

Copula-application to modelling Russian banking system capital adequacy according to Basel II IRB-approach

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Abstract. According to the strategy of the banking system development until 2015, the Central Bank of Russia is going to implement Basel II Internal-Ratings-Based (IRB) approaches in 2015, while Basel III is planned to be introduced in full starting from 2019. Taking into account the effects of the Basel II regulation during the crisis 2008–2009, in particular, the excessive procyclicality of the capital requirements, it is important to investigate the consequences of its adoption for the stability of the banking system in Russia.

The aim of this paper is to model the Russian banking system capital adequacy under the Basel II IRB approach. The main hypothesis tested refers to the existence of the procyclicality effect of the capital adequacy for the whole banking system as if Basel II has been introduced. The research is based on publicly available quarterly financial statements of all the Russian banks for the period 2004Q1–2010Q1. Copulas are used to model joint banking risk distribution.

The methodology consists of three steps. First of all, the copula structural shift for the joint risk distribution for the Russian banking system is assessed in order to examine the dynamics of the individual risks' dependence and analyze the change in the level of the banking system stability. Secondly, risk-weighted assets are modelled using copula. Finally, the Value-at-Risk approach is employed to arrive at the capital adequacy ratio for the Russian banking system.

The analysis of the copula structural shift shows the downward change in the risks' interconnection starting from the third quarter of 2005 being associated with the increased stability of the banking system. The Basel II capital adequacy ratio fell to the minimum of 4% during the period 2009–2010, while the Basel I capital adequacy ratio was well above 15%. However, the hypothesis of the procyclical nature of Basel II is rejected.

The research undertaken highlights the necessity for further investigation and calibration of the models proposed in Basel II and Basel III. Moreover, it is important to work out the appropriate policy options with respect to banks bearing high risks under Basel II.

Keywords: Bank, Basel II, capital adequacy, copula, procyclicality, risk, Russia

JEL Classification Codes: G10, G20, G28

1. Introduction

Taking into account the consequences of the 2008–2009 crisis the Basel Committee has published recommendations with respect to approaches used to estimate aggregate risk of a bank in the framework of Basel II [6]. Copulas were considered as the priority methodology compared to simple summation, diversification and variance-covariance approaches. In October 2010 the Basel Committee published a separate document devoted to methods of aggregate risk modelling emphasizing the advantages of the copula approach [7].

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