The Dynamics of Bank Assets Volatility in Central and Eastern European Countries

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Abstract: An important aspect in managing and addressing a financial crisis is the tax burden sharing between affected countries. Fiscal costs incurred by the rescue of a banking group may be substantial and the sharing process can generate difficult negotiations of the countries involved, leading to delays in the development of crisis management and resolution. Because the mechanisms of fiscal burden sharing imply potential adverse selection and moral hazard problems, it is possible that the appropriate burden-sharing mechanism for the Eastern European Countries be a mix of ex-ante mechanisms. In this paper we estimate the dynamics of bank assets volatility in the case of five major listed banks in Central and Eastern European (CEE) countries, in order to analyze the manner in which the volatility during the financial crises propagated its effects in CEE countries at the beginning of 2009. The findings indicate that there was a sharp increase in volatility at the beginning of 2009, but as of mid 2011 it is converging back to pre-crisis values.

Key-Words: banking crises, burden-sharing, ex-ante mechanisms, assets volatility, option pricing theory, deposits guarantee fund

1 Introduction

In the past few years, the European financial markets have become increasingly interrelated. The assets of bank branches and subsidiaries established in another European country grew from 2000 billion in 2002 to respectively 3000 and almost 4000 billion Euros in 2006. Cross-border banking activity in the EU is largely concentrated in a small number of large and complex financial groups with significant operations in numerous countries or even on a pan-European scale. A number of 39 large cross-border groups owned a significant share of the total assets of approximately 8300 credit institutions in the European Union (EU) in 2007, with their aggregate
assets representing roughly 68 percent of the total EU banking market. Foreign financial groups dominate banking markets especially in the new Member States. In Estonia, Czech Republic and Slovakia over 92 percent of total banking assets were held by foreign-owned banks.

On average, foreigners control more than 65 percent of total banking assets in sixteen transition economies in Central and Eastern Europe (Fig. 1).

![Foreign Bank presence in 2007 (% of total assets)](source: CEE Region, UniCredit Group, London February 2009)

The impact of foreign banks was positive from the beginning because: the capital brought by foreign investors decreased fiscal costs of banks’ restructuring (often privatization to reputable foreign owners was the only way to decrease moral hazard problems induced by previous repetitive bailouts (Tang et al., 2000, [17]); foreign banks brought expertise in risk management and higher culture of corporate governance, rendering banks more efficient (Bonin et al., 2005, [2]); foreign bank presence increased the competition, driving domestic banks to cut costs and increase efficiency (Claessens et al., 2001, [4]) and domestic banks have benefited from technological spillovers brought about by their foreign competitors.

While the benefits of foreign ownership for banks’ efficiency in transition countries seem to be proven, the impact of high foreign ownership on banking sector stability is less clear. Also, the impact of home country conditions on foreign banks is more ambiguous and cannot be easily predicted. We can assume that home country experiences an economic upswing. In this situation parent banks have numerous profitable opportunities in their home countries, and can decide to allocate less capital to their subsidiaries. At the same time, high growth in the home country could make parent banks more profitable and more capable to develop their subsidiaries abroad. The situation would be reverse in case of economic slowdown in home countries, when parent banks could decide either to cut their foreign operations due to low profits at home or expand abroad for new opportunities.


The global financial crisis which began in August 2007 illustrates the importance of effective cross-border crisis management and ex-ante arrangements. The absence of a multinational framework for sharing the fiscal burdens for such crises or insolvencies is, along the fact that legal systems and the fiscal responsibility are national, a basic reason for the predominance of the territorial approach in resolving banking crises and insolvencies. National authorities tend to seek to ensure that their constituents, whether taxpayers or member institutions underwriting a deposit insurance or other fund, bear only those financial burdens that are necessary to mitigate the risks to their constituents. Thus, if no ex-ante burden-sharing agreement can be reached, the most practical steps may be to recognize the strong possibility of ring fencing and implement appropriate crisis management arrangements and supervisory requirements that promote clarity and protect stakeholders. Because it is very difficult to envisage a resolution of the financial crisis and a recovery in the global economy without assured stability in the banking sector and the broader financial system, several countries have announced their intention to complement their existing support measures by providing some form of relief for impaired bank assets.

In the context of such a Community approach, the Communication from the Commission on the Treatment of Impaired Assets in the Community Banking Sector (2009) also offers more specific guidance on the application of state-aid rules to asset relief, focusing on issues such as (i) transparency and disclosure requirements; (ii)
burden sharing between the State, shareholders and creditors; (iii) aligning incentives for beneficiaries with public policy objectives; (iv) principles for designing asset-relief measures in terms of eligibility, valuation and management of impaired assets; and (v) the relationship between asset relief, other government support measures and the restructuring of banks.

Goodhart and Schoenmaker (2006, 2009), [8], [9], present different types of ex-ante mechanisms and a general scheme in order to recapitalize the European banking groups in need. In this general scheme, the countries in the Union assume voluntary their participation in a share; depending on a key, for example the economic power, or the capital for the European Central Bank (individual contribution is independent of any presence of an ailing banking group in that country). But, although ECB may create unlimited liquidity, its ability to absorb losses is limited by its capital. Thus, to give the ECB a credible role, its capital needs have to be underwritten by the national governments. However, this is considered only an intermediary solution.

Therefore, the institutional design of a burden-sharing mechanism is very important and may foster the proper incentives for contributions by the country to the management of cross-border banking crises. In order to mitigate political obstacles to its contribution at the EU level, the voice that a country has could be determined according to its relative contribution at the EU level, the voice that a country to the management of cross-border banking crises. In order to mitigate political obstacles to its contribution at the EU level, the voice that a country has could be determined according to its relative share in collective management efforts: the more a country contributes the bigger voice it has in the collective crisis management decision-making process.

According to Herring (2007), [10], burden-sharing arrangements should consider the countries’ ability to bear the burdens of a cross-border banking crisis. Taking into consideration not only their fiscal resources but also their supervisory capacity, there exist considerable asymmetries among the countries. By fostering cooperation among the countries, burden-sharing arrangements help reduce bailout costs and safeguards financial stability. Burden sharing thus mitigates the moral hazard problem that accompanies state support to banks in distress. However, burden-sharing arrangements itself may induce moral hazard among the countries. If a country feel insured against the large burdens that a banking crisis may create due to the contributions provided by others, they may have limited incentives to monitor market developments and become less risk averse in supervising banks within their jurisdiction. Simultaneously, other countries may be reluctant to contribute to the costs related to a cross-border bank failure that is in large part to blame on insufficient or inadequate supervision by the bank’s home and/or host country.

In the context of the debate regarding the establishing of ex-ante mechanisms for bank resolution it is essential for Central and Eastern European (CEE) countries to assess the volatility of bank assets in these countries. In this paper we estimate the unobserved value of assets as well as the volatility for five major listed banks in CEE countries.

2 The estimation methodology

In this section we briefly describe the methodology developed by Ronn and Verma (1986), [16], that is vastly employed in the literature for estimating the volatility of bank assets.

Following Merton (1977), [15], it is assumed that bank’s assets follow a geometric Brownian motion:

$$\frac{dA_t}{A_t} = \mu dt + \sigma dW_t$$

where $A_t$ is the value of assets at time $t$, $\mu$ is the instantaneous expected return on assets, $\sigma$ is the volatility of the assets, and $W_t$ is a standard Brownian motion.

Merton (1974), [14], considers a firm that issued a single zero coupon bond that promises to pay $F$ at the maturity date $T$. In case of a bank, Merton (1977), [15], analyses the situation that the debt corresponds entirely to deposits. Because most deposits are of demand type, the assumption of term debt is not strictly applicable. However, it is customary in the literature to interpret the length of time until maturity as the length until the next audit of the bank’s assets, length usually chosen to be one year (Merton, 1977, [15]; Ronn and Verma, 1986, [16]; Lehar, 2005, [12]). Moreover, since it is assumed that both principal and interest on deposits are insured, the insured deposits will be riskless and, therefore, $F = De^{rT}$, where $D$ is the current (book) value of the deposits and $r$ is the instantaneous risk free interest rate. At maturity, the value of the bank’s equity is given by max$\left(0, A_F - F\right)$, and, therefore, it is equivalent to the payoff of a call option (Fig. 2).

The value of the debt (deposits) is always $F = De^{rT}$, and the cost incurred by the deposit guarantee fund is max$\left(0, F - A_F\right)$. 

The payoff of the bank equity

Under these conditions, the value of the bank equity \(E\) can be determined as the premium of an European call option with maturity \(T\) and strike price \(r T\), and the premium paid by the bank to the deposits guarantee fund can be determined as the premium of an European put option with maturity \(T\) and strike price \(r T\). The options premiums are computed with the Black and Scholes (1973), \[1\], formula since the underlying (the value of the bank assets) follows a geometric Brownian motion and the risk free interest rate is assumed constant.

In order to use option pricing theory in evaluating the equity and debt of banks, two unobservable variables, respectively the value of the bank assets \(A\) and the volatility of assets \(\sigma\), have to be estimated. Ronn and Verma (1986), \[16\], suggest using two restrictions for the identification of these two unknowns. The first relationship consist in the fact that the equity value of the bank, which is directly observable as the market capitalization of that bank, is an European call option on the bank's assets with a strike price equal to the fructified value of deposits:

\[
E = A \cdot N(d_1) - D \cdot N(d_2)
\]  
(2)

where \(d_1 = \frac{\ln(A/D) + \frac{1}{2}\sigma^2 T}{\sigma \sqrt{T}}\), \(d_2 = d_1 - \sigma \sqrt{T}\), and \(N(\cdot)\) represents the cumulative distribution function for a standard Gaussian random variable.

The second relationship, which can be obtained by applying Ito's Lemma to equation (2), relates the equity volatility, which is can be computed from historical stock price data, and asset volatility:

\[
\sigma_E = \sigma \frac{A}{E} N(d_1)
\]  
(3)

Duan (1994), \[7\], has developed a maximum likelihood framework to estimate these unobservable parameters which is consistent with the results of Merton (1977), \[15\], theoretical model that equity volatility is stochastic. Since the advantage of Ronn and Verma (1986), \[16\], consists in not requiring high frequency data on deposits, we decided to use this widely applied method instead of the more theoretical focused and more data demanding Duan (1994), \[7\], method. Moreover, Duan (1994), \[7\], points out that the sample standard deviation of stock returns, employed in the Ronn and Verma (1986), \[16\], method, is not an efficient, but still a consistent, estimator for the equity volatility.

3 Empirical results

In this section we estimate the dynamics of bank assets volatility in the case of five major listed banks in Central and Eastern European (CEE) countries: Powszechna Kasa Oszczednosci Bank Polski SA (PKO) from Poland, OTP Bank Plc (OTP) from Hungary, Komercni Banka (KOM) form Czech Republic, BRD-Groupe Societe Generale SA (BRD) from Romania, and Vseobecná Uverova Banka (VUB) from Slovakia. Annual balance sheet data for the period 2006 - 2010 was obtained from the annual reports published on the websites of the five banks. The data was transformed in EUR using exchange rate data from European Central Bank.

We employ monthly stock price data for the period January 2005 – June 2011 that was collected from the exchanges that list the shares of the five banks. We make the assumption that the next audit of the bank will take place in one year, and that the maturity of the debt equals one year as well \((T = 1)\). For each month, the stock price volatility is computed as the standard deviation of returns using a rolling window of 24 months.

The level of debt in a given month is obtained by linear interpolation. The value of the bank assets and the value of the assets volatility are obtained using the one-to-one mapping between the unobserved asset value and volatility and the observed equity value and volatility. The estimation procedure has been implemented using Ox object-oriented matrix programming language (Doornik, 2007), \[6\]. Fig. 3 depicts the evolution of volatility for the assets of the five banks.
There was a sharp increase in volatility during the financial crises that propagated its effects in CEE countries at the beginning of 2009. More specifically, the volatility doubled comparative to pre-crisis estimates. However, as of 2011 it is converging back to more “normal” values ranging between 4% and 8%.

Fig. 4 depicts the dynamics of the value volatility of the assets of the five banks as perceived from the stock market perspective.

There was an accentuated decrease in the value of assets, as estimated from the market value of equity, at the end of 2008 and the beginning of 2009. However, as of mid 2011, the assets have reached or even surpassed the pre-crisis value.

4 Conclusion

The absence of a clear framework for dealing with the possible failure of a cross-border institution was identified before the crisis as a major shortcoming of the EU architecture. Concerns were raised both about the lack of incentives to information sharing and the lack of provisions for ex-ante burden sharing arrangements. The ex-ante burden-sharing mechanisms were consistently rejected by the authorities and even the suggestion of a compartmented fund to which countries would all contribute without exercising joint responsibility fell on deaf ears, although studies proved that ex-post mechanisms are not sufficient for crisis times. In the same time, although the countries confronted with the exceptional severity of the crisis and the high risks involved in the failure of a large cross-border financial institution, governments never renounced from the position that there is no European taxpayer and that all support to the banking sector has to be national. Still, Cross-border banking is to a large extent taking place in a regional context, and therefore ex-ante arrangements are needed.

In this article we presented how the sharp increase in volatility during the financial crises propagated its effects in CEE countries at the beginning of 2009 and accentuated the decrease in the value of assets, as estimated from the market value of equity. The findings indicate that there was a sharp increase in volatility at the beginning of 2009, but as of mid 2011 it is converging back to pre-crisis values.

Acknowledgements: We would like to thank Petr Zemcik, Edward Christie and the participants in the RRC XI workshop at CERGE-EI for valuable discussions and suggestions. This research was supported by a grant from the CERGE-EI Foundation under a program of the Global Development Network. Ciprian Necula also acknowledges financial support from CNCSIS-UEFISCSU, grants PN II-RU PD_583/2010 and PN II PCE_1863/2009. All opinions expressed are those of the authors and have not been endorsed by CERGE-EI, the GDN or CNCSIS.

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