

Bankruptcy and Financial Standing Models Application for SMEs

David Plandor, Lenka Landryová

Department of Control Systems and Instrumentation

VSB – Technical University Ostrava

Ostrava, Czech Republic

e-mails: david.plandor@vsb.cz, lenka.landryova@vsb.cz

Abstract—This paper describes a system from software application research, development, implementation and testing. The final software tool is a web-based application used as a finance module by SMEs within the FutureSME portal, which supports small and medium companies for better competition on the market. The finance module offers three bankruptcy and financial standing models for evaluation of their financial health. The results are crucial for their ability to get a loan from banks. The self-assessment way of getting results does not require any advisor or bank representative. The described tool was used in practice by partnering companies.

Keywords—*finance module; financial health; bankruptcy model; financial standing model; SME.*

I. INTRODUCTION

Nowadays, every SME (Small and Medium Enterprise) is in a situation when a loan is needed for future development, expansion or research. It is a long process to get the desired amount of money in a company's bank account. A company needs to hire a financial consultant or contact a bank directly. They have to fill out several forms. They have to expose their financial health to many people, which could be sometimes insecure, as when the company is in red numbers and crucial information leaked out to the public could cause a real problem. Why not use tools that are utilized by banks and use them by a company itself? We would like to research all available tools for stating a company's health and focus on creating a tool that would be accessible via the FutureSME portal and every SME will be able to get its financial health status by filling all requested data in a form and the system will process and generate results. Input data should be in the form of a profit & loss report and/or balance sheet. We would like to apply more than one financial model. The overall result will be presenting a well arranged table with simply expressed results colored or highlighted according to the current company's health status.

II. SMES ANALYSIS AND REQUIREMENTS

At the first phase of the FutureSME project, a long analysis was carried out by all FutureSME R&D partners [2, 5]. The academic research focused on emerging technologies and ICT (Information and Communication Technologies) standards and methods suitable to be used for SMEs [2, 5, 17], the industrial partners of the project were surveyed during seminars and panels organized by the project Consortium. The results, also published in several case studies [7], helped us to focus on financial models [1, 14, 16] and to choose those that are frequently used by banks and other financial institutions. Also this helped to determine a customer's solvency [8, 15], then to select the most suitable form and content to deliver our implementation in order to have it accepted by SMEs in their daily practice, and finally, to create an application using tools for web publishing.

III. FINANCIAL MODELS

All development and programming has a very powerful theoretical background in the financial area. We had been searching for usable models related to a company's profitability and bankruptcy, which would correspond to SMEs specifications. Based on the requirements collected during the analytical phase of the project [2, 5], such as keeping the entry data simple, using the same company's data available for shareholders and/or annual reports, being easy to operate by not technically skilled SME staff and similar areas, we selected three models – two models for profitability – Kralicek's quick test [14] and the DuPont analysis [10] and one bankruptcy model – Altman's Z-Score model [1]. Our research confirmed that Kralicek's quick test is robust method utilizing whole potential of balance sheet and profit & loss report. DuPont analysis was chosen as it is a great tool to show the typical employee, who has little or no financial and accounting background, on how their work and efforts impacts the financial results of their company. Altman's Z-Score model is a common simple and accurate calculation used by investors and plays a relatively easy addition to an investment checklist.

There are many evaluation tools using these models Kralicek's Online Quick Test [13], DuPont Financial Analysis - Easy Calculator [4] and Altman Z-Score Spreadsheet [11], but they are separated standalone utilities requesting almost same input data. We need just one comprehensive application on the portal sharing common

input data for all analyses. User interface must be created for various types of SMEs, so the final application is generic and each company works with paragraphs and fields that are relevant for them.

A. Kralicek's quick test

This test was created by Professor Kralicek in 1991. This test uses an annual report (profit & loss report and balance sheet) and calculates ratio indicators and each of them gets a grade from various perspectives – capital strength, indebtedness, profitability and financial position; see Table 1. This test has four partial results and one overall result [14].

Equity Ratio = Total Owner's Equity / Total Assets

Debt Settlement Period from Cash Flow = (Liabilities - Cash) / Cash Flow

Cash Flow = P/L Acc. Period + Assets Depreciation + Reserves and Deferred Income

Operating Cash Flow / Sales = Operating Cash Flow / Net Sales (Revenue) - This ratio, which is expressed as a percentage, compares a company's operating cash flow to its net sales or revenues, which gives investors an idea of the company's ability to turn sales into cash.

ROA (Return on Assets) = Net Income / Total Assets - An indicator of how profitable a company is relative to its total assets. ROA gives an idea as to how efficient management is at using its assets to generate earnings. Calculated by dividing a company's annual earnings by its total assets, ROA is displayed as a percentage. Sometimes this is referred to as "return on investment" [9].

If we get a grade 1 or 2, our company is profitable [14]; otherwise a company is threatened by bankruptcy.

B. DuPont Analysis

DuPont analysis (also known as the DuPont identity, DuPont equation, DuPont model or the DuPont method) is

TABLE 1 – KRALICEK'S QUICK TEST GRADING

Indicators	Grading Scale				
	1 excellent	2 very well	3 well	4 poor	5 dangerous
Equity / Total Assets	> 30 %	> 20 %	> 10 %	> 0 %	negative
Debt Settlement Period from Cash Flow	< 3 years	< 5 years	< 12 years	< 30 years	> 30 years
Financial Stability	arithmetic mean of total assets and Debt Settlement Period from Cash Flow				
Operating Cash Flow / Sales	> 10 %	> 8 %	> 5 %	> 0 %	negative
ROA	> 15 %	> 12 %	> 8 %	> 0 %	negative
Profit Situation	arithmetic mean of Operating Cash Flow and ROA				
Total Grading	arithmetic mean of all four indicators				

an expression which breaks ROE (Return On Equity) into three parts. The name comes from the DuPont Corporation that started using this formula in the 1920s [10].

ROE = (Profit margin) * (Asset turnover) * (Equity multiplier)
 = (Net Profit/Sales) * (Sales/Assets) * (Assets/Equity) = (Net Profit/Equity)

The DuPont identity breaks down Return on Equity (that is the returns that investors receive from the firm) into three distinct elements. This analysis enables the analyst to understand the source of superior (or inferior) return by comparison with companies in similar industries (or between industries). The DuPont identity, however, is less useful for some industries, such as investment banking, that do not use certain concepts or for which the concepts are less meaningful. Variations may be used in certain industries, as long as they also respect the underlying structure of the DuPont identity. The DuPont analysis relies upon the accounting identity, that is, a statement (formula) that is by definition true.

C. Altmans Z-Score model

The Z-Score formula for predicting bankruptcy was published in 1968 by Edward I. Altman, who was at the time an Assistant Professor of Finance at New York University. The formula may be used to predict the probability that a firm will go into bankruptcy within two years. Z-scores are used to predict corporate defaults and an easy-to-calculate control measure for the financial distress status of companies in academic studies. The Z-Score uses multiple corporate income and balance sheet values to measure the financial health of a company. The Z-Score is a linear combination of four or five common business ratios, weighted by coefficients. The coefficients were estimated by identifying a set of firms which had declared bankruptcy and then collecting a matched sample of firms which had survived, matching them by industry and approximate size (assets) [1].

Z-Score definitions:

- X1 = Working Capital / Total Assets
- X2 = Retained Earnings / Total Assets
- X3 = Earnings before Interest and Taxes / Total Assets
- X4 = Market Value of Equity / Total Liabilities
- X5 = Sales / Total Assets

Z-Score bankruptcy model:

Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + .999X5

Zones of Discrimination:

- Z > 2.99 - Safe Zone
- 1.81 < Z < 2.99 - Grey Zone
- Z < 1.81 - Bankruptcy Zone

IV. SOFTWARE IMPLEMENTATION

Our final software tool is called "Finance Module" and is implemented into the FutureSME portal; see Fig. 1.



Figure 1. FutureSME portal

This portal, as the deliverable of the FutureSME project, supports SMEs for their better competitiveness on the market and, once they log in, offers them free tools to be used for improvement of their business and managing the company transformation dependent on the changing business environment they must face.

Our Finance Module offers them to get their financial grades and check their ability to get a loan from a bank without any further consultancy help, just by filling out their Profit & Loss report and Balance Sheet data; see Fig. 2.

All entered data are processed on the server and then the final reports with results from all three financial models applied using common source data are produced. Just a moment after all data are entered results are generated and presented in the form of simple tables; see Fig. 3, 4 and 5. The final software application is in a form of a webpage. It is programmed in PHP and uses java script for client-side scripting and the Microsoft SQL server for data storing. All input data are related to a company and an analysis. A company is defined by its name, description and type (privately or publicly held). Once a company is stored the user is allowed to create a new analysis. Every analysis is related to a business year. Then, data from the profit & loss and balance sheet are required. There is a cash flow form as well but its data are not mandatory for final results generation.

The balance sheet always requests data from the analysis year and two previous years. It is divided into four areas – the director’s loan, fixed assets, current assets and accruals

Select specific analysis or create new one					
SAVEDAT - 36 - 2011					
Balance Sheet P&L Cash Flow Kralicek Altman Du Pont Setup Users Guide					
Balance sheet in full form					
Assets at 2012-07-25 17:07:07 (thous. CZK)					
	Gross	Adjustm.	2011 Net	2010 Net	2009 Net
[.] TOTAL ASSETS	56247.000	-4990.000	51257.000	50975.000	37446.000
A. Directors' loan	0.000	0.000	0.000	0.000	0.000
B. Fixed Assets	9143.000	-4990.000	4153.000	1105.000	1902.000
B.I. Long-term Intangible Assets	441.000	-441.000	0.000	0.000	0.000
1. Formation Costs	0.000	0.000	0.000	0.000	0.000
2. Intangible Research and Development	0.000	0.000	0.000	0.000	0.000
3. Software	441.000	-441.000	0.000	0.000	0.000
4. Accumulated Depreciation	0.000	0.000	0.000	0.000	0.000
5. Goodwill	0.000	0.000	0.000	0.000	0.000
6. Other Long-term Intangible Assets	0.000	0.000	0.000	0.000	0.000
7. Long-term Intangible Assets in Progress	0.000	0.000	0.000	0.000	0.000
8. Deposits on Long-term Intangible Assets	0.000	0.000	0.000	0.000	0.000

Figure 2. Finance module interface with balance sheet tab

Company evaluation - SAVEDAT			
	2011	2010	2009
Equity / Total Assets	3		1
Debt Settlement Period from Cash Flow		4	
Operating Cash Flow / Sales		4	3
ROA	1	4	1
Average	2	3.5	1.75

Figure 3. Kralicek’s model results

Du Pont analysis - SAVEDAT (Privately held)				
Analysis ID = 36				
		2011	2010	2009
Net Income/Sales	NI/S	0.072	0.017	0.069
Sales/Total Assets	S/TA	2.428	2.055	2.548
Total Assets/Equity	TA/E	5.093	3.756	1.000
NI/S * S/TA * TA/E		0.890	0.131	0.176
NI/E = ROE		0.892	0.133	0.178

Figure 4. DuPont Analysis

Indicator	Score	2011		2010		2009				
		Total	%	Total	%	Total	%			
X ₁ EBIT/Total Assets	3.107	0.22	0.08	0.26	0.68	28 %	0.16	6 %	0.81	28 %
X ₂ Sales/Total Assets	0.998	2.43	2.05	2.43	72 %	2.05	78 %	2.54	87 %	
X ₃ Book Value of Equity/Total Liabilities	0.420	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
X ₄ Retained Earnings / Total Assets	0.847	0.18	0.24	0.29	0.15	4 %	0.20	8 %	0.25	7 %
X ₅ Working Capital /Total Assets	0.717	0.16	0.30	0.27	0.11	3 %	0.22	8 %	0.19	5 %
Z SCORE					99 %	2.43	100 %		100 %	

Interpretation of results

Z SCORE > 2,99 "Safe" Zone
 1,81 < Z SCORE < 2,98 "Grey" Zone
 Z SCORE < 1,81 "Bankruptcy" Zone

Figure 5. Altman Z-Score test

and deferred expenditure. The areas have their own areas and subareas. The user is supposed to fill out either subareas or total numbers. While data are being updated, the results are changing in real time, and there is no need of starting a process. The user only needs to choose a particular model and to click that tab to get the results.

Model results are presented by a table with highlighted numbers according to the particular status. Mostly green, amber and red colors are used. The data used in this paper are provided by one of our partnering companies for testing. The company’s name is not published.

V. CONCLUSION

The goal of this research has been reached. A new Finance Module was developed and implemented into the FutureSME portal. The module was tested by partnering companies and external SMEs as well. The final version of the application was accommodated according to their comments. Companies reviewed this tool as very useful and

helpful when a loan is needed or simply when they want to determine their company's health or development from previous years during current situation into the future. The Finance Module is offered to all registered users of the FutureSME portal and its use is free of charge. A user manual is included and is accessible via the program menu.

VI. ACKNOWLEDGMENTS

The authors would like to acknowledge the FutureSME project team who contributed greatly to the data collection and analysis of requirement specifications for this work, as well as the European Commission for funding and supporting CP-IP 214657-2 FutureSME, (Future Industrial Model for SMEs), EU project of the 7FP in the NMP area.

VII. REFERENCES

- [1] E. I. Altman, Predicting Financial Distress of Companies, pp. 15–22. Available from URL <<http://pages.stern.nyu.edu/~ealtman/Zscores.pdf>> [retrieved: August, 2012].
- [2] M. Assarlind and I. Gremyr, Quality Management in Small and Medium Sized Enterprises, Irish Academy of Management 12th Annual Conference, Conference Proceedings, Galway, 2009, pp. 135-138.
- [3] R. A. Brealey and S. C. Myers. 2000. Principles of Corporate Finance. Irwin: McGraw-Hill, 10th edition, 2010, ISBN-13: 978-0077356385.
- [4] K. Bernhardt, Dupont Financial Analysis - Easy Calculator, Available from URL <<http://cdp.wisc.edu/wk1/DuPont%20EasyCalc.xls>> [retrieved: August, 2012].
- [5] U. Bititci and A. Ates, The appropriateness of current intervention policy patterns and delivery mechanisms to address the manufacturing SME needs in Europe. In Configuring manufacturing value chains - Responding to an uncertain world - 14th Cambridge Symposium on International Manufacturing. 11 pp. Contribution. University of Strathclyde. Available from URL <www.ifm.eng.cam.ac.uk/cim/symposium2009/.../20_omit_bititci.pdf> [retrieved: August, 2012].
- [6] E. F. Brigham and M. C. Ehrhardt, Financial Management: Theory and Practice, USA: Thomson South-Western, 2007, ISBN-13: 978-1439078099.
- [7] FutureSME Consortium, Case Studies, Available from URL <<http://www.futuresme.eu/case-studies/futuresme>> [retrieved: August, 2012].
- [8] A. A. Groppelli and E. Nikbakht (2000). Finance, 4th ed. Barron's Educational Series, Inc. pp. 444–445. ISBN 0-7641-1275-9.
- [9] Investopedia, Return of Assets, Available from URL <<http://www.investopedia.com/terms/r/returnonassets.asp#axz z21YKTWO00>> [retrieved: August, 2012].
- [10] InvestorWords.com, Du Pont Analysis Definition, Available from URL <http://www.investorwords.com/6496/Du_Pont_Analysis.html>, [retrieved: August, 2012].
- [11] J. Jun, Free Altman Z - score Spreadsheet, Available from URL <<http://www.oldschoolvalue.com/blog/investment-tools/free-altman-score-spreadsheet/>> [retrieved: August, 2012].
- [12] E. Kislingerová and J. Hnilica, Finanční analýza krok za krokem. I. vyd., Praha: C. H. Beck, 2005, 137 s. ISBN 80-7179 -321-3.
- [13] P. Kralicek, Online Quicktest, Available from URL <<http://www.kralicek.at/index.php?gr=-30>> [retrieved: August, 2012].
- [14] P. Kralicek, Základy finančního hospodaření: Bilance. Účet zisků a ztrát. Cashflow. Finanční plánování. Systémy včasného varování, Prague: Linde, 1993, ISBN 80-85647-11-7.
- [15] B. E. Needles and M. Powers, Financial Accounting, 2007, Boston: Houghton Mifflin Company, ISBN-13: 978-0547193281.
- [16] The Manage Mentor, Finance – DuPont Analysis, Available from URL <<http://www.themanagementor.com/EnlightenmentAreas/finance/CFA/DUPontAnalysis.html>> [retrieved: August, 2012].
- [17] M. Valas, O. Winkler, P. Osadník, and L. Landryová, Graphic Data Display from Manufacturing on Web Pages. In *Transactions of the VŠB- Technical University of Ostrava, Mechanical Series*, No. 2/2009, volume LV, article No. 1705, VŠB-TU Ostrava 2009, pp. 149-154, ISBN 978-80-248-2144-3. ISSN 1210-0471 (Print). ISSN 1804-0993 (Online). ISSN-L 1210-0471.