

Securitization and financial solvency: Empirical evidence from Portugal

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This paper analyses the effect of securitization issues on the solvency of Portuguese financial institutions. For this purpose we use an unbalanced panel model estimated using GMM methods and find that securitization has a slightly positive impact on the soundness of the issuing entity. We study 35 financial entities and 60 traditional securitizations issued by 9 originators between 2001 and 2013. The analysis reveals that the financial entities' soundness improved slightly, showing that securitization enhanced the quality of the originators' portfolios and increased the regulatory capital requirements. We also found that efficiency and profitability improve the risk-adjusted ROAA and that efficiency increases regulatory capital requirements. The robustness analysis confirms the positive effect of securitization on solvency, where both credit quality and liquidity are shown to be significant variables.

Keywords: securitization; Z-score; soundness; Portugal; financial entities.

Subject classification codes: G28, G21

1. Introduction

Securitization is now an important component of markets that function properly. It remains nothing more than a technique for raising funding and as a support mechanism for lending in the real economy. In addition, securitization makes markets more closely aligned with one another. In general, a securitization transaction may be defined as the transformation of illiquid assets into negotiable stocks, providing the originator with an instrument for transferring risk and raising funds.

E.U. securitization markets have been shrinking significantly since the global financial crisis of 2007/08, due largely to the stigma associated with the misuse of securitization prior to the crisis. From 2008 onwards, the issue of securitized products in Europe has fallen by 80%, in spite of the fact that European securitization has been shown to be relatively safe; they have generated virtually no losses at all (European

Union, 2015). Reactivating a safe securitization market might have important long term benefits for those countries with the most highly developed securitization markets –The UK and the Netherlands -, and also for countries such as Italy, Spain, Ireland, Portugal and Greece where the provision of credit tends to be more problematical. Further, a single harmonized framework for securitization in the EU might make it possible to establish securitization markets in those countries in which they still do not exist, such as in Central and Eastern Europe.

If the predominantly circumspect attitude towards securitization is to change, policy makers will need to be more forward-looking. Various European and International institutions¹, have carried out much work to bring this about. They have attempted to create quality standards, increase transparency and simplify structures but investors and agents working in European markets remain cautious. They cite a lack of transparency and standardization and the unavailability of data related to the underlying assets as key sticking points (ECB, 2014).

This work attempts to provide a better understanding of securitization in Portugal where securitization was less pervasive than in other EU countries.

Portuguese institutions first carried out securitization in 1997 even though there was a distinct lack of specific regulation. Initially, securitization operations made use of offshore structures and the types of assets being securitized were limited to consumer credit, car purchase, leasing agreements and long-term rental.

Between 2001 and 2005, most Portuguese securitization involved using securitized funds almost exclusively as a vehicle, the securitized assets did not appear on the balance sheet (off-balance) and the securities issued were normally acquired by non-residents.

From 2005 onwards securitizations were still normally carried out using securitization funds as a vehicle, but the companies involved were becoming increasingly important and the securitized assets started to remain on the originator's balance sheet (on-balance) as a consequence of regulatory changes. In the main, the securities issued by securitization funds and by companies continued to be bought by non-residents, but in 2007 the originators began to buy the issued securities themselves.

From 2010 to the present day, securitizations have been carried out by companies whose role is nothing more than the securitization itself. Operations prior to 2010 were closed prior to their stipulated redemption dates. The securitized assets normally remained on the originator's balance sheet and the issued securities were usually bought by the originators. Most of these originators were institutions that used these securities as collateral to obtain liquidity through the European Central Bank (ECB).

Securitization in Portugal evolved over a ten year period until it became common practice. The volumes of securitized assets, however, remained modest; the maximum reached €242,115.40 million in 2011 and by 2015 this had fallen to €132,193.60 million. These discreet volumes are echoed in the paucity of specific empirical research².

It is within this framework that we aim to study the financial stability of the principal Portuguese financial institutions. We use a broad timeframe to determine both the impact and the repercussions of the phenomenon of securitization in Portugal. To this end, we propose a model that tries to explain stability, defined via a Z-score ratio. The model takes into consideration the volume of the funds subject to securitization and includes variables that reflect the originators' specific characteristics.

We find that securitization is significant and affects solvency positively in the Portuguese market between 2001 and 2013, although this effect is only slight.

One might say that securitization in Portugal has led to a minor increase in the solvency of the country's financial entities. This positive effect is a consequence of an increase in the capital ratio and the slight improvement in the quality of originators' portfolios.

This work includes all the types of financial institutions in the Portuguese financial market, like savings banks, entities that the majority of studies tend to ignore. By so doing, this analysis attempts to better reflect the reality of the Portuguese financial system and hence glean more far-reaching insights and results that may be useful across a range of spheres.

The analysis is set out as follows: the next section reviews the existing literature, while the third section describes the sample, variables, hypotheses and the econometric methodology employed. The fourth section provides the main results, the validity tests carried out for the models and the robustness checks. The final section presents the conclusions.

2. Literature review

The vast body of literature that deals with securitization may be divided into two main areas; one which analyzes why entities carry out the securitization and a second that looks at its effects on both on the entities themselves and upon the market in general. The objectives of this work fall within the latter category and look at the effects of securitization.

The literature that deals with securitization effects is both extensive and contradictory. Analysts fail to agree on the costs and benefits of securitization in terms of the risk to the originators and to the financial system as a whole. These differences

are due to the fact that securitization affects risk via two basic channels. First, it may place greater or lesser risk within the market as a whole (direct effect). Second, the resultant liquidity may modify the levels of risk in the originator's portfolio depending on the reinvestment strategy (indirect effect).

This section contains an exhaustive review of the wide gamut of literature on the subject with the aim of assessing the effects of securitization on the solvency of the originators. To do this, we first group the results according to the structure first put forward by Kara, Ozkan and Altunbas (2016) whereby theoretical and empirical works are categorised according to whether they were prior or subsequent to the financial crisis. After this, and in greater detail, we analyze the literature that looks at the solvency of the originators.

The first works on securitization, particularly theoretical studies, underline a negative impact on bank lending standards and the stability of the financial system. Greenbaum and Thakor (1987), Gorton and Pennachi (1995), Krahen and Wilde (2006) and Parlour and Plantin (2008) argue that securitization does not in fact lead to diversification in risk but favours its retention and perhaps, as Calem and LaCour-Little (2004), Hänsel and Krahen (2007) and Wagner (2007) argue, increases the banks' appetite for risk. In contrast however, the work of Jiangly, Pritsker and Raupach (2007) suggests that securitization is associated with increased bank leverage and profitability, and potentially with lower bank tail risk. Jiangli and Pristker (2008) use data from US mortgage securitizations and find that banks use securitization to reduce insolvency risk and increase leverage and profitability.

Empirical evidence is contradictory. Some studies seem to show that those entities that most use securitization are also those that lend to the highest risk agents, maintain the riskiest portfolios, retain the riskiest tranches and, in general are subject to

the highest levels of risk (Cebenoyan and Strahan, 2004; Hansel and Krahn, 2007; Casu et al., 2013; Martín-Oliver and Saurina, 2007; Bannier and Hänsel, 2006; Michalack and Udhe, 2012; Affinito and Tagliaferri, 2010; Battaglia and Gallo, 2013; Battaglia, Gallo and Mazzuca, 2014). In contrast, other studies indicate that securitization reduces Banks' insolvency risk, increases profitability, provides liquidity and leads to a greater supply of loans (Jiangli and Pritsker, 2008; Cebenoyan and Strahan, 2004; Loutskina, 2011; Altunbas et al., 2009; Goderis et al., 2007). There are even studies that find no relationship between securitization and bank risk-taking (Benmelech et al., 2012; Shivdasani and Wang, 2011; and Nadauld and Weishbach, 2012; among others).

There are various reasons why the empirical findings are at times ambiguous and contradictory. First, the studies look at different segments of the securitization market which have characteristics that cannot be compared. Second, an important volume of the analyses focus on the U.S. while others look at different European markets which have substantial structural differences because of the diversity of the types of participating entities, accounting norms and legislation and the levels of risk assumed and or the associated losses. However, there is consensus with respect to the conclusions obtained in analyses that look specifically at mortgage securitizations. In the main, these studies focus on U.S. mortgages (Keys et al., 2010; Purnanandam, 2011; Dell'Ariccia et al., 2012; Mian y Sufi, 2009), and come to the conclusion that the banks that were active in the securitization of mortgages issued low quality mortgage loans, had lower mortgage application rejection rates, had higher default rates and lost the incentive to evaluate and control.

Prior to the crisis, a common view was that securitization stabilized the financial system since it was easier for entities to diversify and manage and allocate risk right

across the economy (Kara, Marques-Ibanez & Ongena, 2016). Many considered that the rapid expansion of the securitization market which boosted the growth of credit markets was a key factor in the global financial crisis of 2007/08. The costs and benefits of securitization for the banks and the financial system as a whole began to come under a more critical lens in the pertinent literature. Academic research intensified and emphasised the empirical evidence that might suggest that securitization was responsible for determining the behaviour of the originators and triggering the crisis and indeed, after the crisis, this view held sway. The pros and cons of securitization are still hotly debated (Carbo-Valverde, Degryse, & Rodríguez-Fernández, 2015).

On revising the empirical evidence on the relationship between securitization and the banks' financial solvency, we once again find that conclusions are ambiguous. The use of the event study methodology in conjunction with the modified market models of Lockwood et al. (1996), Franke and Krahen (2006), Hänse and Krahen (2007) and Uhde and Heimeshoff (2009) provides empirical evidence that shows that securitization has a positive impact on the growth of the banks' post-event systematic risk.

Studies performed using panel data reach the conclusion that the growth in the bulk of risk transmitted has a negative impact on the quality of the entity's assets and hence for its financial soundness (Dionne and Harchaoui 2003; Michalak and Udhe 2012; Otero González et al. 2016; López-Andión et al. 2015). Nevertheless, other researchers present evidence suggesting that a reduction in financial soundness only takes place with the securitization of credit cards. They argue that mortgage loans and home equity lines of credit have a positive effect (Uzun and Webb 2007; Jiangli and Pritsker 2008).

In the following section, we describe the database and the econometric method utilized in the paper. These were considered to be the best alternatives for clarifying how securitization affects the financial solvency of the entities while taking into account certain features of the originators.

3. Data and methodology

3.1.Data and sources

Our database is made up of 60 issues of mortgage-backed securities (MBSs) and asset-backed securities (ABSs) carried out in Portugal between 2001 and 2013. More than 65% of the securitized assets were mortgages. The data were obtained by referring to the National Stock Market Commission (CMVM Comissao do Mercado de Valores Mobiliarios – acronym in Portuguese) and the existing Portuguese asset securitization management companies' web pages.

The database used consists of 9 banks and savings banks that have acted as originators and 33 financial institutions that do not carry out securitizations³. Bankscope allowed us to complete our database with further relevant financial information. Table 1 presents the main descriptive statistics.

Table 1. Descriptive statistics

3.2.Variables and hypotheses

We employed the Z-score ratio as an indicator of the financial solvency of the entity. This ratio, an alternative to the Altman Z-score (Altman 1968), is employed in several empirical studies of financial solvency, among them those by Battaglia and Mazzuca (2011), Ben Salah and Fedhila (2012), Michalak and Uhde (2012), and Shaffer (2013). The indicator is defined as follows:

$$Z \cong \frac{ROAA+K}{\sigma} \quad (1)$$

The ROAA is the return on average assets before taxes, K is the equity as a percentage of the total assets, and σ is the standard deviation of the ROAA.

There are different approaches to the construction of the Z-score in terms of the standard deviation of the return on assets used that are applied in the literature. Some studies use the standard deviation of returns over the lifetime of a bank in the sample (Laeven and Levine 2009), while others use a rolling time window (Demigürç-Kunt and Detragiache 2011; Čihák et al. 2012; Sarkisyan and Casu 2012). We tested both alternatives, and the utilization of the rolling time window for different time periods sometimes gave a value for the standard deviation of the ROAA that was too small. This created a value for the Z-score that was abnormally high and lacking in credibility. In addition, this process provoked a substantial reduction in the size of the sample. For all of these reasons, we opted for the former alternative, the standard deviation of returns over the total period.

The Z-score specifies the amount of standard deviations that an entity's asset returns have to fall for it to become bankrupt. In brief, it is a measure of how far an entity's asset returns must decrease below their estimated value before the institution's equity is drained and the entity becomes insolvent. Hence, the higher the Z-score, the lower the probability of insolvency and the greater the entity's financial stability. We constructed this indicator for each of the banks included in the database on an annual basis.

Below, we set out the specifications of the hypothesis that we test in this analysis according the established objectives.

H1. Securitization affects the financial solvency of originating entities either positively or negatively via their Z-Scores.

H2. Securitization may have a positive or a negative effect on the quality of the originating entity's portfolio via their ROAA to the Standard Deviation of the ROAA ratio.

H3. Securitization may increase or decrease the quantity of regulatory capital that the originator has when measured via the relationship between k and the Standard Deviation of the ROAA, whereby the entity's leverage is affected.

For each of the three hypotheses the expected signs obtained from the above postulates were either positive or negative.

As an explanatory variable, we used the ratio of the volume of securitization issued to total assets for each of the financial entities (Altunbas et al., 2009). A priori, the relationship between the volume of securitization and financial solvency is not easy to see. It might be that the banks used securitization to transfer risk and that the relationship was positive. Conversely, the mechanism might have amplified the positions of risk held by the originators, and therefore the relationship would have been negative.

To analyse the relationship between securitization and financial solvency, one must take into account the factors that are specific to each bank, macroeconomic factors and a concentration index⁴ that probably affect solvency. Some of the bank-specific control variables included lags to avoid problems of simultaneity.

We incorporated the bank's net interest margin (Otero González et al., 2016) and the liquidity (Michalak and Uhde, 2012) to consider the effect that profitability and liquidity might have on solvency. It should be anticipated that both these aspects affect stability positively and are hence inversely connected to insolvency. To determine the efficiency of the banks, we included the cost-income ratio (Otero González et al., 2016) and expected a negative relationship. Additionally, to control for the credit risk and the

quality of the loan portfolio, we used an indicator of impaired loans (Battaglia and Gallo, 2013). For this variable we anticipated a negative relationship.

3.3. Econometric methodology

To estimate the financial solvency of Portuguese financial entities, we propose a panel data model defined as follows:

$$z_{it} = \alpha + \beta z_{it-1} + \theta s_{it} + \sum_k \gamma_k x_{k,it} + v_{it} \quad (2)$$

where z_{it} represents the Z-score as an indicator of the solvency of the financial entity i in year t , s_{it} is the indicator of the securitization of credit risk – the ratio asset securitization/total assets, and $x_{k,it}$ is the set of control variables. These are the variables that are specific to each of the entities described above; α , β , θ , and γ are the coefficients, and v_{it} is the composite error term, $v_{it} = u_{it} + \eta_i + \mu_t$, which takes in unobservable components that are specific to each entity and/or that may vary over time, where u_{it} represents the remaining disturbance. The time-specific effects are included by using a set of time dummies.

To carry out the estimation we used the generalized method of moments (GMM). We opted for this method since there is a correlation between the delayed endogenous variable and the unobservable effects. We used three widely-used alternatives: a GMM system developed by Arellano and Bover (1995) and Blundell and Bond (1998), first-differences GMM (Arellano and Bond 1991), and a forward orthogonal deviation GMM (Arellano and Bover 1995). The first-difference GMM carries out the estimation of the model with the variables in differences and uses its lagged values in levels as instruments of the endogenous variable. The GMM system method estimates two equations, one in levels and one in differences, additionally

including lags of the differences in the endogenous variable as instruments for the equation in levels. The forward orthogonal deviation GMM method involves a transformation of the data in such a way that each observation of a given economic unit may be expressed in terms of deviations from the mean future observations. It includes a weighting that allows the new error term to maintain the same characteristics as the original disturbances u_{it} . This process has an important advantage over the widely used first-difference GMM method in that it reduces the loss of observations when working with unbalanced panels with skips, as in our analysis.

The estimations carried out were subsequently subjected to the customary autocorrelation and validity tests for the set of instruments used.

4. Empirical results

Table 2 presents the main empirical results. Each variant of the model was estimated by applying three specific alternative dynamic panel methods: a) system GMM, b) first-difference GMM and c) forward orthogonal deviation GMM. The difference between specification 1 and specification 2 is given by the control variables, liquidity and impaired loans. In case 1 these variables appear in logarithms, while in case 2 they are expressed in ratios with respect to total assets and total gross loans, respectively.

In Table 3, in specifications 3) and 4), the dependent variables are the Z-score components, Z_1 and Z_2 , respectively.

The parameter estimates were completed with the Arellano and Bond tests for the significance of the first- and second-order autocorrelation coefficients of the first-differenced residuals. There is no serial correlation in the disturbance term u_{it} in equation (2) if the first-order autocorrelation coefficient is significantly different from zero but not the second-order autocorrelation coefficient. The results of the Hansen test for the joint contrast of instrument validity are also included.

4.1. Main findings

The equations estimated in Table 2 show the impact of the asset securitization/total assets ratio on the financial solvency which is reflected in the Z-score. The effect of this ratio is significant and positive regardless of the estimation method used. Most control variables do have significant effects, although their significance depends on the estimation method used. The cost–income ratio is always significant in the regressions except in equation 2b. In this equation it is the net interest margin and the liquidity ratio which are both significant and their coefficients both take the expected sign.

An important result is that the lagged ratios, in both of the forms analysed here, are non-significant for almost all of the models tested. This might be due to the correlation that it maintains with other regressors in the equation.

Table 2. Z-score and securitization. Regression results.

The autocorrelation tests and the instrument validity test offer quite satisfactory results for all the specifications.

In view of our results, it may be affirmed that the volume of securitization issued significantly and positively influences entities' financial solvency. Increases in the volume of securitization increase the Z-score and hence impinge positively on soundness. This implies that, with respect to hypothesis H1, securitization positively affects the solvency of the originating entities.

This result agrees with the empirical evidence provided by panel data analyses such as those of Uzun and Webb (2007) and Jiangli and Pritsker (2008).

Given that our dataset spans an extensive time period, we tried to examine whether the economic crisis that so severely affected Portugal had a significant impact on the effects of securitization on solvency. We differentiate between two periods:

2001-2007 and 2008-2013. Before the crisis, securitization continues to have a significant, positive effect, but ceases to exist after the crisis⁵.

4.2. Z-score components and securitization

To analyse hypotheses H2 and H3, we completed the study with some additional estimations. We carried out regressions of the two Z-score components, Z_1 and Z_2 , on the explanatory and control variables.

The Z-score can be broken down into its two components:

$$Z \cong Z_1 + Z_2 = \frac{ROAA}{\sigma} + \frac{K}{\sigma} \quad (3)$$

Z_1 is a measure of the banks' portfolio risk (risk-adjusted return), and Z_2 is a measure of leverage risk.

The first three columns of results in Table 3 indicate that the volume of asset securitization/total assets has a positive effect on Z_1 , which is an indicator of the risk of the activity carried out by the bank, improving the quality of originators' portfolio. This result provides empirical evidence that securitization has a positive impact on the ROAA adjusted to risk, and in so doing improving the quality of the originator's portfolio and, by extension, the solvency (hypothesis H2). Two other factors that affect this indicator are profitability and efficiency. They take the expected signs and indicate that greater profitability and efficiency improved the adjusted ROAA and, in consequence, solvency. The three final columns of Table 3 reveal that asset securitization/total assets ratio is both significant and positively affects Z_2 , which is a measure of the bank's risk coverage in terms of capital. In this case the only significant control variables are liquidity (model 4b) and efficiency, the latter of which indicates that a greater cost/income ratio negatively affects Z_2 .

This result allows us to affirm that securitization means that there is a greater proportion of regulatory capital on the part of the securitizing entity (hypothesis H3). This increases the entity's Z-Score and, by extension, its solvency.

The proportion of an entity's regulatory capital is determined by the regulations in place at any given time. The period being analyzed is affected by two regulatory frameworks; Basel I and Basel II. This has meant that there has been a change in the requisite quantity of regulatory capital. Formerly, there was a simple fixed percentage which was replaced by a methodology based, fundamentally on a credit rating awarded by the ratings agencies for each tranche of securitization. In addition, the performance and behaviour of the Portuguese changed after 2005, prior to this year the securitized assets did not appear on the balance sheet and afterwards they did. After the 2007/08 crisis, the fact that peripheral countries were affected by sovereign ceilings has meant that countries like Portugal cannot obtain high credit ratings for their senior tranches. In consequence, over recent years, the originating entities have been obliged to increase their proportion of regulatory capital by up to 5 or 6 times that of the securitized portfolio (Gómez-Churruca and Cerqueira de Gouveia, 2015).

Table 3. Z-score components and securitization. Regression results.

This result allows us to affirm that, as a consequence of securitization, there has been a process of regulatory capital requirement readjustment that has obliged entities to fulfil higher capital requirements. This process of regulatory capital readjustment runs counter to the findings of López-Andión et al. (2015) in which the Spanish originators actually had lower regulatory capital requirements but, at the same time, there was a slight worsening of the quality of originator's portfolios. In this study securitization had a negative impact on the issuing entities' soundness. Spain is also a country affected by sovereign ceilings but not to the same extent as Portugal. This, in

combination with different time-frames, a specific regulatory framework and a level of market maturity which is substantially different might all go towards explaining the divergence in results.

Securitization never took off in Portugal as it did in other countries. Probably Portuguese entities never considered it to be an instrument that might improve their ability to manage credit risk and thus allows them to operate with greater leverage. We can affirm that the banks' portfolios did not deteriorate and therefore that securitization did not make Portuguese banks less risk averse. The direct and indirect effect of securitization has, in fact, led to an improvement in portfolio quality while at the same increasing capital ratios.

4.3. Tests of Robustness

In order to test robustness we use an alternative measure of solvency to the Z-Score; the default rate, which is defined as the ratio of impaired loans to gross loans. In this case, we expected a negative relationship between the securitization and this particular measure of the credit risk. The control variables that were incorporated into the equation are the loan impaired charges/total assets and net loans/ total assets ratios (Otero González et al., 2013), used respectively as measures of the quality of the assets and the liquidity. The ROE was included as a measure of performance as was total assets (Battaglia and Gallo, 2013) which acted as a measure of the size of the entity.

Table 4: Default rate and securitization. Regression results

The results (Table 4) indicate that the securitization ratio has a significant negative effect on the default rate, which confirms that securitization improves the entity's credit solvency and, hence, we may affirm that, taken together, the direct and indirect effects are positive.

The net loans/ total assets ratio reflects a significant inverse relationship between liquidity and the default rate of Portuguese credit entities. In contrast, the loan impaired charges/total assets ratio is positively correlated to the dependent variable. Both results were expected. The size of the entity and the return on equity has no significant effect on the default rate.

5. Conclusion

Using a sample of 60 traditional securitizations issued by 9 financial entities operating in the Portuguese market between 2001 and 2013 and estimating an unbalanced panel model using GMM methods, we found that securitization has a slight, positive impact on the issuing entities' soundness. With regard to the control variables, we found that efficiency affects solvency in the majority of regressions studied and the control variables profitability, liquidity and the quality of the portfolios all take the expected signs when these are significant.

A breakdown of the Z-Score into its two components allows us to carry out an analysis that reveals that, as a consequence of securitization, there has been a process of regulatory capital readjustment that means that entities actually have higher regulatory capital requirements and there was a slight improvement in the quality of originators' portfolios during the 2001–2013 period when measured using the risk-adjusted ROAA.

The robustness analysis provides support for the findings of this study by highlighting that securitization negatively affects the default rate and by revealing both the quality of portfolios and the liquidity of originator to be significant variables.

Our findings are in line with those of previous works, such as those by Uzun and Webb (2007) and Jiangli and Pritsker (2008). Hence, we may affirm that securitization in Portugal has had a slight but significant positive effect on the solvency of the

financial entities operating in this country. We believe that the characteristics of the Portuguese securitization market, focusing on traditional securitization, which was transparent and, consisting in the main of mortgage securitizations, have had a positive impact on the solvency of the originators. These operations were originally conceived of in order to remove the securitized assets from the balance sheet and are currently conditioned by limitations imposed by credit ratings which are, in turn, dictated by Portugal's status as a peripheral country. In short, we can affirm that, in combination, the direct effect of the transmission of risk to the market and the indirect effect derived from the reinvestment of the liquidity obtained actually improve the solvency of Portuguese entities.

This type of study is important, since it attempts to stimulate the debate regarding the role of securitization as an alternative yet attractive form of financing for credit entities and to foment a sustainable, efficient, robust recovery of the European securitization market. The dearth of studies that look at the Portuguese securitization market makes this study even more salient. Further, the positive effect on the originators' solvency revealed in this paper shows that the blanket-opprobrium of securitization is not warranted in the case of Portugal.

References

- Affinito, M., Tagliaferri, E., 2010. Why do (or did?) banks securitize their loans? Evidence from Italy. *Journal of Financial Stability* 6, 189–202.
- Almeida, A. M., M. T. Crespo. 2010. "Assessing securitization activity in Portugal. Compilation and measurement issues". *Statistic department Banco de Portugal. Eurosystem*. Accessed: 8 September 2016
<http://www.oecd.org/std/na/45164657.pdf>.

- Almeida, A. M., M. T. Crespo. 2011. "Assessing Securitisation Activity in Portugal. Compilation and measurement issues", *Banco de Portugal, Supplement 1/2011 to the Statistical Bulletin*, October 2011.
- Almeida, A. M., M. T. Crespo, S. F. Santa. 2012. "Compilation and measurement issues for the financial sector: the cases for FISIM and securitisation in Portugal". *Banco de Portugal. Statistics Department*. March 2012.
- Altman, E. I. 1968. "Financial ratios, discriminant analysis and the prediction of corporate bankruptcy". *The Journal of Finance*, 23:589–610. doi: 10.2307/2978933
- Altunbas, Y.,L. Gambacorta, D. Marques-Ibanez. 2009. "Securitisation and the bank lending channel". *European Economic Review*, 53,: 996-1009.
- Amaral Loureiro, J. P. 2013. "O fenómeno da titularização em Portugal. Motivações para implementação no sector bancario". Trabalho final mestrado em Finanças. Lisboa School of Economics & Management. Accessed 7 September 2016. <https://www.repository.utl.pt/bitstream/10400.5/6255/1/DM-JPAL-2013.pdf>.
- Arellano, M., S. Bond. 1991. "Some tests of specification for panel data: Monte Carlo evidence and application to employment equations". *The Review of Economic Studies* 58: 277-297. <http://www.jstor.org/stable/2297968>
- Arellano, M., O. Bover. 1995. "Another look at the instrumental variable estimation of error-component models". *Journal of Econometrics* 68:29–51. doi: 10.1016/0304-4076(94)01642-D
- Bannier, C. E., D. N. Hänsel. 2006. Determinants of banks' engagement in loan securitization, Working Paper Series: Finance & Accounting, 171.
- Battaglia, F., A. Gallo. 2013. "Securitization and systemic risk: An empirical investigation on Italian banks over the financial crisis". *International Review of Financial Analysis*, 30: 274-286.
- Battaglia, F., A. Gallo, M. Mazzuca. 2014. "Securitized banking and the Euro financial crisis: Evidence from the Italian banks risk-taking". *Journal of Economics and Business*, 76: 85-100
- Battaglia, F., M. Mazzuca. 2011. "The effects of securitization on banks' performance. Evidence from Italy". Working paper. <http://ssrn.com/abstract=1911178>. Accessed 16 January 2013.

- Ben Salah, N., H. Fedhila. 2012. "Effects of securitization on credit risk and banking stability: Empirical evidence from American commercial banks". *International Journal of Economics and Finance* 4:194–207. doi:10.5539/ijef.v4n5p194
- Benmelech, E., Dlugosz, J., Ivashina, V., 2012. Securitization without adverse selection: the case of CLOs. *Journal of Financial Economics* 106, 91–113.
- Blundell, R., S. Bond. 1998. "Initial conditions and moment restrictions in dynamic panel data models". *Journal of Econometrics* 87:115-143. doi: 10.1016/S0304-4076(98)00009-8
- Calem, P. S., M. LaCour-Little. 2004. "Risk-based capital requirements for mortgage loans". *Journal of Banking & Finance*, 28: 647-672
- Carbo-Valverde, S., Degryse, H., & Rodríguez-Fernández, F. (2015). The impact of securitization on credit rationing: Empirical evidence. *Journal of Financial Stability*, 20, 36-50.
- Cardone-Riportella, C., R. Samaniego-Medina, A. Trujillo-Ponce. 2010. "What drives bank securitisation? The Spanish experience". *Journal of Banking and Finance* 34:2639–2651. doi:10.1016/j.jbankfin.2010.05.003
- Carlstrom, C.T., K. A. Samoluk. 1995. "Loan sales as a response to market-based capital constraints". *Journal of Banking and Finance* 19:627–646. doi: 10.1016/0378-4266(94)00144-R
- Casu, B., A., Clare, S.H. Thomas. 2010. "Does securitization reduce credit risk taking? Empirical evidence from US bank holding". *European Journal of Finance* 17:769-788. doi: 10.1080/1351847X.2010.538526
- Casu, B., Clare, A., Sarkisyan, A., Thomas, S., 2013. Securitization and bank performance. *Journal of Money Credit Banking*. 45, 1617–1658.
- Cebenoyan, S., L. Strahan. 2004. "What drives bank competition? Some international evidence". *Journal of Money Credit and Banking* 36:563–583.
<http://www.jstor.org/stable/3838954>
- Čihák, M., A. Maechler, K. Schaeck, S. Stolz. 2012. "Who disciplines bank managers?" *Review of Finance* 16:197–243. doi: 10.1093/rof/rfr010
- Dell’Ariccia, G., Igan, D., Laeven, L., 2012. Credit booms and lending standards: evidence from the subprime mortgage market. *Journal of Money Credit and Banking* 44, 367–384.

- DeMarzo, P.M. 2005. "The pooling and tranching of securities: A model of informed intermediation". *The Review of Financial Studies* 18:1–35. doi: 10.1093/rfs/hhi008
- Demirgüç-Kunt, A., E. Detragiache. 2011. "Basel Core Principles and Bank Risk: Does Compliance Matter?". *Journal of Financial Stability* 7: 179-190. Doi: 10.1016/j.jfs.2010.03.003
- Dionne, G., T. M. Harchaoui. 2003. "Banks' capital, securitization and credit risk: An empirical evidence for Canada". HEC Working Paper: 03-01
- ECB, 2014. The Impaired Eu Securitisation Market: Causes, Roadblocks and How To Deal with them. Available at https://www.ecb.europa.eu/pub/pdf/other/ecb-boe_impaired_eu_securitisation_market.en.pdf
- European Union (2015). REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL laying down common rules on securitisation and creating a European framework for simple and transparent securitisation and amending Directives 2009/65/EC, 2009/138/EC, 2011/61/EU and Regulations (EC) No 1060/2009 and (EU) No 648/2012. <http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52015SC0185&from=EN>
- Franke, G., J. P. Krahen. 2006. "Default risk sharing between banks and markets: The contribution of collateralized debt obligations". In: Carey, M. and R.M. Stulz (eds). *The risks of financial institutions*. University of Chicago Press, Chicago, pp. 603–633.
- Froot, K., J. P. Krahen. 2005. "Default risk sharing between banks and markets: The contribution of collateralized debt obligations". NBER Working Papers 11741, National Bureau of Economic Research, Inc.
- Greenbaum, S. I., A. V. Thakor. 1987. "Bank funding modes: Securitization versus deposits". *Journal of Banking and Finance* 11:379-401. doi: 10.1016/0378-4266(87)90040-9
- Goderis, B., Marsh, I., Vall Castello, J., Wagner, W., 2007. Bank Behaviour with Access to Credit Risk Transfer Markets. Bank of Finland, Helsinki.
- Gómez-Churruga, R., O. I. Cerqueira de Gouveia. 2015. "Revitalizando el mercado de titulaciones en Europa". Observatorio de divulgación financiera. Nota técnica, 19. Disponible en <https://www.iefweb.org/es/finanzas/visordocumentospdf/46>

- Gorton, G. B., G. G. Pennacchi. 1995. "Banks and loan sales: Marketing nonmarketable assets". *Journal of Monetary Economics* 35:379-401. doi: 10.1016/0304-3932(95)01199-X
- Hänsel, D. N., J. P. Krahen. 2007. "Does credit securitization reduce bank risk? Evidence from the European CDO Market ". SSRN working paper. Accessed 2 December 2010. <http://ssrn.com/abstract=967430>.
- Instefjord, N. 2005. "Risk and hedging: Do credit derivatives increase bank risk? Evidence from the European CDO market". *Journal of Banking and Finance* 29:333–345. doi: 10.1016/j.jbankfin.2004.05.008
- Jiangli, W., M. Pritsker. 2008. "The impacts of securitization on US bank holding companies2. Federal Reserve Bank of Chicago Proceedings. May: 377–393.
- Jiangli, W., M. Pritsker, P. Paupach. 2007. "Banking and securitization". Working Paper, FDIC, Federal Reserve Board and Deutsche Bundesbank.
- Kara, A., Marques-Ibanez, D., & Ongena, S. (2016). Securitization and lending standards: Evidence from the European wholesale loan market. *Journal of Financial Stability*, 26, 107-127
- Keys, B.J., Mukherjee, T.K., Seru, A., Vig, V., 2010. Did securitization lead to lax screening: evidence from subprime loans 2001–2006. *Quarterly Journal of Economics* 125, 307–362.
- Krahen, J. P., C. Wilde. 2006. "Risk Transfer with CDOs and Systemic Risk in Banking". CFS Working Paper No. 2006/04
- Hänsel, D.N., Krahen, J.P., 2007. Does credit securitization reduce bank risk? Evidence from the European CDO market. SSRN Working Paper.
- Laeven, L., R. Levine. 2009. "Bank Governance, Regulation and Risk Taking". *Journal of Financial Economics* 93: 259-275. doi: 10.3386/w14113
- Leland, H. E. 2007. "Financial synergies and the optimal scope of the firm: Implications for mergers, spinoffs, and structured finance". *The Journal of Finance* 62:765-807. doi: 10.1111/j.1540-6261.2007.01223.x
- Lockwood, L. J., R. C. Rutherford, M. J. Herrera. 1996. "Wealth effects of asset securitization". *Journal of Banking and Finance* 20:151–164. doi:10.1016/0378-4266(94)00101-4
- López-Andión, C., I. Iglesias-Casal, M. C. López-Penabad, J. M. Maside-Sanfiz. 2015. "The solvency of financial institutions in Spain: lessons from securitization". *Applied Economics* 47, 44, 4741-4753. doi: 10.1080/00036846.2015.1034841

- Loutskina, E., 2011. The role of securitization in bank liquidity and funding management. *Journal of Financial Economics* 100, 663–284.
- Martin-Oliver, A., J. Saurina. 2007. Why do Banks Securitize Assets? Bank of Spain.
- Mian, A., Sufi, A., 2009. The consequences of mortgage credit expansion: evidence from the U.S. mortgage default crisis. *Quarterly Journal of Economics* 124, 1449–1496.
- Michalak, T., A. Uhde. 2012. “Credit risk securitization and bank soundness: Evidence from the micro-level for Europe”. *Quarterly Review of Economics and Finance* 52:272–285. <https://ssrn.com/abstract=1383469>
- Nadauld, T.D., Weisbach, M.S., 2012. Did securitization affect the cost of corporate debt? *Journal of Financial Economics* 105, 332–352.
- Otero González, L., M. Ezcurra Pérez, O. Martorell Cunil, C. Mulet Forteza. 2013. “Análisis del impacto de la titulización hipotecaria en la estabilidad financiera del sistema bancario español, Spanish Journal of Finance and Accounting / Revista Española de Financiación y Contabilidad, 42:160, 513-533, DOI: 10.1080/02102412.2013.11102928
- Otero González, L. A., L. I. Rodríguez Gil, O. Martorell Cunill, O, J. M. Merigó Lindahl. 2016. “The effect of financial innovation on European banks’s risk”. *Journal of Business Research*, 69: 4781-4786.
- Parlour, C. A., G. Plantin. 2008. “Loan Sales and Relationship Banking”. *The Journal of Finance* . Vol. LXIII, N. 3: 1291-1314
- Pinto, J., M. Marques. 2007. “O movimento de Titularização de Activos em Portugal”. *Cadernos do Mercado de Valores Mobiliários*, 26, 8-45.
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2368617
- Purnanandam, A., 2011. Originate-to-distribute Model and the Subprime Mortgage Crisis. *The review of financial studies* 24, 1881–1915.
- Riddiough, T. J. 1997. “Optimal design of asset backed securities”. *Journal of Financial Intermediation* 6:121–152. doi: 10.1006/jfin.1997.0214
- Sarkisyan, A., B. Casu. 2012. “Credit and liquidity support in securitizations and implications for bank solvency”. Lamfalussy Fellowship Program sponsored by the ECB. Accessed 11 January 2013. http://inscripciones.adeit-uv.es/econgres/finanzas_2012-13/barbara_cassu.pdf.
- Shaffer, S. 2013. “Reciprocal deposits and incremental bank risk”. *Applied Economics* 45:4857–4860. doi: 10.1080/00036846.2013.806784

- Shin, H. S. 2009. "Securitisation and financial stability". *The Economic Journal* 119:309–332. doi: 10.1111/j.1468-0297.2008.02239.x
- Shivdasani, A., Wang, Y., 2011. Did structured credit fuel the LBO boom? *J. Finance* 66, 1291–1328.
- Uhde, A., U. Heimeshoff. 2009. "Consolidation in banking and financial stability in Europe: Empirical evidence". *Journal of Banking and Finance* 33:1299–1311. doi: 10.1016/j.jbankfin.2009.01.006
- Uzun, H., E. Webb. 2007. "Securitization and risk: Empirical evidence on US banks". *The Journal of Risk Finance* 8:11–23. doi: 10.1108/15265940710721046
- Wagner, W. 2007. "The liquidity of bank assets and banking stability". *The Journal of Banking and Finance* 31:121–139. doi: 10.1016/j.jbankfin.2005.07.019

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- ¹ The European Commission has already introduced incentives for properly structured securitisation in the Delegated Regulations for Solvency II (2015/35) and the Liquidity Coverage Ratio (LCR - 2015/62), adopted in October 2014. Both the ECB and the BoE have carried out work on this area. A task force led by the BCBS and IOSCO has been involved in developing International standards to facilitate the identification of simple, transparent, comparable securitisations, while the European Banking Association (EBA) has been fulfilling a similar role for European banking standards.
- ² To the best of our knowledge, empirical, Amaral Loureiro (2013); and theoretical, Pinto and Marques (2007), Almeida and Crespo (2010, 2011) and Almeida, Crespo and Santa (2012).
- ³ Of the 42 entities, only 35 were included in the estimations, since no data were available for any of the variables for the remaining 7 entities.
- ⁴ Following Michalak and Udhe (2012) and López-Andi3n et al. (2015) our model included: the rate of GDP growth, inflation, short term interest rates and the Herfindall Index; but neither was found to be significant. As a result we did not include these variables in the final model. The results will be made available to those interested.
- ⁵ The analysis has been carried out for the referred periods. The results will be made available to those interested.