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Procedia Economics and Finance 20 (2015) 125 – 130

Procedia Economics and Finance

www.elsevier.com/locate/procedia

7th International Conference on Globalization and Higher Education in Economics and Business Administration, GEBA 2013

Financial market stability: a quantile regression approach

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Abstract

The topic of financial markets stability has received greater attention after the occurrence of the crises from the 90s. The testing of econometric models as well as the econometric analyses regarding the financial stability is scarce, also determined by the fact that there is no complete definition for financial market stability. In this paper, we take into consideration the definition of financial stability proposed by Baur D.G. and Schulze N. (2008) and we analyze the stability of financial markets in European Union countries. We took into consideration the stock exchange indices which are computed based on 95% of the stocks listed on the respective markets. The quantile regression used offers the possibility to study the stock markets under normal and extreme conditions. The results obtained confirm the instability of financial markets under analysis.

Peer-review under responsibility of the Faculty of Economics and Business Administration, Alexandru Ioan Cuza University of Iasi.

Keywords: systematic risk; financial stability; eastern european countries

1. Main text

The economic and financial crises from the 90s in East Asia, Russia and Brasilhighlight the importance of continuous monitoring and analysis of financial stability. Even if it is an important topic for the decision-makers regarding the monetary and economic policies, the papers which analyze financial stability are scarce. The reason is that there is not a unanimously accepted definition for the financial stability.

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Peer-review under responsibility of the Faculty of Economics and Business Administration, Alexandru Ioan Cuza University of Iasi.
doi:10.1016/S2212-5671(15)00056-8

There are direct definitions of financial stability as those presented by Padoa-Schiopa (2002),Foot (2003) and, there are also indirect definitions presented by means of financial instability as that of Davis(2001),Ferguson (2003) and Schinasi (2004). In his turn, Issing (2003) identifies definitions of financial stability performed according to the approach of a system and the analysis of volatility of financial variables.

According to Albulescu (2013b, p. 51), financial stability represents "a concept associated with the stability of financial markets, of banking sector and exchange markets".

Baur and Schulze (2009) define financial stability as "a constant impact of systematic shocks in normal and extreme market situations".

The studies on the stability of financial markets have started to increase in the recent years. The causes of the increase in the importance of financial markets' stability presented by Schinasi(2005) are the following: the expansion of the financial system in comparison with the real economy, the increase in the weight of non-monetary assets in comparison with the monetary assets, the increase in the integration of financial system which made possible the appearance of financial conglomerates and the increase in the complexity of the financial system.

The research on financial stability stop at the forecasting of financial stability Albulescu(2010), the impact of banks and monetary market on the stability of financial market Albulescu(2013a), Stiglitz(2002), CocrişandNucu(2013), as well as the influence of the different ways of listing on the stability of capital marketsAnufriev andTuinstra(2013).

A lot of papers written on the financial stability are performed prevalently for the banking system. This situation is justified by the fact that the policies of central banks ensure the financial stability. Padoa-Schiopa (2002) affirms that the central banks have started to have a role in ensuring financial stability "when they undertook the insurance of money as pear currency, which replaced previous metallic currencies". The research that was conducted before the last economic and financial crisis presented the "incompatibility between the monetary policy and financial stability" Albulescu(2013a), anticipating the beginning of the crisis. Cassola and Morana (2004) draw the conclusion that the measures of monetary policy for long-term price stability can also contribute to the stability of stock market.

Baur and Schulze (2009) propose the testing of financial market stability through the impact of systematic and systemic risk on the capital markets. They define the financial market stability as "a constant impact under normal and extreme market conditions".

The study they undertake proves that for the developed markets the shocks of the systematic risk are constant while the emerging markets are affected differently by the shocks of the systematic risk according to the conditions of normal or extreme market.

In this paper we analyze the stability of financial markets in some countries of the Central and East Europe: Czech Republic, Romania, Bulgaria, Cyprus, Estonia, Croatia, Greece, taking into consideration the definition of the stability of financial markets belonging to Baur and Schulze(2009). For comparison purposes we considered several countries with developed financial markets: France, Germany and USA.

The paper contributes to the development of the literature regarding the analysis of financial markets' stability by means of the following elements. First of all, there are no studies which analyze the stability of financial markets in Central and East Europe. The papers written until now stop at the testing of the stability of stock markets in Asia in the paper ofBaurand Schulze (2009) and Africa in the paper of Ayinde and Yinusa(2013). By using the values of the stock market indices in the countries analyzed they reach the conclusion that the impact of systematic shocks under normal and extreme market conditions is different for the emerging countries in these geographical areas in comparison with the developed countries. The result which is obtained confirms that only the developed countries fulfil the necessary conditions for the stability of financial markets.

Secondly, the use of quantile regression offers the possibility to study the markets under normal and extreme market conditions. The paper adds to the increasing literature which uses this method in the financial sector.

2. Methodology

Testing the stability of stock markets will be performed by means of the methodology proposed by Baur and Schulze (2009).In order to estimate the systematic risk we will use regional stock exchange indices since the systematic risk affects several countries. In order to obtain unpredictable elements/the novelties or shocks of the systematic risk, we estimate the regression model between the regional index and a constant. The residual variable

obtained represents the shocks of the systematic risks and we note it with f_t^* . Baur and Schulze (2009) estimate the residual variable by initially taking into account only the hypothesis of the lack of error autocorrelation specific to the regression models, then they compare it with the residual variable that meets all the hypotheses specific to the regression models. The results on the financial stability do notchange. We will have the same stages in what follows.

The estimation of the regression model through the least square method is of the form:

$$r_{it} = a_i + b_i f_t^* + n_{it}$$

In order to take into consideration the normal and extreme market conditions, we will use the quantile regression for the estimation of the following model:

$$Q_r\left(t \mid f_t^*\right) = a_i(t) + b_i(t) f_t^*$$

where: r_{it} –the return of the market at moment t for country i

f_t^* - the shocks of the systematic risk

n_{it} – the non-systematic or specific risk

$Q_r\left(t \mid f_t^*\right)$ - a aconditional quantile

The indices used in the study are provided by STOXX Limited and presented on the website www.stoxx.com. We took into consideration the following indices:

- STOXX Croatia Total Market, STOXX Cyprus Total Market, STOXX Czech Republic Total Market, STOXX Estonia Total Market, STOXX Grecia Total Market, STOXX Bulgaria Total Market. Since for Romania STOXX Limited does not calculate such an index, we took into consideration the exchange index BET-C,which is calculated based on all the listed stocks. For these countries, we took STOXX Eastern Europe Total Market for the estimation of the shocks of systematic risk;

- STOXX Germany Total Market, STOXX France Total Market and STOXX USA Total Market. For these countries, we took STOXX Global Total Market for the estimation of the shocks of systematic risk.

The values of all indices are expressed in dollars and have daily frequency. The indices computed by STOXX Limited take into consideration the stocks that cover 95% of the stock exchange capitalization. On their basis, we calculated the daily continuously compounded return.

3. Empirical Analysis

We estimated the sensitivity of the analyzed stock markets to the systematic risk by means of the quantile regression in order to take into consideration the extreme and normal market conditions. The results obtained for the developed markets France, Germany and United States of America are close to the study conducted by Baur and Schulze (2009).

Table 1. Estimations for the sensitivity of stock markets to the systematic risk

Country	Quantile 1	Median	Quantile 96
Bulgaria	0.42	0.26	0.32
Czech Republic	0.85	0.66	0.70
Croatia	0.52	0.34	0.40
Cyprus	0.70	0.69	0.84
Estonia	0.47	0.37	0.50
Greece	0.78	0.62	0.77
Romania	0.67	0.47	0.52

The regression coefficients estimated for these countries do not vary very much so that we may say there are not significant differences under normal market conditions and under extreme market conditions. For France the slope of the regression line varies from 1.07 for the quantile 1 to 1.13 to the median and to 1.06 for the quantile 96. For Germany these are 1.01, 1.10 and respectively 1.04 while for the United States of America they are 1.08, 0.94 and 0.93, respectively.

We do not meet the same situation for the countries in the East Europe under analysis. The results are presented in the table above.

The results presented in the table above show a great variance of the sensitivity of stock markets to the systematic risk. This shows that the impact of systematic risk differs according to the market conditions. An overview of all the estimated coefficients is performed by means of their graphical representation.

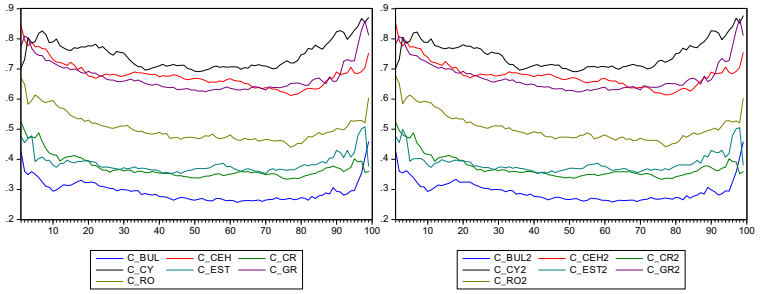

Figure 1.The regression coefficients estimated through the quantile regression for the East European countries ; (a) the shocks of the systematic risk obtained by meeting the hypothesis of the lack of error autocorrelation; (b) the shocks of the systematic risk obtained bymeeting all the hypotheses specific to the regression model.

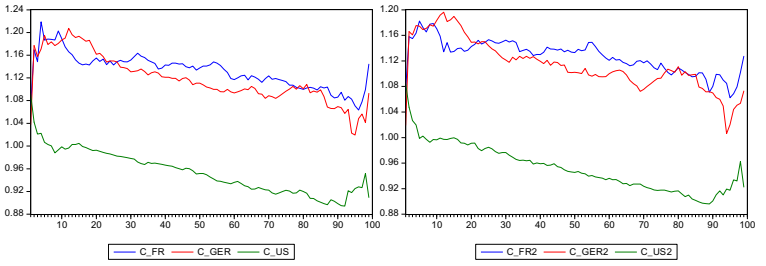

Figure2.The regression coefficients estimated through the quantile regression for France, Germany and the United States of America; (a) the shocks of the systematic risk obtained by meeting the hypothesis of the lack of error autocorrelation; (b) the shocks of the systematic risk obtained bymeeting all the hypotheses specific to the regression model.

Unlike the markets from East Europe, France, Germany and the United States of America, the graphical representation does not suggest a clear form of pattern of the U letter for the estimated regression coefficients and these coefficients do not seem to be constant along all the quantiles. Therefore, we will continue to test the regression coefficients resulted from the quantile regression with the aim to verify if they are significantly different. The test used is the Wald ( )test. The null hypothesis implies that there is no difference between the regressions coefficients (the slope of the regression line) estimated through the quantile regression while the alternative hypothesis supposes that there is a difference between the regression coefficients. The results are presented in the following table.

The table below proves the presence of the significantly different regression coefficients along the quantiles which suggests that the stock markets are not characterised by stability. The stock markets behave differently under normal market conditions in comparison with the extreme market conditions. We also need to mention that in this case the systematic shocks are obtained as a residual variable of the previously presented regression model which meets the condition of the lack of error autocorrelation.

Table 2.Testing the equality of the regression coefficients estimated through the quantile regression

	c^2	Prob.	c^2	Prob.
Bulgaria	176.2799	0.0000	179.7144	0.0000
Czech Republic	133.9218	0.0093	142.3707	0.0023
Croatia	171.0550	0.0000	179.4398	0.0000
Cyprus	129.2549	0.0189	123.0520	0.0443
Estonia	137.7164	0.0051	148.2721	0.0008
Greece	191.3266	0.0000	185.8839	0.0000
Romania	210.4177	0.0000	204.9784	0.0000
France	128.8437	0.0200	104.5834	0.3059
Germany	168.8132	0.0000	120.2544	0.0630
USA	357.2050	0.0000	352.1942	0.0000

Note: * Prob. represents the probability associated forthe test Wald, c^2 is the value of the Wald test

** The results of the two Wald tests are presented, corresponding to the two manners of obtaining the shocks of the systematic risk.

If the systematic shocks are obtained as a residual variable of the previously presented regression model which meets all the hypotheses of a regression model, the situation is maintained with the exception of France and Germany. These two countries meet the necessary conditions for the stability of stock markets.

4. Conclusions

In order to test the financial stability we used the methodology proposed by Baur and Schulze(2009) which implies the use of quantile regression. The quantile regression offers the possibility to analyze the stock markets under normal and extreme market conditions.The results obtained confirm the lack of financial stability on the analyzed stock markets in East Europe such as Czech Republic, Romania, Bulgaria, Cyprus, Estonia, Croatia, Greece and the United States of America and a potential financial stability of two great developed markets, Germany and France.

Acknowledgements

This paper is based on the research for the project “Global Risks for financial and monetary stability. Implications for Romania and the European Union”, conducted within the “Victor Slăvescu” Centre for Financial and Monetary Research, in 2013

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