

Housing Markets and Bank Stability: Evidence from European Countries After the 2008 Financial Crisis**Tsaubin Chen^{1*}**Assistant Professor
Dep. of International Business
Shih Chien University
Taiwan**Abstract**

The house price bank stability relationship was empirically investigated based on 2008–2018 data from 24 European countries. Since the 2008 financial crisis, house price has been an important indicator for assessing the state of the European economy and bank stability. Herein, the author argues that the increase in house prices in European countries may improve the nonperforming loan (NPL) ratios and banking stability may increase. The dynamic panel data analysis results in this study revealed the existence of a negative NPL ratio–house price index relationship in both the long and short run. In conclusion, after the 2008 financial crisis, European housing markets were essential to ensuring banking stability.

Keywords: Nonperforming Loans; Bank Stability; PMG Method; Panel Data Analysis**JEL Classification: C23, C51, G21, and G2****1. Introduction**

The primary aim of the current study was to identify the importance of European housing markets related to banking stability after the 2008 financial crisis. As a result of the financial crisis, almost all European countries experienced reduced economic growth and increased unemployment rates; as an additional setback, some of these countries saw credit risk deterioration.

The World Bank data indicate that the severity of the postcrisis recession in many European countries led to a significant increase in the nonperforming loan (NPL)-to-total gross loan ratios (i.e., NPL ratios). For instance, over 2008–2013, the NPL ratios in Ireland, Cyprus, Bulgaria, Greece, Hungary, Spain, Croatia, and Slovenia grew 1,237%, 973%, 602%, 583%, 421%, 234%, 217%, and 216%, respectively². In European banks, the increased NPL ratio was a key factor underlying the low aggregate profitability³. European banks typically have lower returns on equity, which is estimated to be too low to cover equity costs; however, in these European banks, the 2008 global financial crisis deteriorated asset quality. The increase in the NPL ratios after the crisis possibly reveals the problems in distressed debt management in the European banking system, but the key macroeconomic factor underlying this may be the collapsing housing markets in

European countries as indicated by the postcrisis reduction in the house price index by 49%, 35%, 32%, 16%, 35%, 18%, and 18% in Ireland, Bulgaria, Greece, Hungary, Spain, Croatia, and Slovenia, respectively⁴. Thus, these data indicate that house prices may represent an important determinant of the NPL ratio a problem ignored or rarely considered thus far.

Researchers have argued that NPL determinants are mainly associated with either macroeconomic variables (e.g., economic growth, national debt, unemployment rate, and inflation rate) or bank-specific characteristics (e.g., asset management quality and financial supervision). Several studies have also explored the potential effects of house prices on several factors; however, the role of house prices in credit risk deterioration warrants further exploration.

In European countries, housing markets exhibit different growth patterns: some have a boom and bust cycle, whereas some demonstrate continuous growth, and some exhibit few fluctuations (Hartmann, 2015). In the early 2000s (i.e., precrisis period), house prices in many European countries followed a somewhat similar upward trend (Scanlon et al, 2011); this trend became downward after the financial crisis over 2008–2013 and upward thereafter.

¹ * corresponding author, Tel (Fax): +886-2-2538-1111 ext. 8906, E-mail: tsaubin_chen@g2.usc.edu.tw

² NPL ratio data were retrieved and calculated from the World Development Indicators (WDIs).

³ Please refer to the Keynote speech by Mr. Vitor Constâncio, Vice President of the European Central Bank, at an event entitled “Tackling Europe's non-performing loans crisis: restructuring debt, reviving growth”, organised by Bruegel, Brussels, 3 February 2017.

⁴ Property price index data were retrieved and calculated from the BIS Residential Property Price Statistics.

In contrast to the situation in most European countries where the house price index experienced a boom and bust cycle in the pre- and post-financial crisis turmoil, the related situation in Germany has differed. Over 2008-2013, the NPL ratio sharply decreased to 5.3%, but the decrease became steady after 2013, becoming as low as 1.24% in 2018. By contrast, in Germany, the house price index increased by 8.3% over 2008-2013 and by approximately 30% over 2013-2018. This case of Germany may provide clarification of how housing market development may cause such low NPL ratios.

The purpose of the current study was to confirm that house price is a strong determinant of NPL ratios in European countries over 2008–2018. This issue is considered serious, mainly because bank insolvency has become a critical problem for countries experiencing deteriorations in their bank assets after the 2008 financial crisis. The means by which the European housing markets jeopardize both short- and long-term soundness of a country's financial sector remain ambiguous; thus, examining the empirical data of the European countries may offer some policy implications for bank stability.

2. Literature Review

Bank stability is invariably associated with NPL ratios, and according to numerous empirical studies that have examined this issue, NPL ratio determinants are primarily associated with macroeconomic and bank-specific variables, including GDP growth rates, interest rates, unemployment rates, returns on assets, returns on equity, loans-to-savings ratios, national debt, and CPI inflation. The literature contains numerous empirical studies on NPL ratio determinants,⁵ with most of these studies providing evidence supporting the view that macroeconomic determinants are associated with NPL ratios.

From a recent examination of seven European countries, Kiukaj and Kil (2020) reported that a favorable macroeconomic situation in the European countries in 2015-2017 has contributed to NPL level improvement due to a significant decrease in the unemployment rate. Moreover, Kiukaj and Kil (2020) argued that the deteriorating NPL ratios of their study cases were mainly due to the economic slowdown attributable to the financial crisis over 2007-2009.

Along with the macroeconomic determinants of NPL ratios, some researchers have identified the

determinants of bank characteristics; for instance, Dimitrios et al. (2016) noted that returns on assets and returns on equity had negative correlations with the NPL levels found in Euro-region countries, whereas other studies have also explored the potential effects of asset prices on bank stability (Koeeter and Poghosyan, 2010; Pan and Wang, 2013). Vouldis and Louzis (2018) argued that in Greece, the most important leading indicators for NPLs are bank-specific variables.

Various studies have demonstrated that a typical boom and bust in the housing market can lead to severe financial instability. This severe financial instability can eventually have direct effects on a country's economic growth prospects because housing asset characteristics are associated with bank loan quality⁶ and housing is frequently used as loan collateral (Goodhart and Hofmann, 2007). Hartmann (2015) reported that in European housing markets, boom and bust cycles have been major factors in systemic financial crises.

The relationship between house price and NPL has been empirically tested in various studies, resulting in this relationship being interpreted from different perspectives. Two contrasting views have been reported on the mechanism underlying the effect of house price on bank loans: (1) Increasing house prices can increase collateral value, thereby improving the ability of borrowers to engage in mortgage refinancing and simultaneously reducing the risk of default (Kiyotaki and Moore, 1997). According to this perspective, higher housing prices enhance bank stability, implying a negative house price NPL ratio relationship⁷. (2) Increasing house prices may induce a perverse incentive or moral hazard leading to excessive lending from banks and additional betting by speculators on related assets (Evans et al., 2000; Dell'Ariccia and Marquez, 2006). According to this perspective, higher house prices may create greater information asymmetry, potentially resulting in the banks holding more risky assets, and such increased housing prices eventually lead to an increase in the instability of banks. This perspective, therefore, implies a positive house price NPL relationship.

Instability in the housing market has been reported to lead to instability in the banking sector, with several related studies providing international comparisons clearly showing initial sharp surges in house prices during periods of banking crises, followed by steady declines⁸. The

⁵ See for example Keaton and Morris (1987); Gambera (2000); Nkusu (2011); Louzis, Vouldis, and Metaxas (2012); Kauko (2012); Škarica (2014); Dimitrios, Louri, and Tsonas (2016); Vouldis, Angelos T., and Louzis (2018); and Kiukaj, Radoslaw, and Kil (2020).

⁶ See for example Evans, Leone, Gill, and Hilbers (2000); Reinhart and Rogoff (2008); Davis and Zhu (2011); and Moscone, Tosetti, and Canepa (2014).

⁷ See for example Daglish (2009), Niimimaki (2009), and Moscone et al. (2014).

⁸ See for example Lindgren, Garcia, and Saal (1996); Enoch and Green (1997); Kaminsky and Reinhart (1999); and Evans et al. (2000).

theoretical models used in the relevant studies suggest that when a housing bubble bursts, house owners or speculative investors may have difficulties in rolling over their loans and be unable or unwilling to repay their mortgages; the collapse of a housing bubble may lead to an increase in NPL ratios, ultimately increasing bank instability.

From a recent examination of seven European countries by panel data analysis, Kiukaj and Kil (2020) reported a positive NPL–house price relationship. However, in Taiwan, Wu, Chang, and Selvili (2003) and Chen and Fang (2019) found this relationship to be negative.

To explore this issue, the author collected annualized house price indexes over 2008–2018 from the BIS database; GDP, and NPL ratio, from the World Bank WDI⁹ of 24 European countries.¹⁰ Panel data analysis was subsequently undertaken to verify the relationships between NPL ratios, economic performance, and house price index. Our study involved the use of mean group (MG) and pooled MG (PMG) approaches to estimate the relationships in the dynamic panels, mainly because house price data during boom or bust periods is typically nonstationary.

The investigation of the NPL ratio house price relationship in European countries over our 10-year sample period may provide a valuable contribution to the literature on bank stability. The main findings of our study are that in the long and short run, the NPL ratio house price index relationship was found to be negative.

$$y_{it} = \lambda_i y_{i,t-1} + \sum_{j=0}^1 \delta'_{ij} X_{i,t-j} + \mu_i + \varepsilon_{it}, \quad (1)$$

whereas the error-correction equilibrium can be expressed as

$$\Delta y_{it} = \phi_i y_{i,t-1} + \beta'_i X_{it} + \delta'_{it} \Delta X_{it} + \mu_i + \varepsilon_{it}, \quad (2)$$

where $\Delta y_{it} = y_{it} - y_{i,t-1}$, $\Delta X_{it} = X_{it} - X_{i,t-1}$, $\phi_i = -(1 - \lambda_i)$, $\beta_i = \sum_{j=0}^1 \delta_{ij}$.

The disturbances, ε_{it} , are assumed to be distributed across i and t independently, with zero mean, positive variance, and finite fourth-order moment values; these disturbances are also distributed independent of the regressors, X_{it} . The author next assumed that the long-run equation is stable, and that $\phi_i < 0$, so that the y_{it} – X_{it} relationship is a long-run relationship. The long-run

3. Models and Econometric Estimation

In pooled estimation, including fixed and random effects model analyses, slope coefficients and error variances are considered identical or homogeneous. The MG method is used to estimate separate regressions, followed by coefficient mean calculation, where the slope coefficients are heterogeneous. The PMG method involves an intermediate procedure in which constraints are placed on long-run coefficients, thereby ensuring that the coefficients are identical; this allows across-group differences in short-run coefficients and error variances and thus imposes a homogeneity restriction on long-run relationship coefficients.

Pesaran, Shin, and Smith (1999) reported that various factors may lead to similarities across different groups in long-run equilibrium relationships between variables such as budgetary and solvency constraints, arbitrage conditions, or common technologies, which influence all groups in a similar manner. This long-run slope homogeneity between coefficients can be evaluated using the Hausman test statistic.

Based on an autoregressive distributed lag (ARDL) model, a dynamic heterogeneous panel estimator can be constructed. For simplicity, the ARDL (1, 1,...,1) model can be expressed as:

coefficients on X_{it} , defined here as $\theta_i = -\beta'_i/\phi_i$, are the identical across groups, with both the coefficients of long-run (θ_i) and group-specific error correction (ϕ_i) computed using maximum likelihood estimation.

For the long-run equation, the dynamic panel representation is

$$NPL_{it} = \lambda_i NPL_{i,t-1} + \delta_{10i} HP_{it} + \delta_{11i} HP_{it-1} + \delta_{20i} GDP_{it} + \delta_{21i} GDP_{it-1} + \mu_i + \varepsilon_{it}, \quad (3)$$

⁹ Annual GDPs are based on purchasing power parity and in constant 2011 international dollars. The house price index is calculated from the BIS residential property price of all dwellings. The author transformed the quarterly index into the annual index and selected 2015 as the base year.

¹⁰ On the basis of the availability of data over 2008–2018, this paper analyzes data from 24 EU countries: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Germany, Estonia, Spain, France, the United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Malta, the Netherlands, Poland, Portugal, Sweden, Slovenia, and Slovakia.

and the error-correction representation is

$$\Delta NPL_{it} = \phi_i(NPL_{i,t-1} - \mu_i - \theta_{1i}HP_{i,t-1} - \theta_{2i}GDP_{i,t-1}) + \delta_{10}\Delta HP_{it} + \delta_{20}\Delta GDP_{it} + \varepsilon_{it}, \quad (4)$$

where NPL represents the NPL ratios, HP the house price indexes, and GDP is the gross domestic products all in the logarithmic form. Data from 24 European countries are included, and the panel analysis is conducted using PMG, MG, and fixed effect methods to identify the NPL ratio–house price relationship.

4. Results

The estimation results from the panel data analysis of the NPL ratios and house prices, as described in

TABLE 1

PANEL DATA ANALYSIS RESULTS FOR NONPERFORMING LOAN (NPL) RATIO, ECONOMIC GROWTH, AND HOUSE PRICES^a

Variables	PMG Estimators ^{b,d}	MG Estimators ^{b,d}	Hausman Test ^{c,d} p-value	Fixed Effect ^{b,d}
Intercept	30.4096*** (4.3143)	131.8381*** (38.1847)		29.4514*** (6.5945)
Error Correction Coefficients				
ϕ	-0.3928*** (0.0558)	-0.4664*** (0.1424)	0.7308	-0.2548*** (0.0320)
Long-Run Coefficients				
$\theta(HP)$	-0.7692*** (0.0927)	-0.3687 (2.3287)		-0.5470 (0.6152)
$\theta(GDP)$	-2.7259*** (0.2603)	-7.4295 (5.1092)		-4.2208*** (1.1423)
Short-Run Coefficients				
$\delta(HP)$	-1.2090*** (0.4047)	-0.3110 (0.7423)		-1.5374*** (0.3045)
$\delta(GDP)$	-1.8524*** (0.6697)	0.7892 (1.1024)		-2.0772*** (0.6618)
No. of Groups	24	24		24
No. of Obs.	240	240		240

Notes:

^a The dependent variable is NPL ratio.

^b PMG and MG refer to pooled mean group and mean group methods, respectively.

^c The null hypothesis in the Hausman test statistic is that the difference between the coefficients is nonsystematic and that the Hausman test statistic has a probability greater than the χ^2 value.

^d *** indicates significance at the 1% level; figures in parenthesis are standard errors.

The long-run effects of house prices on NPL ratios were negative with significance at the 1% level in the PMG method alone, whereas they were negative but nonsignificant in the MG and fixed effect methods. Similarly, in all three specifications, the short-run effects of house prices on NPL ratios were negative with significance at the 1% level in the PMG and fixed effect methods, whereas they were negative but nonsignificant in the MG method alone. The long-run effects of GDP on the NPL ratios were negative with significance at the 1% level in the PMG and fixed

Equations (3) and (4), are presented in Table 1, where three specifications are reported based on a sample of 240 observations over 2008–2018. The author found that all error-correction coefficients in the three specifications had negative signs (significance at the 1% level); this implies that the relationship of the dependent variable with the independent variables is a long-run relationship.

effect methods, whereas they were negative but nonsignificant in the MG method alone. Similarly, the short-run effects of GDP on the NPL ratios were negative with significance at the 1% level in the PMG and fixed effect methods, whereas they were positive but nonsignificant in the MG method alone. In all three methods, the intercepts were positive with significance at the 1% level.

The Hausman test statistic did not indicate rejection of the null hypothesis for long-run slope homogeneity in the coefficients; this implied that the PMG

method was preferable to the MG method. The empirical results confirm that long-run equilibria are more likely in the housing market than in other markets (Herring and Wachter, 1999), with the results being consistent with the view that house prices may increase both collateral value and bank stability and the effects of house prices on the NPL ratios may exist in both the long and short run. The current empirical results also confirmed in both the long and short-run that macroeconomic variables such as GDP may affect bank stability. Economic recession may increase NPL ratios.

Several studies have indicated that increasing house prices potentially have either positive or negative effects on NPL ratios. In the present study, the author empirically examined 2008-2018 annual data on 24 European countries by using dynamic panel data analysis and found a negative long- and short-run relationship between house prices and NPL ratios.

5. Conclusions

The relationship between house prices and bank loan performance quality has remained vague thus far. Any increase in house prices can increase the collateral value of the property, which would aid in improving bank loan performance quality. However, any increase in house prices may also induce excessive lending and attract greater attention by speculative investors, thereby leading to an overall deterioration in bank loan performance quality.

REFERENCES

- Ciukaj, Radoslaw, Kil, Krzysztof (2020). Determinants of the Non-performing Loan Ratio in the European Union Banking Sectors with a High Level of Impaired Loans, *Economics and Business Review*, 6 (20), No. 1: 22-45.
- Chen, Tsaubin, Fan, Chiang Ku (2019). Non-Performing Loans and Housing Prices in Taiwan, *Journal of Applied Finance & Banking*, 9(6): 57-66.
- Daglish, T. (2009). What Motivates a Subprime Borrower to Default? *Journal of Banking and Finance*, 33(4): 681-93.
- Davis, E.P. and H. Zhu (2011). Bank Lending and Commercial Property Cycles: Some Cross-country Evidence, *Journal of International Money and Finance*, 30(1): 1-21
- Dell'ariccia, G. and Marquez, R. (2006). Lending Booms and Lending Standards, *The Journal of Finance*, 61: 2511–2546.
- Dimitrios, A., H. Louri and M. Tsionas (2016). Determinants of Non-performing Loans: Evidence from Euro-area Countries, *Finance Research Letters*, 18: 116-19.
- Enoch, Charles and J. H. Green (1997). *Banking Soundness and Monetary Policy*, IMF.
- Evans, O., A.M., Leone, M.S. Gill and P.L.C. Hilbers (2000). *Macroprudential Indicators of Financial System Soundness*, IMF Occasional Papers No.192, International Monetary Fund.
- Gambera, M. (2000). *Simple Forecasts of Bank Loan Quality in the Business Cycle*, Emerging Issues Series, Federal Bank of Chicago.

Moreover, in most previous studies, the discussion on how variations in the duration of a housing boom or bust affect bank stability has been insufficient. Here, based on the selected data, the author performed an empirical examination of the underlying relationships and attempted to distinguish between the short- and long-run effects of house prices on NPL ratios through the PMG method. Our empirical results provide evidence supporting the hypothesis that house prices have direct effects on bank loan performance quality because house prices somewhat explain the reasons behind the presence of high NPL ratios in several European countries in economic recession attributable to subprime mortgage crises.

The current empirical evidence also suggested that persistent decreases in house prices after the 2008 financial crisis can aid in explaining the phenomenon of a high NPL ratio in the 24 European countries, with the findings potentially offering implications for overall financial stability and policymakers in the future. Because of the steady growth of the housing market can reduce NPL ratios over long periods, the housing market may be critical for ensuring financial stability. This further implies macroprudential policies aimed at preventing large boom and bust cycles in the housing markets can increase bank stability. Thus, our empirical results support the perspective that the higher housing prices are, the greater bank stability is; therefore, the NPL ratio–house price relationship is negative.



- Goodhart, C. and B. Hofmann (2007). *House Prices and the Macroeconomy: Implications for Banking and Price Stability*, Oxford, UK: Oxford University Press.
- Hansen L.P. and T.J. Sargent (1980). Formulating and Estimating Dynamic Linear Rational Expectations Models, *Journal of Economic Dynamics and Control*, 2: 7-46.
- Hartmann, Philipp (2015). *Real Estate Markets and Macroprudential Policy in Europe*, Working Paper Series No. 1796, European Central Bank.
- Herring, R. and Susan Wachter (1999). *Real Estate Booms and Banking Busts: An International Perspective*, Center for Financial Institutions Working Papers 99-27, Wharton School Center for Financial Institutions, University of Pennsylvania.
- Kaminsky, Graciela L. and Carmen M. Reinhart (1999). The Twin Crises: The Causes of Banking and Balance-of-Payments Problems, *American Economic Review*, 89(3): 473-500.
- Kauko, K. (2012). External Deficits and Non-performing Loans in the Recent Financial Crisis, *Economics Letters*, 115(2): 196-99.
- Keeton, W. and C. Morris (1987). Why Do Banks' Loan Losses Differ? *Economic Review*, (May, 1987): 3-21.
- Kiyotaki, N. and J. Moore (1997). Credit Cycles, *Journal of Political Economy*, 105: 211-48.
- Koetter, M. and T. Poghosyan (2010). Real Estate Prices and Bank Stability, *Journal of Banking and Finance*, 34(6): 1129-38.
- Lau, E.E.L., G.K.R. Tan and S. Rahman (2005). Assessing Pre-crisis Fundamentals in Selected Asian Stock Markets, *Singapore Economic Review*, 50: 175-196.
- Lindgren, C., Garcia, G. G. and Matthew I. Saal, (1996). *Bank Soundness and Macroeconomic Policy*, IMF.
- Louzis, D.P., A.T. Vouldis and V.L. Metaxas (2012). Macroeconomic and Bank- specific Determinants of Non-performing Loans in Greece: A Comparative Study of Mortgage, Business and Consumer Loan Portfolios, *Journal of Banking and Finance*, 36(4): 1012-27.
- Moscone, F., E. Tosetti and A. Canepa (2014). Real Estate Market and Financial Stability in US Metropolitan Areas: A Dynamic Model with Spatial Effects, *Regional Science and Urban Economics*, 49: 129-46.
- Niinimäki, J.P. (2009). Does Collateral Fuel Moral Hazard in Banking? *Journal of Banking and Finance*, 33(3): 514-21.
- Nkusu, M. (2011). *Non-performing Loans and Macro-financial Vulnerabilities in Advanced Economies*, IMF Working Paper No. WP/11/161, International Monetary Fund.
- Pan, H. and C. Wang (2013). House Prices, Bank Instability and Economic Growth: Evidence from the Threshold Model, *Journal of Banking and Finance*, 37(5): 1720-32.
- Pesaran, S., Y. Shin and R. Smith (1999). Pooled Mean Group Estimation of Dynamic Heterogeneous Panels, *Journal of the American Statistical Association*, 68: 621-34.
- Piergiorgio A. (2005). Bubbles and Fads in the Stock Market: Another Look at the Experience of the US, *International Journal of Finance and Economics*, 11: 195-203.
- Poterba J.M. and L.H. Summers (1986). The Persistence of Volatility and Stock Market Fluctuations, *American Economic Review*, 76: 1142-51.
- Scanlon, K, Lunde, J and Whitehead, C. (2011). Responding to the housing and financial crises: mortgage lending, mortgage products and government policies, *International Journal of Housing Policy* 11:1, 23-49.
- Škarica, B. (2014). Determinants of Non-performing Loans in Central and Eastern European countries, *Financial Theory and Practice*, 38(1): 37-59.
- Tajik, M., S. Aliakbari, T. Ghalia and S. Kaffash (2015). House Prices and Credit Risk: Evidence from the United States, *Economic Modelling*, 51: 123-35.



Wu, Wen-Chieh, Chang, Chin-Oh, and Zeklye Selvili (2003). Banking System, Real Estate Markets, and Nonperforming Loans, *International Real Estate Review*, 6(1): 43-62.

Vouldis, Angelos T., Louzis, Dimitrios P. (2018). Leading Indicators of Non-Performing Loans in Greece: the Information Content of Macro-, Micro- and Bank-specific Variables, *Empirical Economics*, 54:1187-1214.