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The Economics of Beer Processing

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1. Introduction

The brewing sector in the Czech Republic belongs to the most important agrarian business in the Czech Republic. Besides its long tradition (the first record of beer brewing in the Czech territory dates back to the year 993 and actually beer consumption per capita (158 litres per year) is the highest in Europe) it generates according to study of Ernst and Young (Leenen, 2010) nearly 7400 jobs directly in breweries and almost 12 300 jobs in the supplying sectors. Although this represents only minor part of all jobs in the Czech Republic, the industry represents an important factor in the local economic development, providing employment for relatively less skilled labour in the regions. Moreover in the hospitality sector approximately 32000 jobs can be attributed to the brewing sector while in retail around 2800 employees have jobs related to beer sales. These numbers also represent pretty benefits for the state budget from this sector. According to the Ernst and Young calculations (Leenen, 2010) the government revenues due to the production and sale of beer exceed actually to 676 million Euros, which create approximately 1,7 % of the state budget in 2010.

The number of industry breweries descends continuously from 72 industrial breweries in 1989 to 48 subjects in the Czech Republic in 2011. Contrariwise, the number of micro breweries concern 95 in the beginning of 2011 (Altova, 2011). This is the result of the progress from just one microbrewery to present number over the last 22 years. Despite the micro-brewing segment covers only approximately 0,5 % of total beer production in the Czech Republic, the growth of this segment is enormous. In 2006 the Czech Beer and Malt Association registered about 60 of them and it expects the number of these will exceed 100 in the end of 2011. Growth rate of this segment as well as the local character of this production is encouraging interest among researches and developing of economic analysis model for this segment is also a consequence of it.

2. Survey design

The survey involves the following structured sequence of steps. At the first stage brief overview of brewery industry is made. The method used is observation and description. At the second stage the research question is stated and null and alternative hypotheses are formulated. The method used is deduction. In addition the data sample and method of data collection is stated. At the third stage the theoretical framework is observed as the result of extensive theoretical literature review covering the state of the art of the business performance measurement system. Methods used are description, analysis and synthesis. At

the fourth stage the particular steps in research methodology are designed. The method used is analysis and synthesis. At the fifth stage the research findings are explored. The descriptive statistic method is used. The sixth stage involves hypothesis testing and the answering the research question. The ANOVA method is used. At the seventh stage the theoretical model is designed. The synthesis and description method are used. In fine, the discussion and tasks for future research are articulated using deduction.

2.1 Research question articulation

The primary objective of entrepreneurship is the growth of stockholder value in general. Value based management disposes of tools for value enhancement. The main task is the quantity and selection of suitable variable as a proxy for value growth. The research question concerning identification of the most considerable factors of Economic Value Added and the value drivers of particular segment of breweries in the Czech Republic. The research problem is the formulation of theoretical multifactor model for explanation the particular factors based on research findings. For the response on stated research question we articulate null hypothesis H_0 and alternative hypothesis H_1 for existence difference explanation.

H_0 : There is no significant difference of factors in Economic Value Added decomposition.

H_1 : There is distinguishable impact of factors in Economic Value Added decomposition.

If the particular factors impact the business performance balanced, the subsequent theoretical model will cover the same set of variables for each factor. If the particular factors impact the business performance differently, the subsequent theoretical model for explanation requires appropriate set of variables for each factor.

2.2 Data collection

Data surveyed on target population are from secondary likewise primary resources. Method used for data collection and data processing is Stratified Random Sampling. It is assumed that this data is gathered in an unbiased manner. For some forms of analysis that use inferential statistical tests the data must be collected randomly, data observations should be independent of each other and the variables should be normally distributed. Secondary statistical and economic data are assembled from annual censuses of state agencies – Ministry of Agriculture of the Czech Republic, Ministry of Industry and Trade of the Czech Republic, Czech Statistical Office, Institute of Brewing and Malting. In term of legal form target population includes legal person as well self-employed persons. Flow indicators cover the whole structure of breweries according to the number of employees. A nationwide observation is carried out for enterprises with more than 50 employees. A selective survey is carried out for enterprises with 20 – 49 employees, and enterprises with less than 19 employees are calculated. Primary sampling frame comes from Creditinfo – Albertina database and Trade Register of the Czech Republic. Sample of analysed breweries is chosed according to market concentration analysis. Supplemental economic and market information were observed from particular WebPages of sample population of breweries. The target population of an analyzed subjects is geographically limited NUTS0, NUTS1 the Czech Republic. Analyzed data for Economic Value Added decomposition concerning period since 2000 till 2009.

3. Theoretical framework

Shift from the financial perspective to the non-financial one within the performance management invoked genesis of different performance measurement systems. According to Neely (Neely, 2002) a Performance Management System (PMS) is a balanced and dynamic system that is able to support the decision-making process by gathering, elaborating and analysing information. The concept of PMS was developed in response criticisms that traditional performance models are focused on financial measures, are historically oriented and do not cover all of the business areas. According to many scholars a well designed PMS should by using different kinds of measures represent whole organization. The balance approach offers by tying together various measures a holistic organizational view.

Interest on performance measurement management has started to increase in the 80s of the last century. Since then numerous of PMS models were developed and consequently theoretical (and very little empirical) research on PMSs has been carried out. The literature surveys tried to sort the particular models according to different criteria, such as attitude to firm's strategy, focus on stakeholders, balance, dynamic adaptability, process orientation, causal relationships or simplicity (Garago et al., 2005). According Toni & Tonchia (Toni & Tonchia, 2001) the main models of PMSs can be referred to following typologies: hierarchical/vertical (cost and non-cost performance measures on different levels of aggregation), balanced scorecard/tableaux de board (several separate performances are considered independently), internal and external performances.

As our research focuses on performance management in small and medium-sized enterprises only those reviews concerning SME were taken into account. Garago et al. (Garago et al., 2005) focused their review on eight PMS models developed after the mid-1980s. The models considered were six of the most popular generic models and two PMS models designed specifically for SMEs. They focused on following models. Performance Measurement Matrix (Keegan et al., 1989): According to Garago et al. (Garago et al., 2005) and Neely et al. (Neely et al., 2000) this model uses the matrix combining the non-cost and cost perspective with external and internal perspective. The model is balanced and simple, for which it is sometimes criticized. Performance Pyramid System (Lynch & Cross; 1991) is designed as a pyramid with several levels linking the firm's strategy, business units and operations. Results and Determinants Framework (Fitzgerald et al., 1991): This model focuses on searching the relationship between the entrepreneur's results expressed in terms of competitiveness or financial performance and determinants of these results such as quality, innovations and flexibility. Balanced Scorecard (Kaplan & Norton, 1996): 4-box approach to performance measurement. In addition to financial measures, managers are encouraged to look at measures drawn from three other perspectives of the business: learning and growth, internal business processes and customer. The model is balanced and belongs to the most popular models both in the literature and in practice. Integrated Performance Measurement System (Bititci et al., 1997), who defined it as the information system by which the company manages its performance in line with its corporate and functional strategies and objectives, it is based on four levels. According to Hudson et al. (2001) this model fails to provide a structured process that specifies objectives and timescales for development and implementation. Performance Prism (Neely et al. 2000): According to Garago et al. (Garago et al., 2005) this model is three-dimensional, in correspondence with its name a prism graphically represents the architecture of the model.

Organizational Performance Measurement (Chennell et al., 2000), which was designed exclusively for SMEs. Is based on three principles (alignment, process thinking, and practicability) and is balanced. Integrated Performance Measurement for Small Firms (Laitinen, 2002). Within the model the internal dimension monitoring production process and the external dimension monitoring the competitive position are causally likened.

Hudson et al. (Hudson et al., 2001) evaluated ten PMSs. In contrast to Garengo et al. (Garengo et al., 2005) they included 4 different PM approaches. In addition to Garengo's selection following models were considered: Integrated Dynamic PMS (Ghalayini et al., 1997) which focuses on ensuring fast and accurate feedback. Integrated PM framework (Medori & Steeple, 2000) which is criticized for being complicated to understand and use. Integrated Measurement Model (Oliver & Palmer, 1998) defines the dimensions of performance and offers a mechanism for designing the measures. And finally Consistent PM Systems (Flapper et al., 1996) which is being criticized for weak balanced approach for critical dimensions of performance.

The common conclusions of the latest reviews show that there is a difference between models for big companies and models for SMEs. According to Garengo et al. (Garengo et al., 2005) most of the SMEs models are characterized by increasing strategy alignment, while continuing to focus on the most critical aspect for SMEs, i.e. operational aspects. Further all models are balanced, which is particularly important and which makes these models different from the traditional financially oriented ones. Finally clarity and simplicity characterize the most recent models.

3.1 The basis of performance system in Czech conditions

For centuries, economists have reasoned that for a firm to create wealth it must earn more than its cost of debt and equity capital - this principle is in the microeconomic terminology titled 'creating the economic profit'. A good financial performance measure should ask how well the firm has generated operating profits, given the amount of capital invested to produce these profits. In recent years the Stern Stewart & Company has operationalized this concept under the label Economic Value Added. EVA is defined as a spread between the return on capital invested and the cost of capital invested. It describes the ability of the firm to create the economic profit. Contrary to the traditional performance metrics, EVA manages to reflect real costs of the firm because it takes note of the equity costs as well as the other costs of the firm. The EVA metric is based on a simple and straightforward notion, as described in the following equation:

$$EVA = NOPAT - Capital \cdot WACC \quad (1)$$

Where *NOPAT* is Net Operating Profit After Taxes, *Capital* is Capital Employed to generate Operating Profit, and *WACC* is Weighted Average Cost of Capital.

The components of EVA are not directly obtainable from the financial statements, as EVA concept works with items referring entirely to operating activity. The EVA authors define operating activity as those operations that serve the basic entrepreneurial purpose. It is therefore necessary to convert the accounting data; under the Czech accounting rules, the "operating profit" and the corresponding capital include activities that are not directly aimed at fulfilling the basic entrepreneurial purpose - such as the investing of temporary

free operating financial asset into the securities or creating constructions in progress (neither contributes to current operating activities). On the other hand, other activities necessary for meeting the basic entrepreneurial purpose of the firm are not covered under the operating profit and capital. The most important ones include financial and operative leasing, as well as capitalization and amortization of certain marketing costs, research and development costs, unrecorded goodwill, etc.

Similar to many accounting innovations, the concept of EVA promises better performance measurements, incentive schemes and equity valuation. The concept behind EVA is quite simple – maximize the spread between the return on capital used to generate profits and the costs of using that capital. Through its adoption, corporate executives hope that EVA will lead to increased efficiency in the allocation of all assets and hence increased shareholder wealth. In fact, Stern Stewart & Company has advocated that EVA can be used instead of earnings or cash from operations as a measure of performance. They claim that: “Eva is almost 50 % better than its closest accounting-based competitor in explaining changes in shareholder wealth” (Stewart, 1994), or “Forget EPS, ROE and ROI. Eva is what drives stock prices” (Stewart, 1995).

Though from the theoretical point of view EVA is seen as a superior performance metric, the results of some empirical studies do not support this claim. Numerous researchers have looked into the effectiveness of EVA using the independent empirical evidences (for instance: Biddle, Bowen, Wallace (Biddle, Bowen, Wallace; 1997); Turvey, Lake, Duren, Sparling (Turvey, Lake, Duren, Sparling; 2000); Feltham, Issac, Mbagwu, Vaidyanathan (Feltham, Issac, Mbagwu, Vaidyanathan; 2004); Bacidore, Boquist, Milbourn, Thakor (Bacidore, Boquist, Milbourn, Thakor; 1997); Berenstein (Berenstein, 1998); Kramer, Pushner (Kramer, Pushner, 1997) and did not indicate the superiority of EVA among other financial measures. Nevertheless, among both the Czech academic researches and practical financial analysts the usage of EVA is still limited because of the low empirical evidence of the behaviour of EVA within the Czech economy. A critical point of this research in the conditions of Czech economy is a lack of data about publicly trading companies, which at the same time, serve as an exogenous criterion for assessing the quality of the examined measure in the mentioned studies.

One of the most often claimed characteristics of EVA is its capability to inform owners about the creation of shareholder value, which could be in general described by the performance of capital market. In 2010 was carried out a study focusing on the relationship between ability of Czech firms to create economic value and performance of Czech capital market (Chmelíková, 2010). The research question was, whether performance metric EVA describes creation of shareholder value of the firms in the Czech Republic. The answer was found in the relationship between EVA and behaviour of capital market. As the development of these two categories proceeded in the same way it could be concluded, that EVA metric, with respect to its theoretical background, can be used as measure of shareholder wealth creation of the Czech firms. The behaviour of capital market was described by the stock exchange index PX. The official index of Prague stock exchange is currently the index PX, which is being the successor of the oldest Prague index PX 50. The index's values are published daily, which is in contrast to the information about creation of economic value added by firms in Czech Republic that are shown on year basis. This invokes the need to characterize the performance of capital market on the annual basis by using simple arithmetic average of

daily index. Ministry of Industry and Trade of the Czech Republic monitors the creation of economic value added among the industry and construction firms in the Czech Republic. This analysis covers vast majority of all business in this sector (about 90%). Despite the number of business in this study is fluctuating in dependence on the number of currently operating firms, the trend of EVA development is well observable and enables the comparison with the development of capital market performance. The progress of these two categories indicated a general positive correspondence between the development of capital market performance and creation of economic value added among Czech firms. The regression results demonstrated high value of coefficient of determination R^2 , which gets to relatively high level of 0,83. This result is also supported by the research of the relationship between Economic Value Added, traditional performance measures (Return on Assets 'ROA' and Return on Equity 'ROE') and their ability to measure the creation of shareholder wealth of food-processing firms in the Czech Republic (Chmelíková, 2008). The intent of this research was fulfilled by providing a simple regression test of the hypothesis, that the EVA measure is more associated with improved shareholder wealth than traditional performance measures ROA and ROE. The results of regression analysis indicated in all cases a positive correspondence between EVA and financial performance metrics and show higher quality information content of EVA indicator in the relationship to the ability of shareholder wealth creation than traditional performance measures. This fact supports the tested hypothesis as well as the conclusions of corporate finance theory, that from the theoretical point of view EVA is seen as a superior performance metric. The results suggest that EVA should be considered when measuring performance of Czech-food processing firms and can become a basis of economic analysis in this sector.

When analyzing a firm current theory and praxis usually use three types of systems of measures: parallel systems, pyramidal systems and rating and bankruptcy indexes. Parallel systems concentrate measures into the groups according to the particular business areas. The advantage of this approach lies in the rich theoretical background and in the correspondence with functional structure of the firm. On the other hand the disadvantage is poor interconnection between particular groups of the system that leads to complicated interpretation of the results. Rating and bankruptcy indexes offer undemanding computative procedure unfortunately accompanied with rough information content of the results without identifying factors of the firm's efficiency. The advantage of pyramidal systems lies in the reflection of mutual interconnections between particular parts of the system with straightforward linking between the individual indicators and synthesis measure. On the other hand the pyramidal systems suffer from poor theoretical background and impose higher requirements on the analysts' qualification. The consequence is low popularity among financial analysts. Neumaierová (Neumaierová, 2008) claims, that current praxis prefers parallel evaluating systems. This is in contrast to the character of current situation, which is noted for high dynamical complexity due to the globalisation and rather than parallel systems of indicators requires the pyramidal ones. The keystone of pyramidal concepts is the involvement of interconnections between particular indicators, which makes these concepts the most compatible with the new environment. The basic principle of pyramidal system is decomposition of a top indicator with intention to identify the influence of its partial factors, when simultaneously the links between particular measures are represented by mathematical equations.

Enrichment of classical pyramidal system of any financial metric with the non-financial measures will offer a measurement system not dissimilar to the Balanced Scorecard. The Balanced Scorecard is a widely adopted performance management framework first described in the early 1990s through the work of Kaplan & Norton (Kaplan & Norton, 1992). Since then, the concept has become well known and its various forms widely adopted across the world. By combining financial and non-financial measures in a single report, the Balanced Scorecard aims to provide managers with richer and more relevant information about activities they are managing than is provided by financial measures alone. It is a performance management tool that enables a company to translate its strategy into a tangible set of performance measures. A Scorecard has to tell the story of a firm's strategy and the story is told by means of cause-and-effect model that links all the measures to the creating of shareholder value. The scorecard provides a view of a firm's overall performance by integrating financial measures with non-financial measures. This helps to manage the activities that stand beyond the control of financial measures in the framework of a holistic management system and overcomes the main disadvantage of pure financial analysis, which suffers from historic character of its information. The Balanced Scorecard contains a mix of leading and lagging indicators: Lag indicators represent the consequences of actions previously taken, while lead indicators are the measures that lead to the results achieved in the lagging indicators. Lagging indicators without performance drivers (usually described in non-financial terms) fail to inform managers of how to achieve the results. The authors of Balanced Scorecard Norton and Kaplan (Kaplan & Norton, 1992) claim that: "The balanced Scorecard retains traditional financial measures. But financial measures tell the story of past events, an adequate story for industrial age companies for which investments in long-term capabilities and customer relationships were not critical for success. These financial measures are inadequate, however, for guiding and evaluating the journey that information age companies must make to create future value through investment in customers, suppliers, employees, processes, technology, and innovation."

Balanced Scorecard is designed as a simple, 4-box approach to performance measurement. In addition to financial measures, managers are encouraged to look at measures drawn from three other perspectives of the business: Learning and Growth, Internal Business Processes and Customer. The power of the framework comes from a fact that it goes beyond an ad-hoc collection of financial and non-financial measures. Despite the apparent shortcomings of financial measures, a well-constructed Balanced Scorecard is not complete without them. Scorecard practitioners recognize this fact, and consider financial measures to represent the most important component of the Scorecard. Niven (Niven, 2006) claims, that "by using the Balanced Scorecard an organization has the opportunity to mitigate, if not eliminate entirely, many of the issues related to financial measures."

In building the scorecard, the process is just as important as the content. A scorecard devoid of process will be sterile and fail to mobilize both the executive team as well as the operational employees. To build a Balanced Scorecard for a specific company is a task for its whole executive team, since it is necessary to have specific information from all company's divisions. The choice of portfolio of non-financial measures depends on the character of a company. In order to be able to design a framework for economic analysis it is therefore necessary to specify at least the sector, or better a segment for future

application. For this purposes the segment of microbreweries form the brewing sector of the Czech Republic was chosen.

4. Research method

Descriptive statistics are used for basic features of the data in the study. One-way ANOVA is used for hypothesis tests¹. MS Excel is the tool for computation. Observed variables are computed for industry average and the sample of breweries. The results are compared and statistically tested.

4.1 Market concentration

Herfindahl Index (*HHI*) is used for concentration ratio analysis. The *HHI* is calculated by summing the squares of the individual firms' shares, see equation (2). The firms with larger market shares have proportionately greater weight in the results (Horizontal Merger Guidelines [HMG], 2010), thereafter (HMG, 2005). Breweries included in *HHI* constitute sample for Economic Value Added Decomposition.

$$HHI = \sum_{i=1}^N s_i^2 \quad (2)$$

where *HHI* is Herfindahl Index, s_i is the market share of the firm i in the particular market, and N is the number of firms.

Markets are classified into three types (HMG, 2005):

- Highly competitive markets: $HHI < 0,10$,
- Unconcentrated markets: $0,10 < HHI < 0,15$,
- Moderately concentrated markets: $0,15 < HHI < 0,25$,
- Highly concentrated markets: $0,25 < HHI$.

4.2 INFA rating model

Beverage industry in general and brewery sector in particular are analysed by INFA Rating Model (Neumaierova & Neumaier, 2002, 2005, 2005) with particular emphasis on annual EVA decomposition (MPO, 2010). The model of EVA decomposition encompasses financial and risk controlling and analysis. INFA rating model is compiled from three stages of business performance measurement. The first stage considering creation of productive powers ($EBIT/Assets$) allows analyzing the product with no taxation impact. The second stage covers analysis of redistribution of $EBIT$ among government (tax), creditors (interest), and shareholders (net profit). At the third stage involves financial stability analysis via useful life of assets and liabilities ratio. Algorithm of model is based on interdependencies among balance sheet, income statement and cash flow indicators.

INFA Rating Model is based on further simplistic assumptions (MPO, 2010).

¹ Fundamental statistics methods used in a standard way are not explained hereinafter.

- Financial interest is considered annually paid at the cost of debt,
- Market Value of debt is identified with the Book Value of interest-bearing debt,
- Independence of Weighted Average Cost of Capital on capital structure is assumed.
- Rate of EAT/EBT is used in the cost of capital instead of $(1 - \text{Tax})$ due to inclusion of the true impact of taxation.

4.3 Economic value added

Economic Value Added (EVA) modified by Neumaierova & Neumaier (Neumaierova & Neumaier, 2002, 2005, 2005) is primary in the form of shareholder claims articulation, see equation (3). The other explanations are not taken into account. According to methodology of Financial Analysis of Business the focus of EVA analysis is concerned on Value Spread (MPO, 2010). Value Spread ($ROE - r_e$) is difference of real return on equity and expected return on the corresponding risk r_e i.e. alternative cost of equity. If the Value Spread is positive the business reached positive EVA and thus shareholder value increases.

$$EVA = (ROE - r_e) \cdot E \quad (3)$$

where EVA is Economics Value Added, ROE is Return on Equits, r_e is Cost of Equity, and E is Equity.

4.3.1 Return on equity

The priority in economic value creation is a shareholder's perspective. The keen on intrinsic value growth is a cornerstone of entrepreneurial activity and business strategy (Damodaran, 2001). ROE is the result of INFA Rating Model financial controlling.

$$ROE = \frac{EAT}{EBT} \cdot \frac{\frac{EBIT}{A} - \left(In \cdot \left(\frac{CE}{A} - \frac{E}{A} \right) \right)}{\frac{E}{A}} \quad (4)$$

where ROE is Return to Equity, EAT is Earning After Taxes, EBT is Earning Before Taxes, $EBIT$ is Earning Before Interest and Taxes, A are total Assets, In are Interests, E is Equity, CE is Capital Employed (Equity, Debt, Obligations).

4.3.2 Cost of equity

Principle of cost of Equity r_e by course of INFA Rating Model contravenes mostly applied classical Modigliani - Miller theorem of capital structure (Modigliani & Miller, 1958; Brealey & Myers, 2008). The model of risk controlling comes from econometrics studies of rating agencies risk assessment. Mostly used Capital Assets Pricing Model is not suitable for emerging economics. As well, estimation of beta coefficient of non listed companies makes the model too subjective.

The Risk Premium represents the alternative Cost of Equity r_e (5). It is Return on Equity achievable from investment to alternative risk opportunity for investment.

$$r_e = r_f + r_{FINSTRU} + r_{FINSTAB} + r_B + r_{LS} \quad (5)$$

where r_f is Risk Free Rate, $r_{FINSTRU}$ is Financial Structure Risk Premium, $r_{FINSTAB}$ is Financial Stability Risk Premium, r_B Business Risk Premium, and r_{LS} Liquidity Risk Premium.

Risk Free Rate r_f is return on risk-free assets represented by annual yield on 10 years Czech government bond issued Czech National Bank.

Following risk premiums defined functions (6) in general shape. Because of lack of econometric studies suppose that from max certain level of indicators comprising the risk premium will be close to zero. Under these assumptions from min certain level the risk premium will converge to max value. The course of value of base indicator sets the interval of risk premium. Standard deviation measures the volatility of particular indicator in time series. Size of standard deviation indicates minimum value below which the risk premium cannot fall.

$$\begin{aligned} X \leq X_0 &\Rightarrow r_x = \max \\ X \geq X_1 &\Rightarrow r_x = \min \\ X \in (X_0, X_1) &\Rightarrow r_x = a(X_1 - X)^b \end{aligned} \quad (6)$$

where X is the value of particular indicators constituting risk premiums, X_0 is the threshold value of an indicator by which achievement and lower values the risk premium converge to max, X_1 is the threshold value of an indicator by which achievement and higher values the risk premium converge to min, max is maximum risk premium, min is minimum risk premium, r_x is risk premium, a is constant force for equality $m = a(X_1 - X_0)^b$, a is constant indicating the course of function r_x , ($B = 1$ indicates linear function).

Liquidity Risk Premium r_{LS} characterises company size according to total Equity.

Business Risk Premium r_B is an indicator of creation of productive powers ($EBIT/Assets$) (7).

$$\begin{aligned} \text{Condition: } &\frac{EBIT}{Assests} \geq \frac{Interst}{Debt + Obligation} \cdot \frac{Equity + Debt + Obligation}{Assest} \\ \text{Let say: } &\frac{Interst}{Debt + Obligation} \cdot \frac{Equity + Debt + Obligation}{Assest} = X_1 \\ \text{If } &\frac{EBIT}{Assests} < \frac{Interst}{Debt + Obligation} \cdot \frac{Equity + Debt + Obligation}{Assest} \Rightarrow r_B = 10\% \\ \text{If } &\frac{EBIT}{Assests} > \frac{Interst}{Debt + Obligation} \cdot \frac{Equity + Debt + Obligation}{Assest} \Rightarrow r_B = \min\left(Sd \cdot \frac{EBIT}{Assest}\right) \\ \text{If } &0 < \frac{EBIT}{Assests} < \frac{Interst}{Debt + Obligation} \cdot \frac{Equity + Debt + Obligation}{Assest} \Rightarrow r_B = \frac{\left(X_1 - \frac{EBIT}{Assests}\right)^2}{10 \cdot X_1^2} \end{aligned} \quad (7)$$

Financial Stability Risk Premium $r_{FINSTAB}$ is an indicator of financial stability by Liquidity Ratio:

- If $L \leq X_1$ then $r_{FINSTAB} = 10\%$,
- If $L \geq X_2$ then $r_{FINSTAB} = 0\%$
- If $X_1 < L < X_2$ then $r_{FINSTAB} = ((X_2 - L)^2 / ((X_2 - X_1)) * 0,1$
- Market Value of debt is identified with the Book Value of interest-bearing debt,

$$\text{If } \frac{\text{Current Assets}}{\text{Current Liabilities} + \text{Short-term Bank Loans}} \leq X_1 \Rightarrow r_{FINSTAB} = 10\%$$

$$\text{If } \frac{\text{Current Assets}}{\text{Current Liabilities} + \text{Short-term Bank Loans}} \geq X_1 \Rightarrow r_{FINSTAB} = 0\%$$

$$\text{If } 1 < \frac{\text{Current Assets}}{\text{Current Liabilities} + \text{Short-term Bank Loans}} \leq X_1 \Rightarrow r_{FINSTAB} = \frac{(X_1 - L)^2}{10 \cdot (X_1 - 1)^2}$$

Financial Structure Risk Premium $r_{FINSTRU}$ (7) is limited if $r_e = WACC$ than $r_{FINSTRU} = 0\%$. If $r_{FINSTRU} > 10\%$ then $r_{FINSTRU}$ is limited to 10% . The issue is in the case of extreme interest rate. Then interest rate shall be limited in the interval $0 \leq r_{FINSTRU} \leq 25\%$. Similarly tax burden is limited in the interval $0 \leq (EAT/EBT) \leq 100\%$. If the calculated value r_e is lower than $WACC$ then $r_e = WACC$.

$$r_{FINSTRU} = r_e - WACC \quad (8)$$

where $r_{FINSTRU}$ is Risk Premium for Financial Structure, r_e

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