

INFORMATIVE VALUE OF Q-TEST IN CONDITIONS OF CZECH REPUBLIC

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Abstract:

Kralicek's Quick test is one of the well-known financial diagnostic tests in Europe. This model estimates the financial health of the company using the financial analysis tools with comparison with the created evaluation scale. The model was not created based on the sample of real companies and thus the author (even nobody later) has not tested complexly its informative value. That is why the quantification of informative ability of this model was stated using the tested sample of 1504 Czech companies. Even the model was not created using any statistic method (multiple discriminant analysis, logit analysis, decision trees, support vector machines, neural networks, etc.) it was found that its informative value is comparable to models based on empiric data (77.59% with the variation of one degree and up to 71.43% at the prediction of distress).

Introduction

Financial diagnostic models can be divided in the category of bankruptcy models and prosperity models. The bankruptcy models accuracy is known just during their creation using statistical methods and sample of companies for testing. The best known is Altman's Z-score (Altman, 1968), newer is for example Ahn and Kim's hybrid case-based reasoning and genetic algorithm (Ahn & Kim, 2009), the model based on the neural networks (Lee, Booth & Alam, 2005), combination of random subspace approach and binary logit model (Li, Lee, Zhou & Sun, 2011), hazard model based model (Shumway, 2001). The newest Czech models are bankruptcy index with accuracy 80.28% (Karas & Režnáková, 2014) and the model created using the sample of plastic producers and metal manufacturing companies with accuracy 90.96% (Homolka, Doležal & Novák, 2014).

Some models are specialised in companies based for example on the branch, the company size or the specific business activity. For example, the models focused on the accommodation (hotels/lodging) (Youn & Gu, 2010) (Kim, 2011), Internet companies

(Chandra, Ravi, & Bose, 2009), agriculture (Chrastinová, 1998) (Gurčík, 2002), manufacturing industry (Neumaierová, 2005), etc.

On the contrary, the prosperity models were created on the basis of logical assumptions without empiric research and these models do not have determined accuracy. For example the Grünwald's index (Grünwald & Holečková, 2007), Doucha's Balance analysis I., II., III. (Doucha, 1996), Tamari risk index (Tamari, 1966) and Index of creditworthiness (see more Zalai, 2010) are concerned. The Czech index IN99 (Neumaierová 2002), based on which the financially healthy company is the company with positive economic value added, represents the exception.

1. Kralicek's Quick test

This one-dimensional grading test was created in the year 1991 by the Austrian economist Peter Kralicek. It is mainly used in the German speaking countries under the name Quick test, Q-test or Kralicek's Fast Test. This model is different as with the increasing achieved value also the insolvency probability increases too. It uses the point evaluation (from 1 up to 5, like in the school) and is totally unique as in particular evaluated areas of the company economy (level of self-financing, duration of the debt payment, CF in % of revenues, return on assets) it does not distinguish their importance, and thus it does not assign different weights. The resulting grade is the arithmetic average of ratings achieved in particular evaluated areas $((Q_1+Q_2+Q_3+Q_4)/4)$. The company classified with the grade 1 and 2 is considered to be financially healthy, and the one with the grade 4 and 5 is pointed to the bankruptcy. See more in Tab. 1.

TAB. 1: The evaluation scale of the Kralicek's Quick test

Evaluation	Ukazatel		Evaluation scale (grades)				
			1 Very good	2 Good	3 Mid	4 Bad	5 Danger of insolvency
Revenue situation	Q ₁	Quota of equity	> 30%	> 20%	> 10%	< 10%	negative
	Q ₂	Duration of debt payment from CF	< 3 years	< 5 y.	< 12 y.	> 12 y.	> 30 y.
Financial stability	Q ₃	Cash flow in % of revenues	> 10 %	> 8 %	> 5 %	< 5 %	negative
	Q ₄	Return on assets	> 15 %	> 12 %	> 8 %	< 8 %	negative

Source: Adapted according to (Kralicek, 1993). Own interpretation.

Today the original variant of the Quick Kralicek test, as well as its modified variant, can be used. Kuběnka states (Kuběnka, 2015) that the key difference in comparison with the original variant consists in the fact that values of partial indexes (Q_1 up to Q_4) are not compared with previously determined particular values for all branches, but are compared to percentiles of branch values.

2. Methodology and results

In order to apply the Q-test on the analysed sample of companies it is necessary to calculate the values Q_1 , Q_2 , Q_3 , Q_4 stated in the Tab. 1. The used methodology of calculation is following:

- a) Quota of equity = equity/ assets
- b) Duration of debt payment from CF = foreign capital/cash flow
- c) Cash flow in % from revenues = cash flow/revenues
- d) Profitability of assets = EAT/total assets
- e) Revenues = Revenues from sold goods + Revenues from products and services
- f) CF = according to (Kislingerová & Hnilica, 2005) The economic results for the accounting period + depreciations + change of provision status.

Q-test uses grades but for the determination of the informative value capability of this model it is necessary to work with intervals. To divide the grading scale $\langle 1;5 \rangle$ in five intervals, the width 0,8 of point (grade) belongs to every interval. Then the intervals of evaluating scale are as follows:

- a) Grade 1 with interval $\langle 1;1,8 \rangle$
- b) Grade 2 with interval $\langle 1,8;2,6 \rangle$
- c) Grade 3 with interval $\langle 2,6;3,4 \rangle$
- d) Grade 4 with interval $\langle 3,4;4,2 \rangle$
- e) Grade 5 with interval $\langle 4,2;5 \rangle$

Q-test was applied on the sample of financial data (for the year 2012) of 1504 companies from the Czech Republic, from the manufacturing industry (from CZ NACE 10 to CZ NACE 33). The data were taken from the database MagnusWeb of the company Bisnode. The resulting values were compared to the financial situation of these companies at the end of the year 2013. The financial situation of company was derived from the achieved ROE level and from the verification of any symptoms of financial distress. The correct diagnostic consists in the situation when the Q-test evaluates the company with the grade 1 in the year 2012 and one year later, in 2013, $ROE > r_e$ (implicit costs of equity) and at the same time the company shows no symptoms of insolvency or negative equity. The correct diagnostic of the grade 2 is in the case when the analysed company achieves $ROE > r_f$ (risk-free rate) in one year and at the same time is shows no symptoms of distress. The correct diagnostic of the grade 3 is when $ROE_{2013} > 0\%$ (prosperity limits) is without bankruptcy symptoms. The correct diagnostic of the grade 4 is when $ROE_{2013} < 0\%$ (without symptoms of distress) and the correct diagnostic of the grade 5 is in the case when the company shows symptoms of distress. According to the Ministry of Industry and Trade (MPO, 2014) r_f 2013 is 2.26% and r_e 2013 is 12.11%. The methodology for comparison of the Q-test with the achieved ROE value in the following year is shown in the Tab. 2.

TAB. 2: Scale for evaluation of Q-test quality

t	Evaluation scale (final grade)				
	1 Very good	2 Good	3 Mid	4 Bad	5 Danger of insolvency
Interval borders					
t+1	Comparison with financial condition (t+1)				
	ROE > r _e	ROE > r _f	ROE +	ROE -	Negative equity or insolvency
ROE ₂₀₁₃	>12.11%	>2.26%	>0%	<0%	Distress symptoms*

*Distress symptom is negative equity, zero sales/no activity, insolvency, etc. Source: author

The ROE value was calculated based on financial statements (in 2013) of all companies and then compared with r_f rate (risk-free rate) and r_e rate (implicit costs of equity). The average value of ROE was 5.98% in analysed sample of companies, ROE_{max} 99.72%, ROE_{min} ROE_{min} -346.71%, median of ROE was 9.74%, σ - standard deviation 47.46, variance of ROE 2254.42. In Tab. 3 are final frequencies of Q-test application and also results of ROE compared with r_f & r_e rates, critical limit 0% and checking symptoms of financial distress.

TAB. 3: Results of Q-test (in 2012) application and financial condition (in 2013)

Q-test ₂₀₁₂ rating	Evaluat. scale	Frequency	Percent	ROE & distress test ₂₀₁₃	Evaluat. scale	Frequency	Percent
Grade 1 <1;1.8)	Very good	439	29.19%	Grade 1. $r_e > 12.11\%$	Very good	646	42.95%
Grade 2 <1.8;2.6)	Good	358	23.80%	Grade 2. $r_f > 2.26\%$	Good	496	32.98%
Grade 3 <2.6;3.4)	Mid	379	25.20%	Grade 3 ROE > 0%	Mid	126	8.38%
Grade 4 <3.4;4.2)	Bad	239	15.89%	Grade 4. ROE < 0%	Bad	222	14.76%
Grade 5 <4.2;5>	Insolven- cy	89	5.92%	Grade 5. Distress	Insolven- cy	14	0.93%
x	x	1504	100%	x	x	1504	100%

Source: author

Comparison of Q-test and ROE classification frequency is stated in Fig. 1. There is possible to observe quite different frequencies.

FIG. 1: Classification frequency

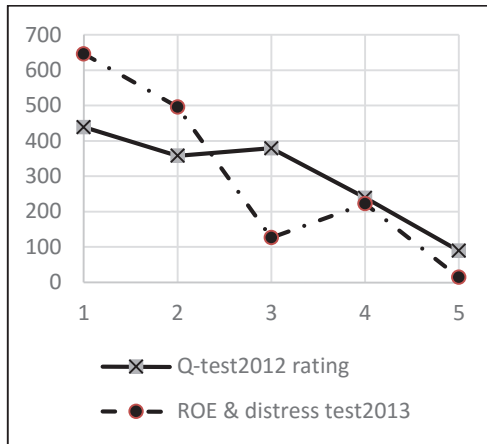
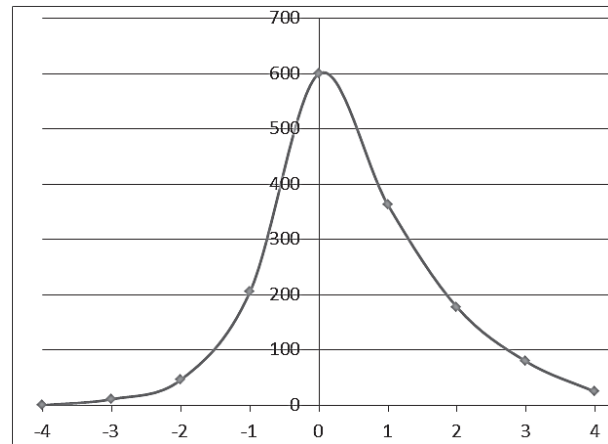


FIG. 2: Q test₂₀₁₂ vs. ROE₂₀₁₃ fault freq.



Source: author

Figure 2 illustrates in graphic form the differences between Q-test grades a ROE & distress test grades. These differences take interval $\langle -4; 4 \rangle$. Zero difference means completely correct diagnosis. Higher difference means lower informative value. It is seen that frequencies are normally distributed. In Fig. 2 and also in Tab. 4 is stated that Q-test grade meets the grade of ROE & distress test absolutely in 39.89%. If we are more benevolent and accept also the variation ± 1 grade (in 5 degrees scale) informative value of Q-test is 77.59%. In this case was stated informative value of Q-test on base of deviation quantification. See more in Tab. 4.

TAB. 4: Informative value of Q-test type A - based on quantification of deviation

Q-test ₂₀₁₂ rating vs. ROE & distress test ₂₀₁₃		Deviation	Frequency	In percent
Fact is:	4 degrees worse	-4	0	0.00%
	3 degrees worse	-3	11	0.73%
	2 degrees worse	-2	46	3.06%
	1 degree worse	-1	205	13.63%
Fact meets prediction		0	600	39.89%
				∑ 77.59%
Fact is:	1 degree better	1	362	24.07%
	2 degrees better	2	177	11.77%
	3 degrees better	3	79	5.25%
	4 degrees better	4	24	1.60%

Source: author

Another way how to quantify the informative value of Q-test is to express number of consistent grades. Tab. 5 shows that Q-test predict prosperity (grade 1 if $ROE > r_e$) in 48.30 % and distress (grade 5) in 71.43%.

TAB. 5: Informative value of Q-test type B - based on no. of correctly predicted grades

Score (grade)	Condition in 2013 (frequency)	Q-test2012 grades (frequency)	Correct evaluation (in percent)
1	646	312	48.30%
2	496	161	32.46%
3	126	43	34.13%
4	222	74	33.33%
5	14	10	71.43%
Total	1504	600	39.89%

Source: author

However, this method is not suitable for comparison with other above mentioned models. This is because most of these models have three degrees (intervals) scale (e. g. Karas & Režnáková, 2014 and Homolka, Doležal & Novák, 2014).

Conclusion

There is no available information nearly for all prosperity models relating the fact how much it is possible to rely on their diagnostic results. Especially, as for the Q-test, it has not been known whether we can ultimately rely on results of its classification (for example at 99%) or, to the contrary, whether it is not reliable (the success rate of diagnostic at 10%). That is why the author aimed to quantify the reliability of this model. For this purpose the own methodology of company financial situation evaluation was created based on the achieved level of ROE and of the current analysis of bankruptcy symptoms of the company. The analysis of 1504 brought interesting results that show that the Q-test has the comparable informative value as some bankruptcy models created using the mathematic-statistical analysis based on empiric data. The informative value of the Q-test was quantified for Czech middle and large companies acting within the manufacturing industry. The question is how would be the diagnostic force of this model in testing of other branches and for example of small companies. This would be the subject of the further research.

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