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FORECASTING LIQUIDITY IN TRADITIONAL AND TECHNOLOGY-BASED SECTORS – THE CASE OF POLAND

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Abstract

The present paper explores the possibility of forecasting company liquidity based on testing the coefficient of variability. Secondly, it analyzes static and dynamic liquidity measures to ascertain which are better at prediction in the traditional and technology-based sectors. It was assumed that the cash conversion cycle should be the more predictable measure and forecasts using it should be more accurate for traditional companies, but the CCC has turned out to work better for technology-based businesses listed on the Warsaw Stock Exchange. Poland is an example of a developing market that has undergone a transformation and has not been dramatically affected by the crisis, and we believe that our research may reveal some liquidity-related economic patterns applicable not only to other in-transition and developing countries, but also to countries facing economic problems. The study was conducted on the non-financial companies listed on the WSE in the period 1997–2010.

INTRODUCTION

Poland belongs to the group of post-transition developing countries. Observing and analyzing changes in such a market may be interesting for Western countries involved in global politics and interventions. The example of Poland, a country of almost 40 million people and with strong internal consumption, may be used in the future to build a strategy for helping countries striving to embrace democracy and capitalism.

We focus on liquidity in companies as a part of short term management. In the literature, long-term financial management tends to be given greater attention. For the shareholders, the most important indicator is the rate of return, which will fall if the company is over-liquid. The liquidity level of a company is not a goal in itself, but it is the way for a company to achieve the highest market value. There are many paths of maximizing shareholder value and managers have to coordinate them. Liquidity can be defined in a static and dynamic sense. The main indicators of liquidity in the static sense are the current ratio (CR) and the quick ratio (QR), which does not take into account inventories (I). High current and quick ratios characterize firms with a good liquidity position. High ratios can be achieved by having either high levels of current assets (CA) or low levels of current liabilities (CL). The ratios can be defined as:

$$CR = \frac{CA}{CL} \qquad (1)$$

$$QR = \frac{(CA - I)}{CL} \qquad (2)$$

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Liquidity ratios represent the strategy of companies and the higher they are, the more conservative the working capital management policy.

Apart from the static liquidity ratios, there is also a dynamic measure of a company's ability to meet its obligations. The cash conversion cycle (CCC) is considered a more appropriate liquidity measure because it is more closely linked to operational management as compared to the traditional static measures (CR and QR). The CCC was introduced by Richards and Laughlin (1980), and many researchers, such as Kamath (1989), Moss and Stine (1993), Lyroudi and McCarty (1993) and others, have confirmed its value for management purposes.

Based on the model developed by Richards and 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:

$$CCC = RCP + ICP - PDP \qquad (3)$$

where:
RCP = receivables conversion period = 360 / Accounts Receivable Turnover
ICP = inventory conversion period = 360 / Inventory Turnover
PDP = payment deferral period = 360 / Payables Turnover

$$\textbf{hence: } CCC = \frac{360\,AR}{Sales} + \frac{360\,Inv.}{CGS} - \frac{360\,CL}{X}$$

$$(4)$$

where:
X = Costs of Goods Sold + Other operation costs – Depreciation

The CCC is called a dynamic measure because corporate liquidity indicates 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 company can recover 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.

Analysis of the CCC level is connected to operational management since specific actions may be taken to decrease or increase the value of this indicator. A high level of the CCC is linked to a conservative management strategy with long inventory and receivables conversion periods. A low CCC is connected to reduced inventories, faster collection of receivables, and extended payment terms. A negative CCC shows that the firm's suppliers are financing its growth in sales, usually at zero cost, and thus the payables are included in the cost of goods sold and have no financial cost.

As a dynamic measure of liquidity, the CCC can be a very helpful indicator for investors to assess the stocks they are considering investing in, as Mauboussin and Kawaja (1999) have shown. According to them, the CCC can be used as a measure to identify those companies that are replacing their tangibles with intellectual capital. Their analysis regarding S&P 500 companies has revealed that the CCC is lower in those companies that place more value on their intangible assets. This statement is also relevant from the viewpoint of forecasting as the CCC can be expected to better predict liquidity than a static liquidity ratio because it refers to current management of assets and liabilities.

It is also important to remember that one can expect a relationship to hold between the current and quick ratios and the cash conversion cycle, but it may either be positive as Richards and Laughlin (1980) argue, or negative, as Lyroudi and McCarty (1993) have reported. A shorter CCC can be obtained by decreasing the receivables collection period or the average inventory, or by increasing the accounts payable period. If accounts receivable, which appear in the numerator of the CR, QR, and CCC, decrease, then all three 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 drops, then the liquidity ratios and the CCC may or may not fall. Any change must depend on the relative magnitude of changes in short-term assets and liabilities. As suggested by Richards and Laughlin (1980), a change can occur only if receivables and inventories are totally financed with long-term funds. According to Lyroudi and McCarty (1993), the relationship of the CCC with the CR is negative, but positive with the QR.

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 are about to increase, and because they appear in the numerator

of the CR, QR, and CCC, all three measures should rise (suggesting that the CR and QR indicate 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 results would occur. Furthermore, if payables, which appear in the denominator of the CR and QR, decrease, the two liquidity indicators will increase (suggesting an improvement in liquidity), and the CCC will also increase due to a drop in the payment deferral period (suggesting a deterioration in liquidity), as stated by Lyroudi and Rychter (Bolek) (2012).

One can expect that forecasting liquidity is important and necessary since shareholders seek long-term returns which are connected to the liquidity level (the higher it is, the lower the profitability). In the authors' opinion, the returns coming from production or R&D are strongly supported by liquidity management. The better it is, the higher the rate of return. The skills of managers working to develop markets for new products have also been changing and the approach to liquidity management is becoming more and more professional. Nowadays, in most Polish companies liquidity means the ability to pay liabilities and being paid in time. Working capital and liquidity can be forecasted, as a rule of a thumb, using historical time series, or derived from sales forecasts. We look for factors affecting company liquidity suggesting that they can be different from the factors affecting sales. The future, similarly as the past, is full of surprises, many of which are hidden in historical data, but may be discovered for forecasting purposes. Different managers are responsible for the capital structure and working capital management and even if the company has one strategy, decisions can be affected by different factors. In this paper, we propose a solution for liquidity forecasting by looking for the best predictable liquidity measure.

Moreover, research is conducted separately for technology-based and traditional businesses to find out if the patterns are different. We expect that technology-based companies are more exposed to risk and their liquidity will be less predictable than that in the traditional business sector, where traditional products are sold. The group of technology-based companies is defined as having the ratio of intangible assets to fixed assets (IA/FA) higher than the median, while the traditional sector is defined as having this ratio lower than the median.

DISCUSSION

Recently, there has been increased interest in liquidity and working capital management both in business and research. Stakeholders have acknowledged the importance of liquidity and the fact that it is not only connected to the return. The Polish market, being a developing one, is affected by managers' lack of knowledge and experience and many companies are disadvantaged by inadequate liquidity management. Companies prefer more conservative working capital management to maintain liquidity ratios at higher levels even if investors prefer profitability over liquidity (Bolek & Wolski, 2012). The proper management of a firm's liquidity may not only protect the company from financial distress, but can also offer it a competitive advantage, especially in innovation-based businesses, where products have shorter life cycles. The current and quick ratios have been recognized as traditional measures of a firm's liquidity, but both are characterized as static and their appropriateness has been questioned by Largay and Stickney (1980) and Aziz and Lawson (1989). Other researchers have recommended more dynamic liquidity measures such as the cash conversion cycle (Hager, 1976; Richards and Laughlin 1980), the net trade cycle (Bernstein, 1983), the lambda (Emery, 1984), and the net liquid balance (Shulman and Cox, 1985). The problem of forecasting is widely discussed in the literature but less attention is given to working capital and liquidity management than to capital structure or earnings management. We would like to discuss here some findings pertaining to our area of interest.

Atkinson et al. (1997) found that traditional accounting-based performance measurement systems are unsuited to current organizations in which relationships with employees, customers, suppliers, and other stakeholders have changed. The authors of this paper emphasize this statement pointing out that while alternative accounting is very often conducted in companies, all analyses are based on official data, so the results may not be accurate. Analyzing the liquidity problem, one can only use the official data, which may not be appropriate. Atkinson et al. (1997) also stated that established measures lack a focus on evaluating intangibles such as services, innovations, employee relations, and flexibility. In this paper, companies are divided based on intangible assets, but it is understood that many of those assets

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are not codified and the actual value of intangibles may be higher. In developing countries, this problem may be even more important since bookkeepers have no experience in valuating intangibles. Moreover, the problem of stakeholders should be incorporated in strategic planning since there are several groups of them with different expectations. Atkinson et al. defined two groups of stakeholders: environmental (customers, owners, and the community) and process (employees and suppliers). The company exists to serve the objectives of the stakeholders, which become its primary objectives. The company must plan for and negotiate explicit and implicit contracts with its stakeholders and evaluate whether the plan meets the expectations of all of them. Liquidity management and forecasting is more vital for internal users who are sensitive to any information about a lack of payment. If they feel they will be not paid for their work they will automatically lose the motivation in their day-to-day duties. Shareholders are less sensitive to such information. Since both groups are interested in strategic planning, liquidity forecasts should be employed to achieve the objective goal of the company. Since there are several measures of liquidity we will try to determine which one should be chosen for strategic planning. Bianchi and Battista (2008) stated that the use of "dynamic" balanced scorecards can significantly improve the planning process in a strategic learning perspective and can be an alternative to a cash flow forecast, but only if this method of management is introduced in the company. Tran stated that to compare and evaluate the performance of many companies, a multi-disciplinary approach should be applied which would combine accounting with predictive statistics, a multi-attribute utilities model and group decision making. Tran found that such an approach could be applied in evaluating the performance of numerous companies within the same sector or even across various industries. Malaska et al. (1984) reported a study of European companies aimed to review the extent of multiple scenario analysis in company planning. They described differences in planning between users and non-users of the system and analyzed the benefits and drawbacks of using the system. Their study provided a large amount of valuable evidence for change in strategic management as a response to the changes that took place in the environment in the 1970s. Analyzing the results connected to strategic planning, one can understand the difficulty of such a

prediction especially when faced with the alternative of costly planning bringing good results versus fast planning with poor results. Efficient project management may ensure the company achieves its goals, but still market variables are independent and one can only use historical data to examine past effects while building a forecasting model.

Greenley (1986) examined published empirical data related to the relationship of strategic planning in manufacturing companies with their overall performance. His study showed that the data were far from conclusive in establishing such a relationship. The data may not be correct, as it has been suggested, because of double bookkeeping in companies. Greenley also examined the potential advantages and intrinsic value of strategic planning, but revealed a lack of evidence to substantiate such benefits. Chakravarthy (1987) found that tailoring a firm's strategic planning system to its context is not a popular practice despite its presumed importance. Moreover, the lack of fit between a firm's strategic planning system and its context appears to be inconsequential to how managers rate their planning systems. Ward (1988) analyzed family-owned businesses and found that they struggle to survive beyond a single generation. Strategic planning—for both business and family—can help to strengthen the family enterprise and extend its lifespan. This finding can be very important for companies listed on the Warsaw Stock Exchange, since many of them are young and managed like a family business due to the fact that some of their founders act as managers. In Poland, traditional business companies listed on the WSE represent the traditional sector, which was previously state-run, while the technology-based sector is represented by new companies. Thus strategic planning incorporating liquidity forecasting can be equally important for these two groups. Traditional businesses are managed based on post-socialist rules with strong labor organizations, while technology-based companies often behave like family businesses and are affected by a fear about the future, so long-term strategic planning is not efficient.

Ooghe and Prijcker (2008) findings are connected to the failure process of a company. Four types of failure processes were identified: the failure process of unsuccessful start-ups, the failure process of ambitious growth companies, the failure process of dazzled growth companies, and the failure process of apathetic established companies. The paper pointed

out, e.g., errors made by management, errors in the corporate policy, and the importance of external factors. Based on the findings, stakeholders of a company can have a clearer view of both the time dimension inherent in corporate failure and the impact of their own actions on bankruptcy. Company failure does not happen overnight and therefore a longitudinal and holistic perspective is needed.

The paper by Mascarenhas (1981) presents an approach to corporate development which relates the instability of the firm's environment to the ability of the firm to change. Using this framework, managers can examine their firm's position vis-à-vis the environment and choose an appropriate strategy. This framework explains why firms can find themselves at odds with their environment and suggests the lines of action that they should pursue to survive and grow. Coates et al. (1995) presented the results of the exercise of control within multinational companies . National studies now and in the future may be significantly influenced by the mechanisms which parent companies require their subsidiaries to adopt. The business pattern is changing and an increasingly large number of companies are formally and informally dependent on international corporations. We should also consider such a change in the future global business structure. Then, strategies will be more centralized and research results will be addressed to a small group of managers working in the headquarters. The performance measurement system is likely to be central to the process of control. Coates's study of 15 multinational companies reported the design features of control systems, focusing on the relationship between performance measurement and corporate objectives, managerial responsibilities, and incentives. The initial findings indicate considerable diversity within and between enterprises which have head offices located in different countries. Malaska (1985) pointed out that scenarios are nowadays a popular subject in management literature. However, information available about how extensively scenarios are used and the possible motives for their use, as well as their effects on strategic behavior in companies, has hitherto been very limited. The results of a survey among Fortune's top 1000 companies in the U.S.A. in 1977 and 1981 showed a growing corporate interest in scenarios. A survey of the use of scenarios in large Western European companies in 1981 provided evidence of similar interest in Europe. We can expect that this kind of planning will become more and

more popular in developing countries (e.g., Poland) following the Western business patterns. The choice of the best variable representing liquidity is also necessary in building a proper system of scenarios.

On the other hand, 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?" As it was pointed out, planning is connected to two groups of stakeholders and even if shareholders are not interested in short-term factors, the internal group will be, according to their expectations. On the other hand, the purpose of the study presented by Gill (2011) was to find the factors that influence working capital requirements based on the Canadian market. He found that the operating cycle, ROA, leverage, internationalization of the firm, Tobin's q, and firm size influence working capital requirements in the Canadian manufacturing industry, and additionally some findings show that the operating cycle, ROA, sales growth, and firm size affect working capital requirements in the Canadian service industry.

Polish market research into liquidity has been presented in several papers. For example, in their study of the Polish market, Bieniasz and Czerwińska-Kayzer (2008) reported that the shorter the cash conversion cycle (CCC) the better the metrics of business performance as measured by the current ratio (CR) and quick ratio (QR). Bolek and Wolski (2010) found that there is no relationship between the liquidity ratios CR, QR, AT and the CCC in the non-financial companies listed on the Warsaw Stock Exchange in Poland. Nesterak and Żmuda conducted a study of the Polish market taking into account both traditional (static) liquidity analysis based on the balance sheet and the modern (dynamic) approach to company liquidity related to cash flow accounting, which has been gaining more and more followers over the last several years. They found that this kind of analysis allows not only for evaluating an enterprise's liquidity, but it also makes it possible to verify the overall financial standing of a given company. According to Bolek and Wolski (2011), there is a positive relationship between liquidity (CR, QR, and AT) and profitability (ROA and ROE), but not between the CCC and ROE in the non-financial companies listed on the WSE. Lyroudi and Rychter (Bolek) (2012) found that profitability affected the

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CCC negatively, company size was negatively related to liquidity, and cash flows were not related in a linear manner to the three liquidity measures (CCC, CR, and QR), but revealed a positive relationship with the most liquid assets.

The objective of this paper is to determine the best liquidity measure for forecasting and to verify the appropriateness of CCC forecasting in traditional and technology-based non-financial companies listed on the Warsaw Stock Exchange.

RESULTS

The results are divided based on three hypotheses to be verified. The first hypothesis is connected with the CCC and we check to see if the CCC can be better predicted than other liquidity ratios. We expect the CCC to have a lower variation coefficient because it dynamically expresses a company's liquidity status. The second hypothesis is connected with the variation coefficient as the level of predictability is to be examined taking into account differences between the sectors in forecasting liquidity ratios. Hypothesis three states that the CCC should be predicted in a more reliable manner for traditional companies than for technology-based ones since innovative products and services have shorter market life cycles and launching new products is connected with higher uncertainty.

The intangible assets/fixed assets (IA/FA) ratio was chosen as an indicator of business type with the median value dividing the sample into innovative and traditional businesses.

Hypothesis 1 – The CCC can be better predicted based on analysis of coefficients of variability (CV)

The first hypothesis is connected to a comparison of the CCC, CR, and QR and we check to see if the CCC can be better predicted than the other liquidity ratios. The CCC is expected to have a lower variation coefficient since it represents the results of management decisions at the level of receivables, inventory, and cash management. Moreover, the sample is divided into traditional and technology-based sectors. Results for innovation-based companies are presented in table 1, which contains coefficients of variability for the CCC, CR, and QR.

Table 1: Variability coefficients for innovation-based companies

Year	tpCCC	tCR	tQR
1998	836.75%	760.75%	748.66%
1999	483.02%	2634.26%	1700.73%
2000	1010.62%	475.02%	550.30%
2001	565.99%	718.99%	488.15%
2002	609.61%	960.74%	974.43%
2003	2685.24%	2094.49%	1097.92%
2004	1030.54%	355.38%	380.58%
2005	341.83%	829.85%	675.70%
2006	738.12%	489.64%	505.55%
2007	890.13%	7471.29%	2282.86%
2008	449.46%	541.05%	638.51%
2009	659.11%	542.43%	516.27%
2010	694.87%	744.18%	777.12%
mean	845.79%	1432.16%	872.06%

The cash conversion cycle is analyzed as a percentage change while the current and quick ratios are presented only as nominal changes as they are more standardized measures than the CCC.

The results show that the coefficient of variability is the lowest for the CCC in innovation-based companies, which confirms the hypothesis. It is also important to point out that the CV for the QR and for CCC is equal, which indicates that inventory management influences the liquidity ratios, making the CR very unstable and unpredictable. Results for companies representing the traditional business sector as defined according to the median value of the IA/FA ratio (with the ratio lower than the median) are presented in table 2.

Table 2: Coefficients of variability for traditional businesses

Year	tpCCC	tCR	tQR
1998	377.37%	563.72%	665.85%
1999	3559.20%	13568.64%	2528.24%
2000	874.00%	848.97%	981.36%
2001	959.32%	10443.38%	4933.86%
2002	941.03%	4068.96%	2881.51%
2003	971.46%	739.00%	738.81%
2004	1154.70%	974.28%	984.75%
2005	949.93%	1089.83%	1120.87%
2006	2806.98%	5182.48%	5235.99%
2007	1417.43%	10753.77%	89365.31%
2008	1336.09%	1261.57%	1311.49%
2009	1115.32%	1344.01%	1396.03%
2010	637.85%	1292.44%	1566.50%
mean	1315.44%	4010.08%	8746.97%

Coefficients of variability for companies representing the traditional sector are higher than those for companies representing the innovation-based sector. This may indicate less advanced management skills and strategies. The value of the coefficient of variability for the CCC is the lowest, which confirms hypothesis 1. Moreover, it can be seen that the CV for the QR is twice as high as that for the CR, which indicates that inventory management positively influences liquidity predictability, while excluding inventory from the liquidity ratio (QR) makes it less stable. In contrast to technology-based companies, traditional companies in Poland focus on proper inventory management more than on other current factors.

Hypothesis 2 – Predictability of liquidity ratios is different in traditional and technology-based sectors

The second hypothesis is connected with the coefficient of variation. The level of predictability will be examined based on Belt's (1985) proposal suggesting differences between sectors in terms of forecasting liquidity ratios. The average equilibrium test will be used to verify the hypothesis. Table 3 presents the results of statistical analysis for innovation-based and traditional businesses.

The CCC is characterized by the lowest average coefficient of variability. Innovation-based businesses are also characterized by a lower standard error of the mean ratio. The results confirm hypothesis two. There are differences in liquidity predictability between sectors and the innovation sector can be better predicted, especially with the CCC and QR ratios. Furthermore, one can check to see if the mean values are equal to confirm the results presented in Table 3.

Table 4 presents the results of a test for independent samples to check the variability of mean values.

Table 3: Average equilibrium test statistics

Ratios	Business	Average	Standard Deviation	Standard error of mean
tpCCC	Traditional	1315.44%	884.53%	245.33%
	Innovative	845.79%	591.11%	163.94%
tCR	Traditional	4010.08%	4582.31%	1270.90%
	Innovative	1432.16%	1934.82%	536.62%
tQR	Traditional	8746.97%	24269.82%	6731.24%
	Innovative	872.06%	548.43%	152,11%

Table 4: Coefficient of variability testing

Test for independent samples	Average equilibrium t-test				
	t	df	Significance	Averages difference	Standard deviation of the difference
tpCCC	1.59	24.00	0,125	469.65%	295.06%
	1.59	20.94	0.126	469.65%	295.06%
tCR	1.87	24.00	0.074	2577.92%	1379.55%
	1.87	16.15	0.080	2577.92%	1379.55%
tQR	1.17	24.00	0.254	7874.91%	6732.96%
	1.17	12.01	0.265	7874.91%	6732.96%

To confirm the results presented in Table 3, the differences between coefficients of variability should be statistically significant. The results for the cash conversion cycle show that the difference between the technology-based and traditional sectors is significant at a level of < 12.5% considering the difference in the mean ratio (259.06%). Thus, hypothesis two for the CCC is confirmed as it is significantly different for the technology-based and traditional sectors. Analyzing the current ratio, we found that the difference of the mean ratio is equal to 2577.92% and is significant at < 7.4%. This result also confirms hypothesis two. The quick ratio is characterized by the highest difference of mean coefficients of variability (7874.91%). Based on the results of the test, one should reject the equal averages assumption at a significance level of < 25.4%, confirming hypothesis two for the QR.

At a high level of significance, mean variability coefficients are not equal for the CCC, CR and QR in the traditional and technology sectors, which indicates their different behavior in particular industries.

Hypothesis 3 – The CCC can be better predicted than other liquidity ratios
Hypothesis three states that the CCC can be better predicted because it expresses a company's liquidity status in a dynamic manner and the results of such forecasts should be more accurate for traditional companies than for technology-based ones since innovative products or services have shorter market life cycles and launching them is connected with higher uncertainty. Based on theoretical aspects connected to company liquidity, a simple model was

created using linear regression. The independent variables include some external and internal factors connected with liquidity: inflation (I), change in gross domestic profit (GDP), relation of current assets to total assets (AS), relation of short-term liabilities to total liabilities (LS), and change in ROE (ROE). The proposed model is not meant to explain reality but to verify the forecasting ability of CCC for traditional and technology-based companies. The results of descriptive statistics for companies representing the technology-based sector are presented in Table 5.

Table 5: Descriptive statistics for the technology-based sector

Ratios	Business	Average	Standard Deviation	Standard error of mean
tpCCC	Traditional	1315.44%	884.53%	245.33%
	Innovative	845.79%	591.11%	163.94%
tCR	Traditional	4010.08%	4582.31%	1270.90%
	Innovative	1432.16%	1934.82%	536.62%
tQR	Traditional	8746.97%	24269.82%	6731.24%
	Innovative	872.06%	548.43%	152,11%

A simple model was built to verify hypothesis 3 for technology-based companies, where the tpCCC is an exogenous variable.

$$tpCCCT^* = a_1{}_l{}_lI + a_2GDP + a_3sAS + a_4ROE + a_5LS + b \qquad (5)$$

where:
CCCT* = the CCC value estimated by the model
a1-a5 = parameters of the model
b = remainder

Table 6: Model results for technology-based companies

Model	R	R-squared	Adjusted R-squared	The standard error of estimate
1	0.082	0.007	0.003	20.21

The statistics for his model are presented in Table 6. The results show that the model may not be used to predict the CCC because it describes the endogenous variable at a very low level of significance.

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Table 7: Model statistics for technology-based companies

Model	Non-standardized coefficients		Standardized coefficients	t	Significance
	B	Standard Error	Beta		
Constant	-0.783	2.435		-0.322	0.748
I%	-10.717	16.545	-0.018	-0.648	0.517
GDP%	49.903	33.178	0.042	1.504	0.133
AS	5.508	2.978	0.056	1.850	0.065
tROE	-0.433	0.282	-0.042	-1.536	0.125
LS	-3.315	2.454	-0.041	-1.351	0.177

We need to focus on the statistics presented in Table 7 to verify the hypothesis. The results presented in Table 7 show that the relation of current assets to total assets significantly influences changes in the CCC at a level higher than 6.5%. The other ratios are insignificant. The following analysis yields results enabling verification of hypothesis 3 by comparison.

Table 8: Descriptive statistics for the traditional sector

	Average	Standard deviation	N
tpCCC	-14.47	566.82	1387
I%	0.05	0.04	1387
GDP%	0.04	0.02	1387
AS	0.38	0.28	1387
tROE	-0.08	34.32	1387
LS	0.64	0.36	1387

The same model was tested in the group of traditional companies, and the results of descriptive statistics are presented in Table 8. The proposed model is the same as that for technology-based companies (formula 5) and the results of estimation are presented in Table 9.

Table 9: Model results for traditional sector companies

Model	R	R-squared	Adjusted	The standard error of estimate
2	0.051	0.003	-0.001	567.10

The R-statistic is lower than that for technology based companies. Analysis of model coefficients is presented in Table 10. The results show that in traditional sector companies, the relation of short-term liabilities to total liabilities is important and significant for the model proposed.

Table 10: Model statistics for traditional sector companies

Model		Non-standardized coefficients		Standardized coefficients	t	Significance
		B	Standard Error	Beta		
2	Constant	-78.41	50.82		-1.543	0.123
	I%	180.11	366.04	0.014	0.492	0.623
	GDP%	291.04	879.24	0.009	0.331	0.741
	AS	-24.47	6.166	-0.011	-0.397	0.692
	tROE	0.023	0.44	0.001	0.051	0.959
	LS	80.19	45.70	0.051	1.754	0.080

Based on the analysis, hypothesis 3 should be rejected because the tpCCC for traditional sector companies is not predicted in a more reliable manner than that for technology-based companies. It is also interesting that in technology-based companies the asset structure significantly influences changes in the CCC, while in traditional companies such changes are significantly affected by the structure of liabilities. Other variables, such as ROE, representing company profitability, and external measures representing the market condition are irrelevant to this measure.

Conclusions

This paper examines the issue of forecasting liquidity ratios as an important factor for project assessment, strategy, and financial institutions. The authors divided the sample of companies listed on the Warsaw Stock Exchange into two groups based on the ratio of intangible to tangible assets. The median was calculated and companies with the ratio higher than the median were defined as innovative, while those with the ratio lower than the median were defined as belonging to the traditional sector. Verifying three hypotheses, the following results were received. The coefficients of variability for companies representing the traditional sector are much higher than for those representing the innovation-based sector. This can indicate less advanced management skills and strategies in traditional companies, which very often continue business activity from before the transition. To solve this problem, stress should be placed on management

change and employees should be educated to achieve a more modern and appropriate model of business. A traditional business with a low level of intangibles may introduce internal R&D and change its profile only if the management becomes more open to innovations and uses specific knowledge connected to commercialization management. The value of the coefficient of variability for the CCC is the lowest, which confirms hypothesis 1. Given this result, one should use the CCC rather than the current or quick ratios as a proper forecasting measure. Moreover, one can see that the coefficient of variability for the QR is twice as high as that for the CR, which indicates that inventory management enhances liquidity predictability in technology-based companies, while excluding inventory from the liquidity ratio (QR) leads to less stable results. At a high level of significance, the mean variability coefficients are not equal for the CCC, CR, and QR in the traditional and technology sectors, which suggests that a different model of forecasting should be built for these measures while planning. Based on the analysis, hypothesis 3 should be rejected, because the tpCCC for traditional sector companies is not predicted in a more reliable manner than that for technology-based businesses. It is also interesting that in technology-based companies the asset structure significantly influences changes in the CCC while in the traditional sector these changes are significantly influenced by the structure of liabilities. Thus it may be concluded that innovation-based businesses manage assets more effectively than traditional sector companies, which are more interested in liability management.

This paper shows the Polish market as an example of a post-transition developing economy in the context of traditional and innovation-based companies listed on the Warsaw Stock Exchange. The results confirm the assumption that the CCC is a better measure of liquidity in terms of forecasting. It is concluded that innovation-based companies, dealing with the uncertainty of the products they launch, are doing slightly better than traditional companies, but each sector stresses different management goals: the traditional one focuses on liability management while the technology-based one on asset management. These results may be utilized in offering solutions to problems found in other developing countries.

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