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VALUE AT RISK METHODS

The present article discusses the possible application of Value at Risk methods. Described in it are basic methods of VaR also essential variables and parameters used to quantify risk using the methodology.

1. INTRODUCTION

The concept of Value at Risk (VaR) itself has been established in 80's when large American banks started to use it. There is mentioned that the creation of this method is reaction on following problem: "At the end of each business day we should know what risks do we face at all types of trade we execute and at all places we do a business".[2] This was the background for origin of famous "message at 4.15", i.e. at time of closing of business day, which presented all market risks by single overall number.[3]

During 90's the VaR method expanded rapidly. The breaking time was October 1994 when the investment bank J. P. Morgan decided to set the standard for VaR measurement by issuance of RiskMetrics system. After that the method usage increased significantly.

At the times of high market volatilities the first deficiencies of the method are found. It led to development of new modifications determined for measurement of specific risks. The method was originally intended only for market risks measurement purposes but its current utilization is universal. It is applied for measurement of credit risk as well as operational risk. The method spread also into non-financial sphere where is used for numeration of financial risks, evaluation of cash flow riskiness or deciding about funding. German conglomerations Siemens and Veba or Norwegian oil company Statoil belonged to pioneers of VaR usage among non-financial subjects. The Dell Computers company uses VaR for its derivates in foreign currency as a one day 5% VaR.

Rapid expansion of VaR in 90's was reaction on many financial catastrophes and turbulences at the markets all over the world. Bankruptcy of Long-Term Capital Management (LCTM) in 1998 was the typical one which could be avoided by usage of

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[2] Dennis Weatherstone, manager of J. P. Morgan investment bank reputedly requested his employees for solution of this problem and it resulted in VaR method creation.
[3] DOWD, K.: An Introduction to Market Risk Measurement, 2002, page 8

remade VaR. It almost caused a collapse of world financial system. This hedge fund 4 brought to its creditors one of the biggest loss in a history of Wall Street.

At the end of 90´s VaR models were implemented into instrument portfolios of large Slovakian banks. When the creation of capital requirements became mandatory this method was assumed also by small banks.

2. MAIN HEADING
2.1 Practical usage of VaR

VaR can be used by every institution exposed to financial risk. There are three phases of the method.

- Passive – information statements at the first phase of VaR the total risk is measured. It can be applied for providing information about market and investment operations risks to management or about financial risk of corporation in simple non-technical language to stockholders.

- Defensive – risk controlling: the next phase is focused on determination of limits for trade and business units. Advantage of VaR is that we have only one value which can be used for comparison of risk activities at diversified markets.

- Active – risk managing: there is rising tendency in usage of VaR for allocation of capital across trade and business units, products and even the whole institution. This process begins with Risk Adjusted Performance Measures (RAPMs) that automatically rectifies incentives for businessmen to undergo higher risk level because of possibility of higher profit.

- VaR became important for deciding in institutions all over the world. Some examples follow:

- Financial institutions: banks with large volumes of transacted portfolios became a leader for implementation of risk management. Institutions working with numerous financial risk sources and complicated instruments are implementing centralized systems of risk management today. Those, who don´t do that, are exposing themselves to high-priced failures.

- Regulators: conservative regulation of financial institutions requires a minimum of held capital as a reserve used for financial risk prevention. Basel Committee on Banking Supervision, Federal Reserves, European Union regulators and the others direct to VAR like indicator of risk. VaR provides sensitive risk measurement and therefore helps with solving of moral hazard problems which are usual at financial markets.

- Non-financial corporations: centralized risk management is useful for every corporation exposed to financial risk. Multinational companies have their cash

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[4] Expression „hedge" should evoke association with funding and thus with secure investment but the reality is different. This type of fund is focused on maximizing profit using leverage effectand it is connected with high measure of risk.

earnings and expenses denominated in various currencies and are badly influenced by unfavorable currency progress.

- Assets managers: investors use VaR more frequently than before because they need to manage their financial risk.

In the Asia there was a crisis recently. Extended interpretation talks about fact that the crisis got worse mainly because of confused and weak application of financial institutions risk management. If the theory is correct VaR systems should help.

2.2 VAR systems

Probability of profit and loss can be caused by two different sources. On the one side there are risk measures that represent active choice of businessmen or portfolio of managers. On the other side there is progress of risk factors that cannot be influenced by investors and is out of their control.
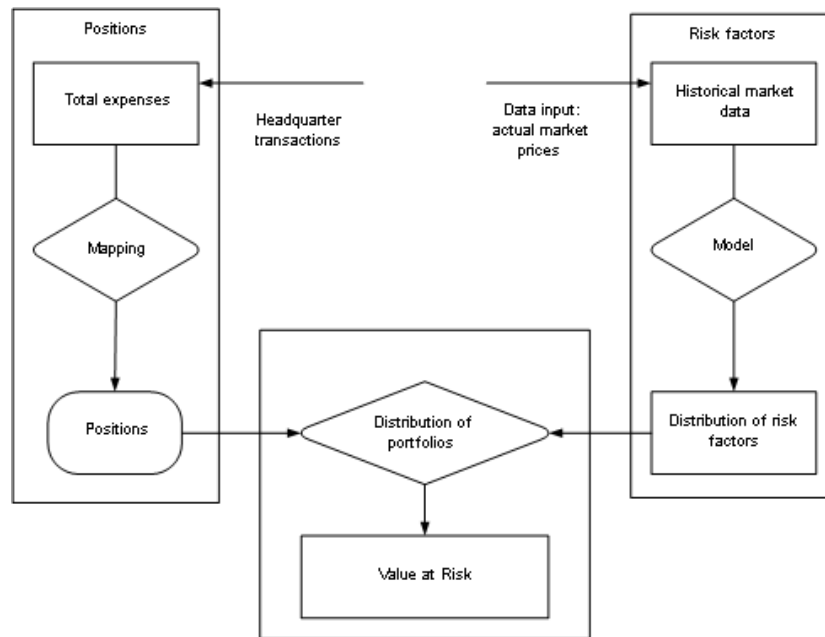
Illustration 1: VaR systems

On the left side of the illustration there are portfolio's positions which can be transacted from headquarter. On the right side there are risk factors with input data in form of actual market prices. Positions and risk factors are put together in Risk Generator and at this point there is generated distribution of portfolio values. These can be summarized by their VaR. Specific VaR methods can cause different presumptions for positions and risk factors simulation. Positions can be substituted either by their linear/quadratic risk measure or by full overestimation. Distribution of risk factors can be simulated by normal distribution,

historical data or Monte Carlo simulation. Modern models for risk numeration are applicable at highest levels of portfolio which includes large number of instruments and risk factors and therefore it would not be useful to simulate all these position separately. Because of that some simplifications in simulation are necessary. Looking for acceptable volume of risk factors during implementation of risk measurement system is important.

2.3 VaR utilization

VaR is related to explicit value expressed by cost units as a maximum what can be lost in specific time period. It is not right to rely on the one risk measure only and so it is considerable to add some other measures to VaR. After that the risk numeration should be more comprehensive.

If the entity we are looking for is portfolio risk measure (possible loss expressed by cost units) we can think over these basic alternatives:

- standard deviation of portfolio earnings – is commonly used risk measure informing about earnings volatility, not about amount of loss expressed by cost units;

- maximum possible loss – is not such a directive information because maximum possible loss is usually the same as a value of held portfolio. In addition to that it predicates neither about loss probability nor relative riskiness of specific assets in portfolio;

- shortfall measures and expected loss if a tail event occurs – looks like a most suitable solution which makes calculation of VaR easier. VaR can be calculated even without necessity to determine presumptions about diversification of portfolio's earnings.

The advantage of VaR method is its use in institutions from micro to macro level. Next to large financial institutions which acquire VaR concept as a principle of their everyday risk management there is extension of method usage also in non-financial institutions. The main impulse to make this step was caused by knowledge that earnings and cash flow of business activities are influenced neither by uncertainty (e.g. volume of disposals) nor financial risks. And these are the same as the risks of financial institutions. Implementation of VaR into non-financial sphere led to its upgrade. New "in risk" values were created, e.g. Earnings at Risk (EaR), Earnings Per Share at Risk (EPSaR) or Cash Flow at Risk (CFaR). All those measures are better in taking specific company environment into consideration.

2.4 The Value at Risk models classification

There are many of methods of VaR estimation, with those differentions:

- methods of risk factors changes simulations
- methods of transformation of changing risk factors to change value of portfolio

One of VaR methods range (variačno-kovariačné variation - covariation methods) supposes knowledge of allocation of portfolio earning (i.e. portfolio value changes) and to VaR estimation uses standard deviation estimation (in case of covariance matrix portfolio).

Other range (simulation methods) simulate changes in risk factors value, to gain through them allocation of changes in portfolio value, what is needed to estimate VaR. By risk factors changes simulations are used two manners:

- there is explicitly anticipation of specified risk factor allocation, i.e. specifies of probability, that financial variable gets specified value in the future:

- there is making use of financial variable trend in the past and its trend prediction in the future, i.e. work with real historical (or empirical) risk factor allocation

There are two main VaR methods groups:

- parametric methods (variation and covariation methods)

- simulation methods (historical simulation method. Monte Carlo simulation)

3. REFERENCES

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