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APPLICATION OF CORPORATE METRICS METHOD TO MEASURE RISK IN LOGISTICS

Corporate Metrics is a methodology aimed to measure the market risk of a company. Two important and significant rates are used earnings and cash flow. The basis of Corporate Metrics realization is a process based on simulation, in which huge amount of various different scenarios are obtained and which facilitate to generate future financial results. Corporate Metrics enables to describe future financial results determination and consecutively to determine different levels of risk.

1. INTRODUCTION

Corporate Metrics is a conceptual framework oriented to market risk measuring in the business environment. It is a complex set of definitions, methodologies, data files and software aimed to measure risk in the given business (corporate) environment. In broad terms, this method is oriented to two important business financial indexes that affect the company's value assessment in a significant way – cash flow and earnings. Corporate Metrics enables every company to predict earnings and cash flow for a variety of expected market rates' values. Foreign exchange rates, interest rates, commodity prices and equity prices are presented as market rates. Considering this, market risk measures can be obtained.

2. DESCRIPTION OF CORPORATE METRICS METHODOLOGY

The methodology is designed to accommodate long-horizon forecasting to coincide with the long-term management cycle that is typical to corporate planning and business management. Moreover, Corporate Metrics method uses other methods, such as Value at Risk which is considered to be a principal method used in portfolio risk analysis.

Corporate Metrics also offers a Risk Metrics which is perfectly adapted to corporate environment and concentrated on portfolio analysis. Both methods are used for market risk measuring but some differences have to be discussed. Risk Metrics is designed to foresee possible changes of financial instruments market risk portfolio such as fixed income securities, foreign exchange, commodities, obligations, equities and their derivatives. The time period is markedly short, from one day up to one month. On the other hand, Corporate Metrics method is more convenient for corporate environment as it is concentrated on

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corporate financial results which are consecutively benchmarked with plan set for the given time period. Time span in which the financial results are effective are defined in horizon from two months to two years, sometimes also longer. Following table compares approaches of risk management in financial and corporate environment.

Table 1: Comparison of risk management in financial and corporate environment

Risk parameter	Financial environment	Corporate environment
Methodology	Risk Metrics	Corporate Metrics
Measure of value	Portfolio value	Earnings, cash flow
Accounting treatment	Fair value	Accrual fair value
Horizon	Day, month	Month, 3 months, year
Benchmark	Market index	Detailed specified targets

Source: LONGERSTAEY, J., SPENCER, M. *Risk Metrics Technical Document*

3. BASIC PROCEDURE OF CORPORATE METRICS REALIZATION

The process of Corporate Metrics operation can be summarized in the following five steps:

1. **Specification of financial instrument** – in this point the company decides for specific financial result, the result is analysed and the risk value is estimated. There is enormous number of financial instruments, changes of which can be affected by the market rates changes, e.g. market capitalization, value of portfolio, equity recoverability etc. Earnings and cash flow are of the most frequent use. The reason is that a high interest is attached to them in corporate and investment environment. Earnings attract attention as they are generally used in methods for assessment of company rentability and efficiency (productivity). It mostly affects the market company value. The second main instrument is cash flow which is derived from operation, investment and financial corporate activities and its aim is to determine if the company has enough liquid financial instruments for daily company operation at the disposal. Moreover, cash flow is also a method to set the company value.
2. **Exposure mapping** – taking the step number 1 into consideration, all earnings and cash flow components identification is necessary because their values can change as market rates fluctuate. Relate the exposures to market rates by defining how the value of each exposure is affected by each market rate and subsequently the risk estimation is defined. The prerequisite that the company's financial indicator is set is of a vital importance and it will be used to estimate the level of risk due to earnings and cash flow.
3. **Scenario generation** – a large number of scenarios is generated. They map potential possible differences in market rates values in the given time horizon. The scenario generation determines the probability distribution of market rates in different time horizons.
 - a. For each horizon is defined the probability distribution of market rates defined in step 2.

- b. Each scenario is generated by sampling a value from each probability distribution and this value is plotted as a function of time.

Then individual scenarios are defined as unique paths that the market rates can take over the specified time horizon. By the realization of various scenarios for each market condition, the range of possible values, that the variable may reach in the specified time period, can be obtained. The most popular method for scenario generation is Monte Carlo simulation.

4. **Valuation**– the future financial results are calculated under each market rate scenario. To achieve the valuation, it is important to use the equation to calculate earnings or cash flow as a function of the prediction of market rates development. The value of the future financial result is gained when the results achieved in step 3 are filled in the equation from step 2.
5. **Risk measure computation** – on the basis of the final distribution of financial result, the risk is calculated. To determine the level of risk of financial results the company sets the following indicators: *standard deviation* (defines the rate of symmetric deviation from anticipated value of estimated financial result), *reliability interval* (determines the probability that the financial results will not be lower than this interval), *maximal loss with respect to specified target* (measures the maximal value up to which the financial result can fall in a comparison with the company plan) and *average loss* (represents the value up to which the financial indicator can fall under the average loss).

This five- step process is known as a simulation based process and forms the basis of Corporate Metrics. A lot of different scenarios can be obtained by using this approach as they facilitate to generate future financial results. The advantage of this approach is an ability to describe in detail the distribution of future financial results which are of assistance to determine the risk levels. This fact is very important for those companies whose financial results do not change linearly to market indicators. There is one disadvantage of the simulation approach in a comparison with analytic approach, the higher computing intensity. When the financial results are linear functions to market indicators, using of analytic approach is sufficient.

Several models are put to use for financial modelling in the Corporate Metrics methodology, random walk model and model mean-reversion.

Random Walk Model

The risk that the value of corporate indicator will not develop positively is determined by changes of risk factors. That is way it is important to determine these factors and analyse their past changes by the time dynamics of yields and their distribution. This model represents the idea that the short-term yields act by so called random walk.

Model Mean Reversion

The random walk model does not provide relevant explanation of financial yields dynamics in the long-term horizon. The base of model mean- reversion is, that the next term yields have a tendency to return back to their average values. This model processes

consist of parameter of long-term equilibrium b and parameter of closing speed to long-term equilibrium a . Mean-reversion processes may be divided into two basic groups:

1. one-factor model: it takes into consideration only one source of uncertainty described by one stochastic differential equation. But only one source of uncertainty can be in specific circumstances limited for the less common forms of yield curves. The most frequent used one-factor models are Vašíček model and Cox, Ingersoll, Ross model, so called CIR model.
2. two-factor model: determines two sources of uncertainty. The reason of the use of this model is the need to model various non standard forms of yield curves that cannot be described by one-factor model.

4. BENEFITS OF CORPORATE METRICS METHODOLOGY

Companies can gain various advantages by Corporate Metrics application as a form of risk management:

- Increased transparency of risk: the quantification of the market rate volatility impact on the corporate financial results may significantly improve the accuracy of risk setting.
- Communication: risk management can improve the level of communication not only between the senior management and business units detecting the risk but also among senior management, the board of director, stakeholders, rating agencies and regulatory authorities.
- Hedging decisions: risk analyses integration assumes that Corporate Metrics facilitates to analyse how risk and anticipated yields change depending on implementation of hedging strategies.
- Capital allocation and performance evaluation: by the risk heightening, the Corporate Metrics provides the base for evaluating potential impacts of adverse market movements on a company's capital and the ability to apply the proper way of project consideration based on risk consideration.
- Control: many companies would like to improve the control process to ensure that their exposures to financial market remain within prudent limits. The earnings indicator facilitates to implement effective policy, to gain information to help control and reduce earnings volatility and as well to set limit structure.

5. SUMMARY

Corporate Metrics methodology is a complex method focused on measure of impact of market risk changes of the company's cash flow. Risk determines the maximal fall of profit considering the market factors changes, the specified levels of importance and the given time horizon. In Corporate Metrics methodology, the potential changes of market prices are realized on the basis of stochastic models, random walk model and model mean-reversion.

6. BIBLIPOGRAPHY

- [1] BOĎA, M.-KANDEROVÁ, M. 2010. *Meranie rizík v nefinančných spoločnostiach*. In: FernStat_CZ2010 : Fakulta sociálne ekonomická, Univerzita J.E.Purkyně v Ústi nad Labem FSE, UJEP, 2010. ISBN 978-80-7414-284-0. s. 15-20.
- [2] CISO, Š. – KLIEŠTIK, T.: *Finančný manažment podniku I*, EDIS Žilina, 2009, 511 s., 26, 91 AH, ISBN 978-80-554-0076-1
- [3] KANDEROVÁ, M.- ÚRADNÍČEK, V. 2005. *Aplikovaná štatistika vo finančno – ekonomickej praxi*. Banská Bystrica: OZ FINANC, 2005. 150 s. ISBN 80-968102-8-9.
- [4] LONGERSTAEY, J., SPENCER, M. *RiskMetrics Technical Document*, dostupný na <http://www.slideshare.net/Micheal22/corporate-metrics-technical-document> [cit. 2011-05-07]
- [5] ZMEŠKAL, Zdeněk. *Finanční modely*. 2.vyd. Praha: Ekopress, s.r.o. 2004. 236 s. ISBN 80-86119-87-4

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