



Application of Altman Z-score for Viability of Small and Medium Enterprises

Dimitar Popov*

Introduction

The OECD report mentions that¹, as governments around the world continue to grapple with uncertain economic prospects and important social challenges, they are looking to small and medium-sized enterprises (SMEs) and entrepreneurs as an important source of economic growth and social cohesion.² By accepting the Small Business Act for Europe (SBA)³, the European Union (EU) provides a comprehensive framework for SME policies, incentivizes entrepreneurship and adopts the principle “Think Small First” in the development of legislation and policies, in order to improve the competitiveness of SMEs. The National Strategy for Small and Medium-sized Enterprises 2014-2020 aims to boost the competitiveness of small businesses by helping start-ups and viable small and medium-sized enterprises in their efforts to be innovative, environmentally-friendly and export-oriented, creating favorable conditions for their development, improving their access to finance; encouraging entrepreneurship and enhancing entrepreneurial skills; simplifying administrative and regulatory requirements⁴.

From strategical point of view, the business viability is a fundamental goal. To achieve this goal, it is necessary to create a model serving business stakeholders to predict the viability, survival and development of an enterprise.

SME Definitions

Small and medium-sized enterprises play a particularly important role in Bulgaria. According to the SBA Fact Sheet 2017, they represent three quarters of the country's employment and two thirds

of the total added value. In both cases, this is about 9 percentage points above the EU average. Through 2012-2016 the high value added of Bulgarian SMEs contrasts with the comparatively moderate employment growth in SMEs. Employment growth in 2015-2016 is 2.3 percentage points. The European Commission expects to maintain the positive trend in SME value-added growth, with the average annual growth rate exceeding 5% for 2016-2018. The employment outlook for SMEs is also positive, with an overall increase of 2.4% 2016-2018, which corresponds to the creation of some 34 700 new jobs⁵.

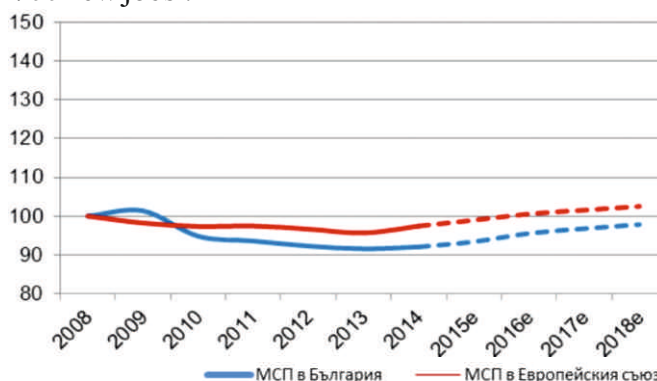


Figure 1. Number of people employed in SMEs (Index: (2008 = 100, estimates from 2015 onwards)).

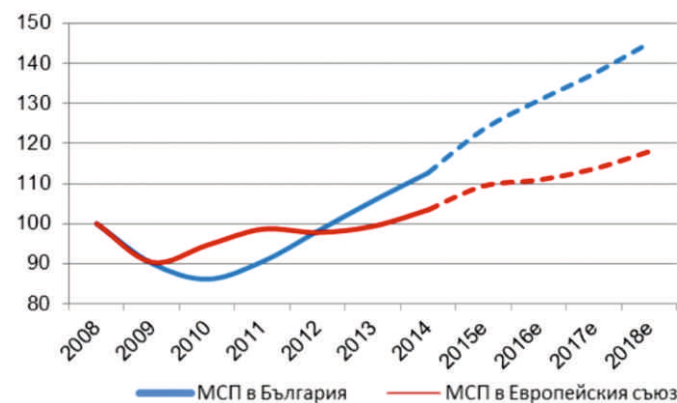


Figure 2. SME added value (Index: (2008 = 100, estimates from 2015 onwards)).⁶

¹ Bulgaria indirectly participates in the OECD activity through the EC representatives – D.P.

² OECD (2016), Financing SMEs and Entrepreneurs 2016: An OECD Scoreboard, OECD Publishing, Paris. http://dx.doi.org/10.1787/fin_sme_ent-2016-en, str.3

³ COMMUNICATION FROM THE COMMISSION “Think Small First”, A “Small Business Act” for Europe, COM(2008)394 final.

⁴ Ministry of Economy, „National Strategy for Small and Medium-sized Enterprises 2014-2020 - Small Business Act“, 2013, str.3

⁵ 2017 SBA Fact Sheet Bulgaria – European commission <https://ec.europa.eu/docsroom/documents/26562/attachments/4/translations/en/renditions/native>

⁶ Ibidem.

* Dimitar Haralampiev Popov, University of National and World Economy



Bolton committee report 1971 on SME's

One of the most frequently discussed and quoted sources in terms of small business definitions is the Bolton report. An attempt has been made to overcome the difficulties of defining small firms by introducing the so-called "economic" definition and "statistical" definition.

The economic definition defines companies as small if they meet three criteria:

1. Have a relatively small share of the market on which they operate;
2. To be managed by the owners or partial

owners personally, without a formal management structure;

3. To be independent, i.e. not to be part of a larger enterprise.

The statistical definition has to address several major issues. First, to quantify the size of the small business sector and its contribution to GDP, employment and innovation. The second objective is to establish how small the small business sector has changed its economic contribution over a given period of time. Thirdly, statistical definitions will allow a comparison between the contribution of small firms to one country over another.⁷

| Дефиниция на комитетът Болтън за малките фирми | |
|--|--|
| Отрасъл | Класификационен признак |
| Машиностроене | 200 заети и по-малко |
| Строителство | 25 заети и по-малко |
| Минно дело | 25 заети и по-малко |
| Търговия на дребно | 50 хиляди лири и по-малко |
| Услуги | 50 хиляди лири и по-малко |
| Търговия на едро | 200 хиляди лири и по-малко |
| Пътнически услуги | Наличие на 5 или по-малко транспортни средства |

Table 1. Source: Bolton Committee Report (1971)

Despite its importance to small business sector, the Committee's report raises some criticisms of the definitions, both statistically and economically.

Storey⁸ points out that if one takes into account the economic definition that small businesses are managed personally by their owners without a formal management structure, this is contrary to the statistical definition of the size of the companies with up to two hundred employees. According to the Bolton report, it is possible to have some intermediate levels of management as supervisors that link the management impact of the manager to his employees and to control their implementation to achieve the organization's goals. According to Atkinson and Meager, real management functions are delegated down to the stage when the firm reaches 10-20 employees. At

that time, owners are no longer the sole source of decision-making, and when an enterprise has more than 100 staff, one notices the delegation of much of the management functions to substantial management teams formed.⁹

Another criticism of the economic definition is the emphasis on the small firm's inability to influence its environment, especially the fact that it cannot make an impact by changing the quantity it produces, the price at which a product or service is offered on the market. According to Storey, Bolton's committee is influenced by the theory of perfect competition. In practice, however, many small businesses occupy "niches". They offer a highly specialized product or service, probably in a geographically isolated area, and are often not perceived as having a clear competition. As a result, in the short and medium term, they can maintain

⁷ Tonge, J., A Review of Small Business Literature Part 1: Defining The Small Business, 2001, str.7

⁸ Storey, D.J., Understanding the small business sector. London: International Thomson Business Press, 1994

⁹ Atkinson, J. and Meager, N., 'Running to stand still: the small business in the labour market'. In Employment, the small firm and the labour market (Ed.) J. Atkinson and D.J. Storey, London: Routledge, 1994



higher profits than industry-specific ones. In the United States, large companies are more profitable than small ones, but in heterogeneous industries, which are more characteristic of niches, this dependence is the opposite.¹⁰

Five key points can be highlighted concerning the critique of Bolton's statistical definition:

▲ There is no single indication of determining the type of companies. Four features have been used, ranging from strictly quantitative (like number of employees) to qualitative (such as ownership structure);

▲ Second, the criticisms are directed at the existence of three different upper limits in terms of turnover for different sectors and two different upper limits for the number of employees. This, at least, makes comparisons difficult between different industries and for individual time periods;

▲ The third critic argument refers to the monetary units used in the definition - this would require price indices (to offset the impact of inflation) in the comparisons performed for different periods. International comparisons are also hampered by the impact of exchange rate fluctuations on individual currencies (a problem somewhat resolved by the introduction of the European single currency in the Eurozone countries – D.P.);

▲ There are problems with using the number of employees as a criterion for distinguishing between small and large companies;

▲ The Bolton Committee treats the small business sector as homogeneous. There are significant differences in the management structures of companies, for example five and twenty employees large¹¹.

Taking into account the above, it is not surprising that the criteria of the European Commission for SMEs are mainly quantitative in nature and give a clear orientation on the legal definition of the concept. This, of course, does not limit the possibilities for research from a scientific point of view and the placement and verification of other hypotheses related to small and medium-sized enterprises.

¹⁰ Bradburd, R.M. and Ross, D.R., Can small firms find and defend strategic niches? A test of the Porter hypothesis, Review of Economics and Statistics. Vol. LXXI, May 1989, No. 2.

¹¹ Fundamentals of Small Business – Center for Entrepreneurial Development 2004

The European Commission definition of SMEs

The European Commission definition of SMEs includes autonomous micro, small and medium-sized enterprises. SMEs are a very heterogeneous segment - ranging from single entrepreneurs to individuals to medium-sized public limited companies listed on the stock exchange. The EU definition is an economic rather than a legal category and covers a wide range of companies:

| SME Definition | | | |
|-----------------------|-----------------|-----------|--------------------------|
| Company category | Staff headcount | Turnover | (or) Balance sheet total |
| Medium | < 250 | ≤ € 50 M. | ≤ € 43 M. |
| Small | < 50 | ≤ € 10 M. | ≤ € 10 M. |
| Micro | < 10 | ≤ € 2 M. | ≤ € 2 M. |

Source: EC, 2014.

Table 2. EC SME Definition, 2014

The European Commission determines the types of enterprises to be taken into account when calculating staff numbers and financial amounts such as:

1. "Autonomous enterprise" means any enterprise which is not classified as a partnership or a linked enterprise ...

2. "Partner enterprises" means all undertakings not classified as linked enterprises ... and between which the following link exists: one enterprise (upstream enterprise) owns, alone or in association with one or more related undertakings, 25% or more of the capital or the voting rights of another undertaking (downstream undertaking).

However, an enterprise may be classified as autonomous, i.e. no partner companies, even if that 25% threshold is reached or exceeded by the following investors, provided that these investors are not related to ... the enterprise concerned:

(a) public investment corporations, venture capital companies, individuals or groups of individuals with a regular venture capital investment activity who invest equity capital in unquoted businesses ("business angels"), provided the total investment of those business angels in the same enterprise is less than EUR 1250000;

(b) universities or non-profit research centres;

(c) institutional investors, including regional



development funds;

(d) autonomous local authorities with an annual budget of less than EUR 10 million and fewer than 5000 inhabitants.

3. "Linked enterprises" are enterprises which have any of the following relationships with each other:

(a) an enterprise has a majority of the shareholders' or members' voting rights in another enterprise;

(b) an enterprise has the right to appoint or remove a majority of the members of the administrative, management or supervisory body of another enterprise;

(c) an enterprise has the right to exercise a dominant influence over another enterprise pursuant to a contract entered into with that enterprise or to a provision in its memorandum or articles of association;

(d) an enterprise, which is a shareholder in or member of another enterprise, controls alone, pursuant to an agreement with other shareholders in or members of that enterprise, a majority of shareholders' or members' voting rights in that enterprise.

There is a presumption that no dominant influence exists if the investors ... are not involving themselves directly or indirectly in the management of the enterprise in question, without prejudice to their rights as stakeholders.

Enterprises having any of the relationships described ... through one or more other enterprises, or any one of the investors mentioned ..., are also considered to be linked.

Enterprises which have one or other of such relationships through a natural person or group of natural persons acting jointly are also considered linked enterprises if they engage in their activity or in part of their activity in the same relevant market or in adjacent markets.

An "adjacent market" is considered to be the market for a product or service situated directly upstream or downstream of the relevant market.

4. Except in the cases ..., an enterprise cannot be considered an SME if 25 % or more of the capital or voting rights are directly or indirectly controlled, jointly or individually, by one or more public bodies.

5. Enterprises may make a declaration of status as an autonomous enterprise, partner enterprise or linked enterprise, including the data

regarding the ceilings set out... . The declaration may be made even if the capital is spread in such a way that it is not possible to determine exactly by whom it is held, in which case the enterprise may declare in good faith that it can legitimately presume that it is not owned as to 25 % or more by one enterprise or jointly by enterprises linked to one another. Such declarations are made without prejudice to the checks and investigations provided for by national or Community rules¹².

Small Business Act

The Small Business Act (SBA) is a comprehensive framework for EU Small and Medium Enterprises (SME) policy. It aims to improve the approach to entrepreneurship in Europe, to simplify the regulatory and political environment for SMEs and to remove the remaining barriers to their development.

Reason for accepting SBA

Managing the transition to a knowledge-based economy is the major challenge facing the EU today. Success will provide a competitive and dynamic economy with more and better jobs and a higher degree of social cohesion. Dynamic entrepreneurs are in a particularly favorable position to take advantage of opportunities arising from globalization and rapid technological change. That is why our ability to boost growth and the innovation potential of small and medium-sized enterprises (SMEs) will be crucial for the future prosperity of the EU. In a globally changing environment characterized by continuous structural changes and increased competitive pressures, SMEs are gaining an increasingly important role in our society by providing employment opportunities and as key figures for the well-being of local and regional communities. Viable SMEs will make Europe more resilient to the uncertainty created in today's globalized.¹³

The EU Better Regulation Strategy is essential for SMEs who will greatly benefit from the modernization and simplification of existing EU legislation and from the ambitious program to reduce the administrative burdens imposed by EU

¹² COMMISSION RECOMMENDATION of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises - (2003/361/EC), article.3

¹³ http://ec.europa.eu/enterprise/enterprise_policy/charter/docs/charter_en.pdf



legislation by 25% by 2012. Despite encouraging progress, the EU still needs to take significant further steps to realize the full potential of SMEs¹⁴.

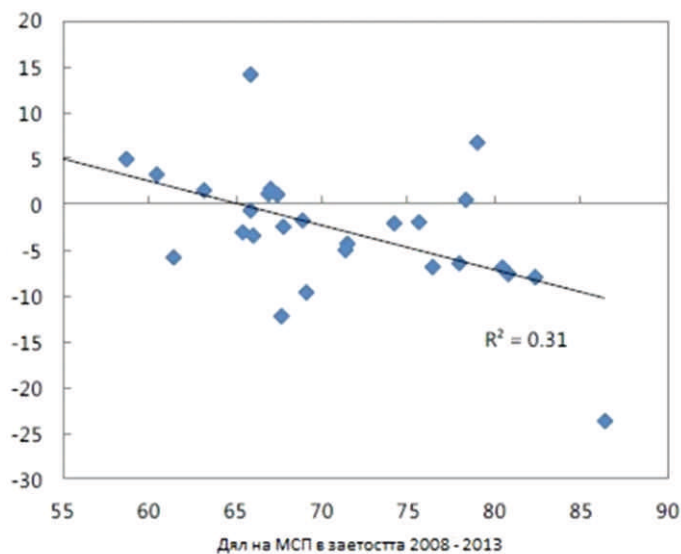


Figure 3. Source: IMF, EC Annual report on European SMEs, 2012/2013.

A key role to play in fostering a favorable environment for SMEs should be to change the perception of entrepreneurship and risk-taking in the EU: Entrepreneurship and the associated readiness to take risks should be welcomed by political leaders and the media and supported by the administrative authorities. Creating favorable conditions for SMEs should become a common policy based on the belief that rules must respect the majority of those who will benefit from them: the “Think Small First” principle.

The SBA builds on the achievements of the policy of the Commission and the Member States, creates a new policy framework covering existing instruments in enterprise policy and is based in particular on the European Charter for Small Enterprises and on Modern SME Policy.

Ten principles of SBA

The symbolic name of an “Act” given to this initiative underlines the political will to recognize the central role of SMEs in the EU economy and to put in place for the first time a comprehensive policy framework for the EU and its Member States through a set of 10 principles to guide the conception and implementation of policies both at

EU and Member State level. These principles outlined in detail in chapter 4 are essential to bring added value at EU level, create a level playing field for SMEs and improve the legal and administrative environment throughout the EU:

I Create an environment in which entrepreneurs and family businesses can thrive and entrepreneurship is rewarded

II Ensure that honest entrepreneurs who have faced bankruptcy quickly get a second chance

III Design rules according to the “Think Small First” principle

IV Make public administrations responsive to SMEs' needs

V Adapt public policy tools to SME needs: facilitate SMEs' participation in public procurement and better use State Aid possibilities for SMEs

VI Facilitate SMEs' access to finance and develop a legal and business environment supportive to timely payments in commercial transactions

VII Help SMEs to benefit more from the opportunities offered by the Single Market

VIII Promote the upgrading of skills in SMEs and all forms of innovation

IX Enable SMEs to turn environmental challenges into opportunities

X Encourage and support SMEs to benefit from the growth of markets¹⁵

SMEs in The Bulgarian SME Act

Small businesses are generally private companies, they have limited financial and human resources and a small amount of sales. Legislation that defines a small business may vary according to the criteria and size used. The main criteria are usually the number of employees, the annual turnover, the value of the assets, the ownership and the interconnection between the enterprises. The Bulgarian Small and Medium Enterprises Act determines the size of the company according to these indicators. The table below shows the criteria:

¹⁴ Impact Assessment - SBA, SEC(2008) 2101

¹⁵ „Think Small First!“, „Small Business Act“, COM(2008) 394 final, 25.6.2008



| Criteria | Micro enterprises | Small enterprises | Medium enterprises |
|---------------------|------------------------|-------------------------|-------------------------|
| Staff headcount | Less than 10 | Less than 50 | Less than 250 |
| Turnover | Less than BGN 3,9 mil. | Less than BGN 19,5 mil. | Less than BGN 97,5 mil. |
| Balance sheet total | Less than BGN 3,9 mil. | Less than BGN 19,5 mil. | Less than BGN 84 mil. |

Autonomous enterprise within the meaning of Bulgarian SME Act ¹⁶

Table 3. Source: Bulgarian Small and Medium Enterprises Act.

Considering that the Bulgarian legislation in many areas is synchronized with the European one, it is not surprising that the above values may seem too large for a small company. Indeed, the above criteria are directly transposed from the European legislation.¹⁷ The criteria set out above are too "comprehensive" for Bulgaria (and probably for other similar countries). i.e. it has the potential to cover almost all companies in the country as small and medium enterprises and leave very few large companies.¹⁸

| Сектори по КИД-2008 | Общо | Групи според броя на заетите лица | | | | |
|---|---------|-----------------------------------|-------|-------|--------|------|
| | | 0-9 | 10-19 | 20-49 | 50-249 | 250+ |
| Добивна промишленост | 357 | 224 | 47 | 38 | 34 | 14 |
| Преработваща промишленост | 31 323 | 23 674 | 2 946 | 2 687 | 1 740 | 276 |
| Производство и разпределение на електрическа и топлинна енергия и на газообразни горива | 1 704 | 1 571 | 57 | 32 | 27 | 17 |
| Доставяне на води; канализационни услуги, управление на отпадъци и възстановяване | 820 | 566 | 67 | 81 | 65 | 41 |
| Строителство | 19 526 | 16 594 | 1 498 | 919 | 480 | 35 |
| Търговия; ремонт на автомобили и мотоциклети | 140 524 | 132 805 | 4 525 | 2 335 | 783 | 76 |
| Транспорт, складиране и пощи | 22 711 | 20 663 | 1 112 | 635 | 253 | 48 |
| Хотелиерство и ресторантьорство | 27 032 | 24 168 | 1 710 | 823 | 308 | 23 |
| Създаване и разпространение на информация и творчески продукти; далекосъобщения | 12 646 | 11 508 | 517 | 376 | 202 | 43 |
| Операции с недвижими имоти | 21 767 | 21 256 | 330 | 146 | .. | .. |
| Професионални дейности и научни изследвания | 43 082 | 41 831 | 810 | .. | 114 | .. |
| Административни и спомагателни дейности | 10 989 | 9 718 | 550 | 423 | 228 | 70 |
| Ремонт на компютърна техника, на лични и домакински вещи | 3 560 | 3 521 | 25 | .. | .. | - |

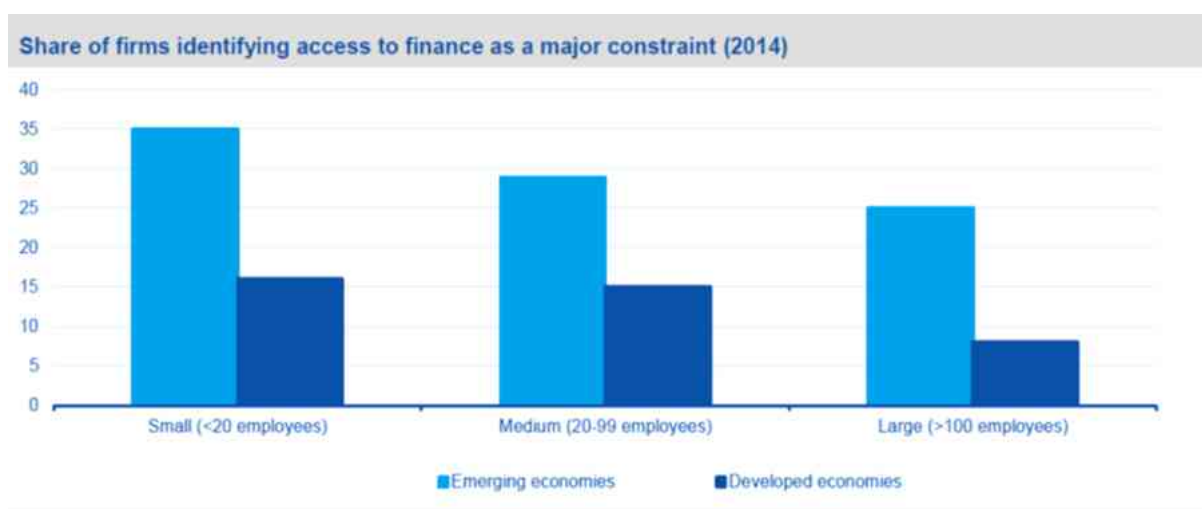
Table 4 Number of enterprises grouped by number of employees.
Source: NSI (2017).

As can be seen from Table 4, according to NSI data from 2017, large enterprises, over 250 people account for only 0.2% of all enterprises in the country, while small and microenterprises account for approximately 98.5% of all enterprises, therefore almost all enterprises operating in the country meet the EU SME definition. This does not, of course, mean that the SME sector, in addition to its number, outperforms large enterprises as well, but is sure to point out that both today and in the future the problems of small and medium-sized businesses in Bulgaria will be relevant.

SMEs under the Basel III agreement

Given the share of SMEs in employment and the gross added value of both developing and developed economies, the creditworthiness of these firms is crucial at a time of economic recovery.

Banks have difficulty measuring the pre-risk of those clients who are at higher risk of going out of business, lack of credit information, and fewer assets that can serve as guarantees.



Source: IMF

Figure 4. Share of enterprises that determine access to finance as a major difficulty (IMF, 2014).

In order to counteract the impact of the Basel III additional regulatory requirements and the granting of loans to SMEs not to be significantly affected, the Loan Regulation (CRR) includes a loan support factor for SMEs. The support factor is defined as 0.7619 and attached to the capital requirements for SME exposures in the bank balance sheet. This figure is estimated as the ratio between the Basel II requirement (8%) and the last Basel III agreement (10.5%). Exposures to SMEs that meet the eligibility criteria are allowed to multiply their risk-weighted assets by the support factor and thus effectively reduce their capital requirements. Equally different, this support factor reduces the

relative cost of capital for SME exposures and therefore gives banks an incentive to continue lending to them. According to the European Banking Federation (EBF)¹⁹ the SME support factor allows capital requirements for SMEs to remain at the same level as Basel II and therefore not be negatively affected by the additional capital requirements set out in Basel III.²⁰

In May 2016, the EBF published a report attempting to analyze the impact of the support factor. It concludes that there is no evidence that the SME support factor provides additional incentives for lending to SMEs compared to large enterprises. Despite the positive growth, SME lending remains below pre-crisis levels and access to finance is a bigger problem for SMEs than for larger enterprises. The EBF also recognizes that it may be

¹⁶ According to BSME, an independent enterprise is an enterprise in which no more than 25% of the capital or of the votes in the general meeting are controlled by another enterprise except for the specific cases mentioned.

¹⁷ The new SME definition User guide and model declaration – European Commission 2005

¹⁸ Tonge, J., A Review of Small Business Literature Part 1: Defining The Small Business, 2001

¹⁹ EBF, “EBF Draft Response to the EBA Discussion Paper on the SME Supporting Factor, 1 October 2015

²⁰ Izquierdo, J., F., Muñoz, S., Rubio, A., Ulloa, C., “Impact of capital regulation on SMEs credit”, BBVA Research Working Paper, 01/2017, str.5-6



too early to fully capture the impact of the support factor as the evidence provided by the industry shows that implementation can take longer to be integrated into the process of making decisions by banks.²¹

Reforms in corporate law exclude micro-enterprises, i.e. enterprises with fewer than 10 employees and an annual turnover not exceeding € 2m. (EU Recommendation 2003/361).²² In addition, micro-enterprises have a high level of individuality and rely above all on quality indicators and the personal capabilities and skills of their creator / owner. Therefore, they can hardly be subject to viability prediction modeling.

Viability of SMEs According to the Systems

Based on systems theory, Poltner and Grecheneg develop a model for the viability of SMEs. They build on Beer's Viable Systems Model (VSM) and develop a framework for SME integration into a virtual organization to cope with competition from large businesses and maintain growth and sustainable profit. Generally, the systems consist of a node and a link. A node may have subsystems that are systems in their own right. Organizations are social systems. The sum of all social systems is society, which is a special kind of social system without systems beyond its borders. Within this social system, organizations are social systems that control access to work.

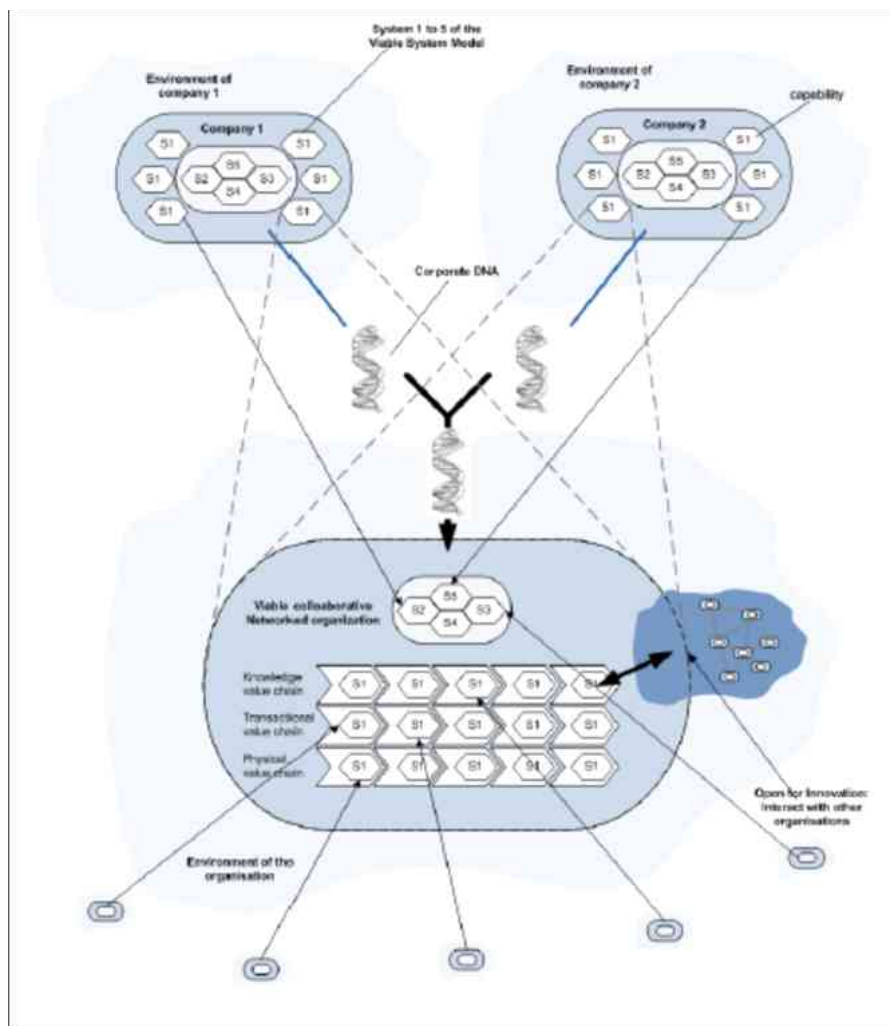


Figure 5. Viable network for organizational cooperation.²³

²¹ EBA, "Report on SMEs and SME supporting factor", 23 March 2016

²¹ Altman, Edward I, Esentato, M., Sabato, G., "Assessing the Credit Worthiness of Italian SMEs and Mini-bond Issuers", WiserFunding Ltd, 2017, str.2-3

²³ Pöltner, P., Grechenig, T., „Fundamentals for an IT-Strategy towards managing viable knowledge-intensive research projects“, Managing Knowledge for Global and Collaborative Innovations, World Scientific Publishing Co. Pte. Ltd., 2010.



Membership in such a system implies the adoption of the rules and guidelines of the system. Variety in the social system refers to the complexity of the system, which encompasses its connectivity and dynamics. According to Ashby, "only the variety in R can restrict variety in D"; "Only the variety (in the regulator) can destroy the variety (in the regulated system)"²⁴. Or, a modeling system or control device can model or manage something only to the extent that it has enough internal variety to represent it²⁵. Variety management is therefore a major task of the social system control mechanism.

In order to accomplish this task, the control mechanism should use a model to assess environmental data and reduce or increase the complexity of the organization. Because the model determines how external factors affect the viability of an organization, the management process cannot be better than the model on which it is based. The management system itself is divided into three parts: the operational level that ensures efficiency (performance and quality), the strategic level that ensures efficiency and regulatory level that ensures that all stakeholder requirements are met.²⁶ Viable organizations recursively fulfill all these management requirements at each level, which means they are also self-organized at each level.²⁷

An enterprise is viable when under normal service conditions it provides a sufficient inflow of resources to ensure its operational costs, strategic outflows and projected risks to the strategic plans and the expectations of stakeholders in the short and medium term. Small and medium enterprises are a special case of organizations.

Interpretation of a viability model (Altman Z-score)

The model developed in 1967 by Professor Edward Altman of the University of New York, which attempts to predict the chances of a public company to remain viable within a two-year period.

The value obtained from the model is referred to as the Z-score of the company, which is a reasonably accurate predictor of future bankruptcy. The model is based on multiple discriminant analysis as a statistical technique for classifying a population.

A score of less than 1.8 means that the company is probably in danger of bankruptcy, and companies with results above 3 will probably stay viable. Investors can use Altman Z-scores when deciding to buy or sell a certain share if they are worried about the financial security of a company. Investors may consider buying shares if their value at Altman Z-Score is closer to 3, or selling or borrowing a short position if the value is closer to 1.8.

Breakdown of Altman's original model

The model formula is as follows:

$$\mathbf{Z\text{-}Score = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E}$$

Where:

Z=Score

A=(Working Capital)/(Total Assets)

B = (Retained Earnings)/(Total Assets)

C = (Earnings Before Interest & Tax)/(Total Assets)

D = (Market Value of Equity)/(Total Liabilities)

E = (Sales)/(Total Assets)

Altman's model returns a z-score to present the likelihood that the company will go bankrupt in the next two years. The lower the value of Z, the more likely the company is going bankrupt. Z-score less than 1.8 indicates that the company is likely to go bankrupt, while estimates above 3.0 indicate that there is unlikely to be an insolvency event in the next two years. Companies with a score of between 1.8 and 3.0 are in the gray area, so bankruptcy cannot be easily predicted.

The Z-score is a linear combination of four or five common business ratios, weighted by coefficients. The coefficients are assessed by identifying an aggregate of companies declared bankrupt and then collecting a cohesive sample of surviving firms with industry coincidence and approximate asset size. The initial data sample consisted of 66 companies, half of which filed for bankruptcy under Chapter 7. All enterprises in the

²⁴ Ashby, R., W, "Introduction to Cybernetics", 1956, str. 207

²⁵ Ashby, R., LAW OF REQUISITE VARIETY, Web Dictionary of Cybernetics and Systems.

²⁶ Pöltner, P., Grechenig, T., A joint infrastructure of "digital corporate organisms" as facilitator for a virtual digital retail ecosystem, International Conference on Digital Ecosystems and Technologies, 2010, str.328

²⁷ Schwaninger, M., „Intelligent Organizations. Concepts for turbulent times based on systems theory and cybernetics. Scientific Annual Meeting of ... and System Analysis; WS 19), Duncker & Humblot GmbH, 1999.



database were manufacturing companies and small firms with assets under \$ 1 million were eliminated.²⁸ The result was originally based on data from publicly traded manufacturing companies but has since been revalued on the basis of other data on private enterprises and enterprises in other economic sectors.

Z- score for private enterprises:

$$Z' = 0.717X1 + 0.847X2 + 3.107X3 + 0.420X4 + 0.998X5$$

Areas of distribution:

$Z' > 2.9$ – Safe zone

$1.23 < Z' < 2.9$ – Grey zone

$Z' < 1.23$ – Danger zone²⁹

Revised Altman Z'

To meet the need for exploring businesses with other characteristics, Altman has developed several revised models. Altman Z' serves as a valuation of private manufacturing companies. Altman Z'' is designed to evaluate non-production

companies with the removal of the sales / total assets ratio, while the EMS model is designed to assess emerging markets.

Altman Z'

In its model for private manufacturing companies, Altman concludes that the coefficients in the model must be recalculated, and in X4 the accounting values of the equity must be replaced by the market value. The results of the new revised Z-Score with a new X4 variable are:

$$Z' = 0.717(X1) + 0.847(X2) + 3.107(X3) + 0.420(X4) + 0.998(X5)$$

Altman concludes that in the revised model, Type I accuracy is slightly less accurate than the model that uses the market value of the assets (91% vs. 94%), and the Type II accuracy is 97% identical to the original model.³⁰

Revised Z'-Score Model: Classification Results, Group Means, and Cutoff Boundaries

| Actual | Classified | | |
|-------------|---------------|---------------|-------|
| | Bankrupt | Nonbankrupt | Total |
| Bankrupt | 30 (90.9%) | 3 (9.1%) | 33 |
| Nonbankrupt | 1 (3.0%) | 32 (97.0%) | 33 |

Note: Bankrupt group mean = 0.15; nonbankrupt group mean = 4.14.

$Z' < 1.21$ = Zone I (no errors in bankruptcy classification):

$Z' > 2.90$ = Zone II (no errors in nonbankruptcy classification):

gray area = 1.23 to 2.90.

Table 5. Revised Z'-score Revised Z'-Score Model: Classification Results, Group Means, and Cutoff Boundaries.³¹

²⁸ Altman, E., Journal of Banking & Finance, PREDICTING FINANCIAL DISTRESS OF COMPANIES: REVISITING THE Z-SCORE AND ZETA® MODELS, 2000, str. 6

²⁹ Ibidem.

³⁰ Altman, E., Journal of Banking & Finance, PREDICTING FINANCIAL DISTRESS OF COMPANIES: REVISITING THE Z-SCORE AND ZETA® MODELS, 2000, str. 25

³¹ Ibidem, Table 1



The gray area is wider since the lower limit is now 1.23 as opposed to 1.81 for the original Altman model. The revised model is somewhat less reliable than the original, but only to a lesser extent. Due to the lack of a database for private companies, this model is not subjected to a secondary sample of troubled and non-troubled companies.³²

Altman (Z ") – adaptation for non-manufacturing enterprises

The non-manufacturing model eliminates one of the variables that is most sensitive to the sector-specific exchange of assets. The model remains without X1 - sales / total assets. Altman uses this model to assess the financial health of companies outside the United States.³³

With the changes made a model with four variables emerges:

$$Z'' = 6.56 (X1) + 3.26 (X2) + 6.72 (X3) + 1.05 (X4)$$

All the coefficients for the variables as well as the groups with the final results are changed. This particular model is useful, within an industry where asset financing differs significantly among firms, and important adjustments, such as lease capitalization, have not been made. In the emerging market model, +3.25 is added so as to standardize the rating with zero (0) equal to the D rating score.³⁴

Emerging Markets Model and Process (EMS)

In a 1995 paper, Altman presents a model for assessing emerging markets. Emerging markets can initially be analyzed in a way similar to that used for the traditional analysis of US corporations. Once the quantitative risk assessment has been established, the analyst can use qualitative assessment to use it for such factors as currency and industrial risk, industry characteristics and competitive position in the industry. Due to the lack of credit experience in a developing market economy, it is sometimes not possible to build a model specific to it on the basis of

a sample from that country. To deal with this problem, Altman and colleagues have altered Altman's original model to create an emerging markets model (EMS).³⁵

The ZETA Credit Risk Model

In 1977, Altman, Haldeman and Narayanan (1977) built a second-generation model with several improvements to the original Altman model. The purpose of this study was to build, analyze and test a new bankruptcy classification model that explicitly addresses the latest trends in corporate bankruptcy. Altman says the new study includes improvements in the use of discriminant statistical techniques. He points to several reasons for building a new model, despite the presence of previous rather impressive models, such as empirical results seem to support his claims. The new model, simply called ZETA, is capable of classifying the viable companies up to five years before the failure and uses a sample of companies in manufacturing and retailing.³⁶

Reasons for creating a new model

Altman points to five legitimate reasons why the viability classification model should be revised and improved. They include:

Changing the size and financial profile of business bankruptcies. Due to the dramatic increase in the average size of bankrupt companies, the impact and concern of financial institutions, regulatory agencies and society as a whole is dramatically increasing. With the exception of Altman's original 1973 model for railways and commercial bank surveys, most of the previous surveys use relatively small corporations in their samples. Each new model should be as appropriate as possible for the population, which it will ultimately apply to.

Altman shows that the new model should be up-to-date with regard to the temporal nature of the data.

Previous models focus on a wide range of manufacturing enterprises or on specific industries.

³² Ibidem, str. 26

³³ Altman, E., NYU Stern School of Business, An emerging market credit scoring system for corporate bonds, 2005

³⁴ Altman, E., Journal of Banking & Finance, PREDICTING FINANCIAL DISTRESS OF COMPANIES: REVISITING THE Z-SCORE AND ZETA® MODELS, 2000, str. 27

³⁵ Altman, E., J. Hartzell, and M. Peck, "Emerging Markets Corporate Bonds: A Scoring System," Salomon Brothers Inc, New York, 1995

³⁶ Altman, Haldeman and Narayanan, Journal of Banking & Finance, North-Holland Publishing Company, "A new model to identify bankruptcy risk of corporations", 1997



Altman believes that with appropriate analytical adjustments, particularly retail vulnerable banks, could be analyzed on an equal footing with manufacturers.

An important feature of this type of study is that data of the financial statements need to be carefully analyzed to incorporate the latest changes in financial accounting standards and accepted good accounting practices. The purpose of these modifications is to make the model not only related to previous failures but also to data that will occur in the future.

To test and evaluate some of the latest achievements and still controversial aspects of discriminant analysis.³⁷

Conclusion

According to the working definition that we will adopt, small and medium enterprises are enterprises with a total number of employees on an annual basis of not less than 10 and not more than 249. With an annual turnover not exceeding BGN 97.5 million. Asset Balance of less than BGN 84 million and the enterprise should be an autonomous enterprise within the meaning of Bulgarian SME Act.³⁸

Micro-enterprises have a high level of individuality and rely above all on quality indicators and the personal abilities and competence of their creator / owner. Therefore, they remain outside the scope of the surveyed SMEs.

Based on the remarks made, it is recommended that the Altman model should not be seen as a universal tool for assessing the viability of enterprises, but to take into account the specific characteristics of individual economic areas (or countries). This is due to the different economic environment. Account must be taken of the differences in local accounting legislation, albeit to a certain extent in line with the European one, the average size of firms surveyed, and the conditions under which they are in difficulty and insolvency.

From a methodological point of view, it is important to take into account the time interval of the data, and preferably more up-to-date data for model building is possible. In addition, companies

from structurally diverse industries could hardly be valued by the same model. Therefore, when developing an SME Assessment Model, it is necessary to identify which sectors can be involved in building the model and which, due to their specificities, will remain outside the scope of the research.

Bibliography

Altman, Edward I, Esentato, M., Sabato, G., "Assessing the Credit Worthiness of Italian SMEs and Mini-bond Issuers", WiserFunding Ltd, 2017

Altman, E., NYU Stern School of Business, "An emerging market credit scoring system for corporate bonds", 2005

Altman, E., Journal of Banking & Finance, "PREDICTING FINANCIAL DISTRESS OF COMPANIES: REVISITING THE Z-SCORE AND ZETA®MODELS", 2000

Altman, Haldeman and Narayanan, Journal of Banking & Finance, North-Holland Publishing Company, "A new model to identify bankruptcy risk of corporations", 1997

Altman, E., J. Hartzell, and M. Peck, Salomon Brothers Inc, New York, "Emerging Markets Corporate Bonds: A Scoring System", 1995

Ashby, R., W, "Introduction to Cybernetics", 1956

Ashby, R., LAW OF REQUISITE VARIETY, Web Dictionary of Cybernetics and Systems.

Atkinson, J. and Meager, N., 'Running to stand still: the small business in the labour market'. In Employment, the small firm and the labour market (Ed.) J. Atkinson and D.J. Storey, London: Routledge, 1994

Bradburd, R.M. and Ross, D.R., Can small firms find and defend strategic niches? A test of the Porter hypothesis, Review of Economics and Statistics, Vol. LXXI, May 1989, No. 2.

Izquierdo, J., F., Muñoz, S., Rubio, A., Ulloa, C., "Impact of capital regulation on SMEs credit", BBVA Research Working Paper, 01/2017

Pöltner, P., Grechenig, T., „Fundamentals for an IT-Strategy towards managing viable knowledge-intensive research projects“, Managing Knowledge for Global and Collaborative Innovations, World Scientific Publishing Co. Pte. Ltd., 2010.

Schwaninger, M., „Intelligent Organizations. Concepts for turbulent times based on systems

³⁷ Altman, E., Journal of Banking & Finance, PREDICTING FINANCIAL DISTRESS OF COMPANIES: REVISITING THE Z-SCORE AND ZETA®MODELS, 2000, str.32

³⁸ EUR 1=BGN 1,95583



theory and cybernetics. Scientific Annual Meeting of ... and System Analysis; WS 19), Duncker & Humblot GmbH, 1999.

Storey, D.J., Understanding the small business sector. London: International Thomson Business Press, 1994.

Tonge, J., A Review of Small Business Literature Part 1: Defining The Small Business, 2001.

Fundamentals of Small Business – Center for Entrepreneurial Development, 2004

Ministry of Economy, „National Strategy for Small and Medium-sized Enterprises 2014-2020 - Small Business Act“, 2013

EBA (2016) “Report on SMEs and SME supporting factor” 23 March

EBF (2015) “EBF Draft Response to the EBA Discussion Paper on the SME Supporting Factor, 1 October.

COMMISSION RECOMMENDATION of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises - (2003/361/EC), чл.3

COMMUNICATION FROM THE COMMISSION “Think Small First”, A “Small Business Act” for Europe, COM(2008)394 final, 25.6.2008

Impact Assessment - SBA, SEC (2008) 2101.

2017 SBA Fact Sheet Bulgaria – European commission <https://ec.europa.eu/docsroom/documents/26562/attachments/4/translations/en/conditions/native>

The new SME definition User guide and model declaration – European Commission 2005

http://ec.europa.eu/enterprise/enterprise_policy/charter/docs/charter_en.pdf

OECD (2016), Financing SMEs and Entrepreneurs 2016: An OECD Scoreboard, OECD Publishing, Paris. http://dx.doi.org/10.1787/fin_sme_ent-2016-en