

LIQUIDITY GAP IN BANKRUPTCY COMPANIES IN THE CZECH REPUBLIC

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Abstract

Purpose: The objective of this study is to analyse liquidity gaps in bankruptcy companies and their potential as a corporate finance management tool employed to timely identify financial problems. The study responds to situations where companies and their management boards do not respond early enough to financial distress, which significantly decreases the possibility of effective remediation over time and an insolvency procedure thus becomes the only solution.

Design/methodology/approach: Our analysis is based on a sample of companies whose financial situation led to bankruptcy over one, two and three years before declaring it. The sample includes financial statements (between 2006 and 2018) of companies that later went bankrupt - a total of 982 financial statements. Each company in the sample has been checked for the occurrence of a liquidity gap and its mean & median values in the said periods. We have also analysed the relations between the liquidity gap occurred and selected financial characteristics of the sampled companies.

Findings: Most of the sampled companies had a liquidity gap already three years before declaring bankruptcy, and the situation gradually got worse as the bankruptcy approached. The average liquidity gap level is over 68%, and the occurrence of liquidity gaps above the tolerance limit is more than 78%. The sampled companies struggled with substantial liquidity gaps, i.e. they found it very difficult to pay their dues already three years before declaring bankruptcy.

Research/practical implications: The analysis has shown that the liquidity gap is a suitable financial management tool, primarily to indicate financial distress and a threat of bankruptcy where applicable. Company managers should integrate the liquidity gap concept into their sets of continuously monitored financial health indicators while also assessing the liquidity gap ex ante in making major decisions, e.g. substantial investments, distribution of profits, etc.

Originality/value: The originality of this study lies primarily in analysing a so far unexplored financial indicator that is part of the existing insolvency legislation. The key added value of the study is that it analyses an all new solvency assessment criterion that was implemented into the insolvency legislation in mid-2017, but no similar research has been done towards this end so far.

Keywords: liquidity gap, financial distress, bankruptcy, financial indicators

JEL Codes: G33, G32

Introduction

Liquidity gap is a financial criterion in assessing insolvency-based bankruptcy. Its principle lies in comparing due liabilities and cash on hand. The liquidity gap concept consists of two components, the situation/condition of the company concerned (static part) and the way such company is expected to further develop (dynamic part), i.e. an outlook of the expected near future the objective of which is to assess the company's ability to close the liquidity gap, if any, within a very short span of time in response to the expected further development of its financial situation, based on relevant facts that have a direct impact on the company's financial situation in the future. It is a tool that shows whether a company is in systemic insolvency or is going through a temporary deterioration of its solvency (temporary delay in payments), i.e. a kind of shock in the company's financial management that can be overcome within a very short span of time.

One of the substantial benefits of the liquidity gap concept is its presence in the existing legislation.⁴ The process of determining a liquidity gap is governed by an independent Decree of the Czech Ministry of Justice.⁵ This significantly increases its importance as a financial (bankruptcy) criterion, because there is no doubt as to how it should be set up and which particular parameters are included in determining it. The power of evidence in the event of its application e.g. in order to identify factual bankruptcy is thus higher than, for example, with some ratio-based indicators in which case we might have a discussion about the types of parameters to be included in the indicator concerned.

The objective of this study is to present our liquidity gap analysis conducted in companies whose crisis reached the stage of bankruptcy and led to insolvency proceedings. The focus of this analysis is on the occurrence of liquidity gaps and their extent one, two and three years before declaring bankruptcy. Further, our analysis explores relations between the liquidity gap and other financial indicators. Therefore, the key question asked in this analysis is whether the respective management board and owners could use the liquidity gap (as one of the criteria) in deciding whether their company was endangered or in financial distress in order to take early remedial action, which, actually, is a due-care obligation that arises from the law and also bears relevance to the liability of members of corporate bodies in any business corporation facing

⁴ See Section 3, paragraph 3 of the Insolvency Act no. 182/2006 (2006)

⁵ See Decree of insolvency of entrepreneurs no. 190/2017 (2017)

bankruptcy⁶; this liability, among other things, is based on the expectation that the members of such business corporation bodies knew or should have known and could have known that their corporation was facing a threat of bankruptcy and, in conflict with their due-care obligation, failed to take all necessary and reasonably expectable measures to avert that bankruptcy.

1. Background

In terms of financial indicators, the liquidity gap can fall under the category of liquidity indicators, because it has the same basis, i.e. the proportion between a certain part of active components of working capital (cash on hand in this case) and short-term liabilities (due and overdue short-term liabilities in this case). While under the Insolvency Act to be insolvent means to have, inter alia, liabilities that are more than 30 days overdue and to fail to meet such liabilities over more than three months, the liquidity gap concept does not reflect any overdue time; on the contrary, the process of determining a liquidity gap is based on all liabilities that are currently due and overdue, and that is one of the key differences from the legal definition of insolvency.

The liquidity gap concept comes with a tolerance limit of one tenth of the difference between the volume of due liabilities and that of available funds. This converts the originally absolute indicator into a relative one that shows the proportion between the absolute liquidity gap and the due liabilities. In its relative form, the liquidity gap then makes it possible to perform inter-company comparisons as well as to identify the depth of the company's problem. This tolerance limit is the threshold for differentiation between companies facing temporary liquidity problems (payment delays) and companies suffering from systemic insolvency. Therefore, the economic essence of the liquidity gap concept lies primarily in differentiating between systemic insolvency and a temporary delay in payments.

However, liquidity gap is not only an insolvency criterion under Section 3, paragraph 3) of the Insolvency Act where it is implemented as a “negative presumption of insolvency” which debtors can use for defence against creditors' insolvency petitions; its factual and practical applicability is substantially more extensive. As mentioned above, one of the other possible applications is in cases of assessing the liability of statutory bodies and managers for failure to meet their obligation to avert bankruptcy and their accountability in a situation where the company managed by them actually goes bankrupt. This concept has two facets: one of

⁶ See Section 68 of the Business Corporations Act no. 90/2012 (2012)

them is based on the Business Corporations Act which tends to (in contrast with the Insolvency Act that makes the statutory body liable in the event of failure to meet their legal obligation to file an insolvency petition) avoid or prevent bankruptcy. This is based on the presumption that the members of the statutory body concerned knew or should have and could have known that their company was facing a danger of bankruptcy but, in conflict with their due-care obligation, failed to take all necessary and reasonably expectable measures in order to avert it. This involves e.g. financial distress as a potential consequence of investment decisions that might be outside the company's financial capabilities or a decision to optimise the company's capital structure by increasing the component of long-term third-party funding resources in a situation where the company is not able to generate enough funds to service the respective debt. As an independent scenario, a dividend payment may drain (regardless of the distributable profit) so much cash that the company is then unable to meet its liabilities. The other facet is the Insolvency Act under which any debtor is obliged to file an insolvency petition without undue delay after they learn or, with due care in place, after they should have learned about their bankruptcy. If the respective statutory body, in conflict with the aforementioned provision, fails to file such insolvency petition, it is liable to creditors for any damage that it may cause by violating this obligation. Therefore, if the company concerned had a persistent liquidity gap in the past (and if it did, it is obvious that it was not able to close it), it is self-evident that the company was systemically insolvent and that its statutory body was obliged to take measures to avert such situation or file a debtor's insolvency petition. A persistent liquidity gap exceeding the tolerance limit is one of the facts indicating to the statutory body that the company has financial difficulties or facing a danger of bankruptcy. (Alexander, Havel, Kuděj, Louda, & Schönfeld, 2017).

So far, liquidity gap-related topics have not been covered extensively in Czech literature, because it is a new concept that was implemented into the respective legislation in mid-2017, based on a concept used in the German insolvency context where liquidity gap is part of the court practice.⁷ In Czech literature, liquidity gap-relevant items only appeared recently (in 2014) in connection with the liquidity gap concept/solution proposed for the Czech context (Kuděj & Alexander, 2014; Kuděj & Louda, 2015) and then in connection with its implementation into the Czech insolvency legislation (Alexander et al., 2017; Schönfeld, 2018) or (Kuděj, Louda, & Alexander, 2015). The context of financial characteristics of companies in

⁷ BGH (Bundesgerichtshof), 24.05.2005 - IX ZR 123/04

crisis is described in some recent works (Schönfeld, Kuděj, & Smrčka, 2018, 2019). On the other hand, both local and international literature deals with business failures, warning signs of coming crises and bankruptcy prevention possibilities fairly extensively. For example, the recent reform of the Italian insolvency law included the implementation of a bad debt restructuring process aimed at improving companies' financial health, and the success of this process depends exclusively on the timeliness of the respective intervention. Towards this end, a new scoring formula has been developed (derived from ratio indicators) for predictions of the legislation-defined state of financial emergency (De Luca & Meschieri, 2017). Recent works also include a study that deals with the impact of key financial indicators on the decision-making process in SMEs – the said key financial indicators are used as early warning signals (Pîrlog & Balint, 2016), as well as a paper whose objective is to highlight the importance of credit risk modelling for SMEs - in this connection, SMEs are divided into three categories, medium, small and micro companies, and the authors' ambition is to show, in each of the segments, the actual prediction capabilities of several bankruptcy models, including some popular and extensively applied bankruptcy models such as Altman's Z-score, Ohlson's O-score, Zmijewski's model, Taffler's model and the IN05 model (Plíhal, Sponerová, & Sponer, 2017). Other sources analyse the impact of the company size on the likelihood of bankruptcy in the SME segment (El Kalak & Hudson, 2016), company failure processes, failure risk components (Lukason & Laitinen, 2019).

2. Data and methodology

Our analysis was conducted using a sample of 982 financial statements of bankruptcy companies (between 2006 and 2018) over a period of one/two/three years before declaring bankruptcy. The data for the analysis were obtained from the Bisnode Magnusweb database (Bisnode Česká republika, a.s., 2019) and further detailed based on data available in the Commercial Register Documents Collection (Czech Ministry of Justice, 2019). Data obtained from the financial statements were then used to identify/determine liquidity gaps and other financial characteristics. The characteristics of the data file generated through the said process are as follows.

Tab. 1: Financial statements of the sampled companies – by industry

	Frequency	Percent	Valid Percent	Cumulative Percent
A - Agriculture, forestry, fishing	21	2.1	2.1	2.1
B – Mining and extraction	4	0.4	0.4	2.5
C – Processing industry	304	31.0	31.0	33.5
D – Production and distribution of electricity, gas, heat and conditioned air	1	0.1	0.1	33.6
E – Supply of water, waste management	7	0.7	0.7	34.3
F – Construction industry	158	16.1	16.1	50.4
G – Wholesale and retail, maintenance and repairs of motor vehicles	239	24.3	24.3	74.7
H – Transportation and warehousing	58	5.9	5.9	80.7
I – HoReCa (hotels, restaurants, catering)	16	1.6	1.6	82.3
J – Information and communication industry	17	1.7	1.7	84.0
L – Real estate industry	51	5.2	5.2	89.2
M – Research, scientific and technological operations	67	6.8	6.8	96.0
N – Administrative and support operations	19	1.9	1.9	98.0
Q – Healthcare and social care	5	0.5	0.5	98.5
R – Culture, entertainment and recreation	3	0.3	0.3	98.8
S – Other activities/operations	12	1.2	1.2	100.0
Total	982	100.0	100.0	

Source: Authors.

Tab. 2: Financial statements of the sampled companies – by turnover

	Frequency	Percent	Valid Percent	Cumulative Percent
1. Turnover of less than CZK 5 mil.	252	25.7	25.7	25.7
2. Turnover between CZK 5 mil. and 10 mil	109	11.1	11.1	36.8
3. Turnover between CZK 10 mil. and 50 mil.	269	27.4	27.4	64.2
4. Turnover between CZK 50 mil. and 100 mil.	104	10.6	10.6	74.7
5. Turnover between CZK 100 mil. and 500 mil.	160	16.3	16.3	91.0
6. Turnover between CZK 500 mil. and 1 billion	47	4.8	4.8	95.8
7. Turnover over CZK 1 billion	41	4.2	4.2	100.0
Total	982	100.0	100.0	

Source: Authors.

On the methodological side, the liquidity gap was calculated as the difference between overdue liabilities and cash reported in the Balance Sheet, using the formula below:

$$LG = OL - C \quad (1)$$

where

LG = liquidity gap

OL = overdue liabilities

C = cash reported in the Balance Sheet

Based on (Alexander et al., 2017, p. 10)

This, in fact, is a kind of modification of the definition found in the insolvency legislation, because detailed data on the items that are subsequently used as inputs in determining the liquidity gap or, on the contrary, are excluded from such determination process, are not available. These include, primarily, unused overdraft loans or liabilities for which the respective creditors have accepted to postpone the due date. That, however, does not substantially change the relevance of the further analysis, because the said items occur fairly exceptionally, bankruptcy companies are usually reasonably expected not to have had any unused overdraft loans and creditors' willingness to accept due date postponements without any additional requirements is usually very low.

Where the value determined through Formula (1) was positive, i.e. a liquidity gap was detected, the next step was to determine the liquidity gap rate as the proportion between the said difference and overdue liabilities, using the formula below:

$$LGR = \frac{LG}{OL} \quad (2)$$

where

LGR = liquidity gap rate

Based on (Alexander et al., 2017, p. 10)

The next step was to create a dichotomic variable to indicate whether the liquidity gap was over the tolerance limit. We therefore created such dichotomic variable for each company in the file, using which it was possible to decide whether the liquidity gap in the particular company was within tolerance or did not exist or whether the company had a liquidity gap over the tolerance limit, which then categorised the bankruptcy companies into two groups (liquidity gap within the tolerance limit or none and liquidity gap over 10%).

As the next step, we created indicators that characterise the primary operations of each company while only containing components that are really relevant to such primary operations. These indicators include, for example, primary EBITDA that only covers production and labour costs, operating EBITDA that also covers other operating costs and revenues, an indicator of primary non-cash working capital components and, predominantly, the difference between active and passive primary non-cash components of working capital which, apart from stock, only contains business receivables, business liabilities and HR cost liabilities which, more or less, corresponds with the aforesaid primary EBITDA. All of the applied indicators are then checked for polarity, i.e. whether they reach positive or negative values. This way we prepared

(for the sake of further analysis) a set of dichotomic variables to show whether or not each of the effects concerned actually occurred.

The core of the analysis is a set of descriptive statistics, primarily relative frequencies identified in contingency tables using which we analysed selected relations among the previously created dichotomic variables using line-specific relative frequencies.

The next step was an analysis of liquidity gap means and medians. The mean and median are used primarily to determine the basic liquidity gap levels which, as opposed to the frequency, show the depth of the problem. To eliminate potential faraway or extreme values, besides the standard mean we also used a 5% trimmed mean that does not contain 5% of the extreme values.

Then we analysed the relation between the occurrence of liquidity gaps, i.e. liquidity gaps over the tolerance limits, and the polarities of other selected financial characteristics. We compared two groups, one where liquidity gaps are not present or are below the tolerance limit and one where liquidity gaps are above the tolerance limit. Since the variables subjected to this comparison are dichotomic, we used non-parametric tests to compare the said groups, namely the Mann-Whitney test for assessing whether two independent groups (samples) come from the same distribution (Řezanková, 2017).

The relations between the liquidity gap and other selected financial characteristics were analysed using line-specific relative frequencies in contingency tables and also the odds ratio, a special parameter used to analyse dependencies of dichotomic variables in a four-pole table. Besides the odds ratio, the analysis also includes a confidence interval using which a dependency is identified in cases where the values of this interval do not include “1” (Řezanková, 2017).

As the last stage, we analysed liquidity gap-related and similar tools developed by other experts – known bankruptcy indicators. Like in the aforesaid analysis of the relation between the liquidity gap and selected financial characteristics, also this analysis compared two groups and the relative occurrence of liquidity gaps and other bankruptcy indicator categories.

This quantitative analysis was conducted in IBM SPSS Statistics, Version 25.

3. Results

3.1 Liquidity gap occurrence and extent in bankruptcy companies over time

The following analysis shows the occurrence of liquidity gaps in bankruptcy companies over time on one hand, i.e. one, two and three years before declaring bankruptcy, and, on the other hand, the liquidity gap extent, i.e. the overall depth of the problem with payments of due liabilities.

Tab. 3: Liquidity gap occurrence in individual pre-bankruptcy periods

	Liquidity gap within tolerance or none	Liquidity gap of over 10%	Observations (N)
1 year before bankruptcy	13.3%	86.7%	982
2 years before bankruptcy	21.8%	78.2%	982
3 years before bankruptcy	28.8%	71.2%	982

Source: Authors.

The frequency of liquidity gaps over the tolerance limit shows that a vast majority of bankruptcy companies had a liquidity gap already three years before declaring bankruptcy, i.e. their management could have identified financial distress three years beforehand and take corrective actions to avoid going bankrupt.

Tab. 4: Liquidity gap mean and median

	1 year before bankruptcy	2 years before bankruptcy	3 years before bankruptcy	Observations (N)
Mean	0.75	0.66	0.57	982
5% trimmed mean	0.78	0.67	0.58	982
Median	0.93	0.86	0.76	982

Source: Authors.

The analysis shows that the bankruptcy companies had, on average, substantial liquidity gaps (high liquidity gap rate) in all of those three years before declaring bankruptcy, substantially above the tolerance limit of one tenth (10%) of due liabilities. The liquidity gap then grows as the bankruptcy declaration approaches, which indicates that the bankruptcy companies concerned had substantial difficulty to meet the due dates of a majority of their liabilities already three years before bankruptcy and that already three years before bankruptcy they would not have avoided declaring such bankruptcy by means of the process set forth in Section 3, paragraph 3) of the Insolvency Act. Moreover, one of the conclusions that might be drawn in connection with these companies is that they in fact *were* bankrupt three years beforehand and continued operating in a state of bankruptcy over those three years until formally declaring bankruptcy.

The mean and median analysis makes it self-evident that the liquidity gap is an important indicator of solvency problems at the sampled bankruptcy companies and that financial distress and a road to bankruptcy could have been identified in most of them already three years before they actually declared bankruptcy.

3.2 Relations between the occurrence of a liquidity gap and the polarity of selected indicators

The following analysis relates the polarity of selected indicators and the existence of a liquidity gap. As mentioned above, the term “polarity” refers to whether the financial characteristics concerned are of positive or negative values, i.e. it shows whether the company in question generates profits, losses or cash-needed deficits cash or whether its short-term liabilities as passive non-cash components of working capital are higher than the active components.

Tab. 5: Inter-group comparison – occurrence of a liquidity gap and polarities of profit generation indicators

Hypothesis Test Summary			
Null Hypothesis	Sig.	Decision	Observations (N)
The distribution of the added value polarity is the same across the categories of liquidity gap polarity.	0.093	Retain the null hypothesis.	982
The distribution of the primary EBITDA polarity is the same across the categories of liquidity gap polarity.	0.000	Reject the null hypothesis.	982
The distribution of the operating EBITDA polarity is the same across the categories of liquidity gap polarity.	0.000	Reject the null hypothesis.	982
The distribution of the EBITDA polarity is the same across the categories of liquidity gap polarity.	0.000	Reject the null hypothesis.	982
The distribution of the EBIT polarity is the same across the categories of liquidity gap polarity.	0.000	Reject the null hypothesis.	982

Source: Authors.

Having compared the groups by means of the Mann-Whitney test, we are rejecting, at a 5% significance level, the null hypothesis for all polarities of profit generation indicators, except for added value.

Tab. 6: Relations between the liquidity gap and the polarity of profit generation indicators

		Liquidity gap within tolerance or none	Liquidity gap of over 10%	Observations (N)
Added value polarity	Positive added value	22.4%	77.6%	982
	Negative added value	17.3%	82.7%	
Primary EBITDA polarity	Positive primary EBITDA	27.2%	72.8%	982
	Negative primary EBITDA	16.8%	83.2%	
Operating EBITDA polarity	Positive operating EBITDA	27.7%	72.3%	982
	Negative operating EBITDA	16.6%	83.4%	
EBITDA polarity	Positive EBITDA	27.8%	72.2%	982
	Negative EBITDA	16.0%	84.0%	
EBIT polarity	Positive EBIT	30.3%	69.7%	982
	Negative EBIT	15.8%	84.2%	

Source: Authors.

The analysis of relations between the liquidity gap and the polarity of profit generation indicators shows that most of the companies with polarity of profit generation indicators have a liquidity gap, regardless of the nature of this polarity. However, it is also obvious that where the selected indicators are negative, the liquidity gap is even higher. The key finding is that the liquidity gap prevails substantially even in cases where the values of these selected indicators are positive.

Tab. 7: Inter-group comparison – occurrence of a liquidity gap and working capital indicator polarities

Hypothesis Test Summary			
Null Hypothesis	Sig.	Decision	Observations (N)
The distribution of the cash-needed polarity is the same across the categories of liquidity gap polarity.	0.000	Reject the null hypothesis.	982
The distribution of the polarity of primary NCWC ⁸ balance is the same across the categories of liquidity gap polarity.	0.013	Reject the null hypothesis.	982
The distribution of the polarity of total NCWC is the same across the categories of liquidity gap polarity.	0.112	Retain the null hypothesis.	982

Source: Authors.

⁸ Non-cash components of working capital

Having compared the groups by means of the Mann-Whitney test, we are rejecting, at a 5% significance level, the null hypothesis for the cash-needed polarity and the polarity of the balance of primary non-cash components of working capital. We are not rejecting the null hypothesis for the total non-cash components of working capital.

Tab. 8: Relations between the liquidity gap and the polarity of working capital indicators

		Liquidity gap within tolerance or none	Liquidity gap of over 10%	Observations (N)
Cash-needed polarity	Cash-needed surplus	63.0%	37.0%	982
	Cash-needed deficit	7.8%	92.2%	
Polarity of the primary NCWC balance	Positive primary NCWC	23.7%	76.3%	982
	Negative primary NCWC	17.0%	83.0%	
Polarity of the total NCWC balance	Positive NCWC	24.0%	76.0%	982
	Negative NCWC	19.7%	80.3%	

Source: Authors.

The situation around the cash-needed surplus and deficit is different. This, no doubt, is a result of the cash-needed format which was set based on a requirement to be at 15%⁹ of the immediate (cash) liquidity indicator. Almost all of the companies that had a cash-needed deficit had a liquidity gap above the tolerance limit, i.e. most of their short-term liabilities were overdue. The postulate for companies with a cash-needed surplus and a liquidity gap is that although their volumes of short-term liabilities were lower, most of such liabilities were overdue. The situation with primary and total non-cash components of working capital, i.e. the polarity of their balance, is similar to the situation with the polarity of profit generation indicators, i.e. most of the companies with polarity of the balance of primary and total NCWC have liquidity gaps, regardless of the nature of such polarity.

⁹ This level was selected as the minimum, taking into account that the focus of the analysis is on bankrupt companies

Tab. 9: Inter-group comparison – occurrence of a liquidity gap and the polarities of capital structure indicators

Hypothesis Test Summary			
Null Hypothesis	Sig.	Decision	Observations (N)
The distribution of the polarity of the difference between long-term capital and FA is the same across the categories of liquidity gap polarity.	0.000	Reject the null hypothesis.	982
The distribution of the equity polarity is the same across the categories of liquidity gap polarity.	0.000	Reject the null hypothesis.	982

Source: Authors.

Having compared the groups by means of the Mann-Whitney test, we are rejecting, at a 5% significance level, the null hypothesis for the polarities of capital structure indicators, i.e. the polarity of the difference between long-term capital and FA, as well as the equity polarity.

Tab. 10: Relations between the liquidity gap and the polarity of capital structure indicators

		Liquidity gap within tolerance or none	Liquidity gap of over 10%	Observations (N)
Polarity of the difference between long-term capital and FA	Positive difference between long-term capital and FA	38.3%	61.7%	982
	Negative difference between long-term capital and FA	12.2%	87.8%	
Equity polarity	Positive equity	28.0%	72.0%	982
	Negative equity	13.8%	86.2%	

Source: Authors.

The polarities of capital structure indicators also show higher associations on negative indicator levels. It is obvious that most of the companies with negative equity have liquidity gaps over the tolerance limit, just like the companies whose long-term capital is lower than their fixed assets. Nevertheless, the occurrence of a liquidity gap is also high in the companies where the values of the aforesaid indicators are positive.

3.3 Interdependences between the liquidity gap and the polarity of selected financial indicators

Tab. 11: Dependences of the liquidity gap on the polarity of profit generation indicators

	Value	95% Confidence Interval		Observations (N)
		Lower	Upper	
Odds ratio for added value polarity (positive added value/negative added value)	1.381	0.946	2.016	982
Odds ratio for primary EBITDA polarity (positive primary EBITDA / negative primary EBITDA)	1.843	1.354	2.510	982
Odds ratio for operating EBITDA polarity (positive operating EBITDA / negative operating EBITDA)	1.915	1.406	2.608	982
Odds ratio for EBITDA polarity (positive EBITDA / negative EBITDA)	2.030	1.488	2.769	982
Odds ratio for EBIT polarity (positive EBIT / negative EBIT)	2.311	1.694	3.154	982

Source: Authors.

As for profit generation indicator polarity, the odds ratio indicates some dependence across all these levels, except for the polarity of added value (where the confidence interval includes “1”). However, it should be pointed out that where the added value is negative, it is obvious that the other profit generation indicator polarities are negative, too. The highest odds ratio is that of the EBIT polarity, i.e. total pre-tax and pre-interest profit. This means that a liquidity gap identified by the management should be a signal for the management that they may be having a problem with profit generation (EBIT) as one of the root causes of deteriorated solvency.

Tab. 12: Dependences of the liquidity gap on the polarity of working capital indicators

	Value	95% Confidence Interval		Observations (N)
		Lower	Upper	
Odds ratio for cash-needed polarity (cash-needed surplus/ cash-needed deficit)	20.161	13.848	29.352	982
Odds ratio for the polarity of primary NCWC (positive primary NCWC / negative primary NCWC)	1.513	1.089	2.102	982
Odds ratio for the polarity of total NCWC (positive NCWC / negative NCWC)	1.290	0.942	1.768	982

Source: Authors.

As for working capital indicator polarity, the odds ratio indicates some dependence of the cash-needed deficit and the polarity of primary non-cash components of working capital, and the by

far highest odds ratio value is that for the cash-needed deficit, which corresponds with the previous findings regarding relations analysed by means of line-specific relative frequencies. Nevertheless, financial distress represented by the existence of a liquidity gap may also be caused by the structure of non-cash working capital components. The existence of a liquidity gap can thus be an indication for the management that there are some deficiencies and problems in terms of working capital management that can be eliminated (if identified early enough) e.g. by alternative financing of receivables, etc.

Tab. 13: Dependences of the liquidity gap on the polarity of asset and capital structure indicators

	Value	95% Confidence Interval		Observations (N)
		Lower	Upper	
Odds ratio for the polarity of the difference between long-term capital and FA (difference between long-term capital and FA / negative difference between long-term capital and FA)	4.443	3.220	6.131	982
Odds ratio for the equity polarity (positive equity / negative equity)	2.440	1.762	3.378	982

Source: Authors.

As for asset and capital structure indicator polarity, there are indications of some dependence in both cases stated above. The higher odds ratio value is that of the polarity of the difference between long-term capital and fixed assets, which makes us believe that in terms of liquidity gap, financing fixed assets by means of short-term capital poses a higher risk. The existence of a liquidity gap can thus indicate also problems in the company's capital and asset structure. Nevertheless, measures taken in this area (e.g. changing the capital structure) tend to be of strategic nature.

3.4 Comparison: liquidity gap and other bankruptcy indicators

Compared to other bankruptcy prediction tools such as bankruptcy and solvency models, the liquidity gap is a single-factor tool. The liquidity gap concept comes with the factor of liquidity, which is a status factor, in contrast with e.g. Altman's z-score, Kralicek's Quick test or the Neumaiers' IN05 Index which come with both status factors and factors independent of the instantaneous status, i.e. they reflect not only the current condition of the company concerned, but also its internal trends and performance. Basically, this means that a liquidity gap may not exist in the next period or, on the contrary, its non-existence in one particular period does not necessarily mean that the financial condition of such company is good. Its interpretation, however, is clear, and its occurrence in multiple consecutive periods (e.g. months) shows the

trend over time; a liquidity gap persistently over the tolerance limit is a serious sign of potential financial distress, or, on the contrary, a sporadic occurrence of liquidity gaps does not indicate real financial distress. Nevertheless, in terms of interpretation, a persistent liquidity gap indicates a situation where the respective company is clearly not able to duly (timely) pay its liabilities, and if other legal criteria have been met, primarily the multiplicity of creditors and the company's inability to pay its liabilities over more than three months, the company is exposed to a substantial risk of bankruptcy (as a consequence of the creditors' insolvency petition).

In this connection, we have compared the liquidity gap and the aforementioned bankruptcy models. As the first step, we compared the distribution within the group in which liquidity gaps are above the tolerance limit and the group in which liquidity gaps do not occur or are below the tolerance limit. Like in the previous case, we used (for the same reason) the Mann-Whitey test, and then we analysed the relative occurrence of liquidity gaps and the categories of the aforesaid bankruptcy models.

Tab. 14: Inter-group comparison – liquidity gap and synthetic indicator categories

Hypothesis Test Summary			
Null Hypothesis	Sig.	Decision	Observations (N)
The distribution of the Kralicek quick test category is the same across the categories of liquidity gap polarity.	0,000	Reject the null hypothesis.	982
The distribution of the Altman's Z-score category is the same across the categories of liquidity gap polarity	0,000	Reject the null hypothesis.	982
The distribution of the Index IN05 category is the same across the categories of liquidity gap polarity.	0,000	Reject the null hypothesis.	982

Source: Authors.

Having compared the groups by means of the Mann-Whitney test, we are rejecting, at a 5% significance level, the null hypothesis for all of the analysed synthetic indicators.

Tab. 15: Liquidity gap occurrence in individual synthetic indicator categories

		Liquidity gap polarity		Observations (N)
		Liquidity gap within tolerance or none	Liquidity gap of over 10%	
Kralicek Quick Test category	3.01+ (Bankruptcy companies)	17.8%	82.2%	982
	2.00 - 3.00 (Grey zone)	41.5%	58.5%	
	<= 1.99 (Solvent companies)	48.1%	51.9%	
Altman's Z-score category	<= 1.230 (Bankruptcy companies)	13.2%	86.8%	982
	1.231 - 2.899 (Grey zone)	25.9%	74.1%	
	2.900+ (Solvent companies)	40.6%	59.4%	
Index IN05 category	<= .900 (Bankruptcy companies)	16.6%	83.4%	982
	.901 - 1.599 (Grey zone)	27.7%	72.3%	
	1.600+ (Solvent companies)	43.5%	56.5%	

Source: Authors.

The analysis of the occurrence of liquidity gaps in the individual synthetic indicator categories has shown that more than a half of the companies that, according to the analysed synthetic indicators, are categorised as solvent companies, have liquidity gaps over the tolerance limit. Further, it has become obvious that also the companies that fall under the grey zone category have substantial liquidity gaps. The reason may be the fact that the liquidity gap concept is a single-factor criterion that reflects a specific perspective of liquidity. It is therefore likely that the other factors that are part of the synthetic indicators have outweighed the liquidity factor (that is also one of the components). Nevertheless, the key postulate in terms of declaration of bankruptcy and financial management is that if a company struggles with a persistent liquidity gap while also showing other signs of bankruptcy (see above), the risk of going bankrupt on the grounds of insolvency is high. The aforesaid prevalence of the other synthetic-indicator factors does not change this postulate, because e.g. the fact that the company concerned may be reaching satisfactory profitability levels is not relevant in terms of declaring bankruptcy under the Insolvency Act.

Conclusion

Our analysis has shown that most of the sampled bankruptcy companies had a liquidity gap already three years before declaring bankruptcy, i.e. most of these companies already had difficulty to pay liabilities by due dates three years before declaring bankruptcy. We can therefore conclude that it was already three years before declaring bankruptcy that these

companies had a problem to generate enough cash, the most likely reason being that they did not generate enough profit and did not manage their working capital appropriately. As for the liquidity gap, i.e. its occurrence and scope, it can be concluded that these companies “kept surviving” rather than lived and that it was only a matter of time before this situation became unsustainable.

We can see that liquidity gaps occurred extensively also in companies that had positive values of polarity of the selected indicators, although the occurrence of liquidity gaps was higher in cases where such polarity was negative. This makes us believe that although the companies did not generate losses, their (operating) profitability was too low to generate enough cash flow. This shows that the liquidity gap concept can be used as a suitable finance management tool.

The interdependency analysis, in particular, has shown that liquidity gaps result from insufficient operating-level performance that is mainly measured through the primary EBITDA polarity (plus the polarities of other levels which, however, are derived from this indicator). Further, we can see a substantial effect of the cash-needed polarity and the related polarity of the balance of primary NCWC. Equally relevant is the influence of the indicators of asset and capital structures – financing long-term assets by means of short-term resources, as well as (in consequence of the negative level of primary EBITDA) generating equity losses has a substantial effect in terms of liquidity gap management.

In view of the above, if the managers involved had monitored and assessed the liquidity gap, they would have inevitably arrived at a conclusion, at least three years before declaring bankruptcy, that they needed to take measures to improve the financial situation of their company while preventing a situation where they might be held liable for failure to exercise all due care. Thanks to the power of evidence of the liquidity gap concept resulting from its presence in the existing legislation, any managers thus might prove more effectively in critical situations that their company’s financial distress or bankruptcy was caused e.g. by some substantial and exceptional circumstances that they could not foresee. Although it was not until 2017 that the liquidity gap concept was implemented into the insolvency legislation, it does not change the fact that it is a liquidity and solvency criterion and that even before its implementation into the respective legislation there were enough tools available for assessing this criterion. However, in the future and, in particular, in the current situation where it is part of the insolvency legislation, the liquidity gap concept should be an important aspect and the occurrence of a liquidity gap should trigger ideas as to how to improve the financial health of the company concerned.

We can therefore conclude that the liquidity gap concept is a suitable finance management tool, a signal of potential financial distress and a trigger point for starting to think about a timely adoption of corrective actions.

One of the interesting challenges in further research might be, for example, to analyse liquidity gaps in individual industries, i.e. reflect the character of each such line of business in terms of working capital demands and the average maturity of liabilities (primarily business liabilities). Also interesting might be an analysis of companies financed by means of bank loans, because banks require companies to provide continuous financial management reports in credit financing projects, including liability age structures and liability payment summaries. Such kind of research might find out whether companies that are required to meet certain credit financing criteria perform better in terms of payment discipline. Another possible liquidity gap-related research project might be a company management analysis that monitors owner-managed companies and family businesses on one side and companies managed by professional managers on the other side, because owner-managed companies and family businesses (primarily in the SME segment) often lack appropriate controlling processes and adequately sophisticated financial management mechanisms.

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References

- Alexander, J., Havel, B., Kuděj, M., Louda, L., & Schönfeld, J. (2017). *Mezera krytí v příkladech a související otázky*. Praha: Triton.
- Bisnode Česká republika, a.s. (2019). Bisnode Magnusweb [Online]. Retrieved from <https://magnusweb.bisnode.cz/>
- Business Corporations Act/Zákon o obchodních společnostech a družstvech (zákon o obchodních korporacích), 90/2012 Sb. (2012). [Accessed July 2019].
- Decree on insolvency of entrepreneurs/Vyhláška k provedení § 3 odst. 3 insolvenčního zákona (vyhláška o platební neschopnosti podnikatele), 190/2017 Sb. (2017). [Accessed July 2019].

- De Luca, F., & Meschieri, E. (2017). Financial distress pre-warning indicators: A case study on Italian listed companies. *Journal of Credit Risk*, 13(1), 73-94.
- El Kalak, I., & Hudson, R. (2016). The effect of size on the failure probabilities of SMEs: An empirical study on the US market using discrete hazard model. *International Review of Financial Analysis*, 43, 135-145.
- Insolvency Act/Zákon o úpadku a způsobech jeho řešení (insolvenční zákon), 182/2006 Sb, (2006). [Accessed July 2019].
- Kuděj, M., & Alexander, J. (2014). Využití zahraničních instrumentů pro sanaci českých podniků. *Ekonomika a Management*, 2014(2).
- Kuděj, M., & Louda, L. (2015). Německá praxe při zjišťování úpadku. *Ekonomika a Management*, 2015(2).
- Kuděj, M., Louda, L., & Alexander, J. (2015). Standardizace insolvenčních procesů – návrh standardu pro posuzování úpadku. *Sborník z Mezinárodní Vědecké Konference*, 2015. Praha.
- Lukason, O., & Laitinen, E. K. (2019). Firm failure processes and components of failure risk: An analysis of European bankrupt firms. *Journal of Business Research*, 98, 380-390.
- Ministerstvo spravedlnosti ČR. (2019). Obchodní rejstřík [Online]. Retrieved from <https://justice.cz/>
- Pîrlog, R., & Balint, A. O. (2016). An Analyze Upon the Influence of the Key Performance Indicators (kpi) on the Decision Process Within Small and Medium-Sized Enterprises (sme). *Hyperion International Journal of Econophysics & New Economy*, 9(1), 173-185.
- Plíhal, T., Sponerová, M., & Sponer, M. (2017). Bankruptcy Prediction Models in Relation to SME Segment in the Czech Republic. In J. Nesleha, T. Plíhal, & K. Urbanovsky (Eds.), *EUROPEAN FINANCIAL SYSTEMS 2017: PROCEEDINGS OF THE 14TH INTERNATIONAL SCIENTIFIC CONFERENCE, PT 2*. Pages: 183-191. Published: 2017. Brno: Masarykova Univ.
- Řezanková, H. (2017). *Analýza dat z dotazníkových šetření (čtvrté přepracované vydání)*. Praha: Professional Publishing.
- Schönfeld, J. (2018). *Transformace a restrukturalizace podniku*. Praha: C.H. Beck.
- Schönfeld, J., Kuděj, M., & Smrčka, L. (2018). Financial health of enterprises introducing safeguard procedure based on bankruptcy models. *Journal of Business Economics and Management*, 19(5), 692-705. <https://doi.org/10.3846/jbem.2018.7063>

Schönfeld, J., Kuděj, M., & Smrčka, L. (2019). Finanční charakteristiky podniků před vyhlášením moratoria. *Politická Ekonomie*, 67(5), 490-510.
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