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ПОВЫШЕНИЕ ЭФФЕКТИВНОСТИ УПРАВЛЕНИЯ НА ПРЕДПРИЯТИЯХ

VALUATION MODEL FOR RUSSIAN FINANCIALLY DISTRESSED COMPANIES

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МОДЕЛЬ ОЦЕНКИ СТОИМОСТИ РОССИЙСКИХ ФИНАНСОВО НЕУСТОЙЧИВЫХ КОМПАНИЙ

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Abstract. In this paper, the authors develop techniques for the evaluation of the Russian financially distressed companies. Firstly, the authors consider the definition of financial distress, as well as look at the factors that lead the company to financial failure. Then the authors characterize the major approaches to identifying financial distress and assessing the probability of bankruptcy. Furthermore, the paper discusses traditional approaches to the valuation of distressed companies.

Аннотация. В работе предлагается авторская модель оценки стоимости российских финансово неустойчивых компаний. Сначала авторы рассматривают понятие финансово неустойчивых компаний, а также факторы, приводящие к финансовой нестабильности. Далее авторы характеризуют основные подходы для выявления финансовой неустойчивости и определения вероятности банкротства компании. Кроме того, обсуждается применение традиционных подходов к оценке стоимости финансово неустойчивым компаний.

Keywords: valuation, valuation model, financial distress, bankruptcy probability, bankruptcy prediction, indicators of financial distress.

Ключевые слова: оценка стоимости, модель оценки стоимости, финансовые затруднения, вероятность банкротства, предсказание банкротства, индикаторы финансовых затруднений.

Every company in market conditions aims to increase its market value, to achieve stability in the prediction of its operations and in cash flow planning. However, a significant number of external and internal factors influence financial results of companies. Some of them may have a positive impact on the companies' financial results, some may lead to financial distress. We can divide all factors that cause financial distress on macroeconomic and microeconomic ones. The former group include macroeconomic instability, inadequate financial, monetary and tax systems, the institutional framework of the economy, inflation, competition in the domestic and international

markets. The latter group includes micro (internal) factors, such as poor management, the miscalculations in marketing and decline in sales, reduction of the product quality or sudden fall of price, unreasonably high costs of production. According to Federal State Statistics Service the share of loss-making organizations by economic activity remains significant and equals approximately a third of total number of organizations (29,9 % in 2010, 30 % in 2011 and 25,9 % in 2012) [11].

The occurrence of financial distress significantly complicates management of a company, including the implementation of current operations: purchase of raw materials, payment of wages, taxes and so forth. The company may also face the probability of bankruptcy due to the inability to pay off obligations to creditors. Owner or investor of business aims to understand whether this business will gain sufficient cash flows in future in spite of current financial distress or should it be liquidated? For this purpose it's necessary to conduct a valuation of company.

Meanwhile, traditional valuation techniques are based on the assumption that the firm is going concern and its business is operating and making a profit. In the case of financial distress it is very difficult to predict exactly, whether this business will survive (because distress may be temporary) or company will go out of business. However, in the modern economic science a lot of attention is devoted to the valuation techniques of stable companies, but there is a lack of scientific perspectives on valuation of financially distressed companies. Therefore, this publication will offer a model that helps to evaluate financially distressed companies in the Russian conditions. First of all, it is necessary to clarify the concept of financial distress, because there is no a consensus of opinion among scientists on this issue.

Therefore, we find it necessary to examine the characteristics of financially distressed companies, as well as look at the factors that lead the company to financial failure. Next, we'll look at the approaches to the distinguishing of such companies. The thing is that it is not still clear how to identify financially distressed companies and opinions differ. Then we'll offer the list of key features of the weak companies, which we use in this research. After that we'll examine the models, which help to assess the probability of a

company's bankruptcy, which is closely related to its valuation. Finally we'll explain all stages of our valuation technique, that, we believe, at this particular point in time, can provide most accurate and most reliable valuation.

1. The concept of financial distress

First, we attempt to find out, why do firms become distressed? According to professor of finance at the Stern School of Business at New York University Mr. A. Damodaran, financial distress may occur, firstly, when firms borrow money to fund their operations and then are unable to make these debt payments and, secondly, because they do not have the cash to cover their operating needs [4, p. 4].

Quite broad and comprehensive description of the reasons for financial failure is proposed by O.N. Yakubova [1]. For the purposes of the study it should be noted that the main advantage of that approach is that it is offered to the Russian conditions. The author distinguishes two groups of causes of the financial instability. The first group includes the internal causes that determine the company's financial position and the peculiarities of its functioning. The second group is represented by external factors, reflecting the macroeconomic environment in which the company operates. Table shows the main factors of financial instability, which the scientist identifies.

R.B. Whitaker from Eastern Illinois University conducted an empirical study based on the sample of firms which entered financial distress during the 1980–1992 years, excluding firms from the financial sector. The final sample consisted of 267 firms. Entry into financial distress is defined by R.B.Whitaker as the first year in which cash flow is less than current maturities of long-term debt. During the distress year, the market value of companies is reduced as a result of financial difficulties. All firms in the sample incurred either a decline in market value or a decline in industry-adjusted market value [13, p. 124]. The empirical tests determined that poor management is a major cause of firm entering into financial distress.

Table

Classification of the causes of companies' financial distress

Internal factors	External factors
– inefficient use of labor resources, low productivity, lack of qualified personnel – lack of working capital funds, insufficient resources for its increasing – high investment in receivables – lack of equity, the excess of the debt capital over equity – inefficient financial management, managerial focus on the short term – poor management, inadequate pricing policy – poor quality of accounting	– breaking of the traditional economic ties – decrease in demand – sudden, unpredictable changes in the economic policy of the government – lack of antitrust regulation – political, economic and financial instability – imperfection of the tax system, low tax discipline – high rates of inflation – instability in the foreign exchange market, devaluation of the ruble against the leading foreign currencies – high rates of bank credit – low competitiveness of domestic products in the domestic and foreign markets – low level of real household incomes

Source: [1].

Indeed, 77 % of the sample firms were poorly managed, reporting a trend of decline relative to their industries, 47 % of firms were in economically distressed industries upon entry into financial distress and 38 % of the sample experienced both economic distress and poor management [13, p. 127]. On the base of empirical study the author identified the determinants of firms' recovery from financial distress. We'll mention only the major of them. A significant determinant of recovery for the full sample is improved economic conditions. Higher growth in industry operating income is a significant factor in recovery if the firm's industry was in economic distress; however, industry performance is not a significant determinant of recovery if the firm entered financial distress as a result of poor management rather than economic distress. Efficiency-enhancing

management actions increase the probability of recovery only for firms that were historically poorly managed. Management actions are not a significant factor in recovery if the firm entered financial distress due to economic conditions in the industry [13, p. 130–131].

One of the main causes of financial failure is a high level of debt. The thing is that an increase in debt often raises the probability of company's bankruptcy. In the literature, these costs are divided into direct and indirect. Direct costs of bankruptcy are associated with a decrease in the real value of the company. It arises because of the possibility of physical damage to assets, need to pay for legal and administrative costs (fees for lawyers, auctioneers, judges, auditors, appraisers). Indirect costs of bankruptcy reflect the complexity of doing business in the period of bankruptcy. Unfortunately, company loses its image. The efforts of the company to prevent further financial failure are often undermined by disloyal behavior of customers, suppliers and other counterparties.

T.C. Opler and S. Titman investigated indirect cost of financial distress and have come to the conclusion that financial distress is costly [9, p. 1028]. Moreover, on the basis of the empirical study based on a sample of 105.074 firm-years for the period from 1972 to 1991, the authors proved that highly leveraged firms lose market share to their less leveraged competitors in industry downturns. The thing is that financial distress makes firm to do things that harmful to debtholders and stakeholders (i.e. customers, suppliers and employees). For example, the company could face a decline in sales, because its consumers doubt the reliability of a bankrupt company as a supplier and prefer to switch to more reliable partners. Also T.C. Opler and S. Titman point out that financially strong firms may be taking advantage of these distress periods to aggressively advertise or price their products in an effort to drive out vulnerable competitors. Finally, more leveraged firms are quicker to efficiently downsize in response to an industry downturn [ibid, p. 1016]. The authors use the median sales growth and the median stock return, to identify problem companies. Negative stock returns (below 30 %) indicated the presence of adverse processes taking place in the company. The authors found a negative relationship between high leverage and firm performance in periods of industry distress and even in good times [ibid, p. 1025]. Firm perfor-

mance is measured by sales growth, stock returns, and changes in operating income relative to industry average [9, p.1019].

A. Purnanandam from University of Michigan regards the financial instability from the view point of the company's solvency [10]. Financial instability is considered as an intermediate state between solvency and bankruptcy. According to the author, apart from the solvent and the insolvent states, a firm faces an intermediate state called financial distress [ibid, p. 707]. The company is unstable if it cannot pay the interest, or violates the terms of a debt agreement. In our opinion, this is quite a narrow understanding of financial failure, because it links this concept only with short-term difficulties that the company can overcome in the short term. It's also very important to take into consideration the risks associated with capital structure and sufficiency of company's cash flows.

H.F. Turetsky and R.A. McEwen determine financial distress as a series of financial events that reflect varied stages of corporate adversity. The authors posit that a volatile decrease in cash flows from continuing operations is one signal of the onset of financial distress, and that subsequent distress stages may be characterized by a reduction of dividend payments, technical or loan default, or troubled debt restructuring [12, p. 323]. The scientists define financial instability as a series of stages, characterized by a sequence of sets of adverse events. Each stage of financial instability has an unstable point and continues until the next unstable point is reached. The movement to and from financial distress is a dynamic process [ibid, p. 324]. The financial instability in the model begins with a decrease from positive to negative operating cash flow of the company. The consequent reduction in the dividend indicates the transition to the next stage, leading to a default, followed by restructuring of distressed debt, which usually leads to a decrease in the risk of potential bankruptcy.

Thus, bankruptcy is one of the possible outcomes of financial instability. In spite of severity of financial distress company's management has the ability to restructure the debt and achieve the appropriate level of solvency, may consider merging with another company, and thus disappear as an independent subject of business, file for bankruptcy as a strategic solution to financial problems.

Revealing the courses allows us to define the situation of *financial distress*. In most cases it means *a high leverage*, *lack of cash flows from operating activities to meet short-term expenses* and *presence of negative cash flows*.

2. The selection of indicators that identify the financial distress

Existing classification methods that detect financial distress may be divided into two groups depending on the type of data being used in the study:

– methods based on accounting information;

– methods based on market data, which use the information from the capital market.

Models, based on the accounting for the detection of financial distress, propose various financial indicators, as the current ratio and quick ratio, the interest coverage ratio, the ratio of net debt to EBITDA, the ratio of long-term debt to capital, degree of financial leverage and so on. Nevertheless, it's necessary take into consideration that the data from financial Statements represent retrospective information about the past state of affairs. However, the relative simplicity of the models and the availability of information made this method the most popular analytical tool for assessing the financial failure of the company. Despite criticism that the financial indicators (ratios) are focused on the past and cannot predict future dynamics and prospects of the company, they work well in models that predict financial instability and the probability of default.

One of the most common bankruptcy prediction models is five-factor model of E. Altman [2]. The model was developed in 1968 on the base of Multivariate Discriminant Analysis (MDA, for shot) of 66 American companies. First, the analysis was based on 22 financial ratios, but in the final model there were only 5 ratios. A significant shortcoming of the Altman's technique is the fact that the conditions and the time of this method may not be the same for country-specific data for a certain period of time. This model can be applied in a developed market economy. And, accordingly, Altman's model cannot be directly applied for predicting bankruptcy for Rus-

sian companies, because it was developed on the base of data obtained from the economy of United States in 40–60's.

Among empirical models that predicting bankruptcy on the base of accounting information we should highlight model of J.A. Ohlson, that was published in 1980 [8]. The author identified four factors as being statistically significant in affecting the probability of failure, these are: the size of company, a measure(s) of the financial structure, a measure(s) of performance, a measure(s) of current liquidity [ibid, p. 110]. Thereafter, the author suggested for each factor a financial indicator(s). Next, the influence of these factors on bankruptcy tested on a sample of 105 bankrupt firms. Thus, the choice of variables is determined not only "common sense", but confirmed by statistical analysis. All variables used in the model are statistically significant. In the result of simulation the author obtained the following model that predicts bankruptcy within one-year period [ibid, p. 121]:

$$
\begin{aligned}
Oscore \ = &-1{,}32 - 0{,}407\,(SIZE) + 6{,}03\left(\frac{TL}{TA}\right) - 1{,}43\left(\frac{WC}{TA}\right) + \\
&+0{,}0757\left(\frac{CL}{CA}\right) - 2{,}37\left(\frac{NI}{TA}\right) - 1{,}83\left(\frac{FU}{TL}\right) + 0{,}285(INTWO) - \\
&-1{,}72(OENEG) - 0{,}521\left(\frac{NI_t - NI_{t-1}}{\left|NI_t\right| + \left|NI_{t-1}\right|}\right)
\end{aligned} \quad (1)
$$

Where $SITE$ – log (total assets/GDP price-level); TL/TA – total liabilities divided by total assets; WC/TA – working capital divided by total assets; CL/CA – current liabilities divided by current assets; $OENEG$ – one if total liabilities exceeds total assets, zero otherwise; NI/TA – net income divided by total assets; FU/TA – funds provided by operations divided by total liabilities; $INITWO$ – one if net income was negative for the last two years, zero otherwise; $\dfrac{NI_t - NI_{t-1}}{\left|NI_t\right| + \left|NI_{t-1}\right|}$ – variable is intended to measure change in net income (NI).

This result could not yet estimate the probability of bankruptcy. To find the probability of bankruptcy, it's necessary to use the following logical transformation:

$$\Pr obabijity = \frac{e^{O_{score}}}{1 + e^{O_{score}}}. \qquad (2)$$

As a result, we obtain value estimating the probability of bankruptcy, which varies from zero to one.

J.A. Ohlson stressed in his article, that a potential disadvantage is that presented model does not utilize any market transactions (price) data of the firms [8, p. 111]. Indeed, market information (stock price or its volatility) might be more useful in default probability estimating. Applying of market information for assessing the probability of default led to evolution of special class of models, based on the market value of firm. Among these models we selected technique proposed by Dean Fantazzini et al. [7]. This technique is based on prices of company's common stock. The author developed a new methodology to extract default probabilities from stock prices. The authors developed a new model to assess the firm value and the default probability by using a bivariate contingent claim analysis and copula theory [ibid, p. 161]. According to Fantazzini et al. the market value of the assets is a claim on the traded securities: stocks and bonds. So they model the dynamics of stocks and bonds and then endogenously evaluate the assets [ibid, p. 163]. Thus, the authors directly obtain the assets value from the processes of traded, i.e., observable, securities. This approach is suited for quoted firms only [ibid].

Whenever the bond issues are illiquid or are not traded at all (which is the usual case), the bond price may be expressed as a function of the risky interest rate. On the basis of this assumption, the value of bonds is known at time t, so to assess value of company it's necessary to take into account the stock price distribution, only. The domain of equity value is range from $-\infty$ to $+\infty$, and the authors consider prices in levels instead of log prices [ibid, p. 165].

The authors estimate default probability as:

$$Pr\,[E_T = A_T - B_T \leq 0]. \qquad (3)$$

Where A_T – company's assets value, B_T – bonds value and $E_T = SP_T$, where P_T is the stock price at time T and S is the number of company's shares.

In order to compute at time t the probability that at time $t + T$ in the future the stock price will cross the zero barrier and the firm will default, i. e., Pr $[P_{t+T} \leq 0]$, the authors consider a generic conditional model for the *differences of prices levels* $X_t = P_t - P_{t-1}$, without the log-transformation. However, the situation then $P_r [P_t + T \leq 0]$ may occur in the very special case of normal distribution. Therefore the authors use a simulation method, which consists of the following steps [7, p. 167]:

1. Considering a generic conditional model for the differences of prices levels $X_t = P_t - P_{t-1}$;

2. Simulating a high number N of price trajectories up to time $t + T$, using the estimated time series model.

3. Estimating the firm pricing function on the base of Monte Carlo methods by using the appropriate discount factor $P_i (t, \ t + T)$. The default probability is simply the number of times n out of N when the price touched or crossed the barrier along the simulated trajectory.

The major advantage of this model is that it requires the stock prices and the face value of the debt for estimating the firm value. In addition, the default probability may be calculated for any given time horizon $t + T$ and the default risk can be screened daily or even intra-daily [ibid]. In Section 4 we develop our valuation model for financially distressed companies we'll apply the models of J.A. Ohlson and D. Fantazzini in predicting the probability of company's bankruptcy.

3. Peculiarities of financially distressed companies' valuation

The difficulty of evaluation of financially distressed companies is explained by the factor of their instability. And in such volatile situation the appraiser cannot valuate financially distressed companies on the base of preconditions and assumptions that is applied for assessment of healthy companies. The thing is that the financial performance and the probability of bankruptcy greatly affect the forecasts of the future bankruptcy. In this Sector we'll examine the principal advantages and disadvantages of traditional

(income, market and cost) approaches to assessing the value of distressed firms.

Income approach

Income approach enables to evaluate the company on the base of expected cash flows of the company over its lifetime. The main methods of the income approach are the income capitalization approach and discounted cash flow (DCF) method (intrinsic valuation). The latter method of valuation is based on the assessment of future cash flows that the company will generate during the expected period. After that, obtained cash flows are discounted back at a risk-adjusted discount rate, *r*.

$$V = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} \frac{CF_3}{(1+r)^3} + ... + \frac{CF_N}{(1+r)^N} \qquad (4)$$

where V – value of company, CF_i – cash flow obtained in year i, r – discount rate, N – period under consideration.

Whereas it's impossible and inconvenient to calculate cash flow of the company over very long period, for example, 20–30 years, cash flows are often estimated exactly during the period of high growth. Then it's necessary to determine the year, when the company will reach stable growth and, thus, measure the terminal value that reflects value at the period of steady growth:

$$V = \sum_{t=1}^{t=N} \frac{CF_t}{(1+r)^t} + \frac{TV}{(1+r)^N} \qquad (5)$$

where V – value of company, CF_i – cash flow obtained in year 1 till t, r – discount rate, TV – terminal value, N – year when stable growth starts.

What are the restrictions for the application of DCF method for the valuation of the financially distressed company? As A. Damodaran rightly stresses, traditional valuation techniques are built on the assumption of a going concern. In discounted cash flow valuation, this going concern assumption finds its place most prominently in the terminal value calculation, which usually is based upon an infinite life and ever-growing cash flows. When there is a

significant likelihood that a firm will not survive the immediate future (next few years), traditional valuation models may yield an over-optimistic estimate of value [5, p. 2].

In addition, the discount rate calculated by the standard method would not reflect the risk of financially distressed company. In particular, calculating of beta coefficient (used in CAPM to measure costs on equity) is usually based on historical data when company could not suffer from financial distress. Finally, it should be noted that calculating of the tax shield is complicated for distressed firms. Thus, the income approach is not suitable for the evaluation of financially distressed companies without adjustments.

Market (relative) approach

Market (relative) approach is based on comparison of the value of evaluated company (or asset) with the similar or comparable companies (assets). The basic principle of this approach consists in selection and justification of comparable firms and in obtaining of their market value. After that we need to convert these market values into standardized values, since the absolute prices cannot be compared. This process of standardizing creates price multiples. Then, we have to compare the standardized value or multiple for the asset being analyzed to the standardized values for comparable company [4, p. 5]. Application of market approach to the evaluating of financially distressed companies is associated with the following difficulties:

1. In the Russian conditions application of market multiples is complicated by selection of comparable companies, because there is no sufficient statistical database of transactions in securities of distressed companies, and access to such information is limited. If used as comparable firm the financially healthy company, we'll get an overestimation value.

2. High level of debt often leads to a probability of failure to make debt payments and to its consequences, i.e. bankruptcy, reorganization, liquidation. Therefore, the traditional market approach ignores such a scenario, and its application would lead to an overestimation of the value of the firm.

3. Market approach may not reflect the management strategy, which aims to financial recovery.

4. The presence of negative financial indicators of the company such as earnings, net income makes it impossible to calculate the required multipliers correctly and evaluate financially distressed companies.

Cost approach

This approach measures the costs of creating of the same company. Cost approach is based on the root principle that any asset costs not more than expenses for substitution of all its elements. Application of cost method is most reasonable when necessary to evaluate firms on the earliest stages in the life cycle (because there are no retrospective data about company's profit), when it's difficult to predict company's future cash flows or to find information concerning comparable firms. The cost approach is based on two methods - net assets and liquidation value. Net assets method is used when we consider company as going concern. The thing is that the balance value of assets and liabilities are often different from their market value (due to inflation, changes in market conditions, etc.), thus, it's required reevaluate company's assets and liabilities. The difficulty of this method is that it's necessary to evaluate each asset and liability separately, that requires a large amount of information. That is why this technique is complex, time-consuming and expensive one.

Liquidation method is applied when we made an assumption that company will go out of business. It is assumed that the evaluated assets will be sold in the shortest time possible. In the case of calculating the liquidation value it's necessary to take into consideration all costs associated with the liquidation of the company: legal, accounting and administrative costs. Formula which allows calculating liquidation value is following:

$$Liquidation\,Value = A_{LV} - L - Exp\,, \qquad (6)$$

where A_{LV} – assets' liquidation value, L – liabilities, Exp – expenses, required for liquidation.

At the same time, when company enter financial distress it's very difficult to predict exactly whether this company will remain a going concern or whether it will not survive. A. Damodaran proposed the valuation model for financially distressed companies, which is based on the assumption, that it's necessary to measure two values for distressed company - going concern value and distress sale value. Then it's required to estimate the cumulative probability that the firm will become distressed over the forecast period. Finally, previously obtained going concern value and distress sale value are weighted to the probability of bankruptcy and the likelihood of sustainable functioning of the company correspondingly. The value of financially distressed company is calculated on the base of the following formula [6, p. 38]:

$$
\begin{aligned}
Firm\,Value = &\ Going\ concern\ value \times (1 - P_{distress}) + \\
&+ Distressed\ sale\ value \times P_{distress}
\end{aligned}
\tag{7}
$$

where $P_{distress}$ is the cumulative probability of distress over the valuation period.

According to A. Damodaran, to value a firm as going concern, we consider only those scenarios where the firm survives. When estimating discount rates, we make the assumption that debt ratios will, in fact, decrease over time, if the firm is over levered, and that the firm will derive tax benefits from debt as it turns the corner on profitability [ibid, p. 39].

More simplified version of the company's valuation, considered as going concern, is to value the cash flows, as if it were a healthy company today. This would require estimating the cash flows that the firm would have generated if it were a healthy firm, then, it's necessary to replace the firm's operating margin by the average operating margin of healthy firms in the business. The cost of capital for distressed firms can be taken as the average cost of capital in the industry. The danger with this approach is that it will overstate firm value by assuming that the return to financial health is both painless and imminent [ibid].

A. Damodaran considers the following approaches for valuation of distressed sale value:

1. The average operating income in a certain period before financial distress is used as a reasonable measure of earnings from existing assets. Also to estimate the value of company's existing assets it's required company's corporate tax rate and the cost of capital of healthier companies [6, p. 44–45]:

$$Value\ of\ existing\ assets = \frac{EBIT(1-t)}{Cost\ of\ Capital} \qquad (8)$$

It should be pointed out, that this formula doesn't take into consideration company's growth, depreciation and others corrections.

2. The most practical way of estimating distress sale proceeds is to consider the distress sale proceeds as a percent of book value of assets, based upon the experience of other distressed firms [ibid, p. 44].

The advantage if this technique consists in inclusion of likelihood of financial recovery, this technique might be applied in every industry and in every company. For the Russian practice the major advantage of this model is simplicity of calculation and availability of information for measurement.

4. Integrated model of financially distressed company's valuation

The presented model of valuation of financially distressed company consists of two stages. Firstly, we'll develop a model of bankruptcy prediction, and then will incorporate obtained data into A. Damodaran's technique (formula 7).

Thus, the algorithm of weighted estimation of the bankruptcy probability is the following:

1. Initially, bankruptcy probability is measured on the base of J.A. Ohlson's model, which uses the information obtained from company's financial Statements;

2. Then bankruptcy probability is calculated on the base of *D.* Fantazzini's technique, which allows to determine bankruptcy probability on the base of market information, i.e. company's stock prices.

3. Thirdly, on the basis of data obtained in paragraphs 1 and 2 coefficient R^2 is calculated for each model.

4. After that we calculate a fraction of each R^2 in the total sum of R^2.

5. The resulting share of R^2 is multiplied by the corresponding estimates of the probability of bankruptcy, and as a result we obtain the weighted probability of bankruptcy – $P_{distress}$.

The process described above can be calculated using the following formulas:

$$Q_{Ohlson} = \frac{\left| R^2_{Ohlson} \right|}{\left| R^2_{Ohlson} \right| + \left| R^2_{Fantazzini} \right|};$$

(9)

$$Q_{Fantazzini} = \frac{R^2_{Fantazzini}}{\left| R^2_{Ohlson} \right| + \left| R^2_{Fantazzini} \right|} = 1 - Q_{Ohlson}$$

$$P_{distress} = Q_{Ohlson} \times P_{Ohlson} + Q_{Fantazzini} \times P_{Fantazzini},$$

(10)

where R^2_{Ohlson} – criterion R^2 in Ohlson's model; $R^2_{Fantazzini}$ – criterion R^2 in Fantazzini's model; Q_{Ohlson} – fraction of R^2 in the total sum of R^2 in Ohlson's model; $Q_{Fantazzini}$ – fraction of R^2 in the total sum of R^2 in Fantazzini's model; P_{Ohlson} – bankruptcy probability in Ohlson's model; $P_{Fantazzini}$ $P_{Fantazzini}$ – bankruptcy probability in Fantazzini's model; $P_{distress}$ – the total bankruptcy probability.

This weighted estimation of the bankruptcy probability is incorporated into previously considered A. Damodaran's valuation model of financially distressed company (8):

$$Firm\ Vaule = Going\ concern\ vaule \times (1 - P_{distress}) + \\ + Liquidation\ vaule \times P_{distress}.$$

(11)

Liquidation value in this model is measured as lower limit of value of financially distressed company. Going concern value is calculated on the assumption that company will survive.

Value of financially distressed company is calculated as the weighted average between the value of the company on the verge of

bankruptcy and the value of the same distressed company if it was financially strong. As the lower limit of value of the distressed company we take equity of the firm. The reason for this is that the owners of the company are not willing to sell company below this value when the shares are traded in the market.

The assessment of company as going concern is a key factor of verifiable model and an upper limit value of the distressed company. For its measurement we'll apply relative method and data of similar or comparable companies, that is companies, which operate in the same industry and in the same business environment, have a similar structure of revenue, equity and a similar degree of product and geographic diversification. The concept of "comparable firm" in this case is nominal, because we estimate value of companies in the considering sample, which operate in a hypothetical situation of financial stability. As multiples we'll take the enterprise value to *EBITDA* multiple (*EV* / *EBITDA*) and enterprise value to Sales multiple (EV/Sales). The magnitude of Sales is often positive and relatively stable in spite of financial distress, that is why we apply EV/Sales multiple in the model. Enterprise value to *EBITDA* multiple has a key influence on measurement of value which is based on relative technique: *EBITDA* characterize directly generated operating cash flow for investors.

We should stress that when company's key financial indicators are negative, we cannot apply the multipliers for company's data directly, and we have to apply these multipliers for company's indicators calculated as if it were a stable company today. Financially distressed company operates inefficiently, and therefore its indicators are not close to the same indicators of industry. As a revenue and operating profit of estimated company we'll employ medians of revenue and operating profit of all comparable firms. Value of company is measured as average between value calculated on the base of EV/Sales and value calculated on the base of *EV*/*EBITDA*.

Now, when we have assessed the probability of a bankruptcy, calculated the value of going concern and liquidation, we can use formula (11) and evaluate financially distressed company.

The chief advantages of the model are following:

– We assess the bankruptcy probability using data from two important sources: market data and data from financial Statements.

– The model takes into account financial recovery.

– This technique of financially distressed companies' valuation is based on the information, which doesn't require taking into consideration industry-specific features. The model may be applied in every industry.

– Simplicity of application of this technique and ease of interpretation of the results are particularly important when it is necessary to prove the accuracy of valuation for the customer.
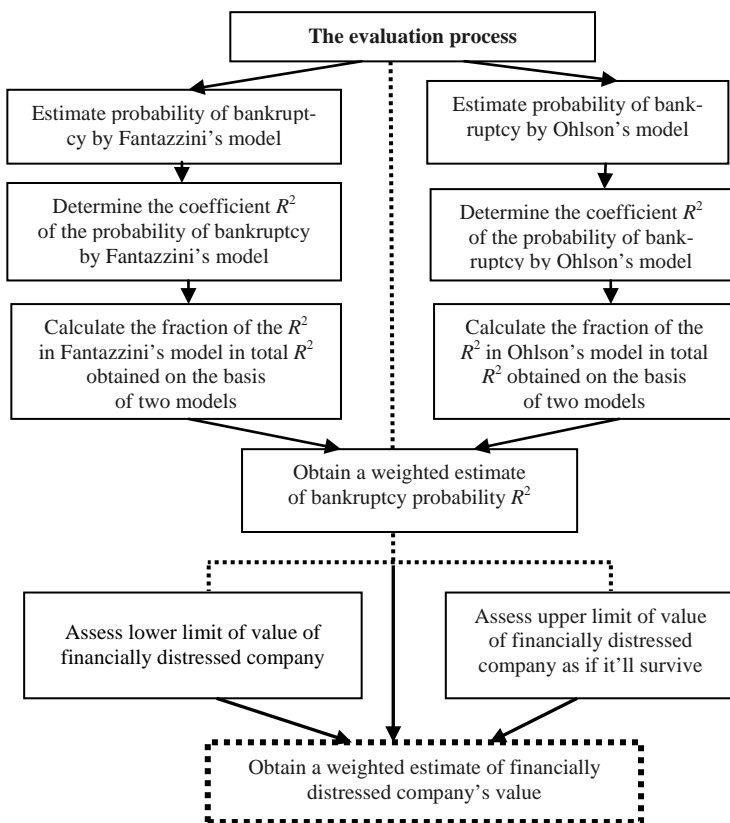
Scheme of the main steps of the valuation
of financially distressedv company

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