel and Prior offered some additional tools in order to obtain a more exact assessment of working capital management. This remark may be important when presenting the results of a study based on accounting data, as it is proposed in this paper.

Hausman (2004) stated that every CEO must always be concerned with supply chain performance understood as "extended supply chain's activities in meeting end-customer requirements, including product availability, on-time delivery, and all the necessary inventory and capacity in the supply chain to deliver that performance in a responsive manner." A number of measures that are designed to support and monitor supply chain performance are proposed to achieve improvements across the supply chain and some shortcomings of several common metrics are also indicated. It is easy to see that the cash conversion cycle is becoming an increasingly important measure due to changes in business resulting from the corporate focus on increased efficiency.

Some other papers, including those by Kamath (1989), and Gallinger (1997), also deal with this problem and may be taken into account in a discussion of liquidity measurement and the relationship between the static and dynamic measures. The growing importance of dynamic metrics of liquidity is emphasized in many papers. It would be interesting to illustrate this process with the example of a developing market, as this could prove a shift from the traditional way of perceiving business by managers to active management based on supply chain management with dynamic measures playing a very important role in business performance.

Model

The main indicator of static liquidity is the current ratio (CR), representing the traditional liquidity management approach. A high current ratio indicates a firm with a good liquidity position, but if it is too high the company is over-liquid. A high CR can be achieved by having either high levels of current assets (CA) or low levels of current liabilities (CL). The ratio can be defined as:

$$CR = CA / CL \quad (1)$$

The liquidity ratio represents the working capital strategy and the higher it is the more conservative the management policy is. Some current assets are temporary and some permanent. The temporary part of current assets may be financed using short-term liabilities while the permanent part may be financed by equity. The more equity is used to finance temporary current assets the more relaxed the working capital management policy and the

higher the level of CR. If permanent current assets are financed with short-term liabilities, then the CR is lower.

The cash conversion cycle has been considered a more appropriate liquidity measure because it has dynamic features as compared to the traditional static measures. The CCC is a dynamic measure of corporate liquidity indicating the number of days it takes a firm to recover the cash it has spent in an operating cycle. A low CCC shows that the firm can recover its cash from the sales of its products faster. The more cash the firm has, the more liquid it will be in the dynamic sense of liquidity. A high CCC shows that it takes the company longer to recover cash from operating processes, which indicates liquidity problems. A low CCC is connected to reducing inventories, faster receivables collection, and extended payment terms. A negative CCC shows that the firm's suppliers are financing its growth in sales, usually at zero cost. Based on theoretical analysis, it can be seen that the CR depends more on the structure of balance sheet items while the CCC is more related to turnover.

Based on the model developed by Richards-Laughlin (1980), the CCC is defined as the sum of the receivables conversion period (RCP) and the inventory conversion period (ICP) minus the payment deferral period (PDP), that is:

$$CCC = RCP + ICP - PDP \quad (2)$$

where: RCP = Receivables Conversion Period = 360 / Accounts Receivable Turnover

ICP = Inventory Conversion Period = 360 / Inventory Turnover

PDP = Payment Deferral Period = 360 / Payables Turnover

$$\text{hence: } CCC = (360AR / Sales) + (360I / CGS) - (360CL / X) \quad (3)$$

where: X = costs of goods sold + other expenses connected to sales – depreciation

AR – Accounts receivable,

I – Inventory.

As it was stated, the lower the cash conversion cycle, the sooner the firm can recover its cash from the sales of its products and the more cash it will have, hence the more liquid it will be. If the CCC is long, it takes the company longer to recover cash. Thus, a long CCC would indicate a liquidity problem.

Since both the current ratio and the cash conversion cycle are based on the same accounting data representing current assets and liabilities, there must be a relationship between the current and quick ratios and the cash conversion cycle, but it may either be positive or negative. Former research by Bolek and Wolski (2010) showed no significant relationship between these two ratios. We know that a shorter CCC can be obtained by

decreasing the collection period of receivables or the average inventory, or by increasing the accounts payable period. If accounts receivable, which appear in the numerator of the CR and CCC, decrease, then both of them should fall, as the inventory will. Furthermore, a reduction in both inventory and receivables may also suggest a reduction in working capital and short-term financing. If short-term financing declines, then the liquidity ratios and the CCC may or may not fall. Any change must depend on the relative magnitudes of short-term asset and liability changes. As suggested by Richards and Laughlin (1980), a change could occur only if receivables and inventories were totally financed with long-term funds. On the other hand, a higher CCC can be achieved by increasing the receivables conversion period or the inventory conversion period, or by decreasing the payment deferral period. So, if inventories, appearing in the numerator of the CR and CCC, are to increase, all of the analyzed measures should rise (suggesting that the CR indicates an improvement in a firm's liquidity position, while the CCC indicates exactly the opposite). In the case of an increase in accounts receivable, the same effects would occur. Also, if payables, appearing in the denominator of the CR, decrease, the liquidity indicator will increase (suggesting an improvement in liquidity), and the CCC will also increase due to a decline in the payment deferral period (suggesting deterioration of liquidity), as it is reported by Lyroudi and Rychter (Bolek) (2012). The cash conversion cycle in days and the current ratio, being a more standardized measure, may be difficult to compare and the number of cycles per year is considered as a more useful ratio, so the 365/CCC formula will be used to calculate the number of cash cycles per year.

The relationship between liquidity measures should be analyzed according to the working capital strategy in the company. If the cash conversion cycle is actively managed, it should be related to the current ratio, which is the liquidity goal. It is difficult to assess a company based on static liquidity ratios, but it can be done by including the cash conversion cycle. Such a relationship should be studied for different strategies of working capital management. If a company decides to pursue an aggressive policy, then decisions in the field of receivables, inventories and payables should result in a low level of current assets and a high level of liabilities to achieve negative working capital and shorten the cash conversion cycle period, meaning a greater number of cycles per year on condition that a high level of sales can be achieved with a low level of receivables. The conservative approach with a positive current ratio should be related to a short CCC, and the higher the CR the lower the CCC period and the higher the number of cycles per year, since more working capital is invested in a more intense conversion cycle related to higher production and sales. For an over-liquid

company with a CR higher than 2 (indicating poor current assets management), the CCC should also rise in days, since too much inventory, receivables and cash can represent a problem with intense production and then a problem with sales. Also the number of cycles per year should decrease.

The model proposed in this paper is built on the assumption that decisions in the field of receivables, inventory and payables have an impact on the level of current assets and liabilities and therefore the CR is a dependent variable influenced by the CCC, which represents operating decisions related to the levels of current assets and liabilities. The author proposes that the regression ratio calculated for the entire range of CR values may not be accurate, since different companies may pursue different working capital strategies and thus three ranges of the CR are considered to represent different approaches:

– the CR in the range (0;0.99) represents aggressive working capital management,

– the CR in the range (1;1.99) represents moderate working capital management,

– the CR > 2 represents relaxed working capital management.

According to the theory and predictions connected to the results of working capital management, we can expect that:

– for the CR in the range (0;0.99), 365/CCC will grow;

– for the CR in the range (1;1.99), 365/CCC will grow;

– for the CR > 2, 365/CCC will fall.

The model is expressed by the following formula:

$$CR = \alpha + \beta CCC + e \quad (4)$$

indicating the relationship between these two liquidity measures. First of all, regression will be done for the entire range and the whole period. In the second step, the data will be divided according to strategy and regression will be done for the period 1997–2010. In the third step, the data will be also divided into years to see how liquidity management changes over time.

Results

The author used 61 regression models to verify the assumptions. The ratios were calculated based on data from the Notoria database for non-financial companies listed on the Warsaw Stock Exchange in the years 1997–2010.

First, the ratios were selected and regression was performed for the entire period. After that, the series was divided based on the working capital strategy represented by the CR value. The CR in the range 0–0.99 was regarded as an aggressive policy (A), the CR in the range 1–1.99 as a moderate policy (M), and the CR > 2 as a relaxed policy (R). Subsequently,

regression for every year and every strategy was performed. Unfortunately, the small number of observations could affect the significance of the results. The results taken together were compared according to strategy. The constant was statistically significant in all of the models, and thus this value should be considered important, influencing the level of the current ratio. The constant refers to the mean value of the current ratio. Analyzing the 1997–2010 period in Model 1, one can see that the determination is very low, with an R-squared of 0.005 and a constant of 1.8635 at a significance level of 1%. If the data are divided into subcategories according to the working capital strategy, then for the aggressive strategy presented in Model 2 R-squared is higher than 0.013 and the constant is lower than 0.661, indicating a stronger correlation of dynamic and static liquidity management, with the average value of current assets lower than that for the entire range of data. The significance of the constant is at a level of 1%, while that for the CCC is 5%. For the moderate strategy presented in Model 3, R-squared is less than 0.004 and the constant is over 1.414, indicating a lower correlation of liquidity management and a higher value of the mean CR. The significance of the constant is at a level of 1%, while that of the CCC is 5%. In the case of the relaxed policy analyzed in Model 4, R-squared equals 0, the constant is 3.333, and only this parameter is significant (at 1%), while the CCC is not. This result indicates a lack of relationship between static and dynamic liquidity measures.

Over the 1997–2010 period, Poland, as every market, functioned under better and worse conditions and, moreover, it underwent a transition which affect the results based on aggregate data. Analysis of every year separately may elucidate the relationship between the current ratio and the cash conversion cycle in a short-term perspective.

The year 1997 is represented by Model 5 with the following results: R-squared equals 0.0219 and the constant is 2.229. Unfortunately, only the constant is statistically significant (at 1%). In this step, the author analyzed the various strategies of working capital management. The results for the aggressive policy are given in Model 6, with R-squared equal to 0.0169 and the constant (at 0.819) lower than that for aggregated 1997 data, and only the latter result is significant (at 1%). For the moderate strategy analyzed in Model 7, R-squared equals 0.003 with a constant of 1.475, being the only significant value. The relaxed policy is presented in Model 8 and is characterized by an R-squared equal to 0.006, and a much higher constant (3.42), being the only significant value. The CCC coefficient is negative, showing its negative correlation with the CR. The year 1997 is characterized by a very low correlation between the CR and the CCC, but it is much higher for the aggressive strategy than for the moderate and relaxed policies.

The year 1998 saw changes in the economy and more companies joined the Warsaw Stock Exchange. In Model 9, for the entire year, R-squared is equal to 0.0118 and the constant is 2.095, being the only statistically significant value. The next model (no. 10) represents the aggressive strategy with the following results: R-squared equals 0.002 and the constant is 0.751, being the only significant value. The CCC coefficient is negative, which shows a negative correlation between the CR and the CCC in the 0–0.99 CR range. Model 11 represents the moderate strategy with R-squared (0.025) higher than that for the entire year and the constant at a level of 1.393, also being the only significant value. Model 12 represents the relaxed policy: R-squared is 0.017 and the constant equals 3.050, with the CCC not being statistically significant and the constant being significant at 1%.

Model 13 presents results for 1999. R-squared for this year is very low (0.002) with the constant (1.959) being again the only significant value. Model 14 describes the aggressive policy, characterized by an R-squared of 0.023 and a constant of 0.802. The CCC coefficient is here negative, indicating a negative correlation between the CR and the CCC. Model 15 represents the moderate strategy with R-squared at a level of 0.028 and the constant equal to 1.487, the latter being the only significant value. In Model 16, reflecting the relaxed policy, R-squared is 0 and the constant is equal to 3.131 (a statistically significant value).

The year 2000 is characterized by results presented in Model 17, where R-squared is 0 and the constant equals 1.802, being a significant value. Model 18 represents the aggressive strategy with R-squared equal to 0.004 and a statistically significant constant of 0.746. Here, the CCC coefficient is not negative, and the change in the direction of the relationship may indicate a change in the liquidity management approach to developing business. Model 19, representing the moderate strategy for this year, brings surprising results. First of all, the results are statistically significant, R-squared (0.072579) is much higher than that in the other models, with the constant being 1.3936 and the CCC coefficient being 0.0294493. Model 20, describing the relaxed policy, yields an R-squared of 0.004181 with a statistically significant constant of 3.30681 and a negative CCC coefficient of -0.0555471.

The results for the year 2001 are as follows: R-squared for the entire year, given in Model 21, is equal to 0.003546 with a statistically significant constant of 1.67391 and a CCC coefficient of 0.01692 (not significant). Model 22 presents results for the aggressive strategy, with R-squared equal to 0.009731, a statistically significant constant of 0.724467 and a not significant CCC coefficient of 0.01692. The moderate strategy is shown in Model 23 with an R-squared of 0.003745, a constant of 1.42363 and a CCC coefficient -0.00875203. The

relaxed policy is described in Model 24, with an R-squared of 0.056525, a statistically significant constant of 3.27021 and a CCC coefficient of 0.126976 (not significant).

The results for 2002 are as follows: Model 25 represents the entire year, with R-squared equal to 0.005869, a statistically significant constant of 1.68576 and a CCC coefficient of 0.0129249 (not significant). Particular strategies are presented in the following models: the aggressive one in Model 26, with R-squared equal to 0.000105, a statistically significant constant of 0.693089 and a CCC coefficient of -0.000170723 (not significant); the moderate one in Model 27, with R-squared equal to 0.002428, a constant of 1.37478 and a negative CCC coefficient (-0.00592728); and the relaxed one in Model 28, with R-squared equal to 0.027353, a statistically significant constant of 3.21308 and a CCC coefficient of 0.121653 (not significant).

The results for the year 2003 are given below. Model 29 presents the results for the whole year: R-squared is 0.027899, the constant is 1.6865 and the CCC coefficient is 0.0836279 (both the constant and the CCC being significant). Model 30 concerns the aggressive policy, with an R-squared of 0.040005, a statistically significant constant of 0.672568 and a CCC coefficient of 0.0163832 (not significant). Model 31 shows the results for the moderate strategy, with R-squared equal to 0.024667, a statistically significant constant of 1.36529 and a CCC coefficient of 0.0242455 (not significant). The relaxed policy is presented in Model 32, with an R-squared of 0.004140, a statistically significant constant of 3.13984 and a CCC coefficient of 0.031923 (not significant).

The year 2004 is presented in Model 33, with R-squared equal to 0.001936, a statistically significant constant of 1.80565 and a CCC coefficient of 0.016959 (not significant). The aggressive approach is given in Model 34, with an R-squared of 0.011786, a statistically significant constant of 0.592073 and a negative CCC coefficient of -0.00687564 (not significant). The moderate strategy is shown in Model 35, with an R-squared equal to 0.007952, a statistically significant constant of 1.40715 and a negative CCC coefficient of -0.0077625 (not significant). The relaxed policy is shown in Model 36, with the following results: R squared is 0.012135 and the constant is significant, while the negative CCC coefficient (0.082246) is not.

The year 2005 is described in Model 37, where R-squared equals 0.018054, the constant is 1.86508 and the CCC coefficient is 0.0519381, both the constant and the CCC being significant. The aggressive approach is given in Model 38, with an R-squared of 0.152872, a constant of 0.633277 and a CCC coefficient of 0.0201545, both the constant and the CCC being significant. The moderate strategy is presented in Model 39, with R-squared equal to

0.009309, a statistically significant constant of 1.47191 and a CCC coefficient of 0.0154167 (not significant). Model 40 presents the relaxed policy with the following values: R-squared equals 0.001277, the constant is statistically significant and equals 3.31015, and the CCC coefficient is 0.0158377 (not significant).

The year 2006 is given in Model 41, with an R-squared of 0.008161, a statistically significant constant of 2.10023 and a CCC coefficient of 0.0479419 (not significant). In the aggressive policy presented in Model 42, R-squared is equal to 0.031821, the constant is 0.701269 (statistically significant) and the CCC coefficient is 0.0194036 (not significant). In the moderate strategy given in Model 43, R-squared is equal to 0.000764, the constant is 1.44045 (statistically significant) and the CCC coefficient is negative -0.00235914 (not significant). The relaxed policy is presented in Model 44, with an R-squared of 0.018080, a statistically significant constant of 3.97288 and a negative CCC coefficient of -0.0811596 (not significant).

The year 2007 is presented in Model 45, where R-squared is 0.008653, the constant is 2.13353 (statistically significant) and the CCC coefficient is 0.0521561, but not significant. The aggressive policy is given in Model 46, with an R-squared of 0.035464, a statistically significant constant of 0.648936 and a negative CCC coefficient of -0.0104838 (not significant). Model 47 presents the moderate approach, with R-squared equal to 0.012494, a statistically significant constant of 1.42836 and a negative CCC coefficient of -0.00906143 (not significant). The relaxed policy is shown in Model 48, with an R-squared of 0.000057, a statistically significant constant of 3.72578 and a CCC coefficient of -0.0108293 (not significant).

The results for the year 2008 are characterized by an R-squared of 0.000061, a statistically significant constant of 2.01529 and a CCC coefficient of 0.00455039 (not significant). The aggressive strategy is presented in Model 50, where R-squared is 0.008032, the constant is 0.566358 (statistically significant) and the CCC coefficient is 0.00552546 (not significant). The moderate approach is presented in Model 52, with an R-squared of 0.070385, a constant of 1.36786, and a CCC coefficient of 0.0292661, both the constant and CCC being significant. The relaxed policy is given in Model 52, with R-squared equal to 0.001176, a statistically significant constant of 0.001176 and a CCC coefficient of -0.0267579 (not significant).

The year 2009 is described in Model 53, where R-squared equals 0.002608, the constant is statistically significant and equals 2.33345, and the CCC coefficient is 0.0550797, but not significant. Model 54 represents the aggressive approach, with an R-squared of 0.003667, a

statistically significant constant of 0.497314 and a CCC coefficient of 0.00736189 (not significant). The moderate strategy is presented in Model 55, with R-squared equal to 0.022547, a statistically significant constant of 1.37349 and a CCC coefficient of 0.0135751 (not significant). The relaxed policy is shown in Model 56 with the following results: R-squared equals 0.012561, the constant is statistically significant and equals 4.50672 and the CCC coefficient is negative at -0.201181 (not significant).

The year 2010 is given in Model 57, with R-squared equal to 0.040413, a constant of 1.55688 and a CCC coefficient of 0.0757548, both the constant and the CCC being significant. The aggressive strategy is presented in Model 58, with an R-squared of 0.051951, a statistically significant constant of 0.609467 and a CCC coefficient of 0.0218151 (not significant). Model 59 represents the moderate strategy, with an R-squared of 0.110994, a constant of 1.3549 and a CCC coefficient of 0.038213, both the constant and the CCC being statistically significant. The relaxed approach is presented in Model 60, where R-squared is 0.147994, the constant equals 2.70126 and the CCC coefficient is 0.117526, both the constant and the CCC being statistically significant.

Model 61 presents the regression results for a negative CCC only when the CR is considered a dependent variable in the aggressive strategy. R-squared for this model is equal to 0.056359 with a constant of 0.790808 and a CCC coefficient of -0.0492748, both statistically significant. This means that if the CR grows, then the CCC also grows. As negative values of the CCC were adopted here, the absolute values should be considered in order to correctly interpret this relationship. Based on the regression results, it is easy to see that in the linear regression model the constant plays an important role and is very close to the mean CR.

The summary results for the regressions are presented in Table 1 and are as follows. The mean R-squared value for the period is 0.01096, and the trend line shown in Figure 1 reveals an increasing correlation between the CCC and the CR, suggesting a corporate policy of measuring both static and dynamic liquidity in Poland. Furthermore, the mean value of the constant is 1.92458 and its trend line (given in Figure 2) also shows increasing values, indicating a growth of the CR in the analyzed period. This value is statistically significant at a level of 1% for this period of time. The CCC coefficient is statistically significant for the entire period, but if one analyzes individual years, the results are not always significant. The trend line is given in Figure 3, and it rises after an initial decline. Every function describing the trend is a polynomial.

To obtain more useful results, yearly observations are divided according to working capital strategy, with the results presented in Table 2. In the aggressive strategy, the mean R-squared value is 0.02927 and the trend line given in Figure 4 is upward and linear, indicating the tightening of liquidity management in companies pursuing the aggressive approach. The mean constant equals 0.67565, with a declining linear trend (given in Figure 5), while the CCC coefficient increases in a linear trend (with a mean of 0.0061), as shown in Figure 6, which indicates that the correlation becomes stronger. The aggressive approach is connected to negative CCC values and Model 61 shows the statistically significant results of this regression with R-squared at a very high level (0.152868), a constant of 0.390418 and a negative CCC coefficient of -0,0250477. These results reveal that the aggressive approach is pursued by strong companies. The CR increases in the range 0–0.99, with a declining CCC, but since only negative values of the CCC were adopted here, the absolute values (numbers of cycles per year) should be considered in interpreting this relationship, as it was already mentioned above. In such a case the CCC value will be increasing.

The results for the moderate policy are presented in Table 3, with the mean R-squared value equal to 0.02823 and an upward trend line shown in Figure 7, which corroborates the hypothesis of market development. The mean constant is 1.41134 and its value decreases in a linear trend, given in Figure 8. The mean CCC coefficient is equal to 0.01862 and grows following a drop in the polynomial trend line (shown in Figure 9).

The relaxed policy results are given in Table 4. The mean R-squared value for this strategy is equal to 0.02216 and Figure 10 shows its upward trend line, which proves the tightening of working capital management. The mean constant equals 3.44159 and rises, as it is shown in Figure 11, while the CCC coefficient declines (see Figure 12).

A comparison of different working capital strategies shows that mean R-squared for the aggressive strategy is the largest, followed by that for the moderate and relaxed policies, but the difference is small and all of the values are rising.

The growth of the constant depends on the strategy and is the lowest for the aggressive strategy and the highest for the relaxed strategy. For the aggressive and moderate strategies, its value declines, while for the relaxed one it rises. If these results are combined with those for the CCC coefficient, one can notice that the mean coefficient value is the highest for the moderate strategy and the smallest for the relaxed one. The CCC trend moves upward in the aggressive and moderate strategies (with a falling constant) while in the relaxed one the CCC trend declines with an increasing constant.

Since the correlation between the CR and the CCC becomes stronger, the aggressive and moderate strategies are characterized by an increased number of cash conversion cycles, while the conservative strategy reveals a decreased number of these cycles. These results are consistent with the theoretical assumptions and improve with market development.

Conclusion

The discussion concerning liquidity management in companies is not intense enough, even if managers spend most of their time making decisions in this field. The business model is changing as corporations are increasingly confident about their sales and operate in the global market using supply chain management to decrease costs. Small businesses are less competitive and affected by a lack of managerial skills, especially in the field of liquidity management. The present study was conducted based on the developing Polish market with a strong and expanding stock exchange (WSE). Using data from a developing economy, we obtained interesting results indicating an increasingly strong relationship between the various approaches to liquidity management. As a specific number of observations is required for the regression model, smaller developing markets could not be studied. Moreover, due to the fact that no huge corporations are listed on the WSE, the improvement in working capital management seems to be connected to the development of managerial skills.

In building the model, the author used the number of cash conversion cycles per year assuming that the relationship between the CR and the CCC coefficient can be analyzed based on their standardized levels, since it is difficult to compare CR levels with days. The current ratio was assumed to be a dependent variable and the cash conversion cycle an independent one due to the nature of their relationship and the fact that the CCC represents the action and the CR the effect. As the working capital strategy significantly affects the current ratio, the sample was divided into 3 subgroups representing aggressive, moderate and relaxed policies. Within these three groups, regression was conducted for the entire 1997–2010 period and for each year individually.

The results for the entire period of analysis show very little correlation between dynamic and static liquidity measures, but it is important that the results are statistically significant. If the sample is divided according to strategy, one can see that the aggressive approach is characterized by a higher R-squared and a lower constant than the other strategies, which shows that the correlation is stronger because the CR increases with the CCC, as expected. On the other hand, in the 1997–2010 period the relaxed policy is characterized by a high value of the constant and a low R-squared with the CCC coefficient not being statistically significant, which indicates a lack of liquidity management in this approach.

The results of the 61 regression models involving each year and type of strategy reveal that the constant corresponds to the mean CR value and is statistically significant, while R-squared is quite low, which indicates a weak influence of the CCC on CR levels. The analysis may be concluded with the following statements:

- The R-squared trend line shows an increasing correlation between the CCC and the CR following a decline, indicating a growing unification of static and dynamic liquidity management.
- Over the period of study, the constant increases following a fall, indicating a growing average CR level in recent years.
- The CCC coefficient rises following a drop, indicating a growing influence of the CCC on CR levels, which is connected to liquidity management both in the static and dynamic context.

When the results are considered according to strategy, the aggressive approach can be characterized by the following statements:

- Regression analysis was conducted with negative values of the CCC, and so the absolute values should be taken into account. Thus, the CCC grows with the CR.
- The R-squared trend line is linear and grows over time, indicating increasingly tighter liquidity management in companies.
- The linear trend of the constant declines with an upward linear trend of the CCC coefficient, as the correlation becomes stronger.

The results show that the aggressive strategy is mostly pursued by large and strong companies, and an increase in the CR in the 0 - 0.99 range is connected to an increase in absolute CCC values (which represent the number of cycles per year).

Given the results for the moderate policy, one can conclude that:

- The upward R-squared trend line proves the hypothesis of market development.
- The constant decreases in a linear trend.
- The CCC coefficient rises following a drop in the polynomial trend line.

It can be seen that the moderate strategy is connected to tighter liquidity management and the CR increases with the CCC.

The analysis results for the relaxed policy lead to the following conclusions:

- There is an upward R-squared trend line, which proves that working capital management became tighter over time.
- The constant shows an upward trend line.
- The CCC coefficient declines.

According to the assumptions, a decrease in the number of cycles will affect the CR positively if working capital management will be implemented in line with the relaxed approach. From the specific moment when a company becomes over-liquid, the number of cycles decreases because the positive value of working capital is not connected with growing sales. This means that the company faces problems that may potentially lead to bankruptcy.

Moreover, a comparison of different working capital strategies shows that mean R-squared for the aggressive strategy is the highest of all, followed by the moderate and relaxed policies, but the difference is not large. As a matter of fact, R-squared values are rather small, but rise over time.

References:

Clancy, Tom, Carl Stiner, and Tony Koltz. Shadow Warriors: Inside the Special Forces. New York: Putnam, 2002.

Bolek M., Wolski R., Profitability or Liquidity: Influencing the Market Value-The Case of Poland, International Journal of Economics and Finance, Vol 4, No 9, 2012, DOI: 10.5539/ijef.v4n9p182.

Cote J.M., Latham C.K., The merchandising ratio: a comprehensive measure of working capital strategy, Issues in Accounting Education, Vol. 14, No. 2, 1999, DOI: 10.2308/iace.1999.14.2.255.

Courtis J.K., Modelling a financial ratios categoric framework, - Journal of Business Finance & Accounting, Volume 5, Issue 4, 1978, DOI: 10.1111/j.1468-5957.1978.tb01059.x.

Farris II M.T., Hutchison P.D., Cash-to-cash: the new supply chain management metric, International Journal of Physical Distribution & Logistics Management, Vol. 32 Iss. 4, 2002, DOI: 10.1108/09600030210430651.

Gallinger G., Drop the Current Ratio – Pick Up the CCC. Business Credit. May 1997.

Hausman W., Supply chain performance metrics, The practice of supply chain management, Volume 62, 2004.

Kamath, R., 1989. How Useful are Common Liquidity Measures? Journal of Cash Management. January / February 1989.

Lancaster C. , Stevens J.L., Corporate liquidity and the significance of earnings versus cash flow: an examination of industry effects, Journal of Applied Business Research, Vol. 15, No 3, 1999.

Lyroudi K., The Liquidity – Profitability Trade-off for Polish Companies, Economies of Balkan and Eastern Europe Countries in the Changed World, Sofia, 2012.

Lyroudi K., Lazaridis Y., The cash conversion cycle and liquidity analysis of the food industry in Greece, SSRN, DOI :10.2139/ssrn.236175, 2000.

Kim C.S., Mauer D.C.,. The determinants of corporate liquidity: Theory and evidence, Journal of Financial and Quantitative Analysis, Vol. 33, Issue 3, September, 1998, DOI: http://dx.doi.org/10.2307/2331099

Moss J.D., Stine B., Cash conversion cycle and firm size: a study of retail firms, Managerial Finance, Vol. 19 Iss: 8, 1993, DOI: 10.1108/eb013739

Ortín-Ángel P., Prior D.,. Accounting Turnover Ratios and Cash Conversion Cycle, Problems and Perspectives of Management, Vol. 1, 2004.

Rappaport A. , The economics of short-term performance obsession, Financial Analysts Journal, Vol. 61, No. 3, May – June, 2005.

Richards V.D., Laughlin E.J., A cash conversion cycle approach to liquidity analysis, Financial Management, Vol. 9, No. 1, Spring, 1980.

Schilling G., Working Capital's Role in Maintaining Corporate Liquidity. TMA Journal, September / October 1996.

Tables

Table 1. Regression results for in period 1997 – 2010

Year	Model	R - squared	Constant coef.	CCC coef.	Significance
1997	5	0,02196	2,22960	0,20590	1%, -
1998	9	0,01182	2,09584	0,09450	1%, -
1999	13	0,00231	1,95951	0,02591	1%, -
2000	17	0,00009	1,80291	0,00400	1%, -
2001	21	0,00355	1,67391	0,01692	1%, -
2002	25	0,00587	1,68576	0,01292	1%, -
2003	29	0,02790	1,68650	0,08363	1%, 5%
2004	33	0,00194	1,80565	0,01696	1%, -
2005	37	0,01805	1,86508	0,05194	1%, 10%
2006	41	0,00816	2,10023	0,04794	1%,
2007	45	0,00865	2,13353	0,05216	1%, -
2008	49	0,00006	2,01529	0,00455	1%, -
2009	53	0,00261	2,33345	0,05508	1%, -
2010	57	0,04041	1,55688	0,07575	1%, 5%
Mean		0,01096	1,92458	0,05344	
St. Dev.		0,01204	0,23497	0,05282	

Table 2. Regression results the aggressive strategy in the period 1997 – 2010

Year	Model	R - squared	Constant coef.	CCC coef.	Significance
1997	6	0,03500	0,81954	0,01683	1%, -
1998	10	0,00205	0,75176	-0,00330	1%, -
1999	14	0,02306	0,80239	-0,00719	1%, -
2000	18	0,00429	0,74660	0,00332	1%, -
2001	22	0,00973	0,72447	0,00263	1%, -
2002	26	0,00011	0,69309	-0,00017	1%, -
2003	30	0,04001	0,67257	0,01638	1%, -
2004	34	0,01179	0,59207	-0,00688	1%, -
2005	38	0,15287	0,63328	0,02015	1%, 5%
2006	42	0,03182	0,70127	0,01940	1%,
2007	46	0,03546	0,64894	-0,01048	1%, -
2008	50	0,00803	0,56636	0,00553	1%, -
2009	54	0,00367	0,49731	0,00736	1%, -
2010	58	0,05195	0,60947	0,02182	1%, -
Mean		0,02927	0,67565	0,00610	
St. Dev.		0,03926	0,09139	0,01113	

Table 3. Regression results the moderate strategy in the period 1997 – 2010

Year	Model	R - squared	Constant coef.	CCC coef.	Significance
1997	7	0,00370	1,47594	0,07751	1%, -
1998	11	0,02528	1,39367	0,04664	1%, -
1999	15	0,02843	1,48774	0,02019	1%, -
2000	19	0,07258	1,39360	0,02945	1%, 5%
2001	23	0,00375	1,42363	-0,00875	1%, -
2002	27	0,00243	1,37478	-0,00593	1%, -
2003	31	0,02467	1,36529	0,02425	1%, -
2004	35	0,00795	1,40715	-0,00776	1%, -
2005	39	0,00931	1,47191	0,01542	1%, -
2006	43	0,00076	1,44045	-0,00236	1%,
2007	47	0,01249	1,42836	-0,00906	1%, -
2008	51	0,07039	1,36786	0,02927	1%, 5%
2009	55	0,02255	1,37349	0,01358	1%, -
2010	59	0,11099	1,35490	0,03821	1%, 5%
Mean		0,02823	1,41134	0,01862	
St. Dev.		0,03315	0,04436	0,02510	

Table 4. Regression results the relaxed strategy in the period 1997 – 2010

Year	R - squared	Constant coef.	CCC coef.	Significance
1997	0,00695	3,42022	-0,17595	1%, -
1998	0,01703	3,05056	0,18614	1%, -
1999	0,00084	3,13182	0,04018	1%, -
2000	0,00418	3,30681	-0,05555	1%, -
2001	0,05653	3,27021	0,12698	1%, -
2002	0,02735	3,21308	0,12165	1%, -
2003	0,00414	3,13984	0,03192	1%, -
2004	0,01214	3,34091	-0,08225	1%, -
2005	0,00128	3,31015	0,01584	1%, -
2006	0,01808	3,97288	-0,08116	1%,
2007	0,00006	3,72578	-0,01083	1%, -
2008	0,00118	4,09201	-0,02676	1%, -
2009	0,01256	4,50672	-0,20118	1%, -
2010	0,14799	2,70126	0,11753	1%, 5%
Mean	0,02216	3,44159	0,00047	
St. Dev.	0,03920	0,47525	0,11468	

Figure 1. Model R – squared trend in the period 1997 - 2010

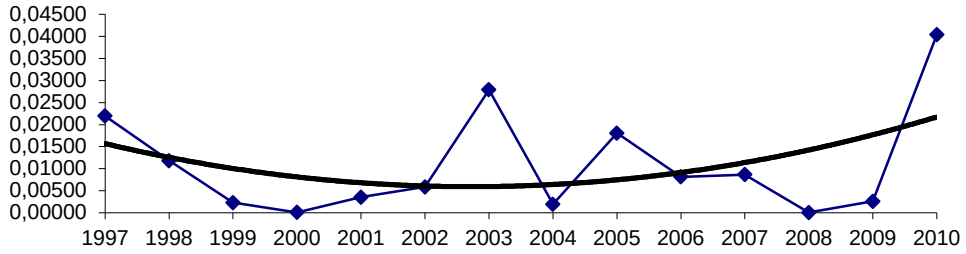

Figure 2. Model constant trend in the period 1997 - 2010

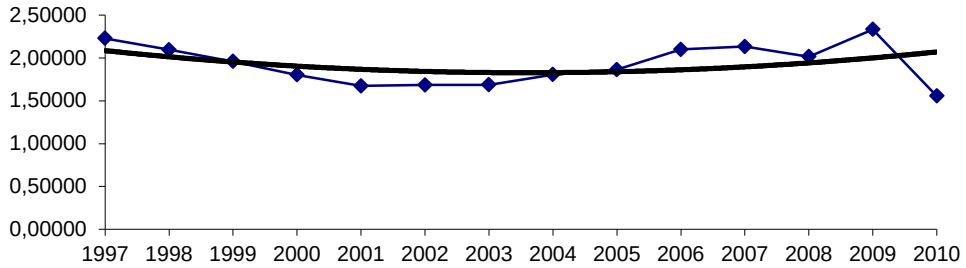

Figure 3. Model CCC coefficient trend in the period 1997 - 2010

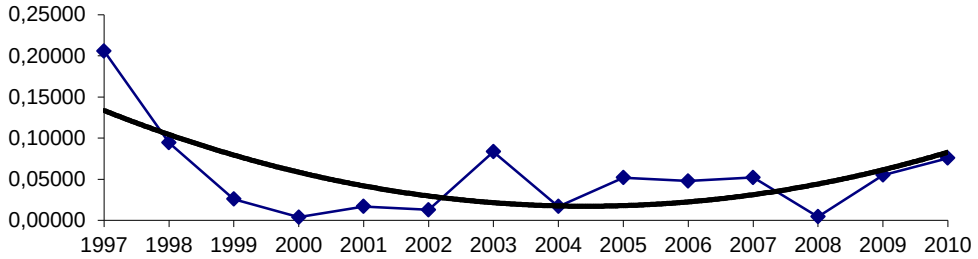

Figure 4. Model R – squared trend in the period 1997 – 2010 the aggressive strategy

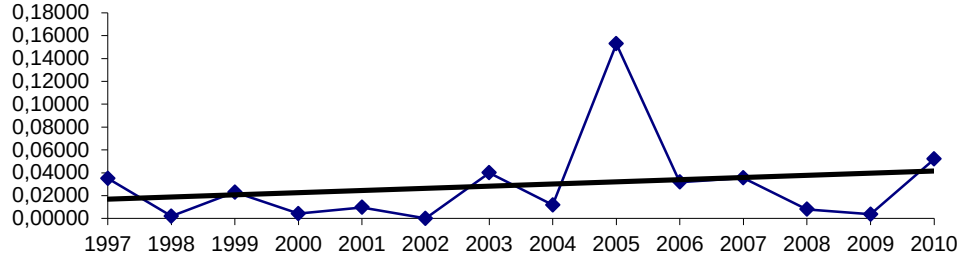

Figure 5. Model constant trend in the period 1997 – 2010 the aggressive strategy

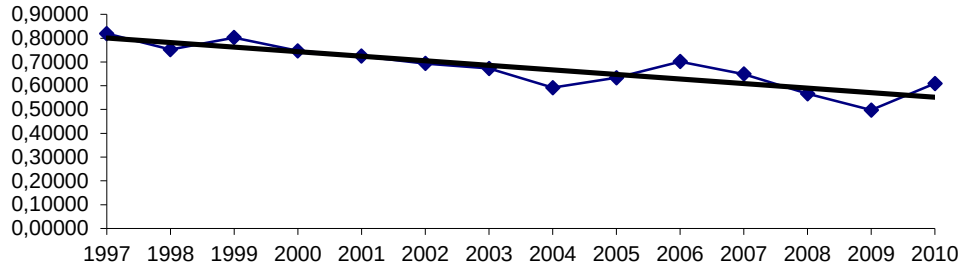

Figure 6. Model CCC coefficient trend in the period 1997 – 2010 the aggressive strategy

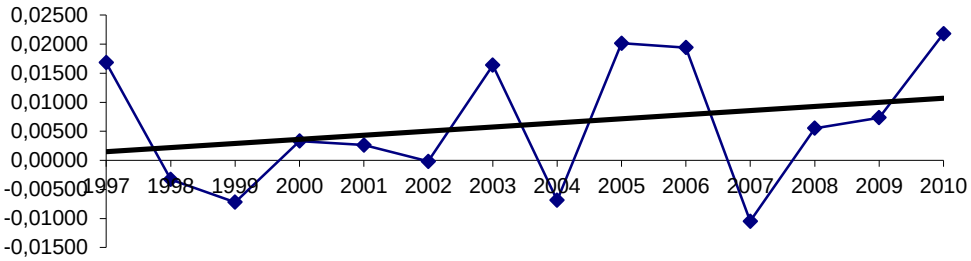

Figure 7. Model R – squared trend in the period 1997 – 2010 the moderate strategy

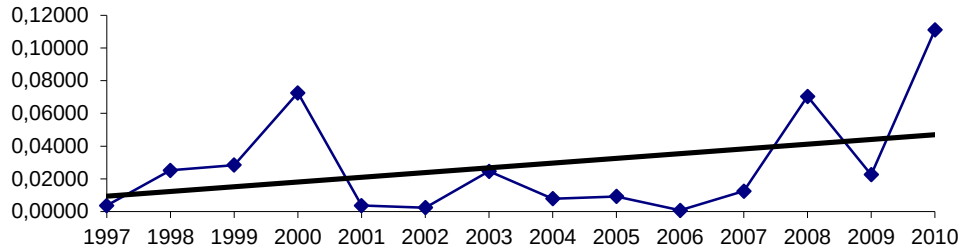

Figure 8. Model constant trend in the period 1997 – 2010 the moderate strategy

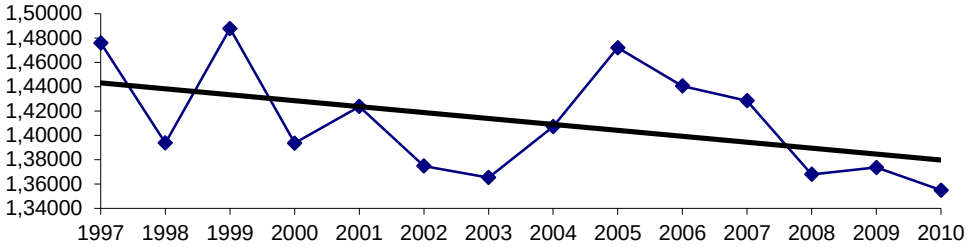

Figure 9. Model CCC coefficient trend in the period 1997 – 2010 the moderate strategy

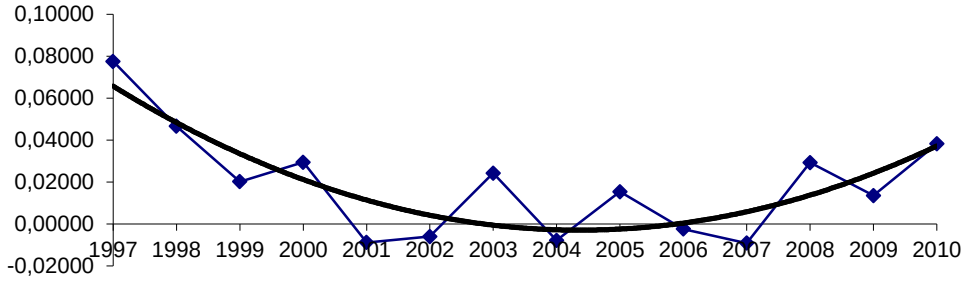

Figure 10. Model R – squared trend in the period 1997 – 2010 the relaxed strategy

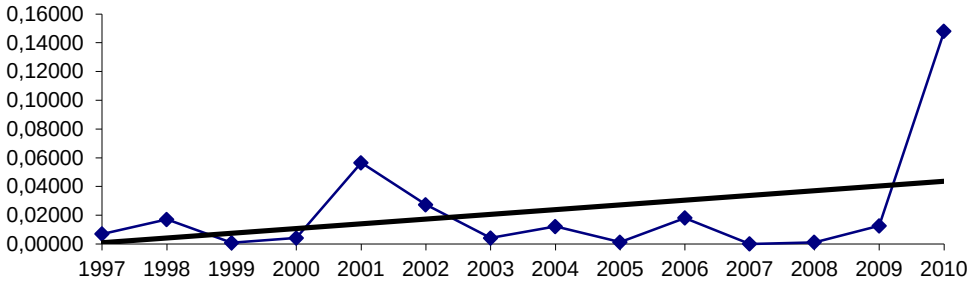

Figure 11. Model constant trend in the period 1997 – 2010 the relaxed strategy

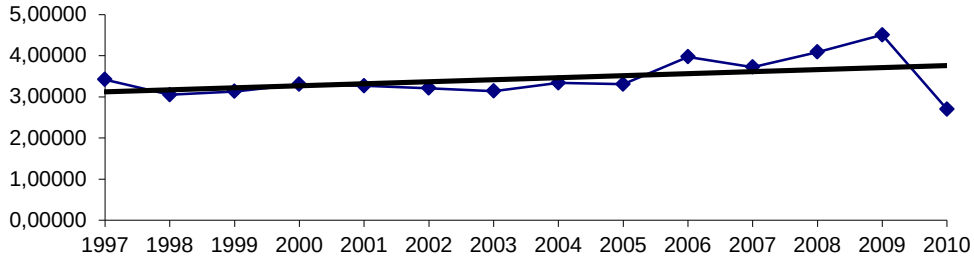

Figure 12. Model CCC coefficient trend in the period 1997 – 2010 the relaxed strategy