Bank prudential behaviour and bank stability – how far do they go

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Received: 4 May 2017 / Revised: 22 August 2017 / Accepted: 12 September 2017 / Published online: 22 September 2017

ABSTRACT

This paper investigates how bank prudential behaviour affects bank stability, focusing only in the period after the global financial crisis. For this reason, we construct a new composite proxy as a measure for bank stability condition and another one for bank prudential behaviour. Then, we make use of a sample with a set of data for 16 banks operating in the Albanian financial sector over the period 2008–2015. The main results provide strong supportive evidence that there exist a strong positive relationship in the prudential – stability nexus, which confirms that prudential behaviour is a key fundamental contributor for bank stability. We also used a quadratic term of the prudential indicator to capture a possible non-linear relationship between bank prudential behaviour and stability, but found no supportive evidence. Finally, macroeconomic conditions are also found to be crucial for bank stability. Similarly, improving operational efficiency and capital structure boost bank stability.

JEL Classification: C26, E32, E43, G21, H63, L51.

Keywords: Bank Stability, Prudential behaviour, LLP.

I. INTRODUCTION

Bank's prudential behaviour is critical in assessing financial system stability, in that it is a fundamental key contributor for fluctuations in banks' profitability and capital positions, which has a bearing on banks' supply of credit to the economy (Beatty and Liao, 2009). In principle, bank focuses on the use of loan loss provisions (henceforth LLP) as a management micro-prudential surveillance tool to mitigate credit risk, which in return requires them to set aside sufficient additional buffers of reserve funds as a cushion to absorb anticipated future expected losses lurking in a bank's loan portfolio [Laeven and Majnoni, (2003)], even before the actual loss can be determined with accuracy and certainty, while unexpected losses have to be cover by bank capital [Dushku, (2016)]. When these anticipated loan losses eventually crystallize, banks can then draw on these reserves, thereby absorbing the losses without impairing precious capital and preserving banks' capacity to continue extending the supply of credit to the economy. The causes for such behaviour may lie not only in the deteriorating economic conditions during a recession,

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DOI: 10.7172/2353-6845.jbfe.2017.2.6

but in the credit risk that was accumulated during an economic boom and which materialised during a recession.

Ideally, the degree of bank prudential behaviour should reflect the beliefs of bank management on the quality of the loan portfolio that they have, indicating that provisions should be able to cover the whole spectrum of expected credit losses if they are to think of prudential behaviour as an attitude to prevent credit risk, without impairing capital, keeping banks safe, sound and able to continue extending credit (Dugan, 2009). Similarly, bank regulators view adequate LLP as a "safety and soundness" issue because a deficit in LLPs implies that ban's capital ratios overstate its ability to absorb unexpected losses [Balla and McKenna, (2009)].

Ever since, the political will to strengthen bank prudential behaviour and bank supervision and regulatory frameworks and to mitigate risks inherent in the financial system was indeed substantiated in the aftermath of the Global Financial Crisis (henceforth GFC), which showed that the potential mechanism to surge lending goes through lowering interest rates or relaxing collateral requirements, loosing credit standards, or a combination of both [Dell'Ariccia and Marquez, 2006; Ogura, 2006; Dell'Ariccia, et al., (2012)]. Therefore, it is trivial to conclude that banks can increase their interest income (and perhaps the absolute net interest result) by an increase of their lending volume [Foos, et al., (2010)], yet it is by far more difficult to assess how the degree of prudential behaviour [Salas and Saurina, (2002); Bikker and Metzemakers (2005); Hess, et al., (2009)] affects relatively bank stability and solvency, while fulfilling their lending functions to society.

Two stylised facts motivate our focus on this question. First, Table 1 in Appendix implies that financial intermediation in Albania is mostly based on the banking sector, which consists of 16 banks. At the same time, in Figure 1a[2] in Appendix, evidences show that banks have managed to adjust the adequate LLPs ratio by applying the provisioning coefficient on gross exposure adjusted with value of collateral accepted. However, the LLPs ratio, in annual growth terms, has picked by the end of 2008. Similarly, in absolute terms their stock has reached nearly 90% of total assets in 2013. Second, evidences (Figure 2 in Appendix) show that there is a high correlation between the degree of bank prudential patterns and bank stability, in particular after the GFC. Therefore, while the capital structure of the banking system in Albania allowed banks to enter the financial crisis in a more robust shape, it is less clear what kind of effect bank prudential behaviour has on bank stability conditions after the GFC. Similarly, empirical analysis on whether prudential behaviour mitigates instability is challenging for two important reasons. First, favourable regulatory prudential support may reduce excessive risk inherent taking, but it is often claimed that such approach may lead banks to cut back on lending [Fratzcher, et al., (2016)]. This may induce banks to take more risk because of moral hazard problems at a time when it is of great importance of restoring and maintaining a sufficient supply of credit to foster economic development and growth. Yet very little is known in the context of emerging market economies, in particular in the case of Albania.

Against this background, this paper investigates the inter-temporal relation between banks' prudential behaviour and bank solvency conditions. In particular we analyse how banks' prudential behaviour affects bank stability after the GFC in the case of the Albanian banking system. For this reason, we utilise quarterly macroeconomic and balance sheet and income statement data for 16 banks operating in the Albanian banking sector over the period 2008–2015. The empirical estimation approach follows a five-step procedure. First, we constructed a composite individual bank stability indicator as explained by Shijaku (2016a). Second, we calculate also a composite index as a measure of bank prudential behaviour, which includes discretionary

[2] According to the Regulation No. 62, Date 14.09.2011 "On Credit Risk Management from Banks and Branches of Foreign Banks" Article 14, Bank of Albania uses the prudential adjustment approach. The prudential provisions are recorded in the balance sheet accounts, while the adjustments are determined by applying the provisioning coefficient on gross exposure adjusted with value of collateral accepted, which are different on classification categories according to perceived risk. Classification on loans are made in five categories (standard, observation, substandard, doubtful and loss) based on debt services, financial performance and judicial proceedings.

DOI: 10.7172/2353-6845.jbfe.2017.2.6

and non-discretionary components representing loan loss provisions made to cover expected loan losses, rather than focusing only on one variable. Then, empirical estimation is based on a dynamic two-step General Method of Moments (GMM) with unbalance panel with quarterly data. Finally, we deepen our empirical analysis either by splitting the sample with regards to large and small banks or checking for non-linearity relationship between bank prudential behaviour and bank stability.

This paper complements the existing literature in several aspects. First, at our best knowledge, no previous study has employed such proxies to investigate the prudential-bank stability nexus and we believe this is an important step forward toward a better understanding of the underlying mechanisms. Second, this is also the first study to investigate empirically how prudential behaviour affects bank stability focusing in particular in the period after the GFC. Third, the banking system in Albania consists mostly of foreign privately-owned banks that operate also in the Eurozone. Therefore, it would be quite interested to see how these banks behave in a small-open emerging economy, in particular after the GFC. Furthermore, since it focuses only on a single country, it avoids any pitfall as described by Uhde and Heimeshoff (2009) related to data issues and ensure comparability across both dependent and independent variables. Nor do we use data from the Bankscope database. On the one hand, we use alternative prudential indicators as means of robustness checks. Finally, we provide appropriate evidence, by fragmentising this sector according to the size of the banks, addressing whether certain institutions show different concentration behaviour than others.

By way of preview, results suggest that bank prudential behaviour is fundamentally crucial for bank stability. A number of robustness checks confirm that bank prudential is linked positively with bank stability. This suggests that the prudential behaviour is a crucial aspect for bank stability that would help banks to better absorb losses in the wake of a possible negative credit cycle. This relationship is found to be stronger for small banks. At same time, we did not find a non-linear relationship in the prudential – stability nexus. Nor, did we find in the case of small banks and large banks. Other results confirm that bank stability is positively linked with market conditions. The bank specific factors, such as operational efficiency and capital structure, are also crucial for bank stability.

The remainder of the paper is structured as follows. Section 2 reviews the existing literature on the use of bank prudential behaviour. Section 3 describes the data and research method. Section 4 discusses our main empirical results and presents robustness checks. The material concludes in section 5.

2. LITERATURE REVIEW

The issue of bank prudential behaviour have received intensive attention focusing mostly on the banks' loan loss provision patterns, but yet again the debate on stability – prudential behaviour remains still an unexplored area both at the theoretical and empirical level. From a theoretical point of view, the accounting and banking literature on banks' provisioning system mainly focus on three different issues. On strand of literature address the hypothesis the LLPs is discretionary, meaning that it is due to utilisation of LLPs for management objectives and arises from the uncertainty and subjectivity in the process of estimating expected losses, while empirical studies have shown that LLPs are used mainly to smooth income and tax-advantaged actions [Niswander and Swanson, (2000); Fonseca and González (2008), Cohen, et al., (2014)]; to manage capital [Ahmed, et al., (1999)]; and to signal financial strength [Beatty, et al., (2002)].

The second strand of literature deals this non-discretionary and addresses the cyclicality of LLPs. This approach is more closely linked to the concept of credit risk, wherein banks set

DOI: 10.7172/2353-6845.jbfe.2017.2.6

aside LLPs, either specific or general provisions[3], according to the underlying quality of their loan portfolio, which is depend on certain credit risk considerations, such as default risk, risk tolerance and the other macroeconomic risks, but Alessi, et al., (2015) believes that in a situation characterised by an ample fluctuation of the business cycle, provisioning policy can be used to stabilise earnings and dividends. This kind of provisioning is said to be back-ward looking since banks mainly relate non-discretionary provisions to identify credit losses. This type of provisioning differs across countries and institutions types and depends of the banks; prudential behaviour. This approach assumes that during good times, few credit losses are identified and the level of LLPs is low. However, during bad times LLPs increase because loan defaults are usually high during this period. As a result, the non-discretionary component is a driving force in the cyclicality of LLPs and leads to a misevaluation of expected credit losses, which are therefore under-provisioned during an upswing phase because the expected credit risk appears as soon as the loan is granted and not only during the downturn when the losses is finally identified. Conversely, banks have to charge provisions too late during bad times. The cyclicality of LLPs directly affects bank profits and bank capital, which could influence the bank's incentive to grant new loans and increase the cyclicality of its lending. This approach includes among other studies those by Anandarajan, et al., (2003), Bikker and Metzemakers, (2005), Bouvatier and Lepetit, (2008).

The thirds strand of literature address the role of provisioning behaviour to mitigate the pro-cyclical effects of business cycles on banks due to risk sensitive capital requirements. Therefore, the counter-cyclical view is that credit risk is build up in a boom and materializes in a downturn (e.g. Borio, et al. (2001). In this view, LLPs should be positively correlated with lending cycle, and banks should build up loan loss reserves in good times to be drawn on in bad times. To that extend, forward looking provisioning behaviour reflected in discretionary loan provisioning practices within a country leads to smoother earnings [Bushman and Williams, (2012)], it raises the questions of whether the observed smoothing behaviour increases the usefulness of earnings by better reflecting risks of the underlying loan portfolio, or whether it reflects earnings management by bank attempting to obscure their risk-taking behaviour or achieve other reporting objectives.

From the empirical point, broadly there are two main strands approaches dealing with research on the bank prudential behaviour. The first strand of literature relates to studies test how prudential behaviour, measured through the use of the net change allows for loan losses (LLPs scaled by total loans) is affected by other explanatory variables. However, the explanatory variables differ. The main factors includes earning smoothing [Greenawalt and Sinkey, (1988); Laeven and Majnoni, (2003); Liu and Ryan (2006)], lending pro-cyclicality [Keeton, (1999); Saurina and Jiménez, (2006);], real loan growth [Foos, et al., (2010); Packer and Zhu, (2012)], credit quality measures [Cohen, et al., (2014)], the loan loss reserve [Bushman and Williams, (2012)], Tier 1 risk-based capital ratio [Liu and Ryan (2006)], the degree to signal financial strength [Bouvatier and Lepetit, (2008)], and liquidity positions of banks [Pabón and Kohlscheen, (2016)]. Some other studies have also use macroeconomic variables to explain patterns of LLPs, which includes the use of economic cycle and economic growth rate [Cavallo and Majnoni, (2001); Curcio and Hasan, (2015)], non-performing loans [Alessi, et al., (2015)], private sector leverage and a lack of capitalization within the banking system [Glen and Mondragón-Vélez. (2011)]. Other papers focusing in this approach includes [Leventis, et al., (2011); Bouvatier, et al., (2014); Balla and Rose (2015); Dushku, (2016)].

The second strands of literature focus on the inter-temporal relationship between bank health and individual risk-taking decisions. According to this latter approach, the difference between individual credit growth of a particular financial institution and the aggregate credit growth in

[3] See also Dushku (2016) for more details on specific and general loan loss provisions.

DOI: 10.7172/2353-6845.jbfe.2017.2.6

a given economy can be a signal of individual risk-taking. In line with the importance of LLPs, some studies have investigated the impact of provisioning on banks future performance. For example, Tahir, et al., (2012) analysed the impact of LLPs on bank profitability using a proxy of return on asset (RoA) and return on equity (RoE). Other studies in this line of research include Ul Mustafa, et al., (2012), Alhadab and Alsahawneh, (2016). Bouvatier and Lepetit (2012) investigates the effects of LLPs on growth in bank lending, making first a difference between non-discretionary and discretionary LLPs. International comparisons are made between five panels of European, U.S., Central and South American, Japanese and South and East Asian banks. Except for Japanese banks, they find a negative and significant effect of non-discretionary loan loss provisions on growth in bank lending. In this line of research, using a sample of 488 listed and unlisted Italian banks for the period 2007–2013, Cucinelli (2015) investigates whether an increase of credit risk during the financial crisis can lead banks to reduce their lending activity. The author finds a negative impact of credit risk on bank lending behaviour, with regard to both credit risk measures: the nonperforming loans and the loan loss provision ratio. From another perspective, Elnahass, et al., (2014) examine the relationship between LLPs and bank value in the case of banks in the Middle East and North Africa region for the period 2006–2011, using a price-level valuation model and a Two-Stage analysis. The results show increasing LLPs is positively linked to bank book value and that there exits also a positive and highly significant cross-sectional associations with share prices.

At the same time, from an empirical point of view only a few papers are loosely related to the research question we address in the case of Albania. The most relevant work is by Barth, et al., (2004) who, using a new dataset on bank regulation and supervision in 107 countries, found that policies that rely on regulatory features that foster among others accurate information disclosure and provisioning standards work best to promote bank development, performance and stability. Silimarly, Demirgüç-Kunt, et al., (2006) whether compliance with the Basel Core Principles for Effective Banking Supervision improves bank soundness. The authors find a significant and positive relationship between bank soundness (measured with Moody's financial strength ratings) and compliance with principles related to information provision. They conclude that measuring bank soundness through means of the Z-scores yields similar results. In a cross-country study of banking systems across 49 countries in the 90s, Tadesse (2006), using a range of survey-based metrics find that banking crises are less likely in countries with greater regulated disclosure and transparency. Fratzscher, et al., (2016) uses a panel dataset for 50 advanced and emerging market economies to analyse how the post-crisis tightening in supervision and regulation affects aggregate bank stability and aggregate credit growth. The authors find that higher capital buffers improve aggregate bank stability after the GFC, whereas a strengthening of supervision independence helped to reduce the decline in domestic credit and improved bank stability of banks.

This paper complements existing literature on this issue in several aspects. First, different from previous empirical work, we do neither focus on real episodes of banking crises nor use binary approach as a proxy for instability episodes, as both approaches may either provide insufficient data for estimation purpose or be based on a threshold level that is not based on well-grounded theoretical or empirical benchmark and therefore are easily criticised. Similarly, with regards to bank stability index, we neither use the Z-score as an in-variant measure of the bank's risk-taking behaviour or distance to solvency, to which Fu, et al., (2014) provides some arguments against, nor use some form of credit risk measure such as non-performing loans (NPL). On the one hand, while the Z-score can be interpreted as the number of standard deviations by which a bank is removed from insolvency, it only focuses on the risk-taking from the profitability point of view. On the other hand, NPL ratio focuses on credit risk only and does not account for other sort of risk that banks may be faced, such as those linked with capital, liquidity or/and exchange rate. Hence, neither of them is a perfect substitute calculations to account for actual bank distress or the probability of default, which are without doubt the most appropriate concepts to define bank

DOI: 10.7172/2353-6845.jbfe.2017.2.6

risk [Kick and Prieto, (2015)]. Instead, based on Shijaku (2016), we use a more sophisticated proxy for bank stability, which is advantageous for three reasons. First, different to Z-Score and NPL, it is based on a wider set of bank balance sheet data that includes information on capital, asset quality, earnings, liquidity and sensitivity to exchange rate market risk. Therefore, our proxy gauges better bank stability conditions. Second, it makes use of the principal component analyses, which highlights the most common factor identifying the patterns in the data without much loss of information and at the same time solves for any problem of endogeneity. Finally, it does not take the probability form of the binary approach, which might expose it either to limitations of insufficient number of episodes or to the vulnerability of the methodology employed to calculate the threshold level, which might even provide falls signals. Rather it consists of a simpler approach that is easier to explain and implements and most importantly allows analysing prudential behaviour as it develops and to that it is applicable for cross-section comparisons.

3. METHODOLOGY APPROACH

3.1. Dependant variable

The empirical literature provides a good description of how one might attempt to build a composite indicator of stability, but obviously this paper follows the Uniform Financial Rating System approach, introduced by the US regulation in 1979, referred to as CAELS rating (Capital adequacy, Asset quality, Earnings, Liquidity and Sensitivity to market risk (See Table 2 in Appendix)[4]. First, using the statistical methods, each indicator included in each of these categorises is normalised into a common scale with mean of zero and standard deviation of one[5]. The formula is given as:

$$Z_t = \left(\frac{X_t - \overline{\mu}}{\overline{\sigma}}\right) \tag{1}$$

Where, X_t represents the value of indicators X during period t; μ is the mean and σ is the standard deviation. Second, all the normalised values of the set of correlated indicators used within one category is then converted into a single uncorrelated index by means of the statistical procedure, namely the principal component analysis (PCA) approach, which is yet again standardised through the procedure in Eq. (3). Then, the estimated sub-index are transformed between the values [0, 1] using exponential transformation $[1 / (1 + \exp(-Z^*)]$. Finally, the BSI is derived as a sum of the estimated exponential transformed sub-indexes, as follows:

$$BSI_{t,w} = \omega_1 \sum_{i=1}^{n} Z^*_{t,C} + \omega_2 \sum_{i=1}^{n} Z^*_{t,A} + \omega_3 \sum_{i=1}^{n} Z^*_{t,E} + \omega_4 \sum_{i=1}^{n} Z^*_{t,L} + \omega_5 \sum_{i=1}^{n} Z^*_{t,S} \tag{2}$$

$$\sum_{*=a,b,c,d,e} \omega^* = 1 \tag{3}$$

Where, n is the number of indicators in each sub-index; 'C' relates to the capital adequacy; 'A' represents a proxy to asset quality; 'E' represents a proxy to earnings; 'L' represents a proxy to liquidity efficiency categorises; and 'S' is related to the sensitivity of market risk. Z^* is the exponential transformed simple average of the normalised values of each indicator included into the sub-index of the individual bank stability index. Then, the estimated index, as shown in

[4] This approach is also used by International Monetary Fund Compilation Guide 2006 on Financial Soundness Indicators, but others authors e.g. Sere-Ejembi, et. al., (2014) and Cleary and Hebb (2016).

[5] Normalizing the values avoids introducing aggregation distortions arising from differences in the means of the indicators.

DOI: 10.7172/2353-6845.jbfe.2017.2.6

Graph 3 in Appendix, is a relatively measurement, where an increase in the value of the index at any particular dimension indicates a lower risk in this dimension for the period, compared with other periods.

The advantage of this approach is fourfold. First, CAELS represents a useful "complement" to on-side examination, rather than a substitute for them [Betz, et. al., (2014)], and thereby creates an internal comprehensive monthly-based supervisory "thermometer" measurement to evaluate bank stability in real time and on an uniform basis and for identifying those institutions requiring special supervisory attention and concern with regards to both the present and future banking sector conditions. Second, as suggested by ECB (2007), it reflects more the Albanian financial structure by attaching more weight to banking sector as it is the most prominent agents in the financial markets, while it takes advantages of a broad range of bank level data. Finally, the estimated index is a relatively measurement, where an increase in the value of the index at any particular dimension indicates a lower risk in this dimension for the period, compared with other periods.

3.2. Measuring Banks' prudential behaviour

Bank regulators desire flexibility in recognition of the importance of LLR for bank safety and soundness [Balla and KcKenna, (2009)]. The regulation on bank's LLPs level is a macro-prudential accounting tool for enhancing bank soundness, with an anti-cycle character that allows to establish higher level of reserve funds during periods of economic booming, which in return could be used in order to cover for possible future credit losses with the economic decline phases. The literature on provisioning practices shows that LLPs are made of two components. The non-discretionary components represents LLPs made to cover expected credit losses, which as a backwards-looking approach is mainly related to the identification of problems loans and exhibit a cyclical pattern. The discretionary component captures LLPs made for managerial objectives such as income smoothing, capital management or signalling [Ahmed, et al., (1999)]. The empirical literature provides a good description of how one might attempt to build a composite indicator of prudential behaviour, but obviously this paper materialise on these two approached as used by others studies[6] to build a composite index. This index is built upon four components, rather than focusing only on one. Each component captures different aspect of bank prudential behaviour, including both the discretionary and non-discretionary components. Therefore, the approach to build this index is as follows. First, using the statistical methods, all four indicators are normalised into a common scale with mean of zero and standard deviation of one[7]. The formula is given as:

$$Z_{i,t} = \left(\frac{X_{i,t} - \overline{\mu}_{i,t}}{\overline{\sigma}_{i,t}} \right) \tag{4}$$

Where, $X_{i,t}$ presents the value of one indicator for bank during the period t; μ is the mean and σ is the standard deviation. Second, all of these indicators are then transformed between the values [0, 1] using exponential transformation as follows:

$$Z'_{i,t} = \left(\frac{1}{1 + \exp(-Z_{i,t})} \right) \tag{5}$$

Then, all the normalised values are converted into a single uncorrelated index by means of the statistical procedure, namely the principal component analysis (PCA) approach, which is yet again standardised through the procedure in Equation (4), and then transformed between the

[6] Among others see Glen and Mondragón-Vélez, (2011), Bouvatier and Lepetit, (2012).

[7] Normalizing the values avoids introducing aggregation distortions arising from differences in the means of the indicators.

DOI: 10.7172/2353-6845.jbfe.2017.2.6

values [0, 1] using Equation [5]. Finally, the proxy for bank prudential index (BPI) is derived as a sum of the estimated exponential transformed sub-indexes, as follows:

$$BPI_{t,w} = \omega_1 * Z'_{1i,t} + \omega_2 * Z'_{2i,t} + \omega_3 * Z'_{3i,t} + \omega_1 * Z'_{4i,t} \quad (6)$$

$$\sum_{*=1,2,3,4} \omega^* = 1 \quad (7)$$

Where, $Z'_{1i,t}$ is the ratio of reserve funds to cover loan losses to non-performing loans (gross); $Z'_{2i,t}$ presents the ratio of reserve funds to cover loan losses to outstanding loans (gross); $Z'_{3i,t}$ shows the ratio of specific fond reserve to outstanding regular loan (gross); and $Z'_{4i,t}$ is the annual growth rate if reserve funds to cover loan losses to total bank asset.

The advantage of this approach is fourfold. First, similar to *CAELS*, *BPI* is also a useful monthly based supervision instrument that can be used for on-side examination purposes in real time and on an uniform basis. It is also based on the *PCA* approach. Neither it is based on the binary approach. Rather it consists of a simpler approach that is easier to explain and implements and most importantly allows analysing prudential behaviour as it develops and to that it is applicable for cross-section comparisons. Finally, the estimated index is a relatively measure, where an increase in the value of the index at any particular dimension indicates a higher degree of bank prudential behaviour in this dimension for the period, compared with other periods.

3.3. The Empirical Approach

The empirical model specification draws on the extensive review as explained in the previous section, but differently this paper departs from them to the fact that it analyses how prudential behaviour affects bank stability conditions. Therefore, our empirical model as expressed in Equation [1] is re-specified as follows:

$$CAELS_{i,t} = \alpha + B_1 * BPI'_{i,t} + \beta_2 * EFFICIENCY'_{i,t} + \beta_3 * LEVERAGE'_{i,t} + \\ + \beta_4 * GDP'_{j,t} + \beta_5 * PSRISK'_{j,t} + \varepsilon_{i,t} \quad (8)$$

Where, $BPI'_{i,t}$ is a proxy for bank prudential behaviour. All other things are as previously explained.

In addition, we re-specify equation [9], in which we use the same proxy related to bank prudential behaviour, but to some methodological changes. First, we include also an additional market-specific explanatory variable that accounts for the degree of competition in the banking sector, namely the Boone indicator. The model, then takes the form as follows:

$$CAELS_{i,t} = \alpha + B_1 * BPI'_{i,t} + \beta_2 * EFFICIENCY'_{i,t} + \beta_3 * LEVERAGE'_{i,t} + \\ + \beta_4 * GDP'_{j,t} + \beta_5 * PSRISK'_{j,t} + \beta_6 * BOONE'_{j,t} + \varepsilon_{i,t} \quad (9)$$

Where, $BOONE_{i,t}$ is our competition indicator for bank i at time t, with $i = 1, ..., N$ and $t = 1, ..., T$, taken from Shijaku (2016b). All other things are as previously specified. Then, following other recent studies[8], we also control for possible non-linearity behaviour in the stability – prudential nexus. For this reason we use a quadratic term of BPI as shown in Table 3 in the Appendix. Therefore, equation [9] is re-specified as follows:

[8] See also among other Jiménez, *et al.* (2013), Liu, *et al*. (2013), Fu, *et al.* (2014), Kasman and Kasman (2015).

DOI: 10.7172/2353-6845.jbfe.2017.2.6

$$CAELS_{i,t} = \alpha + B_1 * BPI'_{i,t} + B_2 * BPI^2_{i,t} + \beta_3 * EFFICIENCY'_{i,t} + \\ + \beta_4 * LEVERAGE'_{i,t} + \beta_5 * GDP'_{j,t} + \beta_6 * PSRISK'_{j,t} + \varepsilon_{i,t} \tag{10}$$

One potential problem with Equation [8] is the fact that as a partially specified model it put together a variety of variables and, so, it nests a conditional restriction with a variety of unconditional ones leading to over-identification problem. Under these circumstances Maximum Likelihood estimators need to identify the moments whose squares are minimized in order to satisfy only the subset of correct restrictions. To correct for this issue, the estimation approach strictly follows the methodology as in Shijaku (2016), which, based on the dynamic General Method of Moments (GMM) weighs differences (AB-1-step) as proposed by Arellano and Bond (1991) and Arellano and Bover, (1995). Han and Phillips (2010) suggest GMM is constructed to be capable of achieving partial identification of the stochastic evolution and to be robust to the remaining un-modelled components. In practical terms, GMM is also a virtuous approach to deal with potential endogeneity and dynamic panel data problems in model estimation [Anderson and Hsiao (1981)]. Furthermore, the GMM weighs differences first step (AB-1-step) approach would also resolve for un-ward (down-ward bias in standard errors (t-statistics) due to its dependence on estimated values (as it uses estimated residuals from an one-step estimator). This may lead to unrealistic asymptotic statistical inference [Judson and, Owen, (1999); Bond and Windmeijer (2002); Ansari and Goyal (2014)] particularly in the case of a data sample with relatively small cross section aspect [Arellano and Bond (1991)]. The instrument variable is based on past information of $X'_{i,t}$, and to limit the number of instruments, we restrict ourselves to 4, i.e., the lag range used in generating the instruments as suggested by Roodman (2006). Then, the Sargan and Hansen test is used for over-identifying restrictions based on the sample analogy of the moment conditions adopted in the estimation process, thereby determining the validity of instrument variables (i.e., tests of lack of serial correlation and consistency of instrument variables).

3.4. Sample and the Data

Sample of this study consist of a quarterly macroeconomic data and a unique set of supervisory micro data taken from balance sheet and income statement items of 16 banks operating in Albania. The strength of the micro data is its sample coverage and reliability of information. The sample consists of 960 sets of quarterly data, coving all 16 banks operating in Albania, since 2001 Q01.

The empirical study focuses on the period 2008 Q04 – 2015 Q03, while 2008 Q4 marks the beginning of pass-through effect of GFC in the Albanian economy[9]. That includes a total panel balanced observations with 425 observations and 28 periods. Variables used for empirical analysis are as follows. Bank-specific variables and the stability indicator are estimated individually for each bank. *CAELS* and BPI are transformed into indices, taking the average performance during the year 2010 as the base year. Both of them are relatively measurement, where an increase in the value of the index at any particular dimension indicates a lower risk (or a higher attitude toward prudential as for BPI) in this dimension for the period, compared with other periods. *EFFICIENCY* is proxy as gross expenditure to gross income ratio. *LEVERAGE* presents the equity to asset ratio of individual banks. *BPI* is transformed into an index, taking the average performance during the year 2010 as the base year. The macroeconomic variables are aggregated indicators that represent the state of the economy. *GDP* represents gross domestic production.

[9] The Albanian economy was not affected directly by the GFC, but the spill-over effects through financial and trade linkages were immediately transmitted from 2008 Q04, which at the same time provides a justification why we choose to the empirical estimation from this period.

DOI: 10.7172/2353-6845.jbfe.2017.2.6

It is transformed in real terms by deflated with the Consumer Price Index. *PSRISK* represents the spread between domestic 12 months' T-Bills and the German 12 months' T-Bills. They are transformed in real terms by subtracting the respective domestic and German annual inflation rate. *CRISIS* takes the value of 1 during the period 2008 Q03 – 2010 Q04, and 0 otherwise. All the data represent the end-period values. They are log-transformed, besides the *PSRISK* and *CRISIS*. Further, the dataset developed for this paper has several sources. Data on GDP are taken from the Albanian Institute of Statistics. Data on the domestic T-Bills rates are taken from the Ministry of Finance. Data on German 12 months T-Bills rates and German Consumer Price Index are taken from Bloomberg. The rest of the data are taken from Bank of Albania.

With regards to the sample, Table 1 in Appendix provides some stylised facts with regards to the Albanian financial sector. First, we notice that the value of financial sector asset as a ratio to GDP has increased substantially from 78.6% in 2008 to nearly 105.1 % in 2015. A large portion of financial intermediation is due to banking sector, where bank assets shifts from about 75.9% in 2007 to nearly 94.9% by the end of 2015. Second, the actual structure of the banking sector is mostly dominated by foreign-owned banks, while by 2015 the number of the Albanian-owned banks reached three. Among the 13 foreign-owned banks, 9 banks are European-based banks and the rest are non-European-based banks. We notice also that in 2016 the largest 4 banks (CR-4) holds nearly 68.7% of total assets from nearly 63.1% it was in 2007, while the banking system is consider to be moderately concentrated as the HHI shows. Similarly, in Table 3 in Appendix, we summarise the main variables that we use in our empirical analyses, with regards to quarterly observations. The data show that the mean (median) of GDP annual growth rate is 3.1% (2.5%), with a maximum value around 9.7% and a minimum of 0.5%. The sovereignty primary risk (PSRISK) has a mean nearly 5.9% and a maximum of nearly 8.6% and minimum of nearly 3.2%. LLP to asset (loan) ratio has a maximum nearly 23.1% (71.6%) and a minimum of nearly 0% in both cases, while the means is nearly 5.4% (10.5%). The equity to asset ratio (LEVERAGE) has a mean of nearly 14.2%, with a maximum value of 23.1% and a minimum of nearly 6.9%. The capital adequacy ratio (CAR), which banks are expected to meet at 12% under the Basel I rules, has in average been at nearly 30.1%. At the same time, in Table 4 we present the correlation matrix between the variables of our interest for the period 2008 Q3 – 2015 Q4. Results show that there is a positive correlation between our stability index, CAELS, with variables such as GDP, LEVARGE and BPI, while the correlation with PSRISK, and EFFICIENCY is negative. The degree of correlation is stronger with GDP and EFFICIENCY.

Finally, as to generate some consistent and unbiased results, we ensure also that variables are stationary using the Augmented Dickey-Fuller (ADF) and the Phillips-Peron (PP) Fisher Chi-square tests[10]. The reason to use these tests is twofold. First, these tests are built on the same null hypothesis that panel variables are stationary. Second, they are mostly used for unbalanced panel models, as it is our sample. Results are presented in Table 5 in the Appendix. Findings imply that some of the variables included in our specified model are integrated of order zero I(0). This means that they are stationary. Therefore, they enter the model at level. This set of variables includes *LERNER*, *EFFICIENCY* and *LEVERAGE*. The other variables, namely *CAELS*, *GDP* and *PSRISK* are found to be integrated in order one, I(1). This means they pose non-stationary properties. Therefore, they enter the model as first difference, since it will transform them into a stationary stance[11].

[10] This approach helps us to understand the properties of the variables and also to be sure that their order of integration fulfils the criteria for our empirical estimation approach. The latter is a pre-required condition in order to receive consistent and unbiased results.

[11] These results are robustness also to other unit root test approaches, including the Im, Pesaran and Shin W-stat test and Fisher test. Data can be provided upon request.

DOI: 10.7172/2353-6845.jbfe.2017.2.6

4. EMPIRICAL RESULTS

4.1. Main results

This section present the results of the model as specified in Equation [8]. The results are reported in Table 6 in Appendix. Column [1] reports the baseline equation in the case of the banking system. Column [2] shows results of an augmented model specification that includes also an additional explanatory variable that accounts for the degree of competition in the banking sector, namely the Boone indicator as is explained by Shijaku (2016c)[12]. Following other recent studies[13], we also control for possible non-linearity behaviour in the stability – prudential nexus. For this reason we use a quadratic term of BPI as shown in Table 3 in the Appendix. Results are reported in Column [3]. Then, columns [4], [5] and [6] provide results on the same approach as previously explained, but this time it consists of only large banks. Similarly, columns [7], [8] and [9] provide respectively results with regards to a sample that consists of only small banks. All models were estimated based on the GMM approach. At the bottom of the table, we report specification test results for the GMM estimation. First, AR(1) and AR(2) are the Arellano-Bond tests for first and second order autocorrelation of residuals. One should reject the null hypothesis of no first order serial correlation and not reject the null hypothesis of no second order serial correlation of the residuals. Second, the Sargan and Hensen test of over-identifying restrictions indicates whether instruments are uncorrelated with the error term. The GMM does not require distributional assumptions on the error term and it is more efficient that the Two Least Two Square approach, since it accounts for heteroskedasticity Hall (2005). Results show that, in our case, requirements are met as suggested by the p-values of AR(1) and AR(2) tests. In addition, Sargan and Hensen test suggests that the instruments used in all specifications are appropriate. This means that all GMM equations are properly specified.

Analyses of estimated coefficients, both external and internal variables, suggest that all explanatory variables have the expected signs and are statistically significant at conventional level. They are also compatible with previous studies as reported by Shijaku (2016a) and (2016b). For example, the coefficients of the variables linked to macroeconomic patterns bear the relatively the same level of significance and on bank stability as in previous studies. The coefficient of *GDP* is positive in all regressions. This suggests that *GDP* is positively related to *CAELS* as in the case of Demigruc-Kunt and Detragiache, (2002). The effect is found to be statistically significant at 1 percentage (%) level. Therefore, one may expect that higher economic growth would play a relatively crucial role for bank stability conditions. It is also of great important to understand, however, that from another point of view this result implies that banks place also a relatively consider manner to the economic conditions in which they operate, since an upward movements in economic activity would improve the situation of the banking system through a higher financial intermediation or for low risks related to bank sovereignty risks.

Further, *PSRISK* has the expected negative effect on bank stability. This means that decreasing sovereignty primary risk, as measured by the spread ratio of domestic and foreign risks, increases bank stability. Therefore, lower risks are expected to materialise through improving stability conditions of banks. This result complements the findings of Jutasompakorn, *et al.* (2014), but by contrast, the estimated marginal effect is considered to be relatively small, even though it is statistically significant at 10% level. This suggests that banks consider shocks related to primary sovereignty risk, even though the pass-through is relative small. The reason is fourfold. First, public borrowing has been orientated towards longer term maturities and towards foreign

[12] Boone is transformed into an index, taking as the base year the average performance during the year 2010. It is a relatively measurement, where an increase in the value of the index at any particular dimension indicates a lower risk in this dimension for the period, compared with other periods. It is log-transformed and enters the model in first difference based on unit root tests.

[13] See also among other Jimenez, et al., (2013), Liu, et al. (2013), Fu, et al., (2014), Kasman and Kasman (2015).

DOI: 10.7172/2353-6845.jbfe.2017.2.6

borrowing. This has lowered the pressure on banks and at the same time has provided the market with more foreign liquidity. Second, the government has taken several structural reforms to minimise possible fiscal risks, which includes the pension system reform, energetic sector, etc. Third, banks in Albania operate under a flexible interest rate to which they place a marginal fixed rate. Therefore, any negative shock that leads to an interest rate hike is reflected immediately to their interest barging, making them to some extend hedge to interest rate. Finally, but not the least, different from other countries, banks in Albania have been well-capitalised and have not vulnerable to a shortage of liquidity, despite the recent trends and financial disintermediation.

On the other hand, the coefficients linked to bank specific factors are found to be also relatively crucial for bank stability. They have the expected sign and are statistically significant at conventional level. The coefficient related to *EFFICIENCY* is negatively related to *CAELS*. This suggests that there is a reverse relationship between operational inefficiency and bank stability at the bank level patterns. Therefore, bank stability would increase proportionally to upturn in operational efficiency. At the same time, this relationship is found to be stronger for large banks compared to small banks. The effect is also statistically significant at conventional level. Similarly, the positive coefficient of *LEVERAGE* reveals that *CAELS* is positively related with improving bank's capital structure. This relationship is statistically significant in our entire sample. This means that bank stability increases through improving operational efficiency and a better capital structure. Similarly, results demonstrate also a positive relationship between bank competition and bank stability. The coefficient of *BOONE* indicator is also statistically significant at conventional level. This means that improving degree of competition would stimulate further bank stability, given that higher value of the *BOONE* indicator signifies a higher degree of competition, thus confirming the competition-stability view in the case of Albania. This is also similar to other findings of Berger and Bouwman (2013), Fiordelisi and Mare (2014), Schaeck and Cihak (2014). At the same time, since the Boone indicator is statistically significant, change of marginal cost has more effects on profits, which means the market share is subject to more competition.

Finally, a relatively very central result is linked to findings with respect to the estimated coefficient associated with *BPI*. The sign of the coefficient of BPI is positive. This indicates that there is a positive nexus between *BPI* linked with *CAELS*. This suggests that policies oriented towards higher bank prudential behaviour would be positive and enable bank greater stability. The coefficient of BPI is also found to be statistically significant at conventional level. That is that prudential behaviour would be relatively crucial for bank stability. Surprisingly, among other bank-specific factors, bank prudential behaviour is found to have the highest effect. Therefore, it would reasonable to suggest that banks must pay great attitude towards prudential behaviour, among policies linked to operational efficiency and capital structure. Furthermore, results as reported in Table 3, column [3] in Appendix reveal an important consideration that is that we did not find evidence of non-linearity relationship between prudential behaviour and stability in the case of the Albanian banking system. Nor did we find when we spitted the sample with regards to small and large banks as reported in Table 2, column [6] and column [9] in appendix][14].

4.2. Robustness checks

In an attempt to provide complementary proof we test the robustness of our results in Section 4.1 by considering five different alternative measures as proxy for bank prudential behaviour. This means that we re-estimate Equation [8] and use respectively each alternative proxies for bank prudential behaviour as explanatory variables to get more robust results. For example, Column [1] in Table 7 in the Appendix, show results when we use *BPI**, an alternative proxy of bank prudential behaviour, which is based on the same approach as explained in Section 3.1., but this

[14] We used also a cubic term of the measures of competition to capture a possible non-linear relationship between bank prudential behavior and bank stability, bust still found no supportive evidence. Results are provided upon request.

DOI: 10.7172/2353-6845.jbfe.2017.2.6

time we did not include in the calculation process the variable on the annual growth of the ratio of reserve funds to total asset[15]. Then, Column [2] show results when instead we used *BPI** as an alternative variable, namely *BPINEW*[16], which includes in the calculations process the ratio of bank provisional expenses to the ratio of bank total asset. In Column [3] we report results linked to the use of *LLP*[17], which presents the ratio of loan loss provision to total bank asset. Furthermore, column [4] provides evidences with regards to another proxy that refers to the difference between LLPs to total bank asset and loan to total bank asset, *LLPNEW*[18]. Finally, Column [5] presents results when instead we used the ratio of reserve funds to cover loans losses to outstanding loan (gross), *MP*[19]. At the same time, in Table 8 we also report results of the augmented model specification, which includes also the *BOONE* indicator as explanatory variable.

All models are estimated based on the GMM approach using quarterly data for the period 2008 Q02 – 2015 Q03. The past information of are used as instrument and their number is limit to 4 lags. Yet again, at the bottom of the table, we report the specification test results for the GMM estimation. Results show that null hypothesis cannot be rejected. The Sargan and Hensen test is used for over-identifying restrictions based on the sample analogy of the moment conditions adapted in the estimation process, thereby as to determine the validity of the instrument variables (i.e. tests of lack of serial correlation and consistency of instruments variables). According to this test, all GMM equations are properly specified. They are also not over-identified as the probability of the Sargan and Hensen test suggests.

Results are generally robust with those of the previous section[20]. Firstly, all coefficients have the expected theoretical sign, albeit with same relatively small changes in terms of the statistical significance level. This means that our model specification is robust as results are insensitive to the inclusion of alternative explanatory variable in our augmented and re-specified. Second, all explanatory variables used as alternative proxies for bank prudential behaviour have the expected positive sign. This confirms previous findings. It also implies a robust conclusion on the assumption that policies toward greater prudential behaviour would provide banks with greater stability conditions in case of negative shocks. Not surprisingly, we see that the size of the coefficients on *BPI** and *BPINEW* are relatively higher compared to those of the other proxies. This is in fact expected given that these two variables are based on a set of different indicators represented through the principal components approach. At same time, it also confirms that prudential behaviour is better capture by proxies that do not solely based on one indicator, but rather includes a set of information based on different aspects of bank prudential policies.

5. CONCLUSIONS

The scope of recent banking crises have fuelled an interestingly growing focus to understand what works best in the bank regulation and supervision and how provisioning plays a crucial role for bank stability and soundness while fulfilling their lending functions. Therefore, with the occurrence of the financial crisis, it becomes more stringent the need to promote stronger norms on macro-prudential supervision tools, such as capital buffers and liquidity resources by credit

[15] It is transformed into an index similar to the approach followed for MPI. An increase of the index indicates a higher degree of bank prudential for the period, compared with other periods. It is log-transformed and enters the model in level based on unit root tests.

[16] It is transformed into an index similar to the approach followed for MPI. An increase of the index indicates a higher degree of bank prudential for the period, compared with other periods. It is log-transformed and enters the model in level based on unit root tests.

[17] See among other papers that make usage of this proxy Fonseca and González, (2008); Glen and Mondragón-Vélez, (2011); Beatty and Liao (2014); Dushku, (2016).

[18] It enters the model in level based on unit root tests.

[19] It is log-transformed and enters the model in level based on unit root tests.

[20] Results are robust also to methodological changes to which we used the GMM White Period 2nd Step approach. The Arellano and Bond test results also require significant AR(1) serial correlation and lack of AR(2) serial correlation (See also Kasman and Kasman, 2015).

DOI: 10.7172/2353-6845.jbfe.2017.2.6

institutions, whose role is to reduce the exposure to the risk of insolvency and hereby the ability of banks to damage the economy by taking on excess risk.

For these reasons, this paper analyses how bank prudential behaviour affects bank stability conditions. This is of obvious interest from an efficiency policy point of view, as banking regulation approach should move towards a prudential behaviour that is closer related to bank stability concerns. To our best knowledge, this paper is the first one to investigate the effect that bank provisions policies have on bank stability, in particular after the global financial crises. The empirical specified model analyses bank stability as a function of indicators linked to macroeconomic conditions, market and bank's specific patterns. The model is estimated based on the GMM approach for 16 banks operating in Albania, using quarterly panel data for the period 2008–2015. This paper improves the existing literature along three crucial dimensions. First, in contrast to other bank-level studies, we use the most direct measure of bank stability and prudential behaviour available, which are generated from the unique supervisory dataset collected by the Bank of Albania. Both of these indicators are constructed based on the principal component of set of different indicators which provides us with a rating based approach on bank stability conditions and prudential behaviour. Therefore, they represent two useful monthly-based supervision instruments that can be used for on-side examination purposes in real time and on a uniform basis. At the same time, they consist of a simpler approach that is easier to explain and implements. Most importantly they allow analysing the stability conditions and prudential behaviour as it develops and is also applicable for cross-section comparisons. Second, among other variables, we use both of these indicators to analyse the prudential-stability nexus in particular in the aftermath of the GFC. Finally, we run a number of robustness checks to control for the consistency of our results through a set of methodological changes, which includes different number of instrument variables and alternative proxy of bank prudential behaviour.

In summary, this paper provides strong supportive evidences indicating that there exists a pro-cyclical behaviour between bank stability and bank prudential behaviour. This means that bank prudential is positively linked with bank stability. Results appear to hold for a wide array of other alternative model specifications and estimation approaches, as well as variable construction. Therefore, any policy oriented towards greater bank prudential behaviour merit special attention as a tool that would enhance further the extent to which banks would be more stable in the wake of a possible negative credit cycle. At same time, we did not find a non-linear relationship in the prudential – stability nexus. In addition, as for other control variables, our results confirm that banks' behaviour towards greater competition has been crucial for boosting bank stability in the aftermath of GFC, thus bolstering the "competition – stability" view. Therefore, we suggest that perfect competition is the desirable market structure in order to promote great stability in the banking sector in the case of Albania. Moreover, our results confirm also that supervisors and policy-makers should carefully monitor macroeconomic risks since lower economic growth and higher sovereignty risks are associated with greater bank instability. Finally, evidences show that a great attention should be paid also to developments within the banking sector, which seems to affect more bank stability conditions. On the one hand, we see that there exists a negative linkage between operational efficiency and bank stability implying that lower efficiency banks are more destine to bank instability. On the other hand, special interest should be given also to capital structure of banks as higher capital ratio significantly boosts the state of bank stability conditions. This effect was found to be among the highest.

Bank loss provision system has become the most debated accounting number in bank financial reporting after bank profitability and derivatives since the 2008 global financial crisis. On problem is linked to the fact that the level of provisioning has had a historically pro-cyclical bias, as it is basically linked to contemporaneous problem assets, so that provisioning mainly rise during downturn [Laeven and Majnoni, (2003)] when credit risk has already materialised. Therefore, one possible future research is to analyse how a cyclical based approaches, e.g. Bank of Spain

DOI: 10.7172/2353-6845.jbfe.2017.2.6

as reported by Saurina, (2009a, 2009b), has introduced such statistical provisioning for loan loss reserves since 2001 in order to dampen excess pro-cyclicality in credit growth. Under this system, banks must make provisions according to the latent risk over the business cycle, or based on the historical information regarding credit losses for different types of loans. By anticipating better the expected losses lurking in a loan portfolio, statistical provisions should provide additional buffers and mitigate pro-cyclicality. Therefore, some policy makers advocate the need for a counter-cyclical or dynamic loan loss provisioning system, which is a macro-prudential tool for enhancing bank soundness with that allows to establish higher LLPs during the economic growth periods and report fewer LLPs during economic downturns so that the surplus LLPs accumulated during good times is used to cover the losses with the economic decline phases. That is why future research on the stability – prudential nexus should take into account the possibility of adopting a dynamic provisioning indicator. Similarly, is important to mention that one limitation of this research is the extent to which current results can be compatible internationally.

Acknowledgements

I would like to express my special thanks and gratitude to my supervisor Professor Franco Fiordelisi for his continued assistance, support and his very helpful comments during my research.

Note

The views expressed herein are those of the author and do not necessarily reflect the views of the Bank of Albania.

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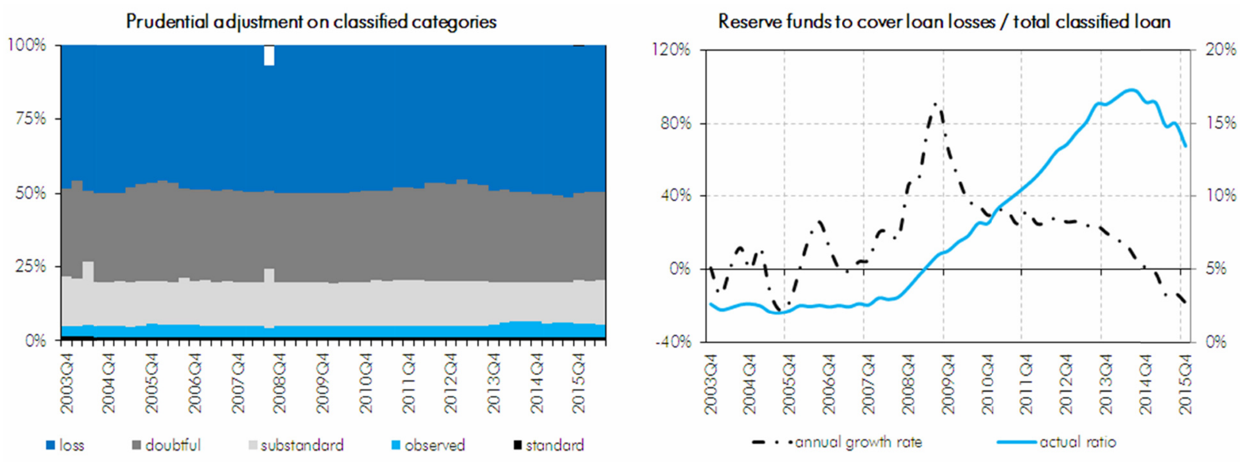
DOI: 10.7172/2353-6845.jbfe.2017.2.6

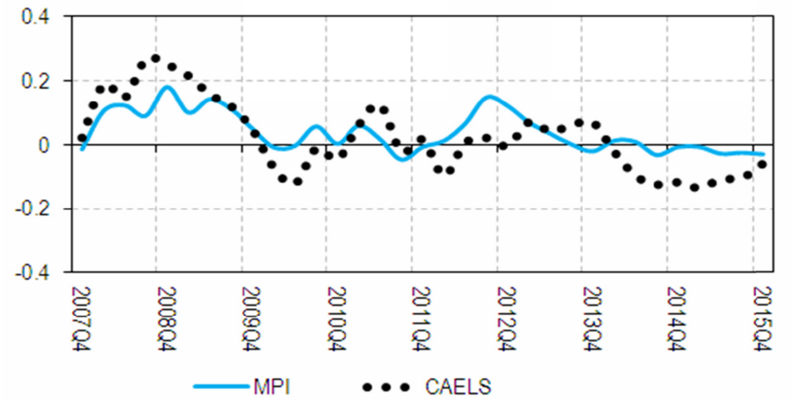
APPENDIX

Graph 1.
Classified reserve funds to cover loan losses, 2002–2015



Source: Bank of Albania, Author's calculations.

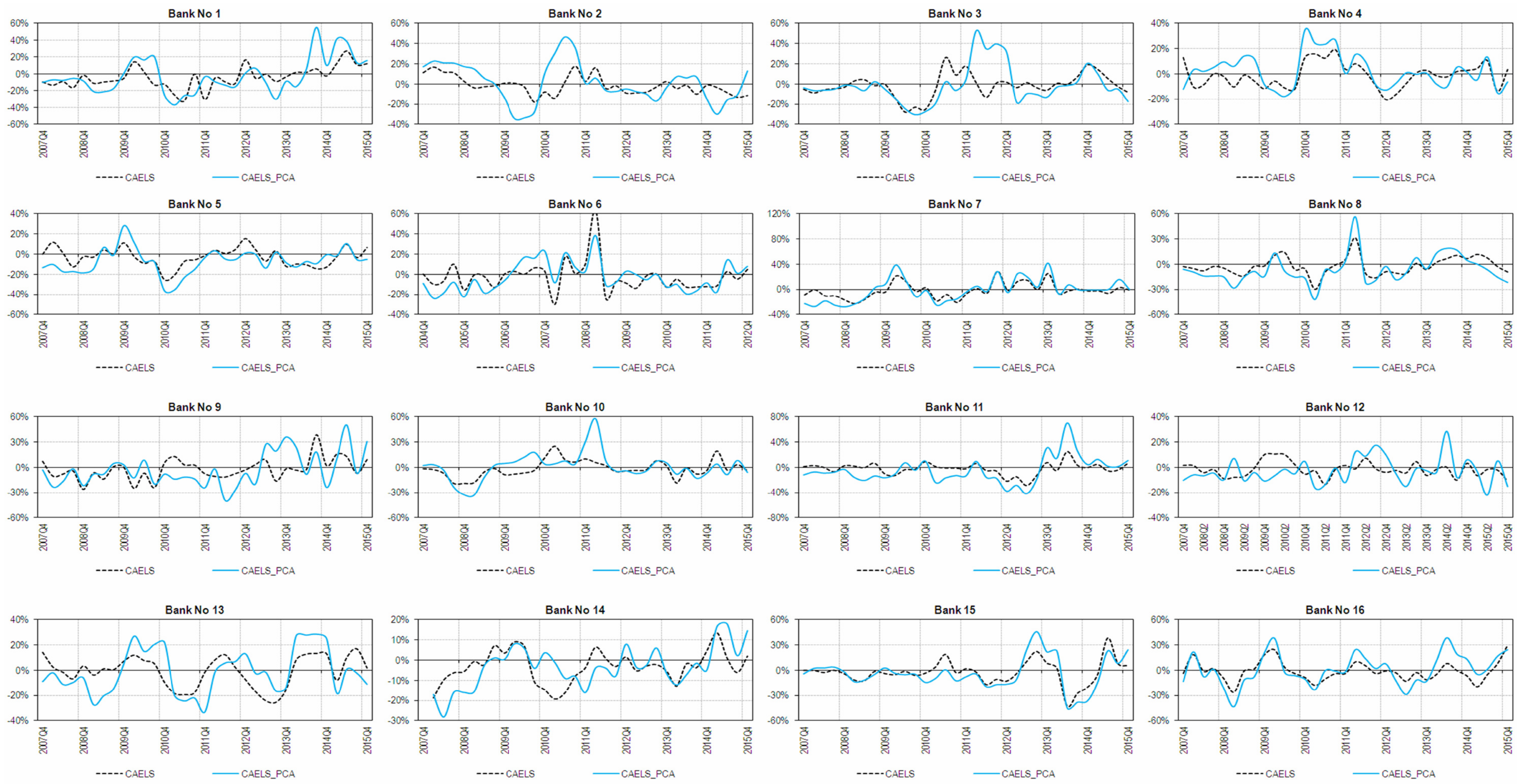
Graph 2.
Bank prudential behaviour and bank stability, 2008–2015



Source: Bank of Albania, Author's calculations.

DOI: 10.7172/2353-6845.jbfe.2017.2.6

Graph 3.
Individual Bank Stability Indicator with and without Principal Component Analysis, Annual Growth Rate



Source: Author's Calculations.

DOI: 10.7172/2353-6845.jbfe.2017.2.6

Table 1.
Banking Sector Developments

	2008	2009	2010	2011	2012	2013	2014	2015	2016
Number of Banks	16	16	16	16	16	16	16	16	16
– *State owned-banks*	0	0	0	0	0	0	0	0	0
– *Albanian owned-banks*	2	2	2	2	2	2	2	3	3
– *Foreign owned-banks*	14	14	14	14	14	14	14	14	14
Financial Leverage (in % to GDP)	80.5	82.0	85.8	89.4	95.9	99.1	101.4	101.3	105.1
– Bank asset / GDP	76.7	77.5	80.9	84.7	89.6	90.5	91.7	91.3	94.9
– Others' asset / GDP	3.8	4.5	4.9	4.7	6.3	8.6	9.7	10	10.2
Herfindahl index (HHI in %)	15.1	14.3	14.2	14.3	14.5	13.8	14.1	14.9	15.3
Concentration Ratio CR-4 (in %)	60.2	61.4	62.8	63.9	65.4	64.9	66.6	69.3	68.7

Source: Bank of Albania, Financial Stability Report (2016).

Table 2.
Indicators used to estimate our bank stability index (CAELS)

Category	Indicator	Notation	Sub-Index
Capital adequacy	Capital Adequacy Ratio	C_1	Z_C
	Core Capital/Total Asset	C_2	
	Equity/Total Asset	C_3	
	Asset growth	C_4	
	Equity Growth	C_5	
	Fixed Asset/Regulatory Capital	C_6	
	ROE	C_7	
	Non-Performing Loan (net)/Regulatory Capital	C_8^*	
Asset Quality	Non-Performing Loan (net)/Total Loan (net)	A_1^*	Z_A
	Total Loan (net)/Total Asset	A_2	
	Growth of Loan Portfolio	A_3	
	Credit Loss (Gross)/Total Loan (Gross)	A_4^*	
	Large Risks (the number of beneficiaries over rate)	A_5^*	
	Provisions for Loan Loss Coverage/Non-Performing Loan (gross)	A_6^*	
Earnings	ROA	E_1	Z_E
	The growth of revenue from interest	E_2	
	Interest revenue/Total Revenue	E_3	
	Net Interest Margin	E_4	
	Efficiency Ratio	E_5	
	Interest Revenue (Net)/Operating Revenues (Gross)	E_6	
	Dividend/Income (Net)	E_7	
	The growth of net interest revenue	E_8	

DOI: 10.7172/2353-6845.jbfe.2017.2.6

Category	Indicator	Notation	Sub-Index
Liquidity	Net Loan/Average Deposits	L_1	Z_L
	Active Liquid/Total Asset	L_2	
	Asset minus Passive with a maturity of three months/Total Asset that provide profit	L_3	
Sensitivity to Market Risk	Asset minus Passive sensitive to interest rate with a maturity up to 3 months/ Total Asset that Provide Profit	S_1^*	Z_S
	Asset minus Passive sensitive to interest rate with a maturity up to 12 months/ Total Asset that Provide Profit	S_2^*	
	Net Open Position in foreign currency	S_3^*	

* Linked to reverse risk order.
Source: Bank of Albania, Authors' Calculations.

Table 3.
Indicators used to estimate bank prudential index (BPI)

	Indicator	Notion
1.	The ratio of reserve funds to cover loan losses to non-performing loans (gross)	X_1
2.	The ratio of reserve funds to cover loan losses to outstanding loans (gross)	X_2
3.	The ratio of specific fond reserve to outstanding regular loan (gross)	X_3
4.	The annual growth rate if reserve funds to cover loan losses to total bank asset	X_4

Source: Bank of Albania, Authors' Calculations.

Table 4.
Descriptive Statistics

Sample: 2008Q3 2015Q4

Variable	Units	No of Obs.	Mean	Median	Standard Deviation	Maximum	Minimum
GDP*	(YoY)	464	0.031	0.025	0.023	0.097	0.005
PSRISK	In %	464	0.059	0.062	0.018	0.086	0.032
EFFICIENCY	Cost / Income	464	1.05	0.99	0.21	2.32	0.69
LEVERAGE	Equity / Asset	464	0.14	0.09	0.14	0.72	0.05
LLP	LLP / asset	464	0.054	0.036	0.051	0.231	0.0
LLP**	LLP / loan	464	0.11	0.07	0.10	0.72	0.0
NPL	NPL / asset	464	0.090	0.063	0.074	0.295	0.0
LOAN	Loan / asset	464	0.502	0.483	0.182	0.962	0.090
ASSET	In million ALL	464	68779.7	39142.6	80150.0	361152.6	1667.3
ASSET*	(YoY)	464	0.114	0.072	0.190	1.097	-0.420
Capital Adequacy Ratio	Equity / risk-weighted asset	464	0.301	0.165	0.455	2.669	0.041
Return on Asset	Ratio	464	-0.254	0.209	7.073	76.349	-44.859
Return on Equity	Ratio	464	-1.567	1.963	18.610	74.427	-70.923

* YoY – Annual growth rate.
Source: Bank of Albania, INSTAT, Bloomberg, Author's calculations.

DOI: 10.7172/2353-6845.jbfe.2017.2.6

Table 5.
Correlation Analysis: Ordinary

Sample: 2008Q3 2015Q3, Included observations: 480
Balanced sample (listwise missing value deletion)

Correlation [*t-Statistic*]	CAELS	GDPR	PSRISK	BOONE	EFFICIENCY	LEVERAGE	BPI
CAELS	1.0 -----						
GDPR	0.103 [*2.29*]	1.0 -----					
PSRISK	-0.070 [*-1.56*]	-0.016 [*-0.36*]	1.0 -----				
DLNBOONE	0.047 [*1.04*]	0.061 [*1.35*]	-0.039 [*-0.87*]	1.0 -----			
EFFICIENCY	-0.103 [*-2.30*]	-0.036 [*-0.79*]	-0.031 [*-0.69*]	-0.068 [*-1.51*]	1.0 -----		
LEVERAGE	0.012 [*0.26*]	0.007 [*0.16*]	0.045 [*1.00*]	-0.005 [*-0.12*]	0.366 [*8.74*]	1.0 -----	
BPI	0.075 [*1.67*]	-0.111 [*-2.48*]	-0.233 [*-5.32*]	0.023 [*0.50*]	-0.289 [*-6.72*]	-0.364 [*-8.68*]	1.0 -----

Source: Author's calculations.

Table 6.
Panel Unit Root Test

Variable	ADF – Fisher Chi-square			PP – Fisher Chi-square		
	Intercept	Intercept and Trend	None	Intercept	Intercept and Trend	None
ΔCAELS	[0.0000]	[0.0000]	[0.0000]	[0.0018]	[0.0000]	[0.0000]
ΔGDP	[0.0000]	[0.0000]	[0.0000]	[1.0000]	[0.0000]	[0.0000]
ΔPSRISK	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[1.0000]	[0.0000]
BPI	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[1.0000]	[0.0000]
EFFICIENCY	[0.0000]	[0.0000]	[0.9649]	[0.0000]	[0.0000]	[0.8965]
LEVERAGE	[0.0000[	[0.0007]	[0.0001]	[0.0000]	[0.0006]	[0.0010]

Note: Δ is a first difference operator. Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Source: Author's calculations.

DOI: 10.7172/2353-6845.jbfe.2017.2.6

Table 7.
The main empirical results based on GMM approach

Variable	Banking System		
	[1]	[2]	[3]
GDP	0.4652*	0.3894*	0.3845*
PSRISK	-0.0697*	-0.0657*	-0.0663*
BOONE		0.2002*	
EFFICIENCY	-0.3767*	-0.3019*	-0.3588*
LEVERAGE	0.4459*	0.4181*	0.4597*
BPI	0.3601*	0.3710*	-0.2830
BPI^2			0.0735
Cross-sections	16	16	16
No. of observations	448	448	448
Instrument rank	20	24	20
J-statistic	10.2	9.1	12.5
Probability (J-statistic)	0.51	0.52	0.57
AR(1)	0.0015	0.0017	0.0016
AR(2)	0.1663	0.1425	0.1344

Note: level of significance as * 1%, ** 5%, *** 10%.
Sargan and Hansen test (J-Statistics and the Probability of J-Statistics) investigates the validity of the instruments used, and rejection of the null-hypothesis implies that instruments are valid as they are not correlated with the error term. The Arellano and Bond test results also require significant AR(1) serial correlation and lack of AR(2) serial correlation (See also Kasman and Kasman, 2015).

Source: Author's calculations.

Table 8.
The empirical results based on methodological changes

Variable	Banking System					
	[1]	[2]	[3]	[4]	[5]	[6]
GDP	0.6418***	0.5343	0.5394	0.4469*	0.4683*	0.6227*
PSRISK	-0.0453*	-0.0643*	-0.0610*	-0.0514*	-0.0566*	-0.0638*
BOONE		0.2189***			0.1468*	
EFFICIENCY	-0.3178***	-0.3659**	-0.3583***	-0.5219*	-0.5423*	-0.5875*
LEVERAGE	0.4897*	0.5910*	0.5728*	0.3372*	0.4067*	0.5670***
BPI	0.3424***	0.3767**	-0.2974	0.1615**	0.1620***	-0.7884
BPI^2			0.0792			0.1045
Cross-sections	16	16	16	16	16	16
No. of observations	448	448	448	448	448	448
Instrument rank	20	24	24	14	16	14
J-statistic	17.5	16.0	12.5	14.0	11.0	5.5
Probability (J-statistic)	0.29	0.60	0.57	0.12	0.27	0.70
AR(1)	0.000	0.000	0.000	0.001	0.008	0.000
AR(2)	0.113	0.163	0.119	0.279	0.204	0.116

Note: level of significance as * 1%, ** 5%, *** 10%.
Sargan and Hansen test (J-Statistics and the Probability of J-Statistics) investigates the validity of the instruments used, and rejection of the null-hypothesis implies that instruments are valid as they are not correlated with the error term. The Arellano and Bond test results also require significant AR(1) serial correlation and lack of AR(2) serial correlation (See also Kasman and Kasman, 2015).

Source: Author's calculations.

DOI: 10.7172/2353-6845.jbfe.2017.2.6

Table 9.
Other empirical results using alternative prudential indicators

Variable	[1]	[2]	[3]	[4]	[5]
GDP	0.7530*	0.6905*	0.6078*	0.6440*	0.5444*
PSRISK	-0.0306*	-0.0219*	-0.0472*	-0.0416*	-0.0468*
BOONE	0.2042*	0.2688*	0.2367*	0.2723*	0.2556*
EFFICIENCY	-0.6058*	-0.5006*	-0.4776*	-0.4857*	-0.4827*
LEVERAGE	0.4685*	0.5463*	0.5223*	0.7321*	0.6438*
BPI*	0.2269*				
BPINEW		0.2427*			
LLP			0.1308*		
LLPNEW				0.1477*	
MP					0.1391*
Cross-sections	16	16	16	16	16
No. of observations	427	427	427	427	427
Instrument rank	16	16	16	16	16
J-statistic	13.5	11.4	15.4	14.7	14.4
Probability (J-statistic)	0.20	0.32	0.12	0.14	0.16
AR(1)	0.00	0.00	0.00	0.00	0.00
AR(2)	0.15	0.14	0.10	0.10	0.10

Note: level of significance as * 1%, ** 5%, *** 10%

Sargan and Hansen test (J-Statistics and the Probability of J-Statistics) investigates the validity of the instruments used, and rejection of the null-hypothesis implies that instruments are valid as they are not correlated with the error term. The Arellano and Bond test results also require significant AR(1) serial correlation and lack of AR(2) serial correlation (See also Kasman and Kasman, 2015).

Source: Author’s calculations.

DOI: 10.7172/2353-6845.jbfe.2017.2.6