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Determinants of financial stability in UK banks and building societies—Are they different?

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Abstract
*Based on a sample of UK Plc banks and building societies, this paper examines whether these types of institution differ in their determinants of financial stability. It also examines whether there is a difference in these determinants before and during the financial crisis. The two periods are analysed separately (i.e. pre-crisis, from 2005 to 2007, and during the crisis, from 2008 to 2010) using ordinary least squares regression (**OLS**) and a set of micro-economic and macro-economic variables. The findings of the OLS regression analysis showed not only that the sign/value of those determinants is different between banks and building societies but also that the determinants differ before and during the crisis. The findings also highlight the importance of using both micro- and macro-economic indicators when assessing financial stability in the banking industry. The author suggests that these determinants should be assessed periodically.*

Key words: Financial stability. Plc Banks. Building Societies. OLS regression
JEL classification: G21

Introduction

Following the recent financial crisis, the stability of the financial system, and especially that of banks, has gained great attention from supervisory bodies around the world. The UK is no exception: its regulatory bodies prepare financial stability reports to assess the stability of the financial system. However, those reports have a number of limitations.

One important limitation is related to the indicators. According to the Bank of England (2012), the financial stability indicators are the simple aggregate leverage ratio, the aggregate leverage ratio, household debt to income ratio, growth in lending to the UK non-financial sector and the UK long-term real interest rate. Hence, these reports do not consider micro-economic factors.

According to Evans et al. (2000), any assessment should use a comprehensive set of indicators rather than focus on macro indicators alone. Basically, using micro-economic factors along with macro-economic factors not only improves the assessment of the financial stability of the industry as whole, but also helps in determining the contribution of each institution to such stability. According to Access Economics and the Institute of Chartered Accountants in Australia (2011), macro-economic indicators do not fully show the scope of unexpected changes in the economy, whereas microeconomic indicators provide significant information regarding the resilience of the financial sector to economic shocks, and can also provide details that are not captured by aggregated information.

Another limit to the abovementioned reports is that they focus only on the major banks in the UK, despite the fact that other financial institutions, such as building societies (hereafter referred to as **BSs**), play an important role in supporting the UK Economy. Although **BSs** are smaller in terms of structure and have a different business model compared to banks, they share in the loans provided to the UK economy and have access to wholesale funding. Thus, any instability in an institution of this kind could affect the stability of the financial system.

Moreover, the UK authorities use the same indicators to assess financial stability across periods. As the economic situation changes from one period to another, it would be valuable to know whether the indicators of financial stability also change. Changes in those indicators could mean that the stability indicators for one period are not reliable in another period.

Little is known about the indicators of financial stability and their use on a micro-economic level. Therefore, the purpose of this paper is to explore the micro- and macro-economic determinants of financial stability and to find out whether the determinants of BSs' financial stability are different from those of Plc. banks (hereafter referred to as **PBs)**. It also explores whether those determinants were different before and during the financial crisis.

This paper contributes to the literature in several ways. First, it highlights the importance of using micro-economic factors when assessing financial stability. Second, the paper considers two periods, i.e. before and during the crisis, and can thus highlight the differences between the determinants of financial stability in the two periods. Finally, as far as the author is aware, this is the first study to compare these determinants in the UK banking industry.

The remainder of the paper is organised as follows. Section 2 provides a brief literature review. Section 3 explains and describes the study data and variables. Section 4 sets out the empirical approach. Section 5 presents the empirical results and Section 6 provides a conclusion and recommendations.

Brief literature review

Many studies have tried to address the financial stability of banks from different perspectives. Fiordelisi and Mare (2014) and Kasman and Kasman (2015), among others, have focussed on the relationship between competition and financial stability. Beck et al. (2013) and Kohler (2015) studied the impact of business models on bank stability. Aoki and Nikolov (2015) investigated the impact of bubbles. Creel et al. (2015) analysed the relationship between financial stability and economic performance. More recently, Blot et al. (2015) examined the relationship between price and financial stability. In addition, Gómez (2015) examined the link between bank takeovers and financial stability.

While there is extensive literature focusing on stability from different perspectives, only a few papers are relevant to the aim of this study. Jahn and Kick (2012) studied the determinants of German banking stability during the period from 1995 to 2010. Their empirical findings showed

that macro-prudential indicators are not useful leading indicators for financial stability. They found that the most important indicator for the financial stability of cooperative banks is the credit-to-GDP ratio. However, this ratio is not important for commercial banks. However, they used only macroprudential indicators. Karminsky and Kostrov (2014) compared the factors of financial stability of banks across several banking systems in Commonwealth of Independent States (**CIS**) countries. They found a significant difference between financial stability indicators across countries.

Diaconu and Oanea (2014) studied the difference between financial stability determinants of Romania's commercial and co-operative banks during the period from 2008 to 2012. They found that GDP growth and interbank offering rate were significantly related to the financial stability of co-operative banks. However, the study used only macro-economic indicators. In addition, it did not take into consideration whether those determinants were different before and during the crisis. Moreover, the study sample contained only one cooperative bank and 13 commercial banks, which could affect the results.

A consequent study by Diaconu and Oanea (2015) sought to identify the determinants of profitability and financial stability of cross-country CreditCoop subsidiaries. Using data covering subsidiaries in 34 counties during the period from 2008 to 2013, they found that there was no relationship between GDP and financial stability. They concluded that capital ratio and efficiency ratio are the most important indicators of subsidiaries' profitability and stability.

Initially, researchers such as Diaconu and Oanea (2015) provided several factors for assessing subsidiaries' stability, and Diaconu and Oanea (2014) and Fiordelisi and Mare (2014) provided several variables to assess the stability of cooperative banks in their papers. However, in case of **BSs,** the situation might differ because of the nature of these institutions. According to the Cass Business School report (2015), **BSs** by regulation are different from cooperative banks and other banks in terms of the range of banking services they provide. This could result in different indicators of financial stability.

Data, variables and descriptive statistics

This paper examines the difference between determinants of financial stability for **PBs** and **BSs** in the UK by using balanced annual data covering 2005 – 2007 as the pre-crisis period and 2008-2010 as the crisis period. To be analysed in this paper, each **PB** or **BS** must have annual reports spanning 2005-2010 as well as the year end of 31/12. Accordingly, the final sample consists of 45 observations for 15 **PBs** and 45 observations for 15 **BSs** in each period. Bank-specific data are taken from the Bureau van Dijk Bankscope database, while country-specific data are taken from the Office for National Statistics.

As a measure of financial stability, this study uses the ***Z-score***, which has widely been used by many scholars, such as Hesse and Cihák (2007), Jeon and Lim (2013), Diaconu and Oanea (2014), Fiordelisi and Mare (2014) and Chiaramonte et al. (2015), among others. The ***Z-score*** is calculated as below:

$$\boldsymbol{Z - Score\ i,t} = \frac{\boldsymbol{ROA\ i,t} + \left(\frac{\boldsymbol{E}}{\boldsymbol{TA}}\right)\boldsymbol{i,t}}{\boldsymbol{\sigma(ROA\ b,t)}}$$

Where $ROA_{i,t}$ represent the return on average assets for **PBs** or **BSs** ***i*** in period **t**. The ***E/TA*** is the ratio of **PB** or **BS** equity to total assets, which represent the capital ratio in period t, and $\sigma(ROA_{b,t})$ represents the standard deviation of return on average assets for each **PB** or **BS** within each individual year. Following Fiordelisi and Mare (2014) and Chiaramonte et al. (2015), the natural logarithm ***ln_z score*** has been used, which allows avoidance of the effect of extreme values.

As independent variables, this paper uses a set of bank-specific variables as well as macro-economic variable that have been used in previous studies.

The first bank-specific variable considered in this article is the cost to income ratio. This ratio represents the management's operating efficiency in controlling their overhead. As stated by Chiaramonte et al. (2015), inefficiency could lead to an increase in banks' risk exposure, because inefficient banks tend to engage in riskier activities in order to improve their profitability. Beck et al. (2013) and Chiaramonte et al. (2015) provide evidence for a positive relationship between banks' efficiency and financial stability.

The second bank-specific variable is the income diversification ratio. This ratio represents the ability of the bank to generate income from its other, non-traditional activities (Tabak et al., 2013). According to Louzis et al. (2012), this ratio reflects banks' reliance on diversified sources of income rather than being dependent on loan-making. Chiaramonte et al. (2015) and Fiordelisi and Mare (2014) found that increasing income diversification leads to a reduction in banks' stability. This confirms the empirical findings of Mercieca et al. (2007) that an increase in non-interest income by one standard deviation leads to a significant decrease in banks' stability. Accordingly, this ratio is expected to be negatively associated with bank stability.

The third bank-specific variable is related to loans. Loans are an important part of banks' assets. By their nature, however, loans are considered to be the riskiest component of the banks' asset portfolio (Lanine and Vennet, 2006). Basically, an increase in loans leads to increase in overall bank risk, and hence affects stability. This paper examines the ratio of net loans to total assets. According to Chiaramonte et al. (2015), this variable represents the credit risk that banks stand, which could negatively affect their stability. Hence, an increase in this ratio is expected to be negatively associated with bank stability.

The last bank-specific variable considered in this study is size, which is considered to be an important indicator of banks' risk. However, its relationship with banks' risk and stability remains ambiguous. On one hand, Bhagat et al. (2015) found a positive relationship between bank size and bank risk taking. This means that an increase in bank size leads to an increase in bank risk and consequently to a decrease in bank stability. On the other hand, Mesa et al. (2014) found a positive relationship between bank size and bank efficiency, such that increasing bank size leads to increasing efficiency and hence to increasing bank stability.

Macroeconomic factors

The effect of a country's economy on its banks' operation should be taken into consideration. The Gross Domestic Product (GDP), which is among the commonly used macroeconomic indicators in assessing financial stability, can be used for this purpose. The relationship between GDP and financial stability is uncertain. Diaconua and Oanea (2014) found that GDP is an important factor affecting cooperative banks' financial stability; in contrast, Diaconua and Oanea (2015) found empirically that GDP does not affect stability.

Table 1, below, describes the variables used in this study and their calculation, while Table 2 presents the descriptive statistics for those variables before and during the crisis.

Table 1:Independent variables:

Variable	**Measure**	**Acronym**
Efficiency	Cost to income ratio, calculated as the non-interest expenses (overhead) as a proportion of total operating income	CI
Income diversification	Calculated as the proportion of non-interest income to total income	NIITI
Bank lending behaviour	Calculated as the proportion of net loans to total assets	NLTA
Size	Natural logarithm of the total assets	LOGTA
Macroeconomic variable	Annual Gross Domestic Product	GDP

Table 2: Descriptive statistics:

Sector	statistics	Before the crisis 2005-2007						During the crisis 2008-2010					
		Ln_z	**GDP**	**LOGTA**	**CI**	**NIITI**	**NLTA**	**Ln_z**	**GDP**	**LOGTA**	**CI**	**NIITI**	**NLTA**
Plc banks	**Mean**	**0.964156**	1.505262	4.852932	62.23244	51.66133	45.06074	**0.232203**	1.495552	5.024622	61.03111	42.63378	45.03230
	Median	**0.868328**	1.501528	5.300211	55.33000	43.82000	49.26876	**0.148220**	1.485616	5.481242	57.28000	42.69000	42.93540
	Maximum	**4.110469**	1.552989	6.278872	323.8600	323.8600	79.66561	**3.339711**	1.541039	6.380510	120.4200	120.4200	80.01282
	Minimum	**-1.146815**	1.461270	2.668572	38.58000	1.080000	0.000000	**2.210408**	1.460000	2.750200	19.17000	1.640000	0.000000
	Std. Dev.	**1.134064**	0.037961	1.103473	41.11595	46.24583	21.95417	**1.093610**	0.034204	1.128596	20.49273	27.58397	22.61887
Building societies	**Mean**	**3.519580**	1.505262	3.216122	61.97200	16.92844	77.86012	**3.233262**	1.495552	3.272483	67.70644	15.33711	75.05252
	Median	**3.479337**	1.501528	3.022098	63.59000	13.70000	78.35483	**3.216266**	1.485616	3.095379	67.57000	14.02000	75.39115
	Maximum	**4.339897**	1.552989	4.311718	84.06000	81.59000	82.77021	**3.874285**	1.541039	4.478369	103.5500	51.37000	78.79770
	Minimum	**3.029978**	1.461270	2.098990	39.79000	-2.45000	69.83495	**2.581940**	1.460000	2.245759	34.39000	1.020000	64.71569
	Std. Dev.	**0.287580**	0.037961	0.614539	11.17942	12.44507	3.181902	**0.312659**	0.034204	0.621987	17.16226	9.884133	2.783117

Table 2 presents the descriptive analysis of the study variables. It can be seen that the **Z-score** for **BSs** is much higher compared to the **Z-score** for **PBs**. This supports the Cass Business School report (2015), which found that **BSs** are more stable than **PBs.**

It also appears that there is a gradual decrease in the **PBs'** Z-score, from 0.964156 before the crisis to 0.232203 during the crisis period, as compared to the **Z-score** for **BSs**, which saw only a slight decrease, from 3.519580 to 3.233262. This means that the financial crisis had a significant negative effect on **PBs'** financial stability. This confirms that **BSs** were more stable than **PBs** not only before the crisis period but also during the crisis.

With regard to **size,** represented by **LOGTA**, a non-significant change can be seen in the size value before and during the crisis for both **PBs** and **BSs**. Table 2 shows a slight increase in the size of **PBs,** from 4.852932 to 5.024622, while the size of **BSs** increased from 3.216122 before the crisis to 3.272483 during the crisis period. Accordingly, it can be argued that the **PBs** and **BSs** display a slight tendency to grow their assets. This increase could have an effect on financial stability.

The **CI** ratio as a measure of efficiency registered a 1.93% decrease for **PBs** during the financial crisis as compared to a 9.25% increase for **BSs.** Basically, an increase in this ratio means an increase in overhead expenses, which leads to a reduction in profitability and hence stability. Thus, the results reveal that **PBs** are slightly more efficient than **BSs**. This might be because **BSs** are smaller than **PBs** in terms of economies of scale, which makes cost-saving more difficult for them.

The ratio of **NIITI** represents income diversification. **PBs** have much higher **NIITI** than **BSs** before and during the crisis. This is expected, as **PBs** benefit from the economies of scale compared to **BSs**. This ratio highlights a moderate decrease for **PBs** during the crisis period, whereas for **BSs,** it records a slight decrease.

The **NLTA** ratio is, on average, greater for **BSs** than for **PBs** before and during the crisis. This might be due to their relative asset sizes. However, there is no significant change in this ratio for either **BSs** or **PBs** before and during the crisis.

With regard to macro-economic variables, the average value of **GDP** shows a minor decline from the pre-crisis period to the crisis period (i.e. from 1.505262 to 1.495552).

Empirical approach

In order to identify the determinants of financial stability for both **PBs** and **BSs** and investigate whether those determinants are different before and during the crisis period, OLS regression analysis for **PBs** and **BSs** was conducted, using the following equation:

$$\mathbf{Z-Score} = C + \beta 1 CI_{i,t} + \beta 2\, GDP + \beta 3\, SIZE_{i,t} + \beta 4\, NIITI_{i,t} + \beta 4\, NLTA_{i,t} + \mathscr{E}$$

Where C is a constant, β is the coefficient of each ratio, and $_{i,t}$ represents the **PBs** or **BSs I** in the period t (i.e. before or during the crisis period). This regression was run four times: twice for **PBs** (i.e. before and during the crisis period) and twice for **BSs**. Table 3 represents the regression results.

Table 3: regression results:

	Coefficient		Std. Error		t-Statistic		Prob.	
	Before crisis 2005-2007	**During crisis 2008-2010**	**Before crisis 2005-2007**	**During crisis 2008-2010**	**Before crisis 2005-2007**	**During crisis 2008-2010**	**Before crisis 2005-2007**	**During crisis 2008-2010**
Plc. Banks:								
C (Constant)	-17.33734	9.540977	3.582224	4.246859	-4.839826	2.246596	0.0000*	0.0304*
CI	-0.025313	-0.005180	0.007258	0.005722	-3.487671	-0.905255	0.0012*	0.3709
GDP	13.86647	-4.633431	2.409261	2.825695	5.755487	-1.639749	0.0000*	0.1091
LOGTA	-0.454107	-0.425594	0.117483	0.090504	-3.865293	-4.702512	0.0004*	0.0000*
NIITI	0.030123	0.016435	0.006787	0.005108	4.438533	3.217247	0.0001*	0.0026*
NLTA	-0.007731	-0.013887	0.006253	0.007188	-1.236246	-1.932052	0.2238	0.0606
R-squared	0.756750	0.728255						
F-statistic	24.26576	20.90341						
Durbin-Watson stat	1.970390	1.754513						
Breusch-Godfrey Test:								
Obs*R-squared	0.061652	2.350766						
Prob. Chi-Square (2)	0.9696	0.3087						
Breusch-Pagan-Godfrey Test:								
Obs*R-squared								
Prob. Chi-Square (5)	10.11180	6.079792						
Jarque –Bera (probability)	0.0721	0.2985						
No. observations	4.442631**(**0.108466**)**	1.201252**(**0.548468**)**						
	45	45						
Building societies:								
C (Constant)	12.87918	9.854075	1.678379	1.759549	7.673579	5.600341	0.0000*	0.0000*
CI	-0.006508	-0.002879	0.003171	0.002044	-2.052784	-1.408352	0.0468*	0.1669
GDP	-4.301260	-2.889486	0.796381	0.909708	-5.401008	-3.176277	0.0000*	0.0029*
LOGTA	-0.261227	-0.340375	0.057395	0.053926	-4.551381	-6.311883	0.0001*	0.0000*
NIITI	0.002850	-0.004768	0.002825	0.003519	1.009062	-1.355015	0.3192	0.1832
NLTA	-0.021704	-0.012225	0.010549	0.011438	-2.057431	-1.068769	0.0464*	0.2917
R-squared	0.596664	0.623953						
F-statistic	11.53873	12.94210						
Durbin-Watson stat	2.082018	1.996429						
Breusch-Godfrey Test:								
Obs*R-squared	0.132094	0.072213						
Prob. Chi-Square (2)	0.9361	0.9645						
Breusch-Pagan-Godfrey Test:								
Obs*R-squared								
Prob. Chi-Square (5)	4.720729	4.538254						
Jarque –Bera (probability)	0.4509	0.4748						
No. observations	5.252454(0.072351)	1.251814(0.534776)						
	45	45						

. Significant (*) at 5% level

Empirical results

Table 3 summarizes the empirical results of the study model for both **PBs** and **BSs** before and during the crisis period. We can observe a number of important differences between the determinants of financial stability for **PBs** and **BSs**.

Before the crisis period, the regression results underline a positive and statistically significant link between the ***Z-score*** and the ***GDP*** for **PBs,** which means that an increase in ***GDP*** leads to an increase in **PBs'** financial stability. In contrast, there is a negative and statistically significant relationship between the ***GDP*** and ***Z-score*** for **BSs**. This supports Chiaramonte et al.'s (2015) contention that there is no certain sign that links **GDP** to financial stability.

In contrast to Chiaramonte et al. (2015) and Fiordelisi and Mare (2014), Table 3 shows a positive and statistically significant link between the ***NIITI*** ratio and the ***Z-score*** for **PBs,** which means that ***NIITI*** contributes to financial stability. In other words, an increase in ***NIITI*** ratio will improve **PBs'** financial stability. This supports Chiaramonte et al.'s (2015) argument that diversification can improve stability if it leads to a reduction in banks' risk.

In the case of **BSs**, the results reveal that there is no significant relationship between ***NIITI*** and financial stability. This might be because **PBs** are engaged in more non-traditional activity than **BSs**.

Table 3 shows a significant negative link between ***NLTA*** and financial stability for **BSs**. This supports Chiaramonte et al.'s (2015) finding that increasing loans leads to an increase in banks' risk and hence to a reduction in financial stability. However, there is no relationship between ***NLTA*** and ***Z-score*** for **PBs**. One possible reason for this is that on average, **BSs** have greater portion of ***NLTA*** (77.86012) than **PBs** (45.06074) as an effect of their total assets (Table 2). Thus, **BSs** bear greater credit risk than **PBs,** which negatively affects their financial stability.

Although there are significant differences between the determinants of financial stability for **PBs** and **BSs** before the crisis, there are also a number of similarities. Table 3 shows that the efficiency ratio (***CI***) has a negative and significant link with the ***Z-score*** for **PBs** and **BSs**. This means that any increase in such ratios will have a negative effect on financial stability. Accordingly, inefficiency in **PBs** or **BSs** will lead to a reduction in financial stability.

Size, as measured by ***LOGTA***, has a similar effect for both **PBs** and **BSs**. Table 3 shows a negative and significant link between LOGTA and the ***Z-score*** for **PBs** and **BSs**. In support of Bhagat et al. (2015), the results show that any increase in size will result in a decrease in financial stability.

With regard to the crisis period, we can see from Table 3 that financial stability for **PBs** can be explained only by ***LOGTA*** and ***NIIT,*** whereas for **BSs,** stability can be only explained by **GDP** and ***LOGTA***. The remaining indicators do not show any association with financial stability.

This analysis of the pre-crisis and the crisis period confirms the author's idea that there is a difference between the determinants of financial stability for **PBs** and **BSs**.

Moreover, Table 3 also shows that the differences are not only between **PBs** and **BSs** but also between **PBs** before and during the crisis and between **BSs** before and during the crisis. The stability of **PBs** can be determined by ***CI, GDP, LOGTA*** and ***NIITI*** before the crisis. However, it can be determined only by ***LOGTA*** and ***NIITI*** during the crisis period. For **BSs**, stability can be determined by ***CI, GDP, LOGTA***, and ***NLTA*** before the crisis. However, during the crisis period, only ***GDP*** and ***LOGTA*** have significant links with financial stability. This supports the author's idea that the determinants of financial stability are different before and during the crisis.

Conclusion and Recommendations

The purpose of this paper was to explore whether there is a difference between the determinants of financial stability of **PBs** and **BSs** in the UK and whether those determinants differ before and during the crisis. The findings indicate that the financial stability determinants not only differ between **PBs** and **BSs** but also before and during the crisis. The findings also highlighted the contribution of micro-

economic factors in explaining financial stability. Hence, the author suggests that when evaluating financial stability, it could be valuable to use both micro- and macro-economic variables instead of focusing only on aggregate and macro-economic factors. As the determinants were not the same before and during the crisis, these determinants should be re-evaluated periodically. Finally, as this paper has restrictions in terms of the number of **PBs** and **BSs** because of the difference in the year-end dates, leading to the exclusion of some **PBs** and **BSs**, the author recommends that the regulatory authorities should work to make the year-end dates of all financial institutions uniform, which would allow a comprehensive view of financial stability.

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