Multi-Factor Models in Express Analysis of Company Attraction as Investment

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Abstract: The paper presents a three-factor model used in express analysis of company attraction for investors. The model incorporates economic fundamentals of company management and theory of expert-statistical data processing.

1. INTRODUCTION

As new kinds of business activities emerge the field of investor activities expand. With the amounts of data to be processed and the number of companies in the market being unwieldy, investors face an uphill task in making an impartial and most reasonable (in particular, optimal in terms of some criterion) decision on managing a company or a region. Consequently, evaluating the attraction of companies as investment and choice of the company to invest in, is becoming a most time and effort consuming and complicated process.

Methods of attracting and using investments are, on the one hand, outgrowths of a methodology that took shape in the recent past (since late 1980s) and, on the other hand, largely dictated by today’s economic and financial trends (Palepu, Healy, Bernard, 2003). Among these trends are the growing role played by the securities market in attracting and using investments, an increasing part played by institutional investors in the activities of the investment market, and deep involvement of the broad public in the investment process. These factors contribute to increasing the importance of theoretical and practical methods and the technology of computation needed to back up investment processes. What is needed in this context is to improve the existing and develop new precise ways to evaluate the investment attraction of companies. An improved management of investment activities and improved methods to evaluate it will promote an increased amount of new investments and speed up investment processes.

2. TODAY’S WAYS TO EVALUATE INVESTMENT ATTRACTION

In a general case the company’s investment attraction is defined in terms of several basis criteria that the company is expected to meet if it is to attract outside investments, or the investor’s money. In effect, it is the extent to which the company meets the investor’s requirements that dictates the amount the investor is prepared to risk. The investor’s objectives make up another major factor that dictates the amount.

A set of exogenous and internal variables in the company activities are used as guidance in evaluating the company’s investment attraction but the large amount of data used does not necessarily lead to the accuracy and efficiency of the results. For this reason, the analyst has to use some basic components such as financial indicators specified in the company’s generally accessible financial statements and so available to a large set of potential investors. Investors tend to take note of a financial indicator such as profit and the management risk and quality and so integral indicators must be determined separately for certain groups of estimates if investors are to check whether their preferences are met.

Because today’s investment attraction evaluation methods add up to a complicated multi-factor process, evaluation processes must be employed in stages. The first stage must be a method of evaluation or analysis, that will identify a small group of potentially interesting processes or classify the processes. The evaluations obtained at this stage are subjected to a more time and effort consuming analysis. What is important is that the methodology and techniques of the primary evaluation must be sufficiently straightforward and precise, allow for today’s trends in company development, today’s methodologies and software and be capable of continuous improvement.

An analysis that we have carried out made it possible to formulate and prove that the requirements, conditions and specifics of the proposed investment attraction express analysis method for companies are sound:

1. The evaluation methodology must recognize the investor’s preferences.
2. The evaluation technology must be fairly straightforward and understandable (transparent) for the findings not to confuse investors and analysts in understanding and using them in making subsequent decisions.
3. Basic primary financial indicators must be used that are reported in generally accessible financial statements available to numerous potential investors and yield a fairly precise and straightforward in processing,
understanding and analysis evaluation of the investment attraction indicator.

4. The evaluation technology must favor elimination of problems attributable to the need to recognize the specifics of the industry and the factory’s size and to impossibility to collate incompatible indicators make it possible to directly compare companies.

5. The method must yield integral indicators that extend performances of different companies and reflect various approaches used by investors to choice and evaluation of companies.

In effect, in the light of the above requirements the most reasonable way to evaluate the company’s attraction as investment would be in terms of its financial indicators that offer a significant forecasting potential. Furthermore, the time characteristics of the variations of the financial indicators may enable the resultant estimates to provide an insight into their future. Because investors give most of their attention to the profit, risk and the company’s management quality, the investing attraction indicator that incorporates, in particular, integral indicators must be determined separately for the above groups of evaluations so as to recognize the preferences of the investors. The proposed multi-factor model of estimation is used for existing and expanding enterprises but does not work in evaluating the specifics of investing in innovative companies or in tackling problems in venture investing etc. because for these processes an investing evaluation is a fairly complicated and largely unformalizable activity.

3. A THREE-FACTOR MODEL AND AN ALGORITHM FOR EVALUATING THE COMPANY’S INVESTMENT ATTRACTION

Evaluation of the company’s attraction as investment in the proposed model relies on financial indicators reported in generally available financial statements. The use of a minimal number of indicators makes it possible to do without duplicating variables. The proposed model provides a comprehensive analysis of three company variables, viz. profitability, risk and management (Sizyk, 2009). That reference proposes a unified data analysis, processing and scaling of the indicators. It analyzes dynamic indicators, collates data in evaluating the management indicator and computes numerous factors (in evaluating the financial risk). The use of dynamic characteristics in evaluating composite indicators of the investment attraction such as profit, risk and management makes it possible to evaluate the stability of the indicator’s variation (or its risk) as well as the indicator’s value for various organizations. Consequently, an evaluation of the company’s investment attraction is represented as a set of data on the three indicators, viz. profit, risk and management, or

$$IA = \{P, R, U\},$$

where P is the profit, R is the risk and U is the management.

An integrated indicator that recognizes the preferences of investors is obtained by using Fishburn weights. A system of N choices (in this case P; R; and U) whose preferences decrease is best described as a system of weights whose value decreases in an arithmetic progression:

$$p_i = \frac{2(N - i + 1)}{(N + 1)N}, \quad i \in \{1, N\},$$

and a system of N choices that are indifferent to each other, az set of equal weights:

$$p_i = N^{-1}, \quad i \in \{1, N\}.$$

In addition to the three estimates that make it possible to arrange various companies in terms of their investment attraction, the technique proposes using a unified scale for classifying companies into groups. Any company may be found to be a member in one of the following groups:

- 1st group (over 0.97 points) are companies with the best possible (high) indicators;
- 2nd group (0.96 to 0.67 points) are companies with higher than the average indicators;
- 3rd group (0.66 to 0.37 points) are companies with average indicators;
- 4th group (0.36 to 0.11 points) are companies with below the average indicators;
- 5th group (0.10 or below points) are low indicator companies.

Companies may be classified in terms of every indicator (P, R or U) or in terms of an integrated investment attraction indicator (that recognizes preferences of investors).

The offering to investors of indicator values separately for each of the three groups makes it possible for the investors to choose the company that suits their preferences.

With values of the indicators P; R; or U for companies that find themselves in the first, second or third group regarded as admissible (A) and those for companies in the fourth and fifth group as inadmissible (I), eight groups of companies may be identified (see Table 1 below). High values of the profit, low values of the risk and high values of manageability are admissible.

As far as potential investors are concerned, all eight groups of companies may be classified in four general groups:

- first group includes companies in which long-term investments may be made;
- second group are companies in which speculative investments may be made;
- third group are companies that offer low profit at low risk;
- fourth group includes companies that cannot attract investments.

In effect, investors may be interested in companies of the first and second groups.
Grouping companies in terms of admissibility of the profit, risk and manageability for investment decisions.

<table>
<thead>
<tr>
<th>Group</th>
<th>Level of $P$</th>
<th>Level of $R$</th>
<th>Level of $U$</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>Companies preferable for investing</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>A</td>
<td>I</td>
<td>Companies to be considered for long-term investing if the investor plans to share in management</td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>I</td>
<td>A</td>
<td>Speculative investing</td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td>I</td>
<td>I</td>
<td>Speculative investing</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>A</td>
<td>A</td>
<td>Investors consider investing in companies with low profit but on condition of zero risks</td>
</tr>
<tr>
<td>6</td>
<td>I</td>
<td>A</td>
<td>I</td>
<td>Investing considered on conditions of low risk, zero risks and possible sharing in management</td>
</tr>
<tr>
<td>7</td>
<td>I</td>
<td>I</td>
<td>A</td>
<td>Investors do not consider companies in this group</td>
</tr>
<tr>
<td>8</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>Investing in companies in this group is not considered (the worst group)</td>
</tr>
</tbody>
</table>

In this research that uses a three-factor model of investment attraction the net profit growth factor over the period being analyzed is regarded as the integral financial economic indicator (profit). Analyzing this dynamic indicator makes it possible to compare various companies in terms of profitability.

In order to determine the profitability indicator let us analyze the net profit level in companies in all quarters of the 2005 - 2008 period. The profit growth factor will be determined by the formula

$$K_{p_t} = \frac{P_t}{P_{t-1}}$$

where $P_t$ and $P_{t-1}$ are the company’s profit over the periods $t$ and $t-1$.

In this way, every company is described in terms of profitability indicators according to quarterly financial statements $P_{1-2006}; P_{2-2006}; P_{3-2006}; \ldots P_{3-2008}$.

As a consequence we have a set of values $P_1; P_2; P_3; \ldots P_{12}$, that make up a sequence:

$$\bar{P}_t, \ t \in 1, m,$$

where in the case under consideration $m = 12$.

In a general case analysis of profitability indicators in terms of points we have a non-stationary time series. Because seasonal oscillations of the process are small we will use a multiplicative model for its analysis. The general form of the data analysis model may be represented as:

$$Y(t) = T(t) \times S(t) \times E(t),$$

where $T(t)$ is the long-term development trend; $S(t)$ is the seasonal component; $E(t)$ is the residual component.

Now let us carry out a preliminary smoothing of the data and identify the trend by computing the moving average; seasonal processes will be analyzed by the moving average model. In smoothing in this way the actual dynamic values are replaced by averages that characterize the median point of the sliding period. Use plain smoothing in which simple arithmetic averages calculated over time periods of length $q$ add up to a new series

$$\bar{x}(k) = \frac{1}{q} \sum_{t=k}^{q+k} x(t), \ k \in 1, n - q + 1,$$

where $q$ is the length of the smoothing period that depends on the nature of the time series and also on the objective of the smoothing and is chosen by the researcher; and $k$ is the ordinal number of the average.

Let us de-seasonalize the original data and use the de-seasonalized data to determine the dynamic indicator of the series such as the average, the r.m.s. deviation and the variation indicator.

The resultant valuation of the company’s financial health is determined in a model that includes the economic and risk components. The indicator of point-wise values of the indicator being analyzed $\langle P,R,U \rangle$ over the time period under analysis is used as the risk component. This model has the form

$$K = k_1 \times (1 - k_2),$$

Where $K$ is the company health indicator; $k_1$ is the average point-wise (de-seasonalized) value of the company’s health; and $k_2$ is the risk component of the indicator.

Let us now adjust the average value of the indicator $(P,R,U)$ being analyzed over the period being considered and use for that purpose a formula for the case of profitability (the other are written in a similar way):

$$P_{cor} = \bar{P} \times K_{stab},$$

where $K_{stab}$ is the stability factor of the average point-wise value of the indicator over the period being considered, in this case profitability.

The stability factor may be calculated in either of two ways.
In one way the factor is found by a formula

\[ K_{\text{stab}} = 1 - \frac{\sigma_1}{P} \]

where \( \frac{\sigma_1}{P} \) is the variation factor of the indicator, in this case profitability over the period being considered. The stability factor thus calculated would significantly reduce the adjusted value of the indicator. This would require an adjustment of scales used in classifying companies in terms of the indicator. Therefore another way to obtain that factor is proposed whereby the stability factor is determined using a table with a calculated value of the quantity \( 1 - \frac{\sigma_1}{P} \).

Trends of variations as well as the stability of variations of the indicator may be recognized. This is done by using the adjusted value of the trend component obtained by using the de-seasonalized data. Consequently, the final value of the indicator is obtained in the following sequence:

Original data \( \rightarrow \) Point-wise indicators \( \rightarrow \) De-seasonalized indicators (a multiplicative analysis of the point-wise data time series) \( \rightarrow \) Average value \( \rightarrow \) Adjusted value (recognition of variation stability) \( \rightarrow \) Final value of the indicator (recognition of trend variations).

Similar models in which dynamics of the indicator are used in computing both profitability and risk plus management quality for the indicators as is the above scale of company groups.

Evaluating the company’s financial risk is useful and quite sufficient to determine the risk component in a three-factor evaluation of the investment attraction. The financial risk is also determined from quantitative data from generally available information sources. At present financial risk evaluation methods are available that rely on calculating financial factors. These methods work for any kinds of companies. This research suggests a modified way to estimate the financial risk in activities of companies that relies on financial factors recognizing the dynamics and direction of variations of the evaluating indicator over the period being analyzed.

A valuation method in which a reference dynamics of the process development is obtained seems to be the most intelligent way to valuate the company management quality. A modified variety of that method is used in evaluating one of the components, in particular the management quality indicator, of the three-factor model. It is important to note that the nature of the company development dynamics largely defines the quality of the company’s operation and so the quality of its management. Dynamic characteristics make a very strong impact on the variety of links inside the organization and the status of the organization’s environment. A reference norm of their development may be used as conditions sufficient for identifying successfully developing systems. The following variables are considered in this case: yield from sale of products; the pre-tax profit; the net profit; the number of the personnel; the joint assets. These variables provide an insight into the principles of high performance company management and may be used in estimating the management because they:

- in the context of information shortage usual in the management process reflect the company development, growth and adaptability;
- are easily accessible;
- reflect the most important financial characteristics such as: the economic growth, company, size, repayment of advanced loans; efficiency of using resources and productivity;
- are easily ordered in dynamics.

These indicators may lead to fairly informative analytical conclusions on the company’s performance and management quality, while the “golden rule” of the company’s economy

\[ 1 < K_p(SA) < K_p(YS) < K_p(PP) \]

holds where \( K_p(\cdot) \) is the indicator growth factor which may be represented as SA, the sum total of assets, YS, the yield from sale of products, or PP, the pre-tax profit.

Supplementing the inequality with the number of the company’s personnel and the net profit we will have an extended “golden rule” in the form

\[ 1 < K_p(NP) < K_p(SA) < K_p(YS) < K_p(PP) < K_p(PIT) \]

where \( K_p(\cdot) \) is the indicator growth factor which represents variables such as NP, the number of the personnel; SA, the sum total of the company’s assets; YS, the yield of production sale; PP, the pre-tax profit (balance profit); and PIT, the net profit after payment of the interests and taxes.

If information is in short supply, the expert-statistical method, in particular the method of analogs (Belyakov, Mandel, 2002; Mandel, 2004; Mandel, Belyakov, Semenov, 2008; Belyakov, Mandel´, Sizykh, 2008) remains the most intelligent tool. In this method the shortage of information on a new investment project (NIP) is offset by taking up data on investment projects (or analog projects) that have been studies earlier and thus identify a set of companies akin to the company in question as far as investment attraction is concerned. The same financial data (the same set and number available at the current time) that is the original data in analysis with all the required information available.

The NIP submitted to the expert is a set of three very short time series \( \{P_t\}_{t=1}^T, \{R_t\}_{t=1}^T, \{U_t\}_{t=1}^T \), (in a degenerate case some or all \( T_P, T_R \) or \( T_U \) may be equal to 0; this is the case of a complete absence of a data sample). In response to the data sample (and/or the investment project name and type) submitted to him the expert compiles a list of similar projects that are represented in the system’s database by much more complete time series, or series whose length significantly exceeds the values of \( T_P, T_R \) and \( T_U \). The list of similar projects may be fairly complete if the expert uses automatic check of relations between available financial indicators.

The missing data in associated time series is obtained in the expert-statistical prediction.
4. CASE HISTORY

Company profitability, risks and company management quality indicators have been estimated in a test of a three-factor model of valuating 51 Russian companies.

The test of valuating certain comprehensive company investment attraction indicators (of profitability, risk and management) has confirmed legitimacy of using dynamic characteristics and the above unified indicator analysis, processing and ranking. An analysis of using dynamic characteristics for evaluating comprehensive investing attraction indicators has shown that the proposed method leads to valuation of the indicator for various companies while recognizing the stability of the indicator’s dynamic variations. The latter attribute is regarded as the risk component of the indicator. Comprehensive indicators thus found give investors a better insight into the company’s health because the dynamic characteristics thus obtained include a forecasting component (an estimate of a quantity and tendencies of its variations).

4.1. Evaluating Financial Risks

Let us evaluate the financial risks run by 51 Russian companies which were selected for testing. We will use quantitative data from generally available sources such as balance sheets of the companies.

The following indices will be used in order to obtain an integrated score of the company’s financial state: absolute liquidity \(L_2\); the “critical evaluation” factor \(L_3\); the current liquidity factor \(L_4\); the autonomy factor \(U_2\); the factor of sufficiency of the company’s own funds \(U_3\); and the financial stability factor \(U_4\).

The absolute liquidity factor \(L_2\) (whose recommended value is \(L_2 > 0.2–0.7\)) shows what fraction of the short-term debt the company can repay on a short notice with its own funds

\[
L_2 = \frac{A_1}{O_1 + O_2}.
\]

The “critical evaluation” factor” \(L_3\) (the lower admissible value is in the 0.7 – 0.8 range; it is desirable that \(L_3 \geq 1.5\)) shows what fraction of short-term debts must be immediately repaid with the funds stored on various accounts, in short-term securities and also with bills paid to the company

\[
L_3 = \frac{A_1 + A_2}{O_1 + O_2}.
\]

The current liquidity factor \(L_4\) (the optimal value must be at least 2.0) shows what part of the current dues on credits and bills may be repaid by mobilizing the company’s entire working capital;

\[
L_4 = \frac{A_1 + A_2 + A_3}{O_1 + O_2}.
\]

The autonomy factor \(U_1\) (the minimal threshold value must be about 0.4; an excess of that value suggests that the company’s financial independence has improved and the company can borrow more money) describes the company’s independence of borrowed assets.

The factor of sufficiency of the company’s own funds \(U_3\) (the advisable value \(U_3 > 0.1\); the closer that index is to 0.5, the better is the company’s financial health) stands for the availability of the company’s own working capital essential for its financial stability.

The financial stability factor \(U_4\) (whose admissible value is \(U_4 > 0.6\); a deduction of the indices suggests that the company faces financial problems) shows what fraction of the assets is financed with stable sources.

The above relations use absolute values of the balance sheet (the original data for computing the factors), in particular, the values of assets such as the most liquid assets \(A_1\), assets that can be disposed of on a short notice \(A_2\), assets that can be disposed on a long notice \(A_3\); and of liabilities such as those due within the most short term liabilities \(O_1\) and short-term liabilities \(O_2\). The indices \(U_1\), \(U_2\) and \(U_4\), are computed in the usual way in line with the international accounting rules.

Let us calculate the numerical score in an integrated evaluation over the analyzed periods (quarters of a year or years). Let us transform these indices into fractions of a unity (in the 0 – 1 scale) in order to make them compatible with estimates of the profit and management performance.

In analyzing the dynamic risk indices in terms of their resultant numerical score carry out a multiplicative appraisal of time series, obtain de-seasonalized indices and calculate the average of the company’s financial health, the r.m.s. deviation and find the final score in line with the two ways proposed in Sect. 3.

The financial health of the company varies impressively. The interrelationship of the indices of the 51 companies over the years 2006 and 2007 amounts to 58.3 percent, over the years 2007 and 2008 to as little as 52.7 percent and over the years 2006 and 2008 to as little as 43.7 percent. This reflects the impact of the financial crisis that broke out at that time and suggests to investors that they should recognize the dynamic characteristics of the company’s financial stability.

No interdependence has been found between the average company financial health and the dynamics of that stability: the interrelationship between the average value of the financial health and its r.m.s. deviation totals 3.1 percent and between the average value and the variation index, 35 percent.

Analyze the resultant indices of the final numerical score by using two ways of the approach suggested in Sect. 3. The final indices correlate fairly well with the average. By way 1 the correlation is 92.0 percent, and by way 2 it is 95.4 percent. Furthermore, the indices by ways 1 and 2 correlate fairly well, 97.3 percent. This result suggests that both ways provide a good evaluation of the financial risk. The interrelationship between groups of companies analyzed separately in either way is found to be 87.5 percent. In other words, the divergence totals nearly 13 percent and is attributable to boundary values of the indices in carrying out the classification. Recognition of the trend of dynamic indices of
the de-seasonalized time series makes it possible to recognize “boundary varieties.” In this light in evaluating the investment attractiveness of companies way 2 seems more advisable.

4.2. Analysis of Inter-Factorial Correlations and Making Integrated Evaluations

An analysis of data on Russian companies has shown that the use of the three chosen indicators is legitimate because these indicators lead to a multi-aspect valuation of the companies. The correlation between indicators of profitability and risk was found to be 20.3 percent and that between profitability and management, 70 percent.

The investor may choose companies for their final values of their indicators or for classification groups in which they are members in terms of the chosen set of indicators. Investment decisions are facilitated by identifying eight groups of companies in terms of admissible estimates of profitability, risk and management. The grouping of companies has revealed that of the 51 companies five, or nearly ten percent of the total number, were most attractive for investors out of the 32 companies identified as preferable for investment. In effect, as few as nearly 10 percent had estimates above the average of 0.66 points. What is also important is that an analysis of companies that have only positive profitability indicators suggests that 61 percent of them are preferable for investment and 15 percent fail to attract investors.

5. CONCLUSIONS

Consequently, the proposed three-factor model of valuating the investment attraction of companies provides most precise data on various companies for potential investors. That data includes a forecasting component and is independent of the industry in which the companies are active. Investors are free to rely on their own experience and recognize their own preferences. Their decisions may be guided either by the three separate indicators or by a common integrated indicator or use the proposed classification of companies into groups.

6. ACKNOWLEDGMENT

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