Review on doctoral dissertation*

The author of the Ph.D. dissertation:	*Saša Žiković*
Institution:	*Faculty of Economics, University of Rijeka*
The title of the Ph.D. dissertation:	*Capital Requirements and Measuring Market Risk in EU New Member States and Croatia in Light of Basel Committee Guidelines*
Committee in charge:	*Vlado Dimovski, chair; Ivan Ribnikar, mentor; Marko Košak, co mentor; Franjo Štiblar*
Defended at (place and date):	*Faculty of Economics, University of Ljubljana on September 3, 2007*

The doctoral dissertation submitted by Saša Žiković, M.Sc., comprises eight independent chapters (264 pages), a reference list of literature and other works cited (17 pages), a list of tables and figures (4 pages), and an extensive appendix with graphs and tables presenting calculations (123 pages), a list of which is provided in the overview of tables and figures (14 pages). The entire dissertation is written in English with a Slovenian abstract.

The content of this doctoral dissertation is defined by two key points of departure. First, this dissertation discusses an important and topical area of evaluating market risks in financial intermediaries. Primarily because of the development level of regulations and their most consistent application, the author proceeds from the issue of appropriate market risk evaluation in the banking sector. Second, the author highlights the issues of fulfilment and non-fulfilment of the criteria for using recognized models and methods to measure market risk exposure in the financial markets of the new EU member states that entered the EU in 2004 as well as Croatia. Precisely because of the strongly established practice of banking regulators, the author focuses on the value-at-risk (VaR) method among the methods of market risk measurement. Even the Basel Committee on Banking Supervision proposed the use of this method in its first serious revision in 1996 together with the required conditions laid down in the Amendment to the Capital Accord to Incorporate Market Risk that must be met in order to use this method. The proper use of individual VaR versions also requires the fulfilment of certain extremely restrictive criteria. In the case of the developing and fast growing markets of Eastern Europe, it does not seem likely, even at first glance, that these criteria would be fulfilled all the time and in their entirety. It is precisely here that the author finds his opportunity to develop the original idea upon which the entire dissertation is based, which can be divided into two parts:

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- The empirical testing of fulfilment or non-fulfilment of statistical and econometric criteria for using individual alternative versions of VaR models,

- Developing an original expanded method taking into account the specific situation in the financial markets of Eastern European countries; in addition, the author proves the robustness of the new method with statistically comparative tests.

In the first chapter, *Introduction*, the author first provides a detailed description of the research area – that is, market risk measurement in financial intermediaries (especially banks). The author proceeds from empirically established trends that are well-known in the literature and according to which investments in various market financial forms and trading with these financial forms are becoming increasingly important in modern banking compared to traditional credit transactions. Because of this, the importance of certain risks in banking that normally do not present themselves in traditional credit transactions, or are not that important, is increasing. In general, these risks can be referred to as market risks, which represent one of the most important risk dimensions (but not the only dimension) in changing the banking structure. However, knowledge of all of the market risk aspects and the ability to correctly evaluate the exposure to such risk is becoming increasingly important in ensuring the successful and secure operation of modern banks. As a rule, banking security is the basic guideline for banking regulators in determining minimum requirements (or criteria) for evaluating exposure to risks and in determining the requirements for capital adequacy. As a rule, national regulators follow the basic standards created by the Basel Committee on Banking Supervision. The same is also true for EU member states' regulators, with the only exception that the Basel standards are almost completely incorporated into the EU banking guidelines, which are binding for member states' banks and regulators. In defining the issue studied, the author of this dissertation immediately focuses on the use of VaR models for evaluating market risks and draws appropriate attention to the use of these models in less developed financial markets, among which he also includes the markets of the new EU member states and Croatia. Because violating or disregarding individual criteria of the VaR models used in less developed financial markets results in incorrect evaluation of market risk exposure, the author clearly highlights the unfavourable consequences for banks engaged in such practices (i.e., possible losses can be underestimated, which can be fatal for banking, but they can also be overestimated, which due to regulators' capital requirements can create additional costs for the banks and lower their competitiveness). In the introduction, the author determines which of the established models will be tested in the following chapters (i.e., normal variance-covariance VaR, RiskMetrics, historical simulation for 50, 100, 250, and 500-day time periods, age-weighted historical simulation, RiskMetrics using the GARCH volatility forecast model, normal Monte Carlo, and exponentially weighted moving average Monte Carlo). In addition, he states that he will develop an original method (i.e., Hybrid Historical Simulation), which should take into account the special features

of the developing financial markets of the countries studied to the greatest extent possible. Based on the well-defined problem area in the introduction, the author provides a detailed definition of the basic hypothesis and seven additional hypotheses, which he later uses to test individual elements of the basic hypothesis' validity and which are mainly directed towards testing individual statistical and technical special features. The basic hypothesis states: "*Value-at-risk (VaR) models, which are usually used in developed financial markets, are not appropriate for measuring market risks in the new EU member states and Croatia*."

In the second chapter, titled *Risks in financial industry* the author provides a general overview of individual aspects of banking risks and the role of effective risk measurement and management in modern banking.

The third chapter, titled *Basel Committee on Banking Supervision and its' role in actualisation of market risk awareness* is a logical continuation of the second chapter because the author presents the role and meaning of the Basel Committee on Banking Supervision and the mechanism of capital standards as developed and established in modern banking by this committee, which is part of the Bank for International Settlements. Special attention is directed towards the presentation of market risk evaluation and the circumstances leading to the inclusion of market risks in the Basel capital standards after 1996, as well as their inclusion in the provisions of the EU Capital Directive. In addition, the author provides a detailed presentation of both basic methodologies envisaged by the Basel standards – that is, the standardized measurement method, and the method of using internal models to measure market risk. The possibility of developing internal models in banks is also the basis for further consideration of testing the appropriateness of existing VaR models and developing a robust VaR method for conditions typical for Eastern European financial markets. In the third chapter, the discussion of the basic characteristics of financial markets in Eastern European countries, banking practices in regulating exposure to market risks, and the overview of success in monitoring individual risk aspects is worth highlighting; here, the author uses selected specialized studies from this area.

The fourth chapter, titled *Measuring market risk via Value-at-Risk (VaR) methodology* presents various possible methods for evaluating market risk exposure (e.g., sensitivity analysis, scenario testing, etc.), whereby special emphasis is devoted to presenting the value-at-risk (VaR) concept, including the basic requirements for using this approach and a description of possible applications. It should be highlighted that in this chapter the author critically evaluates the applicability of value-at-risk methodology and draws attention to the weaknesses of its use, as well as comparing it to the similar CVaR (conditional value-at-risk) concept, clearly demarcating the priority areas of use of both concepts.

The fifth chapter, titled *Calculating Value-at-Risk for market risk exposure* is dedicated exclusively to an accurate and detailed presentation of individual established

value-at-risk calculation techniques that are well-known in the literature, in which, with each technique, the author clearly draws attention to the criteria that ensure the reliability of results, and to the advantages and disadvantages of each technique. In the group of nonparametric and semi-parametric techniques, the author introduces a method that he developed independently – that is, the HHS or Hybrid Historical Simulation – and takes into account the adaptations resulting from two typical characteristics in less developed financial markets: the high volatility of return rate in time, and the leptokurtic distribution of return rates in these markets. In its nonparametric part, the HHS method developed takes into account corrections due to leptokurtosis and asymmetry of the return rate statistical distributions and, in its parametric part, corrections due to autocorrelation and heteroskedasticity in the return rates observed are taken into account using an ARMA GARCH model.

The sixth chapter, titled *Backtesting market risk models* presents the methods for statistical testing or quantitative evaluation ("backtesting") of the suitability of individual methodologies for calculating value-at-risk. The author uses a large number of methods to prove the validity or invalidity of individual criteria used with individual value-at-risk calculation methods in the following chapter.

The seventh chapter, titled *Measuring market risk in EU new member states and Croatia* summarizes and explains the findings of the empirical analysis of the selected VaR models. Graphs and tables presenting the related calculations are collected in the appendix. Testing of selected VaR models is performed on stock market indices calculated in organized markets of the new EU member states and Croatia. The test results are used as the basis for comparing and ranking the selected VaR models, in which the newly developed HHS model proves to be the most robust and reliable due to the adaptations mentioned above.

In *Conclusion,* the eighth and final chapter of the doctoral dissertation *Capital Requirements and Measuring Market Risk in the New EU Member States and Croatia in Light of the Basel Committee Guidelines*, the author provides a short summary of his findings and forms his final conclusions.

Doctoral dissertation titled Capital Requirements and Measuring Market Risk in the New EU Member States and Croatia in Light of the Basel Committee Guidelines submitted for evaluation by Saša Žiković, M.Sc., represents a conceptually in-depth and methodologically demanding study that satisfies all of the criteria for obtaining a doctorate at the University of Ljubljana's Faculty of Economics. The originality of the author's research approach and thus his contribution to the field's development is evident primarily in the following aspects:

- Through the analysis of stock market indices in the new EU member states and Croatia, the characteristics or special features of these financial markets are tested and clearly presented;

- Empirical testing of fulfilment or non-fulfilment of statistical and econometric criteria for applying individual existing and already established alternative versions of VaR models;

- Development of an original expanded method taking into account the specific conditions in the financial markets of Eastern European countries (i.e., great variability of return rates and established leptokurtosis of return rate distributions); in addition, the author proves the robustness of the newly developed method with statistically comparative tests;

- The findings of this doctoral dissertation have direct applied value. As a whole, the doctoral dissertation submitted also opens possibilities for continuing the author's research in both the theoretical and applied sense.

Rijeka, November 2007

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